



Madison Water Utility

Strategic Asset Management Plan Implementation Strategy and Roadmap

December 2018

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Appendices

Appendix A – MWU AM Program Team Charter

Appendix B – Madison Water Utility Gap Assessment

Appendix C – AM Policy

1. Introduction

1.1 The Need for Asset Management

Madison Water Utility (MWU) manages water supply, treatment and distribution assets to deliver services to its customers. MWU is commencing a multi-year, phased implementation of a Strategic Asset Management (SAM) Program to develop and implement leading asset management (AM) principles and practices focused on improving MWU's overall efficiencies and effectiveness in delivering services to its customers. AM practices include managing all phases of the asset lifecycle, over numerous disciplines, for each of MWU's service areas. The initial phase of the program is the development of the Strategic Asset Management Plan (SAMP), which will include the framework elements of an SAM Program that are appropriate for MWU. The SAMP will form the basis of the development of the Strategic Asset Management Implementation Plan (SAMIP or Roadmap). This involves the development of the overall AM strategy, supporting improvement initiatives and roadmap. MWU's SAM Program is expected to achieve the following changes and improvements to how assets are managed at MWU:

- Integrate information across MWU
- Make information available to all customers
- Establish asset management requirements
- Quantify actual asset condition and the associated risk profile
- Contribute to continuously improving the Utility's long-term asset planning
- Achieve consistent and accurate performance monitoring and reporting based on objective asset data
- Compare, optimize and prioritize among potential capital projects
- Compare, optimize and prioritize among potential maintenance activities
- Achieve benefits/cost efficiencies
- Understand, articulate and refine Levels of Service as the strategic performance metrics for asset management
- Ensure that confidence in MWU's proposed budget recommendations by rate decision-makers is high
- Measure and monitor organizational buy in and practicing of the Utility's AM principles
- Increase and retain institutional knowledge through asset knowledge management and training/capabilities development of staff

1.2 SAM Team

MWU's SAM Program is being developed under the initiative and leadership of the SAM Team. The SAM Team has been chartered under this project and will continue to function as a team during the SAM Program's implementation. The SAM Team and Program Charter is included in Appendix A.

MWU's SAM Team includes the following:

- Tom Heikkinen, General Manager
- Joe Demorett, P.G., Water Supply Manager
- Al Larson, P.E., Principal Engineer
- Pete Braselton, Mapping/GIS Coordinator
- Seth McClure, P.E., Asset Manager
- Joe Grande, Water Quality Manager
- Dan Rodefled, Operations Manager
- Doug Van Horn, Maintenance Supervisor
- Tom Rosemeyer, Field Supervisor
- Robin Piper, Chief Administrative Officer
- Amy Barrilleaux, Public Information Officer

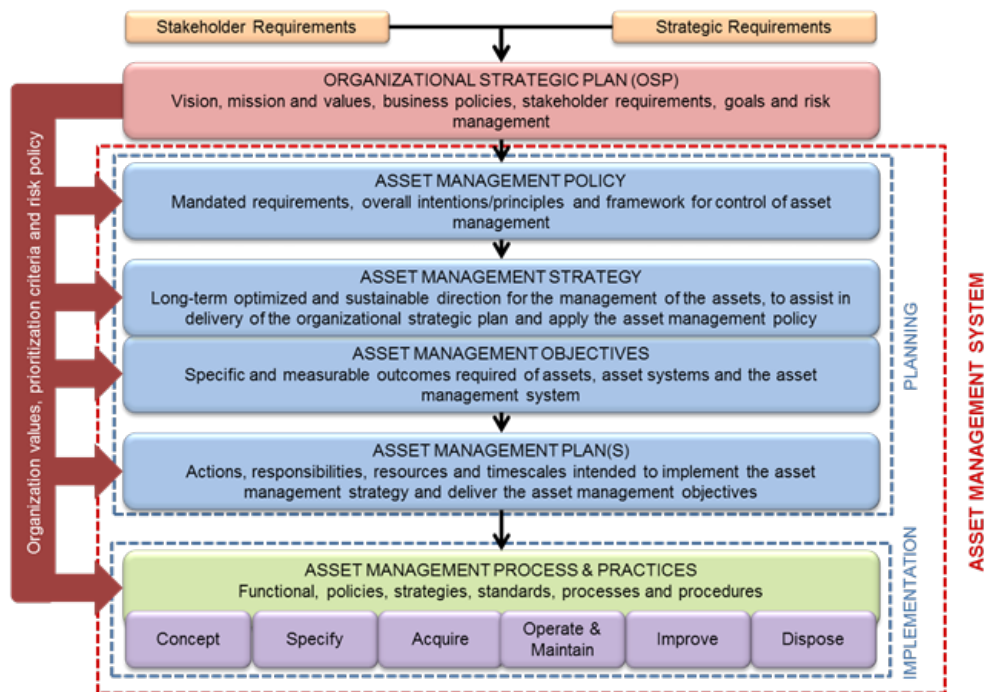
1.3 Overview of the Development of MWU's SAM Program Implementation Strategy

1.3.1 AM Definition

Asset Management is often defined as a framework, which is a way of thinking that is built around a body of leading practices. This way of thinking and the body of leading practices focus on seeking the lowest total lifecycle cost of ownership for infrastructure assets while delivering services at a level customers and stakeholders require and are willing to pay for at an acceptable level of risk to the community. While asset management is a strategic-level framework that supports the primary function of the organization, it is only fully effective when also practiced day-to-day at the tactical asset level – that is, when individual capital investments that support growth, augmentation, or renewal are the right solutions, for the right reasons, at the right time, and when maintenance investment is cost-effective in extending asset life, sustaining performance, and enhancing reliability.

The Strategic Asset Management Plan (SAMP) is developed based on leading practices, can be used to guide the development of tactical asset management plans (TAMPs) and can be used to implement the strategies that are identified. GHD's proposed approach considers key elements of an asset management program as identified by ISO 55000 and the US EPA AM frameworks. Figure 1 presents the relationship between different asset management program elements and defines which of those elements are considered inside the asset management system. As shown in Figure 1, the asset management system is comprised of planning and implementation elements.

Development of MWU's SAM Program will utilize the results of MWU's asset management practices gap assessment conducted previously that identified improvement areas, with the main focus being on leveraging the Utility's existing data and information systems.



Source: IAM (adapted from PAS-55:2008)

Figure 1 Asset Management Program Elements

1.3.2 Strategic Asset Management (SAM) Framework

Asset Management is an approach that helps determine the appropriate mix of management investment in maintenance, operations, and capital that sustains organizational performance over a long-term horizon while minimizing lifecycle costs. MWU's SAM Program will provide the means for effective management of assets by finding the appropriate balance between levels of service, cost of service, and acceptable risk.

Asset management program elements and business processes included in the SAM Framework include:

- Asset Management Policy;
- Asset Management organizational structure, roles and responsibilities;
- Asset Management goals, objectives and outcomes;
- Levels of Service (LOS) and Performance Framework;
- Risk Management Framework (this will build upon work already completed); and
- Change management, training and education.

Leading practices in asset management that have evolved over the past two decades point to the development of strategic and tactical asset management plans as key to answering the questions and telling the story of the assets. Tactical asset management plans (TAMPs) are updated on a periodic basis as central, living documents that help articulate to the organization and to stakeholders how assets are managed. The SAMP identifies and sets goals, objectives, and strategies to be used in the development of future TAMPs. The TAMPs will be used to define the requirements and strategies to be implemented for asset classes or groups.

The framework for developing TAMPs will be based on the US EPA's Five-Core Questions and 10-Step Process. This framework is structured around answering the following questions about utility infrastructure assets:

Question 1: What is the current state of our assets?

- What do we own?
- Where is it?
- What condition is it in?
- What is its remaining useful life?
- What is its remaining economic value?

Question 2: What is our required level of production or service?

- What is the demand for our services by our stakeholders/customers?
- What do the regulators require?
- What is our actual performance?
- What are the physical capabilities of our assets?

Question 3: Which assets are critical to sustained performance?

- How can assets fail?
- How do assets fail?
- What are the likelihoods (probabilities) and consequences of asset failure?
- What does it cost to repair the asset?
- What are the other costs (social, environmental, etc.) that are associated with asset failure?

Question 4: What are our best O&M and CIP investment strategies?

- What alternative strategies exist for managing O&M, personnel, and capital budget accounts?
- What strategies are the most feasible for our organization?
- What are the costs of rehabilitation, repair, and replacement for critical assets?

Question 5: What is our best long-term funding strategy?

- Do we have enough funding to maintain our assets for our required level of service?
- Is our rate structure sustainable for our system's long-term needs?

Figure 2 shows the five Core Questions, the 10 steps, and the primary asset management work processes that support them.

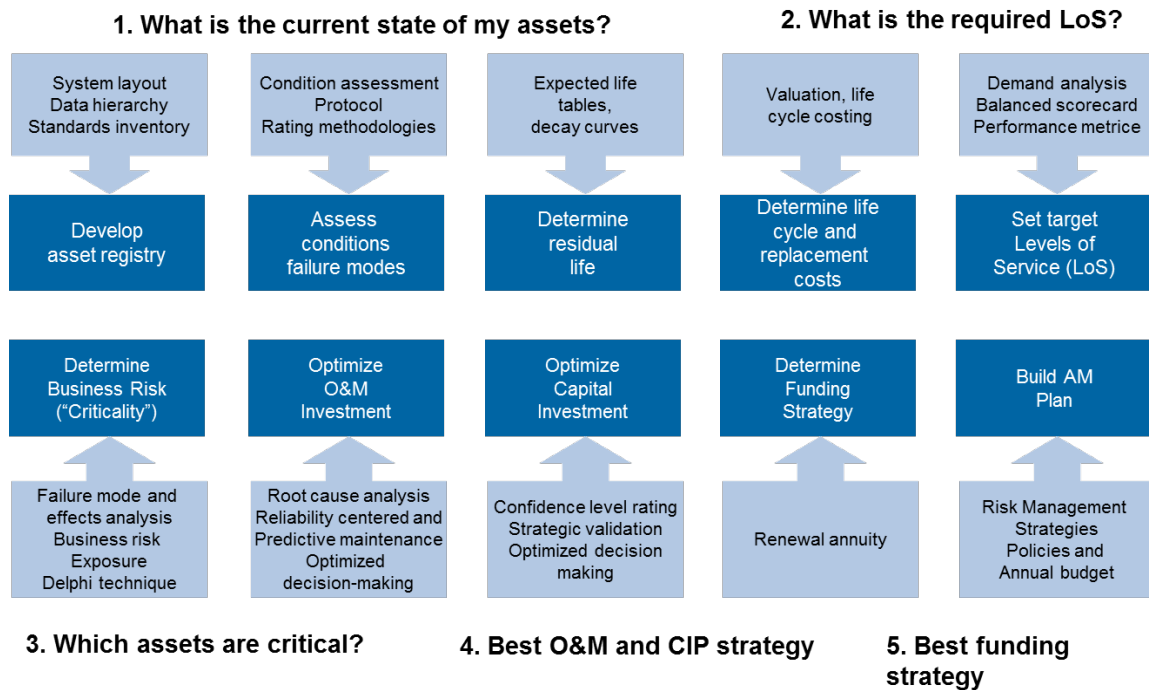


Figure 2 10 Tactical Asset Management Plan Development Steps

Implementing improved asset management practices and building an asset management plan is comprised of ten steps that are directly related to the five Core Questions discussed above. Note that certain leading practice processes and techniques are necessary for the execution of each of these steps. To successfully execute the steps, an organization must master the basics of the associated practices and processes.

1.4 Report Organization

The following sections are provided within this report to guide you through the SAM Implementation Strategy and Roadmap that has been developed for MWU.

- Section 1 Introduction
- Section 2 MWU Gap Assessment
- Section 3 SAM Program Framework Elements
- Section 4 SAM Program Key Functional Elements
- Section 5 Asset Management People and Organizational Considerations
- Section 6 Asset Management Initiatives and AM Roadmap

1.5 Acronyms List

Below is a list of acronyms found in this document.

| Acronym | |
|---------|--------------------------|
| AM | Asset Management |
| AMP | Asset Management Plan |
| BCE | Business Case Evaluation |
| BRE | Business Risk Exposure |

| Acronym | |
|---------|--|
| CIP | Capital Improvement Plan |
| CMMS | Computerized Maintenance Management System |
| COF | Consequence of Failure |
| COS | Cost of Service |
| DSS | Decision Support System |
| EDMS | Electronic Document Management System |
| FTE | Full Time Employee |
| GIS | Geographical Information Systems |
| IIMM | International Infrastructure Management Manual |
| LOS | Levels of Service |
| MCL | Maximum Contaminant Levels |
| MSG | Management Strategy Group |
| MWU | Madison Water Utility |
| O&M | Operations and Maintenance |
| P&P | Process & Practices |
| POF | Probability of Failure |
| SAM | Strategic Asset Management |
| SAMIP | Strategic Asset Management Implementation Plan (Roadmap) |
| SAMP | Strategic Asset Management Plan |
| SMCL | Secondary Maximum Contaminant Levels |
| TAMP | Tactical Asset Management Plan |
| TBD | To Be Determined |
| TBL | Triple Bottom Line |
| UDF | Unidirectional Flushing |
| USEPA | United States Environmental Protection Agency |
| WDNR | Wisconsin Department of Natural Resources |
| WERF | Water Environment Research Foundation |
| WSLH | Wisconsin State Laboratory of Hygiene |

2. MWU Gap Assessment

2.1 Introduction

Madison Water Utility (MWU) completed the web-based SAM GAP Analysis tool in February 2016. This tool was developed by the Water Environment Research Foundation (WERF) in conjunction with the USEPA to serve as a preliminary, but detailed self-assessment tool. A gap analysis is a systematic process to characterize or profile an organization's current asset management business practices. The purpose of completing this task was to establish the current state of asset management maturity at MWU. As part of the assessment, opportunity gaps were identified, which provided input into the development of the SAM Framework.

2.2 Goals of the Gap Assessment

During the gap assessment, current asset management related processes and practices in the organization were reviewed and assessed to provide a baseline for MWU's SAM Strategy. This involved completing a gap assessment of these processes and practices against what is generally regarded as industry leading practices developed over the past several decades. MWU will select and implement only those leading practices that are practical and cost-effective given its specific needs and resources to close any identified gaps.

When compared to leading practices, opportunity gaps were identified that served as the basis for the development of improvement initiatives.

The elements form the structure for the gap analysis that is used to measure where MWU is in its asset management processes and practices relative to where it wants to be within a specified period. The gap is the distance between the current and the desired future state of the organization. The gap analysis process facilitates clear identification of MWU's asset management processes and practices relative to:

- The best run asset-intensive organizations across the utility/municipal sector.
- What is reasonable and relevant for MWU?

This latter aspect of considering what is reasonable and relevant for MWU is particularly important. Not all industry-leading practices are appropriate or applicable to every organization. It is important to identify best practices – those practices that fit MWU's unique needs and then to customize a work plan and measure progress against that benchmark.

2.3 MWU's Gap Assessment Findings

The SAM GAP Analysis completed by MWU was comprised of seven core elements:

- Life Cycle Processes and Practices;
- Information Systems;
- Data and Knowledge;
- Service Delivery;
- People Issues;

- Organizational Issues; and
- Asset Management Strategies and Planning.

These categories have proven effective in helping utilities create asset management plans.

Figure 3 below illustrates MWU's assessment results in comparison to the Top 10% of Water and Wastewater Organizations in North America. The dotted black line defines the level of best appropriate practice for those completing the assessment.

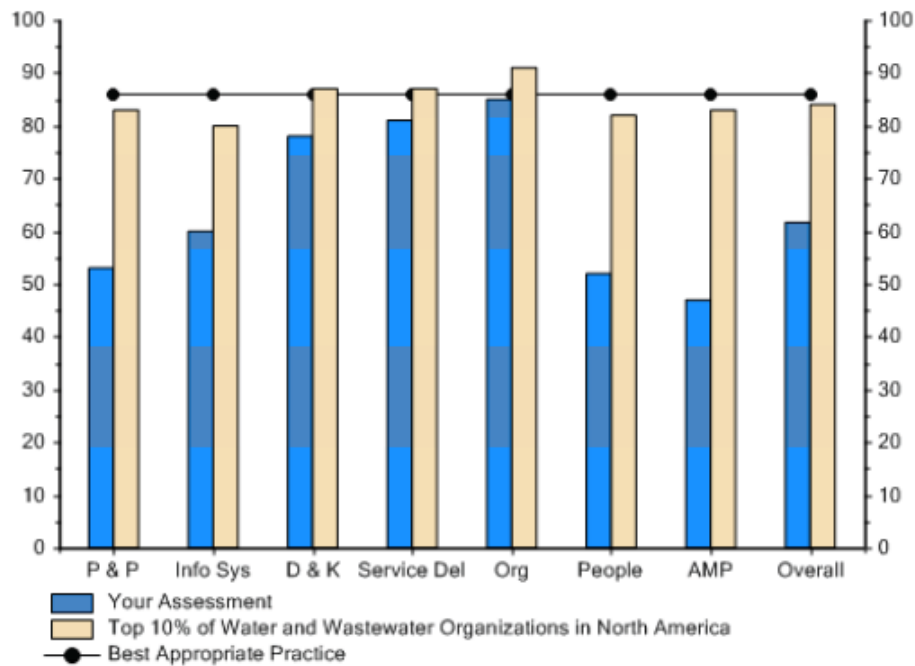


Figure 3 MWU Gap Assessment Findings

Based on the seven core elements upon which MWU was assessed, MWU has the greatest gaps in applying asset management related processes to decision making in the following areas:

- Asset Management Plans (AMP);
- People Issues (People);
- Process and Practices (P&P); and
- Information Systems (Info Sys).

Further detail and explanations of MWU's SAM Gap Analysis results can be found in Appendix B. The findings from MWU's assessment have been used as the foundation and building blocks for GHD and the development of this SAM Implementation Plan Strategy and Roadmap.

3. SAM Program Framework Elements

This section presents the functional elements and implementation considerations of the Strategic Asset Management Plan Framework.

3.1 SAM Program Framework Overview

The SAM Program Framework is the context within which asset management activities and initiatives will occur at MWU. Figure 4 provides an overview of the organizational elements considerations for implementing a SAM Program Framework. This organizationally focused implementation framework combines key business management concepts that, when implemented, collectively facilitate the effective delivery of services.

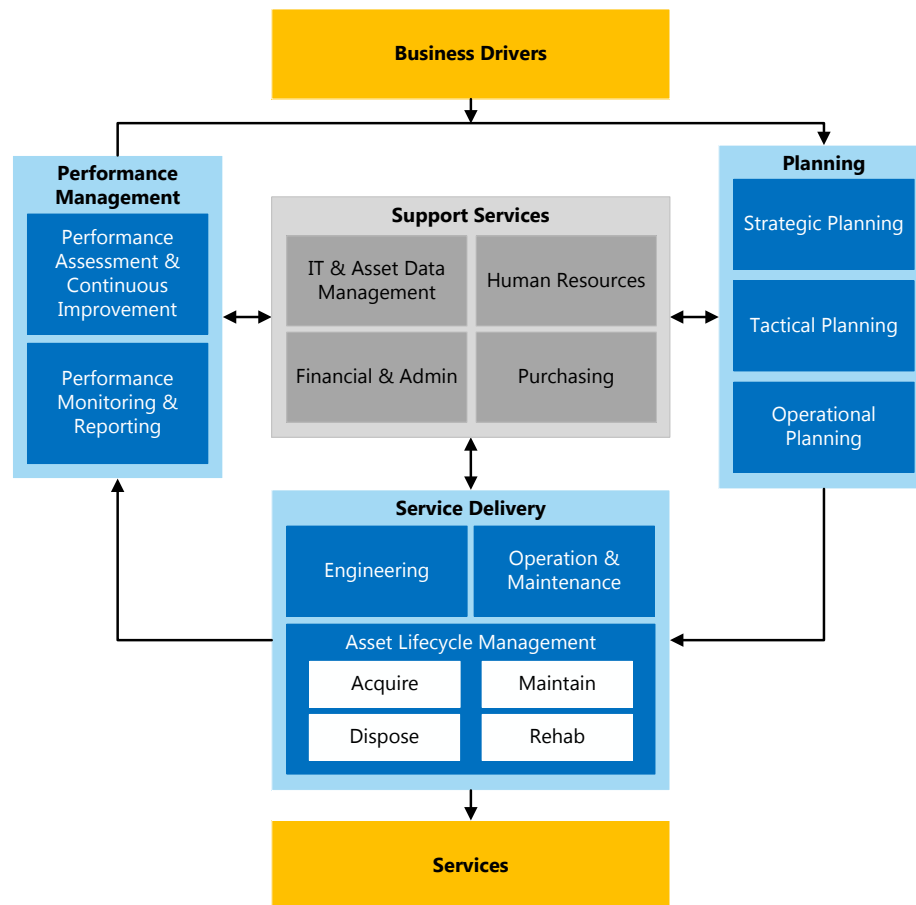


Figure 4 SAM Program Implementation Framework Organizational Elements

As shown in Figure 4, the SAM Program Framework implementation framework has several major organizational elements as described below:

Business Drivers and Services – (shown in orange) provide the boundaries or ‘bookends’ to the framework. Business drivers are both external and internal influences to MWU’s business and include service requirements such as growth, aging infrastructure, stricter regulations, increasing stakeholder expectations, revenue and funding constraints, loss of knowledge through staff retirements, extreme weather events, as well as rate payers (residential, commercial, industrial, institutional), wholesale (suburban, municipalities, utility companies), and other customers (e.g., fire companies, breweries). Services are the outputs that customers and stakeholders require and

experience. Examples of services include water supply, protection of aquifer, fire protection, and energy among others.

Core Processes - (shown in blue) contribute directly to the delivery of services to program areas and cover the entire lifecycle of the assets, with individual practices required for different asset types include planning, service delivery, and performance management.

- a. **Planning** converts the business drivers into a set of operational plans that describe how MWU will deliver services: the scope and quality of services, the programs (or processes) that will be used to deliver the defined services and the inputs required, including financial resources, human resources, and technology resources. The levels of planning include:
 - Strategic/Long Term Planning which converts regulatory and customer requirements into service outcomes and overall long-term strategies (e.g., corporate/departmental strategic plans, organizational policies, long term funding strategy, demand forecasting, facility planning)
 - Tactical/Medium Term Planning which develops sub-plans to allocate resources (natural, physical, financial, human, etc.) to achieve the strategic goals, while meeting defined levels of service (e.g., Master Plans, Performance Management, Asset Management Plans, Human Resources Plan, Business Continuity Plans)
 - Operational/Short Term Planning, which converts tactical, medium term, plans into short-term executable plans and budgets (e.g., Capital Programs, Annual Operating Budgets, Emergency Preparedness & Response Plans, and Operational Standards and Specifications).
- b. **Service Delivery** implements the short term executable plans including the following:
 - Operations and programming
 - Engineering and capital project delivery
 - Lifecycle asset management
 - Asset performance and reliability maintenance - to retain an asset as near as practicable to its original condition, but excluding rehabilitation or renewal
 - Asset renewal (rehabilitation and disposal) - to rebuild or replace an asset to restore it to a required functional condition and/or extend its life, using available techniques and standards
- c. **Performance Management** checks that MWU is doing what it intended to do. This occurs at multiple levels: meeting program area needs (the ultimate outcome), delivering the defined scope and quality of services (the key output), delivering the defined programs through the efficient and effective use of infrastructure, financial, human and technology resources (interim outputs). Activities associated with performance management include:
 - Developing and reviewing Levels of Service targets
 - Monitoring actual results and reporting against targets over time
 - Conducting results based benchmarking (over a multi-year time horizon)
 - Assessing gaps
 - Adapting existing processes and/or creating new processes to effect continuous improvement

Support Services - (shown in gray), include administration, information technology and data management, human resources, finance and administration, and purchasing. These functions are essential to supporting the Planning, Service Delivery and Performance Management functions.

4. SAM Program Key Functional Elements

These and other key elements and functions of the SAM Program Framework are shown in Figure 5, and also in Appendix D. MWU is currently implementing several of the asset management related functions shown in Figure 5, such as implementing Cityworks as the Utility's Computerized Maintenance Management System (CMMS). Figure 5 shows both the existing and new SAM key functional elements needed for implementation and their relationships to each other.

Existing elements are those functions that currently exist within MWU's business processes and are shown in gray and include.

- Administration of Cityworks computerized maintenance management system (CMMS)
- Use of the Geographical Information Systems (GIS)
- Identification of capital and operational needs
- Development of the annual Operations Budget and Capital Improvements Plan
- Performance measurement

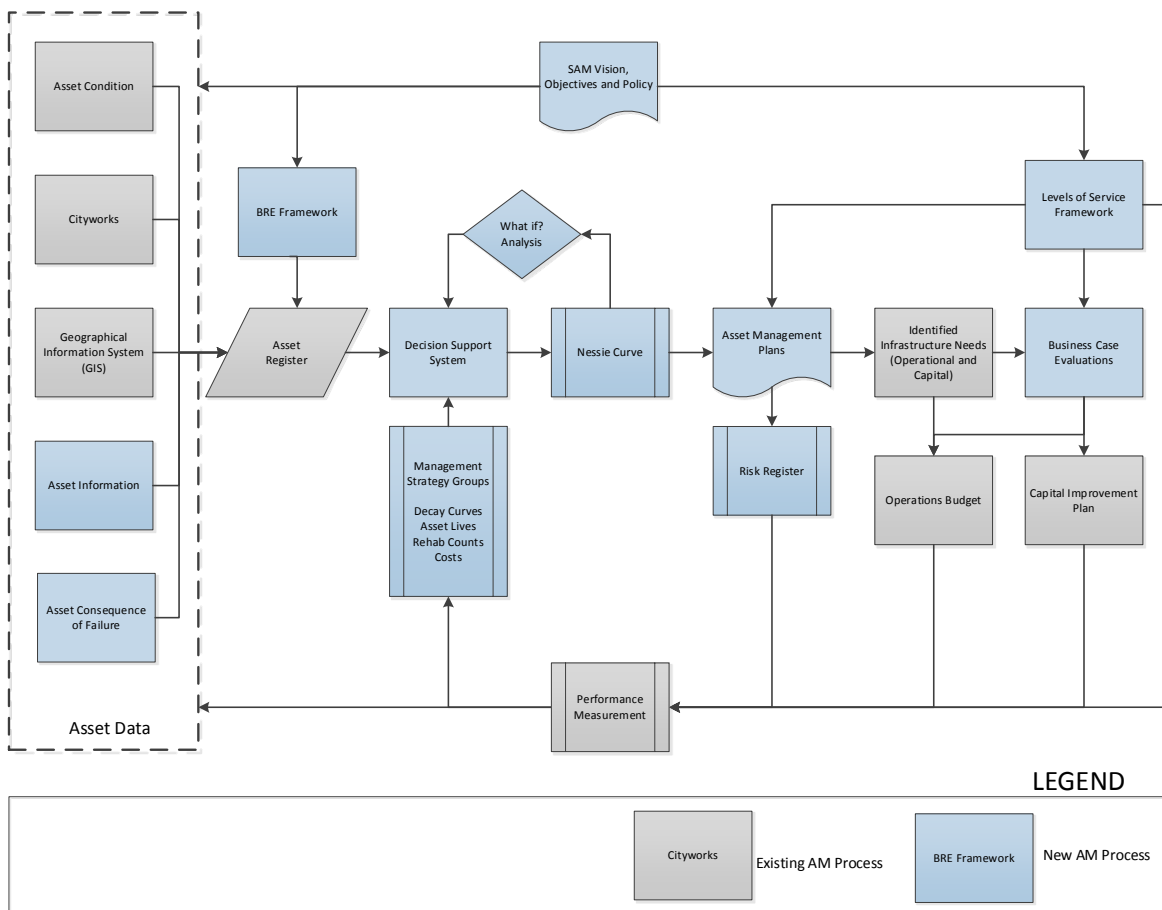


Figure 5 SAM Key Functional Elements Needed for Implementation

For the implementation of the SAM Framework, these existing functions may need some improvement to integrate with other new functional elements as well as adding new elements. The

existing functional elements include (and which are included also as part of the Master Plan and CMMS projects):

- Asset Condition
- Cityworks
- Geographical Information System (GIS)
- Asset Register
- Identified Infrastructure Needs (Operational and Capital)
- Operations Budget
- Capital Improvement Plan
- Performance Measurement

New functional elements include:

- SAM Vision, Objectives, and Policy
- Levels of Service Framework
- Business Risk Exposure Framework
 - Asset Consequence of Failure
- Risk Register
- Decision Support System
 - Management Strategy Groups (that incorporate decay curves, asset lives, rehabilitation approaches, and costs)
 - Annual “Nessie” Curve (Investment Forecasting)
- Development of Tactical Asset Management Plans
- Development of a Business Case Evaluation Process
- Determining and Tracking Asset Information and Information Systems, Including Maintenance and Further Development of MWU’s Asset Register

Each of the new AM key elements needed for implementing the SAM Framework are described in more detail in the following sections.

4.1 SAM Program Vision, Mission, Goals and Guiding Principles

MWU’s mission, as a utility, is as follows:

We are entrusted by the people of Madison to supply high quality water for consumption and fire protection, at a reasonable cost, while conserving and protecting our ground water resources for present and future generations.

To support this mission, MWU is implementing asset management to improve infrastructure decision making. To guide this implementation, the SAM Team has developed a SAM Program Vision, Mission and associated goals as presented below and included in SAM Team Charter (see Appendix A).

4.1.1 SAM Program Vision Statement

Consistently meet our established levels of service targets/goals at sustainable and responsible asset lifecycle costs and acceptable levels of risk. Individually and as an organization, lead and be known as best in class in asset management in Wisconsin and nationally. As an organization, meet MWU Board policies and City, State, and Federal requirements.

4.1.2 SAM Program Mission Statement

This asset management program will be implemented over a multi-year period, and will be sustained into the future to provide customers ongoing service excellence and cost effectiveness through;

- Asset knowledge management;
- Optimized organizational decision making;
- Protection of the environment;
- Responsible financial stewardship (sustainable, equitable, affordable);
- Promotion of health and safety;
- Transparent decision making; and
- Staff capability development and training – agility in making improvements.

4.1.3 SAM Program Goals

- Integrate information across MWU
- Make information available to all customers
- Establish asset management requirements
- Quantify actual asset condition and the associated risk profile
- Continuously improve the Utility's long-term asset planning
- Achieve consistent and accurate performance monitoring and reporting based on objective asset data
- Develop and analyze potential capital projects
- Develop and analyze potential maintenance activities
- Achieve benefits/cost efficiencies
- Understand, articulate and refine Levels of Service as the strategic performance metrics for asset management
- Ensure that confidence in MWU's proposed budget recommendations by rate decision-makers is high
- Measure, monitor, and encourage organizational buy in and the practicing of the Utility's AM principles
- Increase and retain institutional knowledge through asset knowledge management and training/capabilities development of staff

4.1.4 SAM Policy and Guiding Principles

To achieve the SAM Program vision, mission and goals, the following are guiding principles for the SAM Program. The following guiding principles are included in MWU's SAM Policy:

Manage MWU's assets including current condition and remaining life.

- Know what assets MWU owns and for which assets MWU has responsibility or legal liability. Assets are recorded in an asset register down to a maintenance managed item level.
- Monitor the condition, performance, use, and value of assets down to the appropriate level and against prescribed service levels and regulatory requirements.
- Consider both tangible assets (e.g., pumps, pipes) and intangible assets (e.g., public trust, community partnerships) in managing MWU's portfolio.

Maintain a high level of service to MWU's customers and stakeholders.

- Understand customer and stakeholder requirements and expectations.
- Understand and record the current levels of service provided.
- Continually improve levels of service to meet future demands and expectations.
- Communicate frequently and effectively to customers and stakeholders.

Understand and manage MWU's business risk exposure.

- Identify and focus on those assets that are critical to MWU's service levels and prioritize their management to prevent their failures.
- Identify, understand, and manage the business risks associated with operating MWU's resources.

Prepare asset management plans for capital and operational strategies.

- Prepare asset management plans for MWU's assets.
- Improve the effectiveness of predictive and preventative maintenance programs and move from a reactive to a proactive O&M environment.
- Drive efficient work planning (daily/weekly/monthly/annual) with asset management plans.
- Review and validate the asset management plans with summary updates annually.

Develop a long term funding strategy.

- Develop funding strategies and identify appropriate asset renewal levels to sustainably manage MWU's assets.
- Collaborate with other stakeholders to leverage the investment in asset management.
- Link MWU's organizational and asset management strategic goals to asset related investments and action plans.
- Use validation processes to evaluate planned investment in capital projects, maintenance programs, operations and associated support services, as well as their impact on rates (including business cases, decision support systems, etc.).

Embed sustainable asset management practices throughout the organization.

- Engage the entire organization to provide training on asset management processes and procedures appropriate to individual roles and responsibilities.
- Establish defined roles and responsibilities to implement and sustain asset management practices.
- Apply effective data and information technology solutions to support the asset management program.
- Dedicate adequate resources to support the continued development and implementation of the asset management program.

See Appendix C for a copy of the finalized SAM Policy.

The SAM vision, mission and policy are key elements of the implementation strategy for MWU.

4.2 Levels of Service Framework and Performance Measurement

Policy Statement – Maintain a high level of service to MWU’s customers and stakeholders.

Objectives:

- Understand customer and stakeholder requirements and expectations.
- Understand and record the current levels of service provided.
- Continually refine and report levels of service to meet future demands and expectations.
- Communicate frequently and effectively to customers and stakeholders.

One of the key elements of an SAM Program is to define the levels of service (LOS) that customers, end users, and key stakeholders experience. LOS describes the outcomes that a utility expects to achieve in providing services to its customers. LOS connects the strategic direction of the utility to the performance requirements established within the various parts of the organization.

As stated in the International Infrastructure Management Manual (IIMM), levels of service:

“are a key business driver and influence all Asset Management decisions. Levels of Service statements:

- *Describe the outputs the organization intends to deliver to customers;*
- *Commonly relate to service attributes such as quality, reliability, responsiveness, sustainability, timeliness, accessibility and cost;*
- *Should be written in terms the end user can understand and relate to; and*
- *Should drive the selection of performance measures.”*

A LOS framework links operational activities with tactical and strategic outcomes and articulates how the management of assets contributes to the overall vision, mission and guiding principles. This type of framework helps utility organizations place focus on continuous improvement efforts that keep the service output foremost in mind while measuring and minimizing asset life cycle cost and asset system risk. LOS also is used in determining needed investment levels across utility’s asset portfolio by understanding performance, condition and operations targets to be achieved through asset maintenance, renewals and new construction.

For MWU, customers and the services provided are summarized in Figure 6 as identified in the SAM Framework development process.



Figure 6 MWU Customers and Services Provided

Customer expectations can be articulated in the following service attributes:

- **Water Quality/Safety:** Services are delivered such that they minimize health, safety and security risks and meet all regulations.
- **Reliable:** Services are predictable and continuous.
- **Suitable:** Services are suitable for the intended function (fit for purpose).
- **Sustainable:** Services preserve and protect the natural and heritage environment.
- **Available:** Services of sufficient capacity are convenient and accessible to the served community.
- **Cost Effective:** Services are provided at the lowest possible cost for both current and future customers, for a required level of service, and are affordable.
- **Responsive:** Opportunities for community involvement in decision making are provided; and customers are treated fairly and consistently, within acceptable timeframes, demonstrating respect, empathy and integrity.

For purposes of MWU's SAM Program, the term **External LOS** refers to performance metrics related to how MWU customers and stakeholder experience MWU's service delivery and how performance is *received and perceived by the customer*. External LOS do not seek to measure the internal activities or the efficiency of the organization. The term **Internal LOS** refers to performance metrics related to how MWU operates internally on a day-to-day basis with metrics that are important to MWU staff but not specifically visible to MWU customers and stakeholders.

Like other performance measures, External LOS must have specific, measurable indicators that provide the organization with a focus when planning the physical (asset) infrastructure and functional (organizational) infrastructure required to deliver the service. LOS define a set of service characteristics that identify the minimum level of performance expected to be generated by the

assets. These characteristics typically include aspects such as *how much* and *how frequently* the service will be delivered. They also serve as reference points to measure the effectiveness of the organization in delivering on its objectives, and provide a focus for day-to-day activities and decisions.

Figure 7 shows the relationship between output objectives, External LOS, Internal LOS, data, and underlying technology tools. A LOS framework identifies the metrics that have the most significant and direct impact on service delivery to customers and stakeholders. It also enables utility organizations to track trends, report progress against targets, and make critical adjustments when necessary.

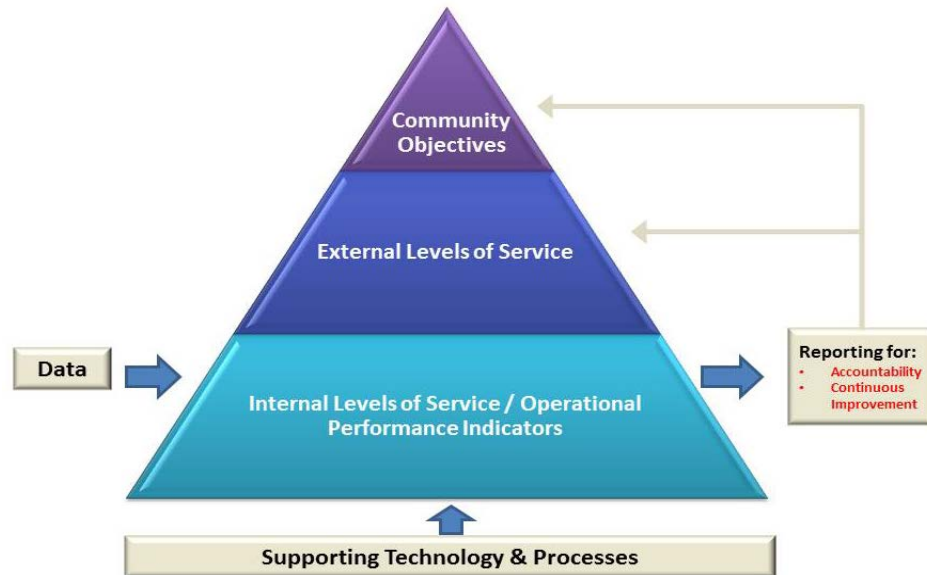


Figure 7 Levels of Service and Performance Measure Framework

4.2.1 Identifying Levels of Services for MWU

MWU has identified the following Key Service Areas (from the 2016 Madison Measures Report) as the utility's primary categories of External Levels of Service as shown in Figure 8 below.

| Key Service Area | Key Service Area Description |
|------------------|---|
| KS1 | We deliver every day a high quality, reliable supply of drinking water that protects public health. The citizens of Madison depend on it for safe water to drink, prepare our food, wash our clothes, and bathe our families. |
| KS2 | We work to protect our precious groundwater source by using sustainable practices ourselves and encouraging conservation by our customers. We are all stewards of the water infrastructure and resources handed down to us by previous generations. |
| KS3 | We ensure that a sufficient supply of water is available at hydrants throughout the city to fight fires. We keep this water flowing at the right pressure to enable the Fire Department to protect lives and property. |
| KS4 | The water pipes below our streets make everyday conveniences possible and provide the Madison community a high quality of life. We all support essential water service by paying for the necessary infrastructure and processes to get water to every customer. |
| KS5 | We deliver a reliable and affordable supply of fresh water to support the local economy, to supply business, industry, government, and a world-class research university with an essential need. |

Figure 8 MWU Key Services Areas

To determine if MWU is delivering its services as defined in the Key Service Area description, performance indicators are identified and associated with each Key Service Area. Table 1 below identifies performance indicators that are aligned with the Key Service Areas and service delivery attributes.

To meet the performance identified for the Key Service areas, MWU is using the following strategies:

- Long-term planning for capital improvements.
- Infrastructure management and business strategies.
- Preventative maintenance and repair.
- Continual monitoring, sampling and reporting of water quality.
- Compliance with state and federal regulations.
- Water conservation and source water protection.
- Attention to financial matters, business practices and customer service.

Table 1 External Levels of Service Performance Measures

| Service Criteria Area | Key Performance Indicator # | Key Performance Indicator | Target Level of Service (Interim Goal) | Measurement Data | Current Performance |
|---|-----------------------------|---|--|---|---------------------|
| Water Quality - Color KS1 | | # of complaints per year | <200 per year | Madison Measures; WQ Correspondence database | 265 (2015) |
| Water Quality - Taste KS1 | | # of complaints per year | <30 per year | Madison Measures; WQ Correspondence database | 24 (2015) |
| Water Quality - Odor KS1 | | # of complaints per year | <30 per year | Madison Measures; WQ Correspondence database | 41 (2015) |
| Water Safety - Microbiology | | # E. coli positive samples | 0 | Wisconsin State Laboratory of Hygiene (WSLH) analysis | 0 |
| Water Safety - Chemistry | | # samples above a primary drinking water standard (MCL) | 0 | WDNR and internal MWU databases | 1 |
| Water Safety - Lead | | 90th percentile lead level, single family residential | <5 ppb | Lead & Copper Rule monitoring results | 3.5 ppb (2014) |
| Water Safety - Compounds of Concern | | # unregulated contaminants monitored per year | 2-3 | EPA UCMR program; Internal MWU database | 3 |
| Reliability - High Pressure | | # complaints per year | <25 per year | Madison Measures; WQ Correspondence database | TBD |
| Reliability - Low Pressure | | # complaints per year | <25 per year | Madison Measures; WQ Correspondence database | TBD |
| Reliability – Pressure KS1 | | Pressure levels at the tap | 80 psi 99% of time tested | SCADA, pressure gauge data | TBD |
| Water Quality / Safety – Lead Mitigation KS1 | | # of known lead service laterals in the system | 0 known lead laterals | Lead database | TBD |

| Service Criteria Area | Key Performance Indicator # | Key Performance Indicator | Target Level of Service (Interim Goal) | Measurement Data | Current Performance |
|---|-----------------------------|---|--|--|--|
| Sustainability - WHP | | # of wellhead protection plans reviewed | 4/year | Madison Measures | 100% |
| Sustainability – Aquifer Water Levels KS2 | | Aquifer water levels at each well point within X standard | 100% of wells | Well location aquifer water level data | 100% |
| Reliability / Availability / Safety - Fire Protection KS3 | | Hydrant functions correctly | Each zone and every hydrant meets fire flow capacity 100% of the time. (Interim Goal: 99%) Fire Rating: Class 1 | See Capacity report | 98% MWU has Class 1 utility fire rating |
| Reliability / Availability / Safety - Fire Protection KS3 | | Hydrant functions correctly | 100% of hydrants repaired within 72 hours of hydrant issue identified (except construction areas) | Fire Dept. log in / log out hydrant data | TBD |
| Reliability / Availability / Safety - Fire Protection KS3 | | Hydrant functions correctly | 100% of hydrants inspected every two years and issues addressed | Hydrant database | 100% of hydrants assessed within the last two years or more recently |
| Reliability / Availability / Safety / Responsive - Fire Protection KS3 | | Hydrant flow test | 33% of all hydrants tested every 5 years. | Hydrant database? | 100% of flow test requests addressed in one week or less |
| Reliability / Availability - Planned Water Outages KS1, 3, 4, 5 | | Time out of service | 85% of planned outages <4 hours in duration | Work order time stamp data; leak reports | TBD |

| Service Criteria Area | Key Performance Indicator # | Key Performance Indicator | Target Level of Service (Interim Goal) | Measurement Data | Current Performance |
|---|-----------------------------|--|--|--|--------------------------------------|
| Reliability / Availability – Unplanned Outages KS1, 3, 4, 5 | | Time out of service | 95% of planned outages <8 hours in duration | Work order time stamp data; leak reports | TBD |
| Reliability – City Call Center Management and Execution KS1, 3, 4, 5 | | % of City Call Center issues routed to the appropriate dept. in the first instance | TBD | Call Center data | TBD |
| Reliability / Availability – Residential Customers KS1, 4 | | Number of residential system leaks per year | 1/block/year 3/block/7 years | Leak and repair information | TBD |
| Reliability / Availability – Wholesale Customers KS4, 5 | | Volume of water provided per agreements | Meet 100% of agreed water volume supply | Water meters | 100% of agreed water volume provided |
| Reliability / Availability – Commuters KS4, 5 | | # of commuter complaints per year | TBD | Customer complaint database | TBD |
| Reliability – Availability – Business Owners KS4, 5 | | # of business complaints per year | TBD | Customer complaint database | TBD |
| Responsiveness – Permit Issuance for New Potable Water KS1, 2, 3, 4, 5 | | Average time to review applications and issue permits | 60 days from completed application submitted | PW database | TBD |

| Service Criteria Area | Key Performance Indicator # | Key Performance Indicator | Target Level of Service (Interim Goal) | Measurement Data | Current Performance |
|---|-----------------------------|--|---|----------------------------------|---|
| Reliability / Responsive – Mapping Customers Internal/External System Connections KS 1, 4, 5 | | Map accuracy | 100% of DSRs to scale | Map data source | 15% exceeding (TBD) |
| Responsive – Public Communication KS 1, 2, 3, 4, 5 | | # of press releases | TBD | Press releases | 22 in 2016 |
| | | # of earned media mentions | TBD | Earned media mentions | 57 in 2016 |
| | | # of content media articles | TBD | Content media articles | 11 in 2016 |
| | | # of content media articles picked up | TBD | Content media articles picked up | TBD |
| Responsive – Public Communication KS 1, 2, 3, 4, 5 | | # of email list subscribers | TBD | Email list subscribers | ~2,000 |
| Well Capacity / Pumping Ratio | | Ratio of capacity to pumping for all wells and reported to the Water Board | 50% pumping vs. capacity for all 22 wells | TBD | 16 of 22 wells are pumping at 50% or less of available capacity |
| Facility Inspections | | # of inspections for high hazard facilities per year | 100% of high hazard facilities inspected at least once in two years | Database | TBD |

Table 2 Internal Levels of Service Performance Measures

| Service Criteria Area | Key Performance Indicator # | Key Performance Indicator | Target Level of Service (Interim Goal) | Measurement Data | Current Performance |
|-----------------------------|-----------------------------|--------------------------------------|--|---------------------------------|----------------------|
| Water Safety - Microbiology | | # coliform samples collected | 250/month | WSLH and Public Health Analysis | Monthly average: 305 |
| Water Clarity – Turbidity | | Miles of main flushed per year (UDF) | xxx miles/year | Field reports | xxx miles (201X) |

| Service Criteria Area | Key Performance Indicator # | Key Performance Indicator | Target Level of Service (Interim Goal) | Measurement Data | Current Performance |
|----------------------------------|-----------------------------|--|--|--|---------------------------------------|
| Water Quality - Iron & Manganese | | % samples above the secondary standard (SMCL) | <5% | Internal MWU database | 1.4% |
| Disinfection - Entry Point | | % samples within the range, 0.30 - 0.55 mg/L chlorine | >95% | Chlorine analyzer; daily check by Rounder, WQ Aide | 96.5% |
| Disinfection - Distribution | | % samples >0.1 mg/L chlorine | >99% | Measurements by Water Quality Aide | 98.9% |
| Fluoridation | | % samples within the range, 0.70 +/- 0.15 mg/L fluoride | >90% | Daily check by Operator II | 91.9% |
| Water Quality - Water Age | | TBD | TBD | TBD | TBD |
| Water Supply | | # of deep wells off-line at the same time | 1 deep well off-line due to mechanical failure. Well returned to service within 60 days of failure. | TBD | TBD |
| Booster Pump Down Time | | # of pumps impacted at any one time | Maximum of one booster pump off line at any one time | SCADA | TBD |
| Chlorine Level | | Chlorine residual concentration at key representative points in the system | 0.30 - 0.55 mg/L No more than one chlorine related facility outage per year. | Measured by Cl2 monitor | TBD |
| Fluoride Level | | Fluoride concentration at key representative points in the system | No more than one fluoride incident per year | TBD | TBD |
| Chemical Usage Volume | | % on-time monthly reporting of chemical usage volume to DNR | 100% on-time monthly reporting | Calculated and actual values based on volume | 100% on time monthly reporting to DNR |

| Service Criteria Area | Key Performance Indicator # | Key Performance Indicator | Target Level of Service (Interim Goal) | Measurement Data | Current Performance |
|-------------------------------|-----------------------------|---|---|------------------|---|
| Flow Meter Testing | | % of flow meters tested annually and reported to the PSC | 100% of flow meters tested annually and reported to the PSC | TBD | 100% |
| Well Capacity / Pumping Ratio | | Annual ratio of capacity to pumping for each well reported to the Water Board | 50% pumping vs. capacity | TBD | Wells are pumping at 50% of less of available annual capacity |
| Facility Inspections | | # of inspections for high hazard facilities per year | 100% of high hazard facilities inspected at least once in two years | Database | TBD |

4.2.2 Asset Performance, Condition and Remaining Life

Policy Statement – Manage MWU’s assets including current condition and remaining life.

Objectives:

- Know what assets MWU owns and/or for which assets MWU has responsibility or legal liability. Assets are recorded in an asset register down to a maintenance managed item level.
- Monitor the condition, performance, use, and value of assets down to the appropriate level and against prescribed service levels and regulatory requirements.
- Consider both tangible assets (e.g. pumps, pipes) and intangible assets (e.g. public trust community partnerships) in managing MWU’s portfolio.

It is important to understand the actual performance of an asset to assist in management decisions related to maintenance, operations and renewal. In other words, every organization needs to understand how their assets are performing, and how long they continue to perform before they fail to provide the expected service. From an asset management perspective, assets can fail to perform to provide the expected service in one of four ways (as shown in Table 3):

1. **Physical Mortality** - occurs when an asset is no longer useful due to physical failure (e.g., pipe wall collapse). Condition is a primary indicator for physical mortality failure.
2. **Capacity** - occurs when an asset, regardless of its physical condition, fails to meet the capacity required by the demands of customers, processes, or systems.
3. **Level of service** - occurs when an asset fails to meet the service level established for that asset.
4. **Financial efficiency** - occurs when there is a lower cost alternative replacement option to operating and maintaining an asset (i.e., high life cycle cost).

Table 3 Failure Modes Description Details

| Failure Mode | Definition | Tactical Aspects | Primary Management Strategy |
|--------------------|---|---|-----------------------------|
| Physical Mortality | Consumption of asset reduces performance below acceptable level | Physical deterioration due to age, usage (including operator error), acts of nature | O&M optimization, renewal |
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | Redesign |
| Level of service | Functional requirements exceed design capacity | Codes and permits, noise, odor, life safety; service, etc. | O&M optimization, renewal |
| Efficiency | Operations costs exceed that of feasible alternatives | Pay-back period | Replace |

Understanding the failure mode of an asset allows an organization to apply the right strategy option in order to maximize the service benefit per cost spent. Each failure mode, where appropriate, has a time period associated with it. For example, an asset could have 20 years remaining before physical failure, five years before level of service failure, and 10 years before financial failure, but two years remaining before capacity failure. In this scenario, the remaining useful life of the asset

would be two years, and the appropriate strategy might be to increase the capacity of the asset through redesign.

Condition assessment and remaining service life

Condition assessment is the technical review of the physical condition of an asset, using an organized and defensible method that will assist in determining a consistent, relevant and useful estimate of remaining life of the asset. This condition assessment process looks at one aspect of the life cycle of an asset in detail, its *condition*, which, as discussed earlier, is a measure of the predominant failure mode – the physical mortality.

Why condition assessment?

An infrastructure or asset-based organization needs to understand how its assets are performing in relation to their rate of consumption and condition and how long they will remain in service to optimizing decision making over the life cycle of the asset. This will lead to a set of guidelines that can drive an effective Capital Improvement Program (CIP) and Operations and Maintenance program. A well-structured condition assessment program increases the confidence of these management decisions.

The limited knowledge of an asset’s current condition may lead to its unexpected failure. This may leave the organization with only one option – i.e. to replace the asset, which is generally the most expensive and least cost-effective option. The premature failure of an asset may also create an unplanned potential loss of service for the organization due to the critical nature of the asset.

Asset deterioration and condition rating

Buried water and wastewater assets (e.g., pipes and manholes) are mostly passive assets (no moving parts) and can serve their intended design functions for many decades, unless there are underlying issues such as manufacturing defects, design deficiencies, or installation problems not caught and corrected during construction management activities. Facilities or vertical assets (e.g., treatment plants and pumping stations) are divided into one of the four categories of asset type: mechanical, electrical, instrumentation or structural. Each type of asset has a unique decay pattern and curve shape. Table 4 shows the condition rating score of 1 to 5 that is used to assess the condition of an asset along with the description of each score.

Table 4 Condition Rating Description*

| Condition Score | Definition | Description |
|-----------------|------------|---|
| 1 | Very Good | Sound physical condition to meet current standards. Operable and well maintained. Asset likely to perform acceptably with routine maintenance for 10 years or more. No work required. |
| 2 | Good | Acceptable physical condition but not designed to current standard. Asset shows minor wear. Deterioration has minimal impact on asset performance. Minimal short-term failure risk but potential for deterioration or reduced performance in medium term (5-10 years). Only minor work required (if any). |

| Condition Score | Definition | Description |
|-----------------|-----------------|--|
| 3 | Moderate / Fair | Functionally sound plant and components, but showing some wear with minor failures and some diminished efficiency. Minor components or isolated sections of the asset require replacement or repair but asset still functions safely at acceptable level of service. Work required but still serviceable. For example, bearing and gland wear becoming evident and some corrosion present. |
| 4 | Poor | Plant and components function but require a high level of maintenance to remain operational. Likely to cause a noticeable deterioration in performance in short-term. No immediate risk to health or safety but work required to ensure asset remains safe. Substantial work required in short-term, asset barely serviceable. |
| 5 | Very Poor | Failed or failure imminent. Asset effective life exceeded and significant maintenance costs incurred. A high risk of breakdowns with a serious impact on component. No life expectancy. Health and safety hazards exist which present a possible risk to public safety, or asset cannot be serviced/operated without risk to personnel. Major work or replacement. |

*Definitions are adapted from the International Infrastructure Management Manual

After installation, every asset deteriorates through a combination of many factors including its manufacture, operating environment, and degree of internal and external stresses. The decay of an asset follows a profile similar to the decay curve in Figure 9 that shows a typical deterioration of condition (and performance) over an asset's life. Once a relationship between condition/performance and asset age is established, an asset's current condition can be used to estimate the probability of failure (as discussed in Section 4.3 below).

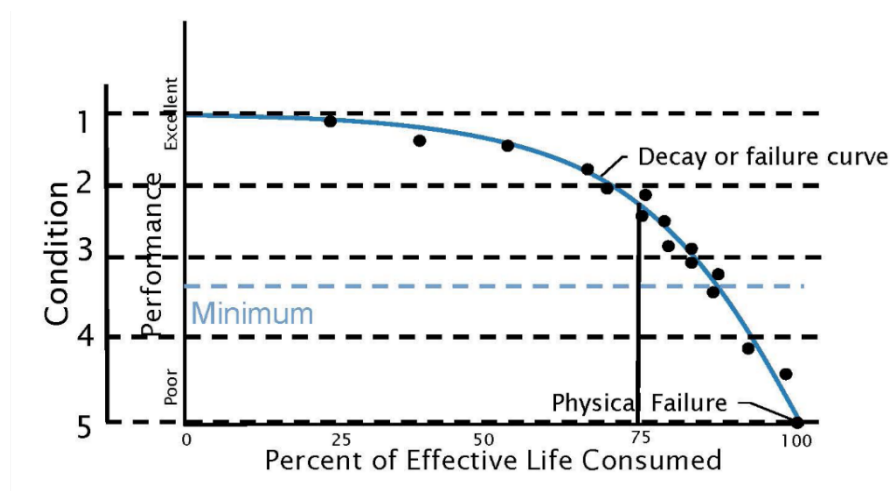


Figure 9 Example Decay Curve Showing Asset Condition vs. Asset Life Consumed

Condition Assessment Levels

Level 1 Condition Assessment (Staff Knowledge and Desktop)

The level 1 rating system is applied to all of the assets included in the asset register. Level 1 condition scores are derived from a combination of staff knowledge and desktop analysis.

The probability of an asset failing may be the result of physical mortality (structural integrity), capacity, changes in levels of service or because of inefficient operations. Example influences of physical mortality include material type, age, construction methods, operational environment and external influences among others. Table 5 presents examples of data source requirements needed for asset level 1 desktop condition assessment.

Table 5 Data Attributes and Sources for Pipe (Example) Condition Assessment

| Data Type | Attributes | Source |
|------------------------------------|---|--------------------------------------|
| Asset Attributes | Date of installation | GIS / Record Drawings |
| | Material | GIS / Record Drawings |
| | Size | GIS / Record Drawings |
| | Length | GIS / Record Drawings |
| | Lining/Rehab status | GIS / Contract data |
| Geospatial parameters | Proximity to roads | GIS |
| | Proximity to other utilities | |
| | Proximity to railway lines | |
| | Groundwater elevation | |
| | Soil type | |
| Work order data, when available | Type of work order (structural failure vs. operational failure) | Maintenance records |
| | Date of work order | |
| Inspection records, when available | Leak detection | Inspection records and Contract data |
| | Condition assessment technologies | Inspection records and Contract data |

An example approach for the determination of asset condition scores for linear assets is illustrated in Figure 10.

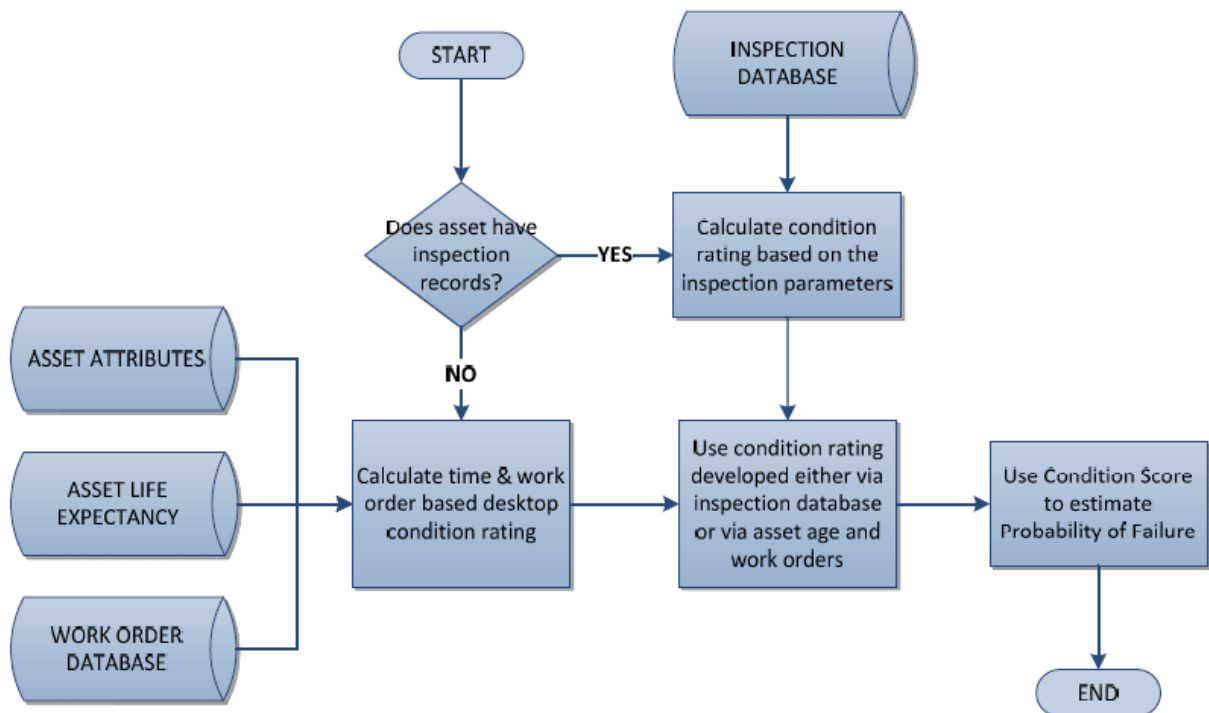


Figure 10 Process Flow Diagram for Estimating Asset Condition

Level 2 Asset Assessment (Visual)

The purpose of level 2 is to undertake a more detailed assessment of the assets through visual inspection and observation. Where assets cannot be assessed visually as a result of being buried, concealed or in a confined/inaccessible space, ratings should be determined either through advanced visual inspection tools or in consultation with staff. In cases where poor condition is suspected, asset samples may be selected for more detailed level 3 condition assessment (such as removing coupons from existing pipes for testing) or excavation to improve the visual assessment. This is an acceptable method to enhance the level 1 approach for most assets and especially those that do not have a more sophisticated system.

The level 2 process involves the enhancement of the organization's ability to more effectively rank those assets that constitute a significant problem. E.g. condition scores, 3, 4, and 5 (particularly 4 and 5) from the level 1 assessment.

For each asset, one rating (from 1 to 5) is to be determined for each of the parameters based on a specific distress mechanism. More than one parameter is commonly assessed for each asset. However, one overall condition rating for each asset is selected. The intent of the level 2 condition rating is to select the life limiting parameter (worst case) for each type of asset. This parameter establishes the level of condition when an asset would be considered to require replacement or rehabilitation. For example, for a structure, the structural or foundation condition would both be life limiting parameters, rather than surface condition. When a rating of any life limiting parameter is equal to 5, an overall rating of 5 is adopted.

Level 3 Asset Assessment (Advanced)

Level 3 assessments are only undertaken for those assets that are further determined as requiring higher level assessment. Assets to be considered for level 3 assessments should be placed on a schedule of condition testing, based on a filtering process. Example selection criteria include:

- Having a Business Risk Exposure score requiring a level 3 level assessment.
- High replacement value assets.
- Condition/Reliability Rating of 4 or 5.
- Whether condition testing would provide worthwhile additional information.
- The budget available for condition testing.
- An assessment of whether the condition assessment is a cost effective step (i.e. is the management strategy run to failure?).

4.3 Business Risk Exposure Framework

Policy Statement – Understand and manage MWU's business risk exposure.

Objectives:

- Identify and focus on those assets that are critical to MWU's service levels and prioritize their management to prevent their failures.
- Identify, understand, and manage the business risks associated with operating MWU's resources.

A Business Risk Exposure (BRE) method provides a set of rules for determining the direct and indirect implications of the failure of an asset and helps management teams focus on high-risk assets and related issues. Figure 11 is a schematic representation of the key variables of business risk exposure with components that contribute to each variable. The term "core risk" is defined as

the product of consequence of failure (CoF) and the probability of failure (PoF) without adjusting for risk mitigation measures that may be in place for the asset or system. The term ‘risk mitigation’ refers to those practices applied to an asset to either reduce the probability of failure (by adding “resistance” to the asset) or the consequence of failure by, for example, providing a parallel asset/process (e.g., redundancy) with the same functionality as the critical asset that can be used should the critical asset fail or be out of service. Once the core risk is calculated as a baseline measurement, risk mitigation strategies can be considered and/or developed that can reduce the level of risk. Business risk exposure is closely related to the consequences associated with the total loss or failure of the asset. It is noteworthy that critical assets may be in good condition and therefore unlikely to fail in the immediate future, but the asset remains critical to the provision of services.

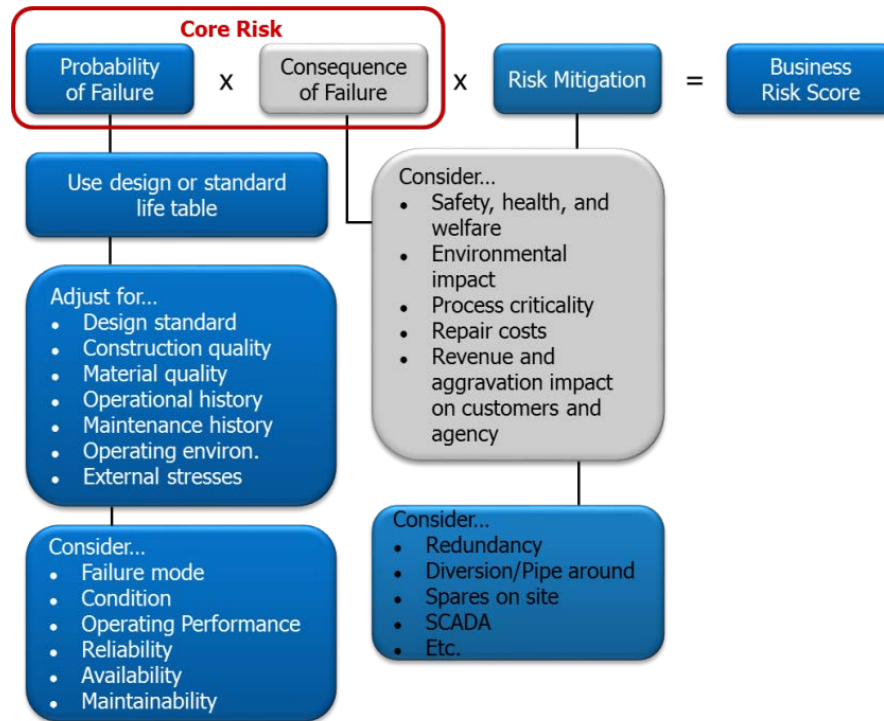


Figure 11 Business Risk Exposure Elements

The probability of failure aspect of BRE is directly related to the asset’s condition as previously discussed in Section 4.2.2. The consequence of an event can be expressed in Triple Bottom Line (TBL) categories. Triple bottom line categories used for the MWU AM Framework are as follows:

Table 6 Triple Bottom Line Categories and Elements

| Categories | Category Elements |
|--------------------------|---|
| Social/Community | Public Trust, Customers Affected, Critical Customers, Public Health, Public Safety, Loss of Service, Water Quality/Water Pressure |
| Financial | Total Cost of Failure, Operational/Resource Impact |
| Environmental/Regulatory | Board Policy and Regulatory Compliance, Environmental Impact |

Table 7 presents the consequence of failure scoring matrix for the AM Framework. The scoring system is based on a 1 to 5 score, with 1 being a low consequence and 5 being a high consequence.

Table 7 MWU AM Consequence of Failure Scoring Table

| CoF Elements | | Social/Community | | | | |
|--|---|--|---|--|---|---|
| Public Trust | No Impact | Alert posted on website but no media attention | Local coverage | State coverage | National coverage | |
| Customers Affected | No Impact | Level 1 | Level 2 | Level 3 | Greater than Level 3 | |
| Critical Customers | Residential/Multi-family only | High water users* | Wholesale customers** | Schools or Child care centers, Public Utilities | Hospitals, Health clinics | |
| Public Health & Safety | No impact | Minor illness/injury | Moderate sickness/injury | Major sickness/injury | Potential for fatalities | |
| Loss of Service | Can be out of service for extended period | Cannot be out of service for a week | Cannot be out of service for several days | Cannot be out of service of several hours | Critical - cannot be out of service | |
| Water Quality | Short-term (< 3 months) SMCL exceedance | Long-term (>3 months) SMCL exceedance | Short-term (<1 year) exceedance of MCL for chemical constituent where chronic exposure leads to illness | MCL exceedance leads to situation in which acute illness is possible | MCL exceedance leads to situation in which acute illness is probable in <24 hours | |
| | | 1 | 2 | 3 | 4 | 5 |
| | | CoF Rating | | | | |
| | | Financial | | | | |
| Total Cost of Failure | <\$5,000 | \$5,000 – \$25,000 | >\$25,000 to \$100,000 | > -\$100,000 to \$500,000 | >\$500,000 | |
| Operational / Resource Impact | Negligible impact | Low impact | High impact (scheduled work is delayed) | High impact and diverts funds | Outsourcing to specialty contractors | |
| | | 1 | 2 | 3 | 4 | 5 |
| | | CoF Rating | | | | |
| | | Environment/Regulatory | | | | |
| Board Policy and Regulatory Compliance | No consequence | Regulatory sanction possible | Regulatory sanction likely | Extensive regulatory sanction virtually assured | Severe sanctions likely | |
| Environmental Impact | Damage reversible within a week | Damage reversible within three months | Damage reversible in less than one year | Damage reversible in one to five years | Damage reversible in five years or more | |
| | | 1 | 2 | 3 | 4 | 5 |
| | | CoF Rating | | | | |

*High water users include hotels; commercial laundromats; food producers and distributors

**Wholesale customers include the University of Wisconsin, other municipalities, etc.

Depending on asset type, there are different attributes that help measure the impact associated with each of the elements shown in Table 7.

The consequences based on each of the attributes that are applicable to an asset type (e.g., well facility, transmission mains) are added in order to develop a comprehensive consequence rating for that asset. The consequence of an event is calculated based on a 1 to 5 score for each TBL

category and associated elements. The minimum consequence of failure score is three and the maximum is 15.

Table 8 presents example attributes for each element. Example data requirements for the consequence of failure analysis are summarized in Table 9.

Table 8 Example Triple Bottom Line Attributes and Elements

| Attributes | LoS Elements | | | | | | | | | | |
|--|--------------|--------------------|--------------------|---------------|---------------|-----------------|------------------------------|-----------------------|-----------------------------|--|----------------------|
| | Public Trust | Customers Affected | Critical Customers | Public Health | Public Safety | Loss of Service | Water Quality/Water Pressure | Total Cost of Failure | Operational/Resource Impact | Board Policy and Regulatory Compliance | Environmental Impact |
| Number of customers connected to the segment | ● | ● | ● | ● | | ● | ● | ● | ● | ● | |
| Critical customer category | ● | ● | ● | ● | | ● | ● | | ● | | |
| Proximity to roads | ● | ● | | ● | ● | | | ● | ● | | ● |
| Proximity to railroads | | ● | | | ● | | | ● | ● | ● | ● |
| Proximity to environmentally sensitive areas | | | | ● | ● | | | ● | ● | ● | ● |
| Proximity to buildings | ● | ● | ● | ● | | | | ● | ● | | |
| Repair costs | | | | | | | | ● | | | |
| Zoning and land use | ● | ● | | ● | | | | ● | | ● | ● |

Table 9 Example Data Requirements for Pipe CoF Assessment

| Data Type | Attributes | Source |
|-----------------------|---|---------------------------------|
| Asset attributes | Date of installation | GIS / Record drawings |
| | Material | GIS / Record drawings |
| | Size | GIS / Record drawings |
| | Length | GIS / Record drawings |
| | Customer count | GIS / Customer billing database |
| | Critical customer type | GIS / Customer billing database |
| | Repair costs | Contract data |
| Geospatial parameters | Proximity to roads | GIS |
| | Proximity to other utilities | |
| | Proximity to railway lines | |
| | Proximity to environmentally sensitive areas (e.g., wetlands, open water) | |
| | Proximity to high-risk institutions (hospitals, etc.) | |
| | Proximity to buildings | |

The probability and consequence of events are used to develop the BRE chart. An example BRE chart is shown in Figure 12. The BRE chart is divided into five risk management zones. Each zone is described as follows:

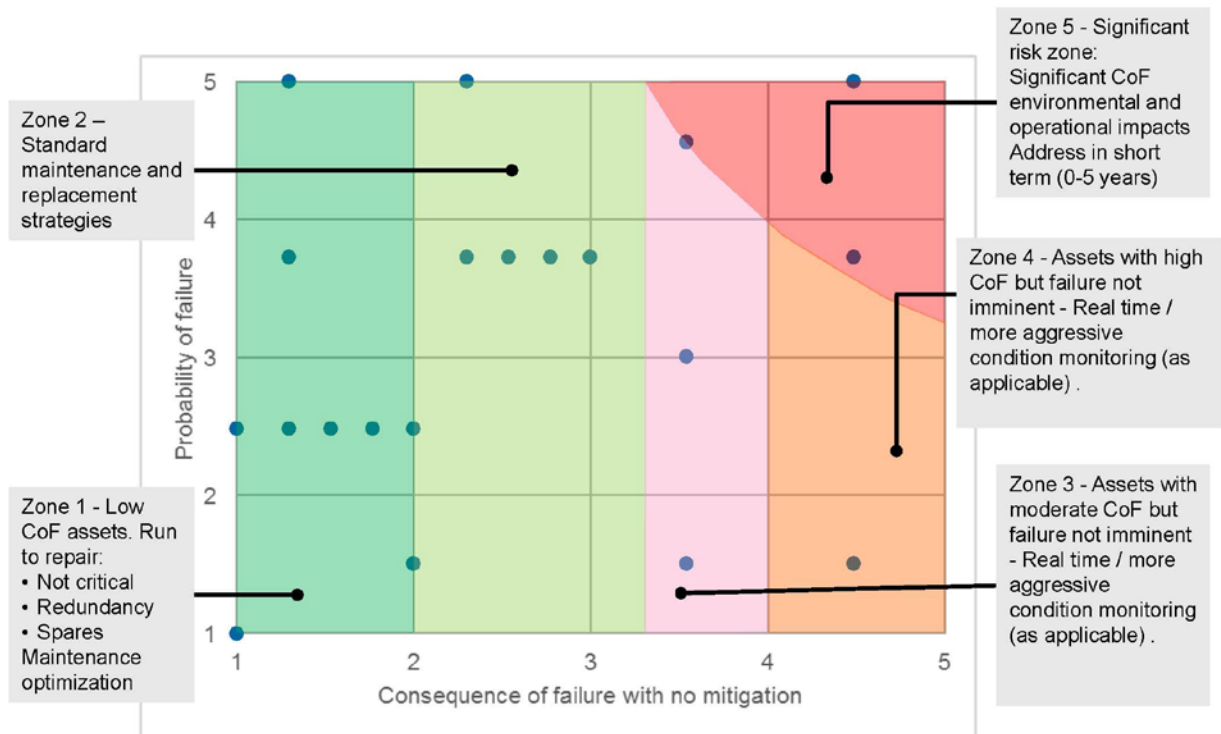


Figure 12 Example BRE Chart (with example assets)

Zone 5: Contains assets that represent a significant risk to the organization. In general, these assets are approaching the end of their useful life and upon failure, may cause significant social, financial, and environmental impacts.

Zone 4: Contains assets that have a high consequence of failure but have not deteriorated enough to be included in the significant risk zone (Zone 5). Increased visual and/or predictive condition assessments (thermal scanning, oil analysis, etc.) may be justified as their condition deteriorates and they move vertically in the graph approaching Zone 5.

Zone 3: Contains assets that would experience failure consequences that are tolerable because they may be being managed through designed redundancy and operational mitigation such as spares and condition monitoring. Zone 3 assets can also migrate into Zone 5 and as such, require additional focus by management.

Zones 1 & 2: Contains assets with lower consequences of failure. Applicable management strategies for these assets may be run to fail and maintenance optimization.

4.3.1 BRE Business Process Mapping

The BRE Framework as a key element for MWU is shown in Figure 13, as well as in Appendix D. There are multiple inputs and outputs with ownership of different elements of the process predominantly in Planning, Engineering and Operations & Maintenance. Example inputs include condition assessment data, staff knowledge and understanding of what happens if an asset fails, and geo-spatial proximity analysis using GIS. Example outputs are risk registers and risk profiles. Outputs are used in the development of asset management plans (including the development of the risk register) and in business case evaluations.

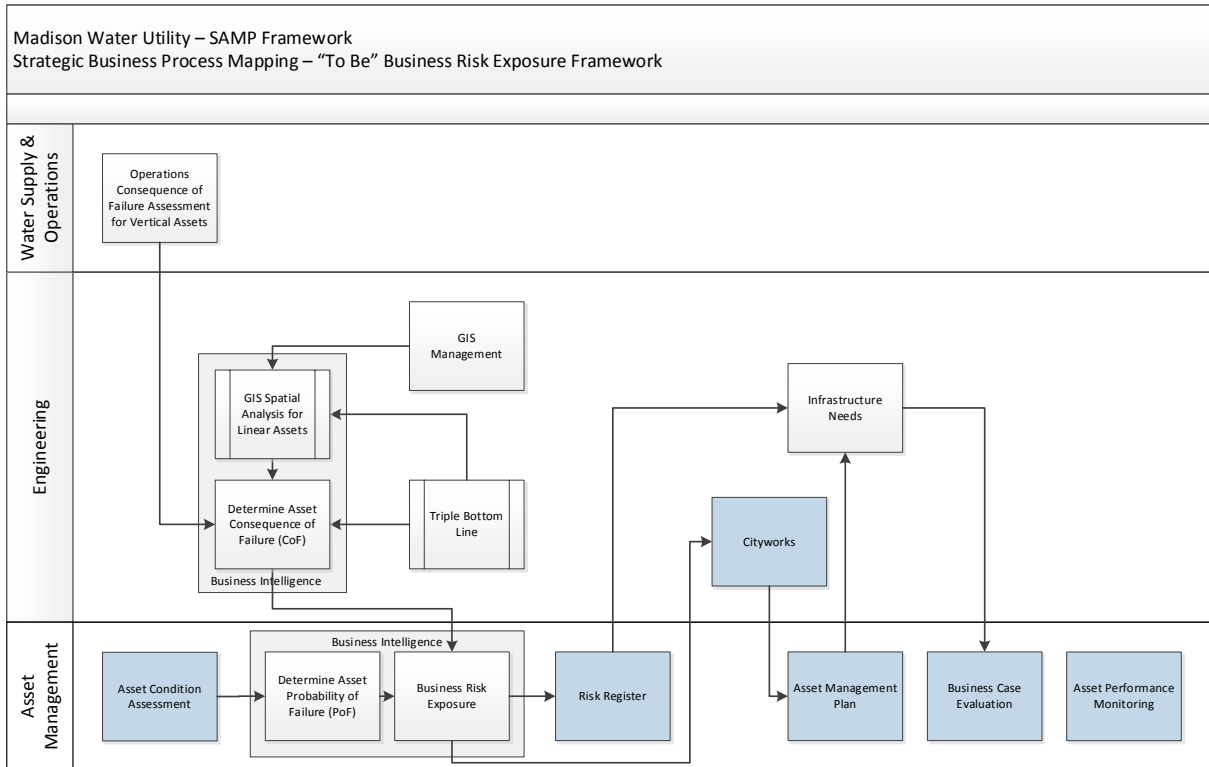


Figure 13 Strategic Business Process Mapping - Business Risk Exposure

4.4 Decision Support System

Policy Statement – Develop a long-term funding strategy.

Objectives:

- Develop funding strategies and identify appropriate asset renewal levels to sustainably manage MWU’s assets.
- Collaborate with other stakeholders to leverage the investment in asset management.
- Link MWU’s organizational and asset management strategic goals to asset related investments and action plans.
- Use validation processes to evaluate planned investment in capital projects, maintenance programs, operations, and associated support services, as well as their impact on rates (including business cases, decision support systems, etc.).

A Decision Support System (DSS) allows for the analysis of the application of different infrastructure management strategies and their resultant future investment requirements. A main output of the DSS is the “Nessie Curve” or forecasted capital and O&M investment profile as shown in Figure 14.

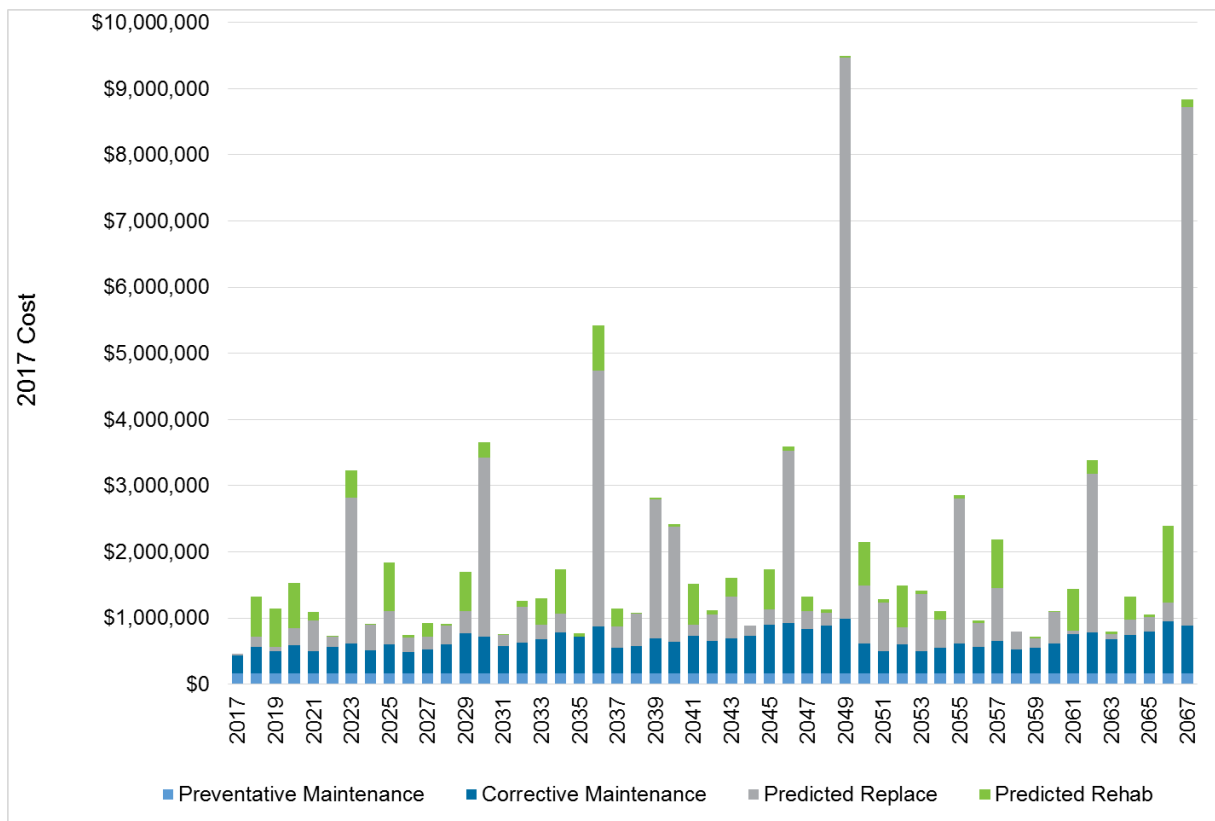


Figure 14 Example Nessie Curve from DSS Analysis

A DSS is a key tool used by asset managers to make better decisions. While the DSS is data driven, it is important to note that there are other inputs into the process. For example, data-driven DSS analysis may indicate that an asset should be rehabilitated due to physical mortality in the next five years. However, a new regulatory requirement (Levels of Service) may result in the need for an asset to be replaced earlier (e.g., permit change). There are also Triple Bottom Line (TBL) inputs that are not solely data-driven such as social/community considerations.

The backbone of a DSS is a set of business rules used to model the rehabilitation, renewal and replacement schedule for assets. Each total predicted annual expenditure is based on life cycle analysis and management strategies for each asset. A DSS allows asset managers to build the AMP “bottom up” from the data and information at the asset level. The DSS inputs include asset condition data, consequence of failure data, physical effective lives, rehabilitation strategies (including costs), replacement strategies (including costs) and intervention triggers. Outputs from the DSS primarily are an input into the AMP, but it can also be used as a decision tool to inform various aspects of MWU outside of the AMP process as shown graphically in Figure 15.

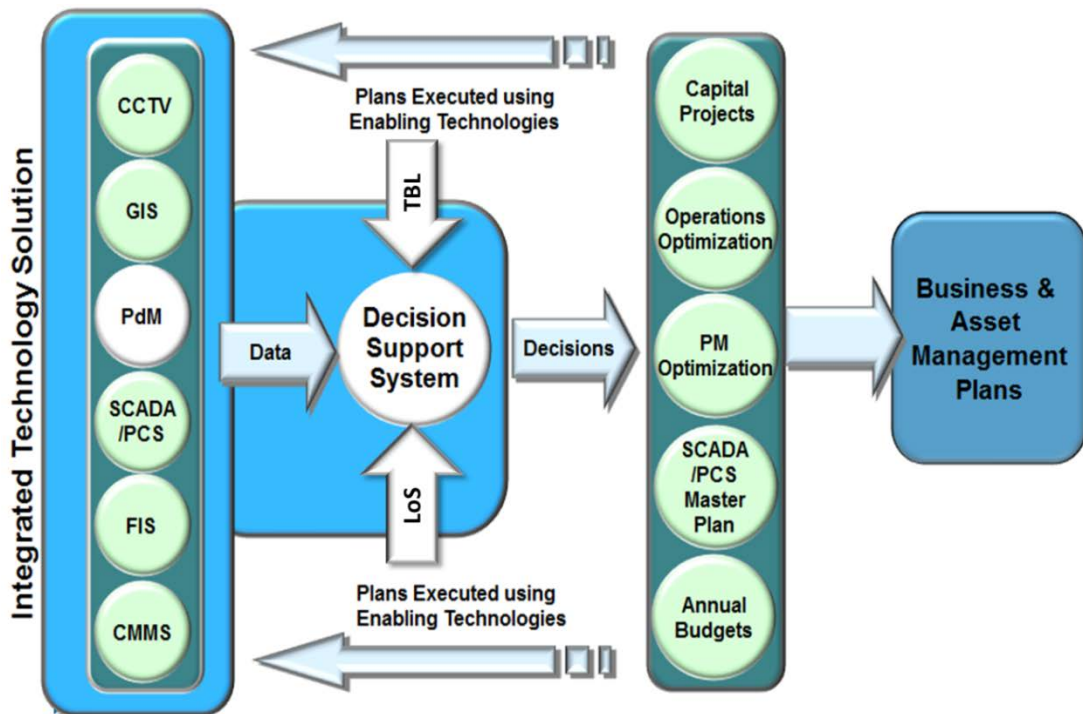


Figure 15 Decision Support System Schematic

Initially, a DSS for MWU could simply be a spreadsheet (or a set of spreadsheets) used to analyze the inputs described above and to develop “what-if” scenarios for different management and investment strategies. Longer term implementation considerations for a DSS include:

- Desired functionality
- Reporting requirements
- Integration with other planning tools, such as CIP project development and packaging

The “To Be” Strategic Business Process mapping for implementing DSS and AMP development within MWU is presented in Figure 16 and also in Appendix D. It is important to note that:

- The DSS analysis function and development of AMPs reside in Engineering.
- Outputs of the DSS and AMP process reside primarily in Engineering (e.g., business case development); however, other functional areas have inputs and outputs to the process.

and rejecting each option, makes a recommendation on how the project should proceed, and provides the documented justification for proceeding with the project.

An important component of Asset Management is validating the Capital Improvement Program (CIP). The main elements of a BCE process include Need Identification and Validation, Life Cycle Cost Analysis, Risk Reduction, and Benefit-Cost Analysis, which are summarized in a Business Case and then prioritized by the CIP Committee. These main elements are shown graphically in Figure 17.

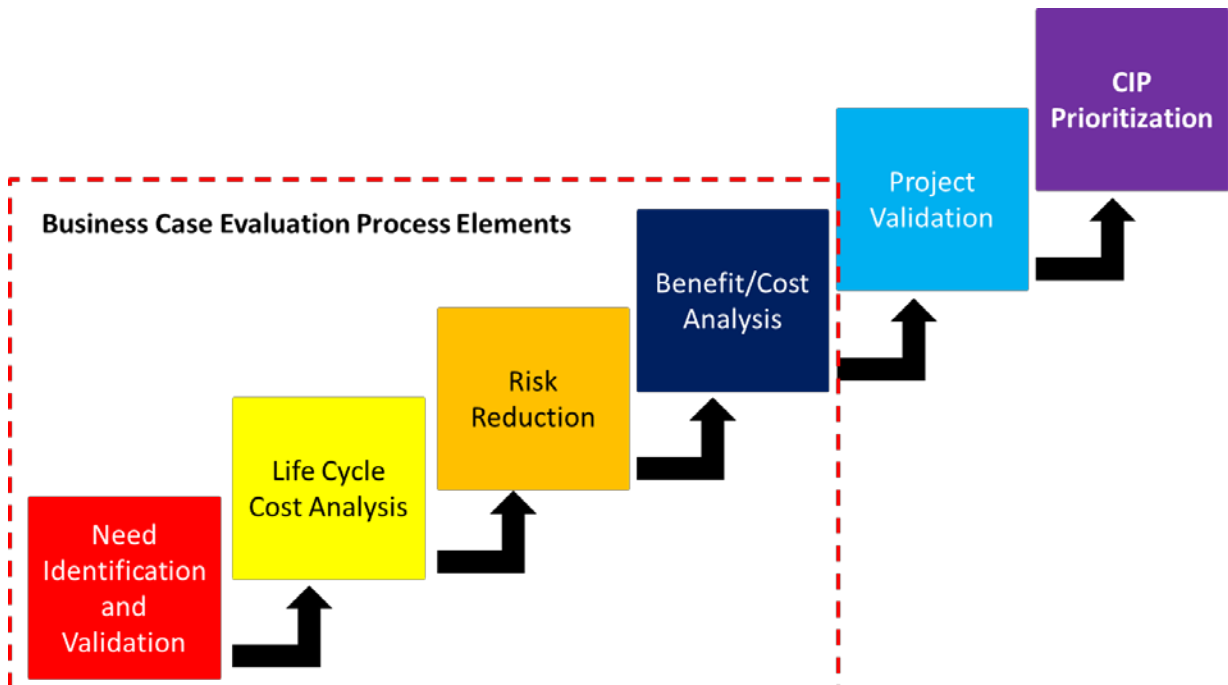


Figure 17 Business Case Evaluation Process for CIP Development

The Business Case provides the following benefits:

- A record of the issues identified and analysis performed to prepare and justify a project
- A framework for summarizing and reporting on the results of the Project Validation, Risk Reduction, the Life Cycle Cost, and the Benefit/Cost for each project option considered
- A consistent way of receiving projects for consideration
- A basis for selecting the appropriate treatment option for a project
- A consistent way of considering and analyzing projects at a committee level, allowing comparison between projects more easily
- Improved decision making based on improved project data
- A structured way of presenting a project's justification to stakeholders
- Improved basis for justifying decisions made to MWU's Commissioners

The Business Case makes a recommendation on how a CIP project should proceed and presents the project justification. It documents supply and demand projections, the project validation score in the analysis completed for the project, the risk reduction value that the project represents to the business, the range of alternatives analyzed, the reasons for accepting or rejecting each option, and the project metrics justifying project approval.

A Business Case is recommended for all capital projects under consideration for the Capital Improvements Program (CIP). A separate Business Case “Light” Process can be developed for Operational and other ad-hoc needs.

A business case for a need can be developed either in-house by MWU or be performed with support from external sources. The outsourcing option can be exercised if the effort associated with a business case is anticipated to exceed the availability of the in-house resources. Figure 18 presents the proposed Strategic Business Process Flow for developing business cases at MWU. A larger version can be found in Appendix D. The definitions of terms used in the Business Case Development are listed in Table 10.

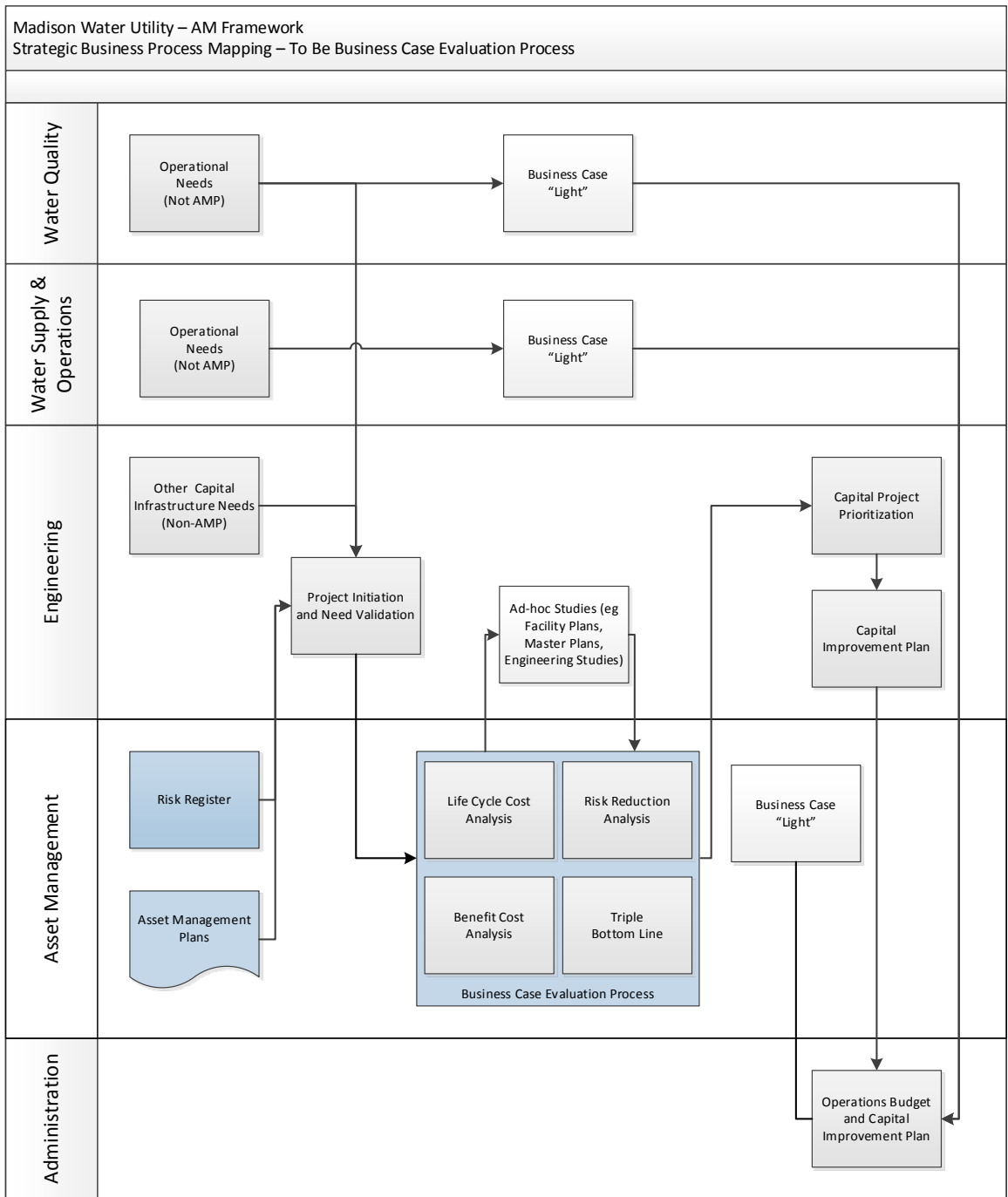


Figure 18 Strategic Business Process Flow for Developing Business Cases

Table 10 Main Business Case Terms and Definitions

| Term | Definition |
|----------------------------|--|
| Project Initiation | The process of validating and documenting that an identified failure or impending failure (physical mortality, level of service, capacity, financial efficiency) requires a capital project solution that warrants development into a project for consideration in the CIP (Capital Improvements Program) or other Operational, regulation-driven and ad-hoc investments. |
| Initial Project Validation | The Initial Project Validation rating is a percentage score that reflects an assessment of the process, data, and knowledge associated with identifying renewal, level of service, capacity, or financial efficiency failures/needs. |
| Project Prioritization | A need can be identified by anyone in the organization. Once a need is identified to remedy an existing or an anticipated failure and validated with the Initial Project Validation, the need is prioritized with respect to other identified needs to assess which needs proceed through the business case development process. |
| Engineering Studies | Studies required to identify alternatives to address an infrastructure need. Studies required to improve the Initial Project Validation score to the threshold value that would enable a project to progress through to Risk Reduction / Life Cycle Cost and business case development. Studies to improve the level of understanding of factors impacting asset life and performance. |
| Life Cycle Cost | The sum of all outgoing costs associated with the ownership and operation of the infrastructure installed or constructed through the project. Cost components are planning, design, construction, operations, maintenance, decommissioning, and rehabilitation. |
| Risk Reduction | An estimate of the likelihood that an asset will fail multiplied by the consequences that will likely result from that failure taking into account the current level of risk mitigation. |
| Benefit / Cost | Benefit / Cost ratio is an expression of the total estimated benefits and costs associated with a project assessed on a triple bottom line basis and including organizational and community (indirect and intangible) benefits and costs. |

4.6 Asset Management Plans

Policy Statement – Prepare asset management plans for capital and operational strategies.

Objectives:

- Prepare asset management plans for MWU’s assets.
- Improve the effectiveness of predictive and preventative maintenance programs based on asset data and move from a reactive to a proactive O&M environment.
- Drive efficient work planning (daily/weekly/monthly/annual) with asset management plans.
- Continuously review and validate the asset management plans with summary updates annually.

As described previously, a critical element of the AM Framework is the development of asset management plans (AMPs). An AMP systematically tells the story of the state of MWU’s infrastructure and provides both capital and O&M management strategies. The AMP answers the 5 Core Questions and an additional question focused on challenges in implementing the AMP. The

list below provides an initial content outline for MWU's AMP development. The content sections are organized around each of the five Core Questions (+1 additional).

Q1 – What is the State of Our Assets?

- Asset Description
- Asset Statistics
- Management Strategy Groups
- Management Strategies
- Condition Assessment
- Probability of Failure
- Consequence of Failure

Q2 – What is Our Required Level of Service?

- Levels of Service Targets and Data Sources
- Levels of Service Measures and Performance
- Demand and Need Forecasting

Q3 – What Assets Are Critical to Sustained Performance?

- Business Risk Exposure

Q4 – What is Our Infrastructure Improvement Plan?

- CIP Information and Integration
- Operations and Maintenance
- Needed Projects

Q5 – What Will It Cost to Implement the Asset Management Plan?

- Cost Estimates
- Year-by-Year Cost Projections

Q6 – What Business Improvement Opportunities Should Be Pursued?

- Areas of Evaluation
- Areas of Process Improvement Implementation

Ultimately, the AMP identifies needs and recommended management strategies that are an input into the capital and operational budgeting process.

Developing an AMP can be effectively supported through the use of a DSS.

5. Asset Management People and Organizational Considerations

To realize the full benefit and value of enhanced asset management, appropriate organizational alignment and governance with the right people in the right roles with the right expertise needs to be in place. An effective Asset Management Program incorporates people and organizational considerations into the asset management framework as it is the engagement, capability and motivation of the employees of the organization that determine the long-term success of any implementation.

In addition, implementation of asset management necessarily involves some degree of change, both in the form of minor and universally welcome changes as well as in the form of more substantial and challenging changes. Therefore, attention to change management principles is necessary to achieve the desired results.

5.1 Asset Management Governance

One definition of governance is:

The establishment of policies, and continuous monitoring of their proper implementation, by the members of the governing body of an organization. It includes the mechanisms required to balance the powers of the members (with the associated accountability), and their primary duty of enhancing the success and viability of the organization. (Source: BusinessDictionary.com)

An appropriate and effective governance model supports strategic and tactical asset management practices, asset investment decision-making, and work flow management. Governance activities may include: overseeing strategy, creating policies and practices to achieve the strategy, overseeing the implementation of the strategy, monitoring and measuring the implementation, and reporting and communicating regularly.

Specifically, governance models promote improved coordination and effectiveness in the following areas:

- Physical Asset Management
 - Setting direction, including strategy, policy, and SAM Program Framework
 - Levels of service and performance management
 - Risk management and project options analysis
 - Asset renewal and replacement planning
 - Project prioritization
 - Developing and managing asset management plans
 - Strategic and tactical AM implementation
- Work Management and Maintenance Management
 - Service request management
 - Asset data entry at the front line
 - Work planning and scheduling
- Materials Management

- Inventory management
- Purchasing processes
- Technology Support and Integration
 - CMMS support, maintenance, and upgrade
 - Integration and coordination with other core systems
 - System development and lifecycle management
 - General technology support
- Skills and Competency Development
 - Support of new or revised roles and responsibilities for asset management
 - Driving leading practices
 - Effective use of technology enablers

Effective governance also serves as a way to engage the organization and efficiently assign resources to appropriate tasks. In this way, governance also:

- Creates the right environment for individuals and groups within an organization to work together
- Fosters communication and collaboration, removing silos and barriers to both
- Organizes an efficient, moderately lean organization structure suitable to the task (i.e., overly lean organizations can be taxing on personnel trying to achieve asset management goals)
- Generates energy and momentum (including recognizing when energy is flagging and doing something about it)
- Provides an appropriate forum for recognizing conflicts and resolving them (e.g., manages the ‘healthy tension’ and minimizes the other more destructive kinds of conflict)
- Sets priorities and creates focus within the organization

5.2 Organizational Design Principles

The structural configuration of an organizational design should reflect the way work is divided and how the organization wants to achieve coordination among its various work activities. An organizational design structure resolves the two basic tasks of getting work done by: (1) Dividing up the work in the organization into logical units (this enables performance management); and (2) ensuring the work gets done by providing the coordination and control of work.

The organizational and governance model for asset and work/maintenance management should focus on effectiveness as defined in Figure 19 where effectiveness is a function of an organization’s inherent capability and delivered execution.



Figure 19 Model of Organizational Effectiveness

Understanding the assets that MWU manages, and the work needed throughout the full lifecycle (plan, design, create, operate, maintain rehabilitate/replace and dispose) of these assets to provide the required customer service is fundamental to the organizational design process.

In general, organization structures can be designed to achieve the desired outcomes based on functional responsibilities, geographic boundaries, service departments, or a matrix approach as shown in Table 11.

Table 11 Example Organizational Structures

| Organizational Structure Type | Description |
|-------------------------------|--|
| Functional | Logical reflection of the organization’s activities. Based on specialization that is efficient. |
| Service-Based Focus | Adaptable and flexible to meeting the needs of managers as they use assets to deliver a set of related services. |
| Territorial (or Geographic) | Establishes work groups based on a geographic area. |
| Matrix | Composed of managers and project teams who are employees from different functional units. |

Successful and effective AM governance and organizational models most commonly:

1. Reflect the strategic vision, mission, and values of the organization and the department as well as the vision for AM strategy implementation.
2. Allocate and balance human resources and workload across positions within existing and vacant positions and provide for appropriate critical functions.
3. Acknowledge and leverage the existing skill and expertise areas of management and staff; acknowledge the strengths of management and staff involved and identify and create opportunities for further enhancing skills (gap and skills analysis – development and succession planning).
4. Reflect the organization’s current Human Resources policies and practices.
5. Foster a decision-making process that considers the best interests of the organization, customers, and staff.
6. Define roles, responsibilities, communication links and decision-making rights clearly.
7. Support the integration of asset management across the organization and the necessary interdepartmental relationships required to coordinate activities and decisions.
8. Foster an environment and culture that enables the organization to attract and retain the right people/skills.
9. Provide for performance measurement of asset management program implementation.
10. Demonstrate flexibility in supporting and adapting to evolving asset management needs over time.

5.3 MWU Current Organizational Structure

The current organization structure for MWU is functional based and has six functional groups (Public Information, Water Supply, Engineering, Water Quality, Operations, and Administration)

reporting to MWU's General Manager. There are governance and reporting requirements to both the City of Madison and to the Water Utility Board of Directors. Figure 20 and Figure 21 show the primary organization structure for MWU.

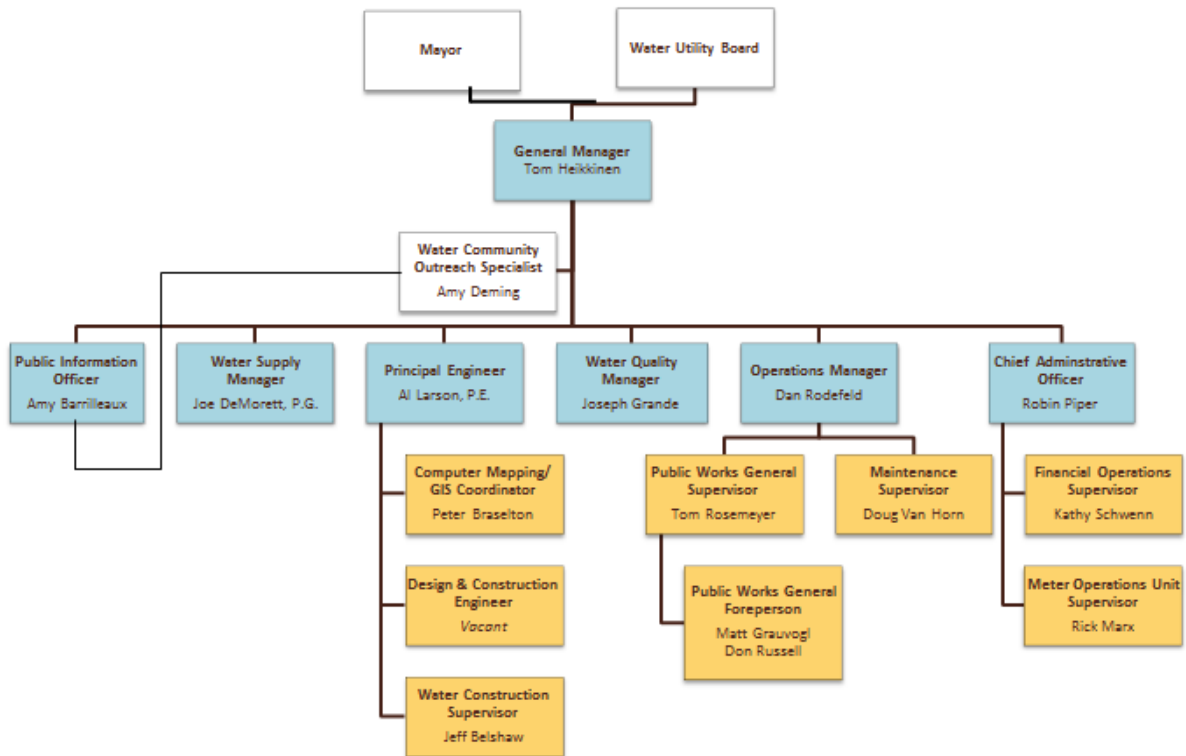


Figure 20 Current MWU Organizational Structure

At this initial stage of MWU's asset management program evolution, the Asset Manager function is seated in the Engineering Division within the Computer Mapping / GIS Coordinator function, as shown in Figure 20. The Asset Manager position is a relatively new position to MWU and is a role that serves to oversee and coordinate the SAM efforts for the organization. It should be noted that Asset Management as a Framework and set of practices is not confined to one division. Rather, it involves input, development, leadership and execution from all six MWU divisions.

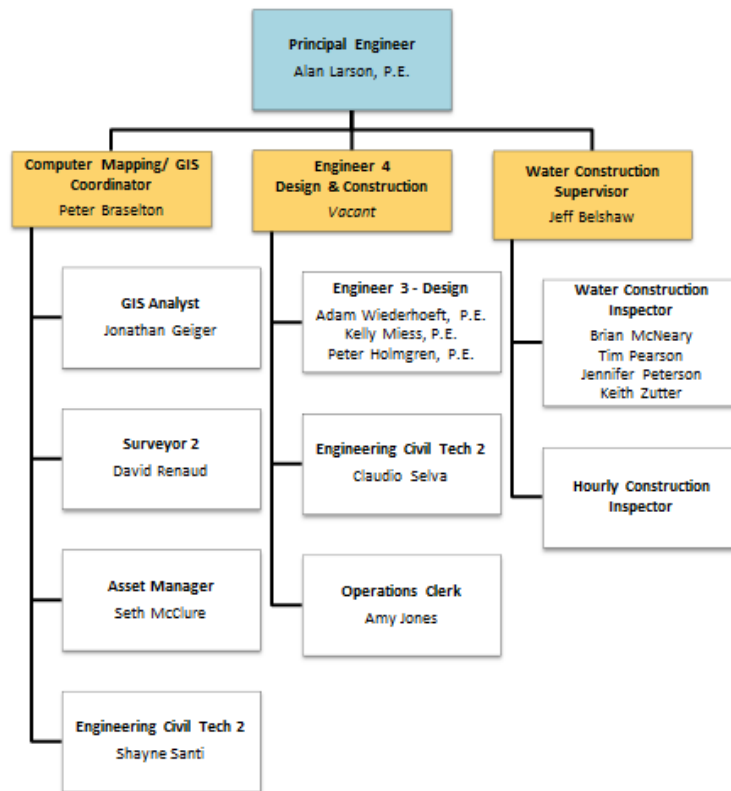


Figure 21 Current MWU Engineering Structure

5.4 Asset Management Roles and Responsibilities

As indicated, MWU's SAM Program is not confined only to the Engineering Division, even though that is the segment of the organization in which the role of Asset Manager sits. Strategic Asset Management is best implemented as an organization-wide effort with roles distributed to and amongst several existing positions. Each MWU division have critical leadership and implementation roles. As described above in Section 1.2, MWU's SAM Team provides the leadership for the SAM Program. The SAM Team has representation from all six MWU divisions and includes the following individuals:

- Tom Heikkinen, General Manager
- Joe Demorett, P.G., Water Supply Manager
- Al Larson, P.E., Principal Engineer
- Pete Braselton, Mapping/GIS Coordinator
- Seth McClure, P.E., Asset Manager
- Joe Grande, Water Quality Manager
- Dan Rodefled, Operations Manager
- Doug Van Horn, Maintenance Supervisor
- Tom Rosemeyer, Field Supervisor
- Robin Piper, Chief Administrative Officer
- Amy Barrilleaux, Public Information Officer

During SAM workshops, the SAM Team agreed that asset management roles and responsibilities are shared throughout the divisions of the organization. Each member of the SAM Team (or their designee) as well as other individuals within each division have primary and supporting leadership and implementation roles as part of the SAM Program. While the position of Asset Manager coordinates the SAM Team and serves as a centralized resource to bring the various elements of the SAM Framework together as an integrated whole, key responsibilities for development and implementation of the SAM Program reside and are owned by other parts of the organization. As a group, the SAM Team is chartered to identify, develop, take ownership, and implement the list of formal and informal asset management functions shown in Table 12.

Table 12 Formal and Informal AM Functions

| Type of AM Function | AM Function |
|--|--|
| Formal AM Functions | <ul style="list-style-type: none"> • Provide AM leadership and direction • Develop and communicate AM vision, policies, framework, and procedures • Define External and Internal Levels of Service • Establish, implement, and maintain the AM Program • Provide input to the Capital Program • Drive AM continuous improvement • Establish and implement risk-based decision-making practices • Develop and update Asset Management Plans (AMPs) • Define AM technology requirements • Provide AM training and skill development • Communicate AM progress to the Executive Team and Water Utility Board |
| Either Formal or Informal AM Functions | <ul style="list-style-type: none"> • Update and maintain the asset inventory, asset hierarchy, and asset register • Define procedures for collecting, validating, analyzing, storing and retrieving data • Perform asset life cycle cost analyses and asset remaining life analyses • Identify and communicate needed and potential asset investment projects • Perform business case analyses and resulting project prioritization • Identify database system user requirements • Provide wide access across the divisions to asset data and analysis tools • Manage the handover of assets from planning to design to construction to operation • Perform GIS data entry and other asset data source management |
| Informal AM Functions | <ul style="list-style-type: none"> • Implement AM vision, policies, framework and procedures • Procure, implement, and support IT systems that support AM • Perform reliability evaluations to enhance maintenance and operational asset performance • Perform condition assessment and collect required asset data • Implement work management processes and procedures, including work order prioritization • Report on asset performance • Manage asset inventory and spare parts • Research and report on alternative project approaches |

As MWU's asset management program develops the assignment of responsibility for the following key primary programmatic functions is needed:

- Strategic Asset Management Governance
 - Facilitate and coordinate the SAM Team
 - Lead the development of the asset management vision, policies, and framework elements
 - Facilitate and coordinate the asset management functions from across the organization
- Asset Register
 - Establish the asset hierarchy
 - Define asset data fields to be collected, including asset naming and numbering conventions
 - Provide direction to the rest of the organization on the population and maintenance of the data in the asset register
 - Develop quality review systems to periodically evaluate the organization's asset data quality
- Data Collection, Management and Analysis
 - Define the categories, types, and formats of asset data to be collected in the AM asset register
 - Perform condition assessments
 - Analyze asset condition and determine asset remaining life for each asset
 - Determine and record asset consequence of failure
 - Integrate and analyze available GIS spatial data with asset attribute information and visualization of asset management analysis using GIS tools
 - Lead the technical requirements development process for asset management database systems implementation and upgrade
 - Develop and implement CMMS Work Order management processes
- Risk Framework
 - Review and provide input to the MWU's capital planning and risk register development
 - Design and implement MWU's Business Risk Exposure (BRE) process
 - Identify MWU's critical assets
- Capital and O&M Strategies
 - Define Management Strategy Groups (MSGs)
 - Analyze legacy and current information to determine MWU specific asset decay patterns and compare the decay patterns to industry standards
 - Implement and manage MWU's Decision Support System (DSS)
 - Develop and evaluate capital investment options and decisions
 - Identify operational needs and provide input to O&M procedures with the aim of optimizing asset life
- Business Case Evaluation (BCE) Process
 - Establish standards and guidelines.
 - Provide analytical support to the BCE process

- Participate in Business Case Evaluation activities as a precursor to including projects in capital and O&M planning
- Tactical Asset Management Plans (AMPs)
 - Perform asset life cycle cost analysis
 - Develop the content requirements for MWU's AMPs
 - Develop AMP content based on asset data analysis
 - Communicate AMP content and recommendations to the rest of the organization for input and refinement
 - Develop short, medium and long-range asset investment forecasts ("Nessie curves")
 - Develop AMP Executive Summaries that tell "The Story" of the assets
 - Develop and review asset management–related processes and procedures, and communicate these to the rest of the organization
- Performance Measurement
 - Provide input to the Chief Engineer and General Manager on the development of appropriate key performance indicators
 - Development Internal and External Levels of Service targets
 - Develop the procedures for measuring progress against Internal and External Levels of Service targets
 - Analyze asset life performance and cost information and compare to MWU's applicable Internal and External Levels of Service targets
 - Lead asset management training activities for staff according to their role
 - Recommend asset management related roles and responsibilities to MWU's Human Resources division for inclusion in job descriptions and performance evaluation processes as appropriate
 - Communicate relevant results to external stakeholder, as appropriate

These functions are distributed amongst the six MWU divisions. Figure 22 shows these functions in a 'RASIC' matrix. RASIC is an acronym denoting who is **R**esponsible, **A**ccountable, **S**upporting, **I**nformed, and **C**onsulted.

| Responsible; Accountable; Supporting; Informed; Consulted | | | | | | | |
|---|--------------|------------------------|---------------|---|----------------|--------------------|------------------|
| SAM Programmatic Function | Water Supply | Engineering | Water Quality | Operations | Administration | Public Information | Asset Management |
| Strategic AM Governance | S | S | S | S | A - Heikkinen | S | R - McClure |
| Asset Register Development and Management | S | S | S | S | C | I | AR - McClure |
| Data Collection, Management and Analysis | S | A - Larson / Braselton | S | R - Van Horn (vertical) R - Rosemeyer (horizontal) | C | I | S+ |
| Risk Framework | S | A - Larson | S+ | S | C | S | R - McClure |
| Capital Budget | R - Demorett | A - Larson | S+ | C | I | I | S+ |
| O&M Strategies | C | S | C | AR - Rodefeld | I | I | S |
| Business Case Evaluation (BCE) Process | S | S | S | S | A - Heikkinen | I | R - McClure |
| Tactical Asset Management Plans | S | S | S | S | S | S | AR - McClure |
| Asset Management Performance Management | C | C | C | C | S | I | AR - McClure |

Figure 22 RASIC - Overview

As the SAM Framework is further defined and implemented at MWU, responsibilities and RASIC identification for these functions will need to be revisited. The above responsibilities require sufficient resources in order to execute appropriately and as the organization evolves and advances it is important to revisit that each critical SAM role resides with the appropriate staff who have the requisite capabilities and support to achieve the expected results.

5.5 Model for Organizing Asset Management Functions

In addition to these direct programmatic functions listed above, all divisions within the MWU organization participate in and contribute to asset management activities. MWU has established the SAM Team, which is currently responsible for overseeing the development of the Strategic Asset Management Implementation Plan (SAMIP). GHD recommends that MWU establish informal coordination relationships between the SAM Team and the different divisions of MWU during the implementation phase.

The general organizing model for Strategic Asset Management at MWU is shown in Figure 23. This organizing model for MWU shows the SAM Team supported by the Asset Manager position and accountable to MWU Executive Leadership for the success of the SAM Program. All six MWU divisions are represented on the SAM Team and SAM Team members identify from their respective divisions additional individuals who form an informal network of asset management champions. This informal network of AM champions serves as key staff to support SAM-related initiatives. Depending on the SAM initiative focus, initiative teams are formed from one or more of the six divisions. External resources are made available as needed to support individual initiative tasks or the SAM Program as a whole, as appropriate.

The advantages of this structure are that the SAM Program is coordinated centrally in the roles of the Asset Manager and the SAM Team who form a group that spans across all divisions and is accountable to the GM and executive leadership team. This central coordination provides consistency in AM practice and standardization of tools and templates. At the same time, each division has ownership of the SAM Program and provides input to how the SAM Program elements

are developed and implemented. The model is flexible to enable different divisions to implement SAM elements differently if the SAM Team is in agreement. The model relies on a collaborative approach, one where the Asset Manager role and the SAM Team consider input from all divisions, then make decisions based on what is most appropriate for the organization as a whole.

It is important to note that the organization model presented is generalized for an asset management governance model and does not represent a recommendation for a proposed change to the current organizational structure shown in Figure 20 and Figure 21 above. The asset management champions and unit leaders would also participate significantly in training MWU staff on asset management procedures as well as be responsible for leading or overseeing other asset management related functions such as data collection, condition assessment, business case evaluation, annual budget input, and asset life cycle forecasting.

One particular area raised by the SAM Team during the initial stages of the SAM Program is a real or perceived difference between the two primary staff work locations. There is a sense by the SAM Team that differences exist between MWU main headquarters building and the MWU's Operations Center building. Some of the difference the SAM Team has identified is a result of job function, physical geography, staff background, tenure with MWU, and communication. As part of SAMP Implementation, additional attention to this issue should be made at the outset and throughout to address these sensitivities.

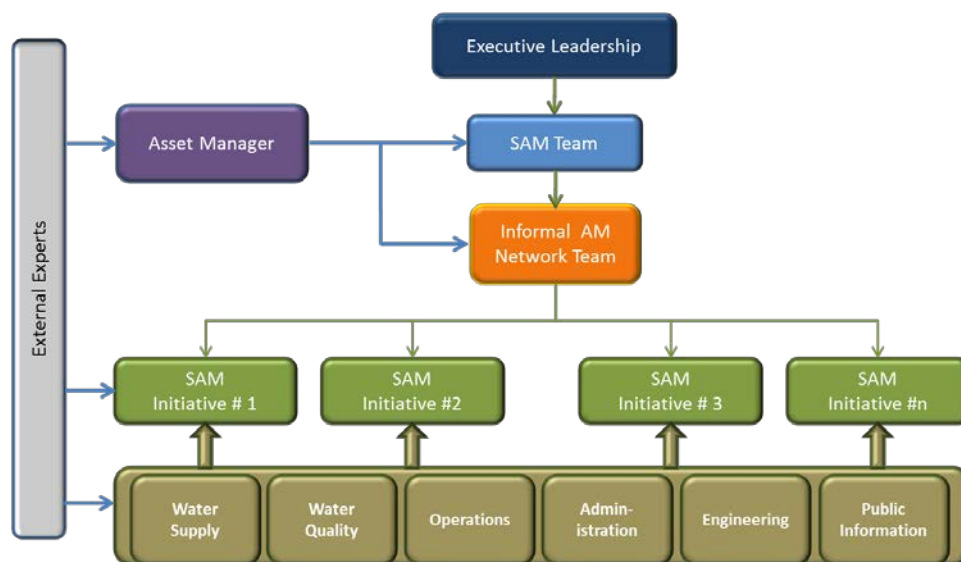


Figure 23 SAM Organizational Alignment and Governance Model

5.6 Change Management Considerations

A key to a successful SAM Program is the incorporation of organizational change management principles. Effective change management drives successful transformation of strategy to process, technology, and performance improvements in ways that allow people to contribute meaningfully and feel part of the action. One effective model is Jeff Hiatt's recognized ADKAR model for organizational change. The model is simple and proven and illustrates how people move through change in a predictable way. ADKAR stands for:

- **A**wareness of the need for change
- **D**esire to participate and support the change
- **K**nowledge on how to change

- Ability to implement required skills and behaviors
- Reinforcement to sustain the change

Table 13 below shows some of the key elements for each of the five areas.

Table 13 Key Elements of ADKAR Change Model

| Awareness | Desire | Knowledge | Ability | Reinforcement |
|--------------------------------------|---|----------------------------------|---------------------------------------|---|
| Effective communications | Effectively sponsor change with employees | Effective training and education | Day-to-day involvement of supervisors | Celebration and recognition |
| Executive sponsorship | Equip managers to be change leaders | Job aides, checklists, templates | Access to subject matter experts | Rewards |
| Coaching by managers and supervisors | Assess risks and anticipate resistance | One-on-one coaching | Performance monitoring | Feedback from employees |
| Ready access to information | Engage employees in the change process | Knowledge groups and forums | Hands-on exercises during training | Reviews and performance measurement systems |
| | Align incentive programs | | | Accountability systems |

There are several effective change models that have been developed and used successfully within the utility sector. The ADKAR model is just one of these. MWU may elect to use this model or a different model as part of implementing technical, operational, procedural, or organizational changes associated with the SAM Program. An intentional and planned approach to enacting change has a much higher probability of success than doing so without.

All change models include emphasis on effective communication. The following are key elements of effective communication that should be implemented as part of the organizational change and alignment efforts.

- Visible, active and frequent leadership engagement.
- Frequent communications directed appropriately to managers, supervisors, foremen, and front line staff with the intention of make these enhancement topics regularly talked about by the staff.
- Emphasis that some business, technical, and operational processes will be different going forward with explanation for the reasons and benefits for the changes.
- Clear communication to all levels of the organization of answers to "What's in it for me?" type questions.
- Effective and sustained training opportunities to drive awareness and to be a catalyst for change, including a strong train-the-trainer program.
- Frequent updated communication to stakeholders such as Human Resources, IT, and Purchasing divisions so they are aware of potential support they can provide personnel, systems and projects.
- Frequent update communication with union representatives with the aim of enable proposed adjustments to roles and responsibilities to be understood and embraced.

- Frequent progress updates at various levels with candid status updates (both positive and less positive progress information).

As each SAM Program initiative is planned and executed, attention to these change principles and clear communication should be applied. In addition, identifying and fostering those in the organization who can act as champions for asset management will yield accelerated results over the case where asset management is only implemented top-down from executive leadership, the Asset Manager or the SAM Team. As respected and credible individuals within the organization visibly demonstrate support for and early adoption of asset management, the pace of uptake of the new processes will increase. Conversely, attention should be paid to monitoring for pockets of resistance and intervening with the help of champions quickly and effectively to minimize the chance of a significant roadblock and to demonstrate leadership commitment to moving forward with the new approaches.

As part of MWU's SAM Program development, change management considerations are being implemented, including in the following ways:

- MWU leadership is visibly involved and active in the planning and implementation.
- The SAM Team has representation from all six MWU divisions, enabling a forum for wide input to how asset management is implemented. Asset management objectives are tied to MWU overall strategic objectives.
- Every workshop and meeting on asset management includes some aspect of awareness training on asset management topics to further understanding amongst MWU staff. Asset management training is planned for those roles in MWU that require.
- Attention is being focused to address how asset management is anticipated to impact individual roles and why asset management practices are important for each division, the organization as a whole, and the City of Madison.
- A pilot approach to asset management process implementation is being followed, enabling a test-phase stage for making adjustments before rolling out to the entire organization.
- Frequent and clear communication is considered a critical part of the implementation plan.

6. Asset Management Initiatives and AM Roadmap

This section presents the tasks necessary to implement a fit-for-purpose Strategic Asset Management program for Madison Water Utility, and the relative priority of each task that makes up this implementation plan or roadmap. Implementation tasks are divided into four functional areas based on the SAM Program Implementation model presented in Section 3. These four areas are:

1. Planning;
2. Core Service Delivery;
3. Performance Management; and
4. Support Services

The implementation tasks are presented in Table 14 and include the initiative/task description, and planning time frame/priority. The planning time frames are presented as:

- Short Term (Phase 2 - Design and Pilot) – to be initiated within the next fiscal year (FY2018 - one to two-year horizon)
- Medium Term (Phase 3 - Implement Best-in-Class Practices) – to be initiated within a two to three-year horizon
- Long Term (Phase 4 - Monitoring and Continuous Improvement) – to be initiated within a three to five-year horizon

The implementation priority has been developed based on the logical sequence/inter-dependency of implementation tasks; AM Team input on available resources; other MWU initiatives; and, budgetary considerations. It is anticipated that the specific priorities will be adjusted over time. The initial priority listed in the tables below has primarily been used to determine the timing of the needed tasks.

Table 14 AM Roadmap Implementation Task Descriptions Summary Table

| AM Organization Framework Element | No. | Improvement Task | Description | Priority |
|-----------------------------------|-----|--|---|-------------------|
| Planning | P1 | SAMP AM Policy & Framework and AM Strategy | Monitor and report on AM implementation progress quarterly, and update the AM Policy and implementation plan annually as needed to align with MWU's Strategic Plan and budget. | Medium/Long |
| | P2 | Tactical Asset Management Plans (Wells, Distribution, Storage) | Develop and pilot Consequence of Failure (COF) and Probability of Failure (POF) tables for one (or group) of well facilities assets and a group of distribution system assets; modify tables as appropriate. Develop Tactical Asset Management Plans (TAMPs) for well facilities, storage, distribution and transmission. TAMPs include asset registers, maintenance strategies, risk profiles and rehabilitation/replacement strategies. Update plans over time to improve maintenance procedures as needed based on experience. | Short/Medium/Long |
| | P3 | Master Plan Update | Ongoing Master Plan update. | Short |
| | P4 | Capital and O&M Planning Budget Process Improvement - Prioritization, Business Case Evaluations, Budgeting | Develop standard procedures for prioritizing capital improvement projects including incorporating Business Case Evaluations (BCEs) as part of the Capital Improvement Planning (CIP) process. The improved process will define the CIP prioritization process and include a, life-cycle cost tool; risk reduction tool, cost/benefit tool, and BCE "Light" process for smaller projects. | Short/Medium |
| Core Service Delivery | CS1 | Review and Redesign Asset Creation/Renewal Processes and Workflows | Develop standard procedures and associated forms for entering new assets into CMMS, updating asset information, and asset renewal/replacement or disposal. Identify staff responsibilities for updating asset registers for well facilities, storage, distribution and transmission. Refine procedures as appropriate to improve workflows after gaining experience with the new procedures. | Medium |
| | CS2 | Refine Operations & Maintenance Processes & Workflows (including PM Optimization) | Implement the maintenance strategies described in the TAMPs at the asset level. Monitor and report out on maintenance activities including Work Requests, Work Order Backlogs, PM Compliance, Schedule Compliance, Percent Proactive Work, and Percent Predictive Work. | Medium |
| | CS3 | Develop and Implement Condition Assessment Process for Linear and Vertical Assets | Develop standard procedures and associated forms for completing condition assessments of well facilities, storage, distribution and transmission system assets. Identify responsible staff for completing each of three levels of condition assessment (desktop, visual and advanced). Include procedures for capturing condition assessments in CMMS. | Short/Medium |

| AM Organization Framework Element | No. | Improvement Task | Description | Priority |
|-----------------------------------|-----|--|--|--------------|
| Performance Management | PM1 | Develop the AM Performance Management and LOS Framework | Develop Levels of Service (LOS) framework and associated performance measures for well facilities, storage, distribution and transmission. | Short/Medium |
| | PM2 | Design and Implement a Failure Investigation/Root Cause Analysis Business Process | Develop standard procedures for root cause analysis and failure investigations, and standard failure modes and codes for entry into CMMS. Prepare a workflow chart identifying the steps for failure investigations and subsequent training and modifications to operation and maintenance procedures to incorporate lessons learned and improve performance. Identify responsible staff for conducting investigations and coding failure modes. | Medium |
| | PM3 | Redesign the Performance Assessment Workflows and Implement Continuous Improvement Including External Benchmarking | Update reported performance measures to include performance against LOS for well facilities, storage, distribution, and transmission assets. Participate in external benchmarking activities and adjust LOS as appropriate over time. | Long |
| Support Services | SS1 | Develop and Implement an AM Governance Structure that Supports Both Corporate and Service Area Objectives | Identify AM responsibilities and update position descriptions as necessary. | Short/Medium |
| | SS2 | Review Staff Skills and Experience and Implement AM Training Programs to Develop Appropriate Skills | Assess staff experience and skills and develop succession plans for knowledge transfer throughout the organization. Develop and implement training programs for implementing each of the AM initiatives and the asset management program as a whole. | Medium |
| | SS3 | Update and Implement a Consistent Asset Register and Standards for Activity Data Tracking | Review and update asset register content and format to support AM initiatives as necessary. Review and update asset hierarchy, unique identifiers, asset description/names and Maintenance Strategy Groups (MSGs) and update to support AM initiatives as necessary. Review and update (if necessary) data security and backup procedures to maintain integrity of data over time. | Short |
| | SS4 | Incorporate AM Requirements into CMMS | Develop and implement standard operating procedures for data and management of data including developing asset data attribute standards required for AM program decision making. | Medium |

| AM Organization Framework Element | No. | Improvement Task | Description | Priority |
|-----------------------------------|-------|--|---|-------------------|
| Support Services | SS5 | CMMS Implementation | Perform Ongoing Cityworks implementation. | Short |
| | SS6 | Develop & Implement a Utility Wide AM Knowledge Management Program | Develop requirements and process for a Document Management System. | Long |
| | SS7 | Develop Interfaces to CMMS and Existing Core Systems to Support AM Requirements | Determine what interfaces are required to collect and report out AM data and information from CMMS. | Medium |
| | SS8 | Implement DSS for Integrated Capital Planning | Evaluate, select and implement an integrated capital and maintenance planning system (Decision Support System, or DSS) including predictive models for asset failure, life-cycle costs, and LOS, COS and risk to inform the budgeting process. | Medium |
| AM Program Implementation | AMPI1 | Ongoing AM Support and Coordination (e.g. Life Cycle Cost Analysis, Continuous Improvement, Management of AM Implementation) | Engage a dedicated AM staff person to oversee the implementation of the asset management program. Assign resources as needed in all departments to support implementation of AM initiatives, and contract for outside resources as appropriate. | Short/Medium/Long |

Detailed descriptions of each of the recommended implementation tasks are further described below in Section 6.1.

As indicated in Section 3, the implementation of the SAM framework will require MWU resources to be allocated and assigned to each of the implementation tasks included in the Roadmap.

Figure 24, Figure 25 and Figure 26 present the Roadmap relative timing of each implementation task and includes an estimate of internal MWU resource requirements expressed as an employee full time equivalent (FTE). Please note that 1 FTE is equal to approximately 1800 hours of effort per year (based on a 40-hour work week subtracting out vacation, holiday and sick time).

As shown on the graph in Figure 24, on average, over the next three years, approximately 1.75 FTEs/Quarter will be required to support these initiatives, which equates to about 3,150 hours of staff time per quarter. During the most intense phases of implementation, between 2.25 and 3.75 FTEs are estimated to be needed per quarter. During less intense periods, 1.5 FTEs or fewer are anticipated to be needed.

| Task ID | Task Name | Priority | 2017-Q3 | 2017-Q4 | 2018-Q1 | 2018-Q2 | 2018-Q3 | 2018-Q4 |
|---------|--|-------------------|---------|---------|---------|---------|---------|---------|
| P2 | Tactical Asset Management Plans (Wells, Distribution, Storage) | Short/Medium/Long | | | | | | |
| P3 | Master Plan Update | Short | | | | | | |
| P4 | Capital and O&M Planning Budget Process Improvement - Prioritization, Business Case Evaluations, Budgeting | Short/Medium | | | | | | |
| CS3 | Develop and Implement Condition Assessment Process for Linear and Vertical Assets | Short/Medium | | | | | | |
| PM1 | Develop the AM Performance Management and LOS Framework | Short/Medium | | | | | | |
| SS1 | Develop and Implement an AM Governance Structure that supports both Corporate and Service Area Objectives | Short/Medium | | | | | | |
| SS3 | Update and Implement a Consistent Asset Register and Standards for Activity Data Tracking | Short | | | | | | |
| SS5 | CMMS Implementation | Short | | | | | | |

Figure 24 MWU Implementation Plan Roadmap Short Term Planning Horizon

DRAFT Madison Water Utility AM Implementation Plan Roadmap

| AM Organization Framework Element | No. | Improvement Task Description | Planning Term | Resources |
|-----------------------------------|-------|--|-------------------------------|---------------|
| | | | S: 1 yr, M: 2-3 yrs,L: 3+ yrs | Internal FTEs |
| Planning | P1 | SAMP AM Policy & Framework and AM Strategy | Medium/Long | 0.25 |
| | P2 | Tactical Asset Management Plans (Wells, Distribution, Storage) | Short/Medium/Long | 1 |
| | P3 | Master Plan Update | Short | 0.5 |
| | P4 | Capital and O&M Planning Budget Process Improvement - Prioritization, Business Case Evaluations, Budgeting | Short/Medium | 0.5 |
| Core Service Delivery | CS1 | Review and Redesign Asset Creation/Renewal Processes and Workflows | Medium | 0.5 |
| | CS2 | Refine Operations & Maintenance Processes & Workflows (including PM Optimization) | Medium | 1 |
| | CS3 | Develop and Implement Condition Assessment Process for Linear and Vertical Assets | Short/Medium | 0.75 |
| Performance Management | PM1 | Develop the AM Performance Management and LOS Framework | Short/Medium | 0.5 |
| | PM2 | Design and Implement a Failure Investigation/Root Cause Analysis Business Process | Medium | 0.75 |
| | PM3 | Redesign the Performance Assessment Workflows and Implement Continuous Improvement including External Benchmarking | Long | 0.5 |
| Support Services | SS1 | Develop and Implement an AM Governance Structure that supports both Corporate and Service Area Objectives | Short/Medium | 0.25 |
| | SS2 | Review Staff Skills and Experience and Implement AM Training Programs to Develop Appropriate Skills | Medium | 1.5 |
| | SS3 | Update and Implement a Consistent Asset Register and Standards for Activity Data Tracking | Short | 1 |
| | SS4 | Incorporate AM Requirements into CMMS | Medium | 1 |
| | SS5 | CMMS Implementation | Short | 1.5 |
| | SS6 | Develop & Implement a Utility Wide AM Knowledge Management Program | Medium | 1.5 |
| | SS7 | Develop Interfaces to CMMS and Existing Core Systems to Support AM Requirements | Medium | 1 |
| | SS8 | Implement DSS for Integrated Capital Planning | Medium | 1 |
| AM Program Implementation | AMP11 | Ongoing AM Support and Coordination (e.g. Life Cycle Cost Analysis, Continuous Improvement, Management of AM Implementation) | Short/Medium/Long | 1 |

DRAFT Madison Water Utility AM Implementation Plan Roadmap FTE Requirements

| AM Framework | No | Improvement Initiatives | Planning Term S: 1 yr, M: 2-3 yrs, L: 3+ yrs | Total Costs | 2017 | | | | 2018 | | | | 2019 | | | | 2020 | | | | 2021 | | | |
|---------------------------|-------|--|--|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | | | | Internal FTEs | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| Planning | P1 | SAMP AM Policy & Framework and AM Strategy | Medium/Long | 0.25 | 0.13 | 0.13 | | | | | | | | | | | | | | | 0.06 | 0.06 | 0.06 | 0.06 |
| | P2 | Tactical Asset Management Plans (Wells, Distribution, Storage) | Short/Medium/Long | 1 | | | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | | | | | | | | | | | | |
| | P3 | Master Plan Update | Short | 0.5 | 0.13 | 0.13 | 0.13 | 0.13 | | | | | | | | | | | | | | | | |
| | P4 | Capital and O&M Planning Budget Process Improvement - Prioritization, Business Case Evaluations, Budgeting | Short/Medium | 0.5 | | | | | 0.13 | 0.13 | 0.13 | 0.13 | | | | | | | | | | | | |
| Core Service Delivery | CS1 | Review and Redesign Asset Creation/Renewal Processes and Workflows | Medium | 0.5 | | | | | | | 0.13 | 0.13 | 0.13 | 0.13 | | | | | | | | | | |
| | CS2 | Refine Operations & Maintenance Processes & Workflows (including PM Optimization) | Medium | 1 | | | | | | | 0.25 | 0.25 | 0.25 | 0.25 | | | | | | | | | | |
| | CS3 | Develop and Implement Condition Assessment Process for Linear and Vertical Assets | Short/Medium | 0.75 | | | | | 0.19 | 0.19 | 0.19 | 0.19 | | | | | | | | | | | | |
| Performance Management | PM1 | Develop the AM Performance Management and LOS Framework | Short/Medium | 0.5 | | | | | 0.13 | 0.13 | 0.13 | 0.13 | | | | | | | | | | | | |
| | PM2 | Design and Implement a Failure Investigation/Root Cause Analysis Business Process | Medium | 0.75 | | | | | | | | | 0.19 | 0.19 | 0.19 | 0.19 | | | | | | | | |
| | PM3 | Redesign the Performance Assessment Workflows and Implement Continuous Improvement including External Benchmarking | Long | 0.5 | | | | | | | | | | | | | 0.13 | 0.13 | 0.13 | 0.13 | | | | |
| Support Services | SS1 | Develop and Implement an AM Governance Structure that supports both Corporate and Service Area Objectives | Short/Medium | 0.25 | | | | | 0.06 | 0.06 | 0.06 | 0.06 | | | | | | | | | | | | |
| | SS2 | Review Staff Skills and Experience and Implement AM Training Programs to Develop Appropriate Skills | Medium | 1.5 | | | | | | | 0.38 | 0.38 | 0.38 | 0.38 | | | | | | | | | | |
| | SS3 | Update and Implement a Consistent Asset Register and Standards for Activity Data Tracking | Short | 1 | | | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | | | | | | | | | | | | |
| | SS4 | Incorporate AM Requirements into CMMS | Medium | 1 | | | | | 0.25 | 0.25 | 0.25 | 0.25 | | | | | | | | | | | | |
| | SS5 | CMMS Implementation | Short | 1.5 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | | | | | | | | | | | | | | |
| | SS6 | Develop & Implement a Utility Wide AM Knowledge Management Program | Medium | 1.5 | | | | | | | | | | | | | | | | | 0.38 | 0.38 | 0.38 | 0.38 |
| | SS7 | Develop Interfaces to CMMS and Existing Core Systems to Support AM Requirements | Medium | 1 | | | | | | 0.25 | 0.25 | 0.25 | 0.25 | | | | | | | | | | | |
| | SS8 | Implement DSS for Integrated Capital Planning | Medium | 1 | | | | | | | | 0.25 | 0.25 | 0.25 | 0.25 | | | | | | | | | |
| AM Program Implementation | AMP11 | Ongoing AM Support and Coordination (e.g. Life Cycle Cost Analysis, Continuous Improvement, Management of AM Implementation) | Short/Medium/Long | 1 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | |
| Total | | | | | 0.88 | 0.88 | 1.25 | 1.25 | 1.88 | 2.13 | 2.50 | 2.75 | 1.69 | 1.44 | 0.69 | 0.44 | 0.63 | 0.63 | 0.63 | 0.63 | 0.94 | 0.94 | 0.94 | 0.94 |

DRAFT Madison Water Utility AM Implementation Plan Roadmap Schedule

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|--|--|---|---|--|--|
| PLANNING (Short, Medium & Long Term) | SAMP AM Policy & Framework and AM Strategy | Asset Management Policy & Framework Provides Ongoing Direction and Support for Asset Management Development | | | SAMP AM Policy & Framework and AM Strategy |
| | | Tactical Asset Management Plans (Wells, Distribution, Storage) | | Ongoing AMP Updates | |
| | Master Plan Update | | Ongoing Analysis | | |
| | | Capital and O&M Planning Budget Process Improvement - Prioritization, Business Case Evaluations, Budgeting | | Ongoing Analysis | |
| CORE SERVICE DELIVERY (Asset Life Cycle Management, Operator's & Programs) | | Review and Redesign Asset Creation/Renewal Processes and Workflows | | Ongoing Update and Improvement of Business Processes & Workflows | |
| | | Refine Operations & Maintenance Processes & Workflows (including PM Optimization) | | Ongoing Update and Improvement of Business Processes & Workflows | |
| | | Develop and Implement Condition Assessment Process for Linear and Vertical Assets | | Ongoing Condition Assessment | |
| PERFORMANCE MANAGEMENT (Performance & Continous Improvement, Performance Monitoring & Reporting) | | Develop the AM Performance Management and LOS Framework | Populate LOS Framework (Target LOS) by Major Asset Class and Report on Metrics on an Ongoing Basis | | |
| | | | Design and Implement a Failure Investigation/Root Cause Analysis Business Process | Ongoing Failure Investigation and Continuous Improvement Initiatives | |
| | | | | Redesign the Performance Assessment Workflows and Implement Continuous Improvement including External Benchmarking | Ongoing Continuous Improvements for Performance Monitoring & (including Condition Monitoring) Reporting Processes: Additional Assets |
| SUPPORT SERVICES (Finance & Admin, IS & Data Management, Human Resources Management) | | Develop and Implement an AM Governance Structure that supports both Corporate and Service Area Objectives | Ongoing Training Program Development, Update and AM Related Training Delivery | | |
| | | | Review Staff Skills and Experience and Implement AM Training Programs to Develop Appropriate Skills | Ongoing Training | |
| | | Update and Implement a Consistent Asset Register and Standards for Activity Data Tracking | Ongoing Update of Asset Register | | |
| | | | Incorporate AM Requirements into CMMS | Ongoing updating and review and AM Requirements for CMMS | |
| | | CMMS Implementation | Ongoing Administration of CMMS | | |
| | | | | | Develop & Implement a Utility Wide AM Knowledge Management Program |
| | | | Develop Interfaces to CMMS and Existing Core Systems to Support AM Requirements | Ongoing Administration and Support | |
| | | | Implement DSS for Integrated Capital Planning | Ongoing Development of Integrated Capital Planning System | |
| AM Program Implementation | Ongoing AM Support and Coordination (e.g. Life Cycle Cost Analysis, Continuous Improvement, Management of AM Implementation) | | | | |

6.1 Implementation Task Descriptions

This section presents additional information and detail for each implementation task.

Task P1 SAMP AM Policy & Framework and AM Strategy

Description: Monitor and report on AM implementation progress quarterly, and update the AM Policy and implementation plan annually as needed to align with MWU's Strategic Plan and budget.

Deliverable/Output: Updated AM Policy, AM Framework and Implementation Strategy

Schedule: 2021-Q1-Q4

Planning Time Frame (Priority): Medium/Long

Task P2 Tactical Asset Management Plans (Wells, Distribution, Storage)

Description: Develop Tactical Asset Management Plans (TAMPs) for well facilities, storage, distribution and transmission. AMPs include asset registers, maintenance strategies, risk profiles and rehabilitation/replacement strategies. Update plans over time to improve maintenance procedures as needed based on experience.

Develop and pilot Consequence of Failure (CoF) and Probability of Failure (PoF) tables for one (or group) of well facilities assets and a group of distribution system assets; modify tables as appropriate. Pilot output will be used as a template for doing other AMPs.

Deliverable/Output: Each AMP will include the following sections:

- Asset Inventory and Asset Register
- Condition and Remaining Life
- Performance Measures (i.e., External Levels of Service) and Business Risk Exposure
- Operation and Maintenance Strategies and Practices
- Capital Rehabilitation and Replacement Strategies
- CIP Investment Prioritization and Future Planning
- Business Process Improvement Project Descriptions
- Pilot Results and Implementation Plan

Deliverables in addition to each AMP will include:

- Asset Register (including condition and remaining life)
- Management Strategy Groups (including maintenance strategies)
- Risk Profile
- Rehabilitation and Replacement Strategies

Schedule: 2017-Q3 to 2019-Q1, 2020-Q1-Q2, 2021-Q1-Q2

Planning Time Frame (Priority): Short/*Medium*/Long

Task P3 Master Plan Update

Description: Ongoing Master Plan Update

Deliverable/Output: Updated Master Plan

Schedule: 2017-Q1 to 2017-Q4

Planning Time Frame (Priority): Short

Task P4 Capital and O&M Planning Budget Process Improvement - Prioritization, Business Case Evaluations, Budgeting

Description: Develop standard procedures for prioritizing capital improvement projects including incorporating Business Case Evaluations (BCEs) as part of the Capital Improvement Planning (CIP) process. The improved process will define the CIP prioritization process and include a life-cycle cost tool, risk reduction tool, cost/benefit tool, and BCE “Light” process for smaller projects.

Review and make recommendations on improvements to the existing CIP development process, including determining which criteria should be used in the prioritization process and how they are weighted. The objective for this task is to make decisions more transparent as to which projects get scheduled when and allow prioritization of projects that are different in nature.

This task will also focus on development and implementation of a BCE process. A BCE is a methodology for documenting and presenting a solution to an identified infrastructure need as a result of the asset management planning process and/or through other processes. This task will focus on implementing the BCE process and integrating with Madison Water Utility’s Project Charter development process.

This task includes the following subtasks:

- Conduct workshop to review existing CIP prioritization process.
- Identify areas of improvement for alignment with the AM Framework (during and after workshop).
- Conduct workshop to review and finalize “new/to-be” process, prioritization criteria weighting.
- Summarize prioritization process in a summary technical memorandum and document future work flow/timing.
- Develop the BCE process to include the following elements:
 - Need Validation and Prioritization;
 - Alternative Generation;
 - Life Cycle Cost Analysis;
 - Risk and Risk Reduction Analysis;
 - Benefit Cost Analysis.
- Develop/document common assumptions and practices to be used in developing life cycle costs and business cases.
- Develop a set of spreadsheet tools to support the BCE process.
- Develop an approach for a Business Case Light version of the BCE process, including associated procedure and tools.
- Document revised BCE process in a Summary Technical Memorandum.

Deliverable/Output: Summary Technical Memorandum in the form of a standard operating procedure including flowcharts for CIP Prioritization Process. BCE Process Summary Technical Memorandum; Life Cycle Cost Tool; Risk Reduction Tool; Benefit Cost Tool; BCE Light Process and associated tools.

Schedule: 2018-Q1 to 2018-Q4

Planning Time Frame (Priority): Short/Medium

Task CS1 Review and Redesign Asset Creation/Renewal Processes and Workflows

Description: Develop standard procedures and associated forms for entering new assets into CMMS, updating asset information, and asset renewal/replacement or disposal. Identify staff responsibilities for updating asset registers for well facilities, storage, distribution and transmission. Refine procedures as appropriate to improve workflows after gaining experience with the new procedures.

This task is intended to be part of the continuous improvement of the asset management program. This task will review and update business processes related to Asset Creation (Replacement), Renewal & Disposal, including:

- Identify desired roles/responsibilities,
- Communication and training needs,
- Data and knowledge,
- Technology and performance management requirements based on updated / redesigned business processes.

Deliverable/Output: Summary technical memorandum with recommendations for updating business process work flows for asset creation, renewal and disposal.

Schedule: 2018-Q3 to 2019-Q2

Planning Time Frame (Priority): Medium

Task CS2 Refine Operations & Maintenance Processes & Workflows (Including PM Optimization)

Description: Implement the maintenance strategies described in the tactical AMPs at the asset level. Monitor and report out on maintenance activities including Work Requests, Work Order Backlogs, PM Compliance, Schedule Compliance, Percent Proactive Work, and Percent Predictive Work.

Continue to develop and roll out optimized maintenance concepts to all areas supported by Cityworks maintenance/work management solution being implemented under task SS5. Update / redesign and document business processes related to Maintenance, Operations and Work & Resource Management based on leading practices. This task will identify:

- Desired roles/responsibilities,
- Communication and training needs,
- Data and knowledge, technology and performance management requirements,
- Develop PM optimization techniques based on using Risk Management Zones and implement this across all service area. Develop and implement a Maintenance “Dashboard”

to include at a minimum Work Request, Work Order Backlogs, PM Compliance, Schedule Compliance, % Proactive Work, % Predictive Work.

Deliverable/Output: Technical memorandum on updating / redesign and documenting business processes related to Maintenance, Operations and Work & Resource Management; PM Optimization Process; including recommendations for a Maintenance “Dashboard”.

Schedule: 2018-Q3 to 2019-Q2

Planning Time Frame (Priority): Medium

Task CS3 Develop and Implement Condition Assessment Process for Linear and Vertical Assets

Description: Develop standard procedures and associated forms for completing condition assessments of well facilities, storage, distribution and transmission system assets. Identify responsible staff for completing each of three levels of condition assessment (desktop, visual and advanced). Include procedures for capturing condition assessments in the CMMS.

This task includes developing a condition assessment protocol (CAP) for vertical (facility) and linear (pipes, appurtenances) assets that will be applied through the following levels:

Level 1 Assessment – entails a desktop condition assessment using experienced judgement and a simple condition scale of one (1) through five (5). This process is further augmented with work order data and failure patterns, in addition to the use of photos and process schematics. Experienced judgement is attained through holding workshops with functional area experts to discuss and reach consensus. Level 1 is applied to all assets in the asset register.

Level 2 Assessment – visual assessment that incorporates asset distress modes such as noise, vibration, amperage, heating, etc. in which a condition rating is derived from these distress modes. Level 2 is primarily applied to critical and high consequence of failure assets.

Level 3 Assessment – more sophisticated approach that incorporates multiple means to assess asset condition, including the visual inspection, analog meter / gauge measurement, and digital instruments, which includes specialized equipment such as infrared guns, accelerators, etc., to identify and measure distress modes. Level 3 is primarily applied to assets that have the highest business risk exposure (BRE).

An asset class based Level 1 and Level 2 condition scoring matrix will be developed based on Management Strategy Groups (MSGs) for vertical assets. For linear assets, Level 1 and Level 2 CAPs will be developed based on industry best practices scoring methodologies.

Deliverable/Output:

- Condition Assessment Protocol for Vertical (Facility) Assets
- Condition Assessment Protocol for Linear Assets
- Development of an Implementation Strategy (including a pilot) for using Cityworks for integrating the condition assessment process in the work order management work flow
- Development of training requirements that will be an input into Implementation Task SS2

Schedule: 2018-Q1 to 2018-Q4

Planning Time Frame (Priority): Short/Medium

Task PM1 Develop the AM Performance Management and LOS Framework

Description: Develop Levels of Service (LOS) framework and associated performance measures for well facilities, storage, distribution and transmission.

The purpose of this task is to build upon the work completed as part of the AM Framework development task, specifically focused on Performance Measures and LOS.

This task includes the following subtasks:

- Finalize the list of performance measures.
- Determine and develop the following for each of the selected new measures:
 - Description of the key performance measures
 - Units of measure
 - Source and availability of data to support the key performance measures
- For key performance measures that have data readily available, determine the following:
 - Target or Goal
 - Actuals
 - Key performance measures that do not have readily available data will be identified and addressed.
- Summarize findings in a technical memorandum.

Deliverable/Output: Key Performance Measures Technical Memorandum

Schedule: 2018-Q1 to 2018-Q4

Planning Time Frame (Priority): Short/Medium

Task PM2 Design and Implement a Failure Investigation/Root Cause Analysis Business Process

Description: Develop standard procedures for root cause analysis and failure investigations, and standard failure modes and codes for entry into CMMS. Prepare a workflow chart identifying the steps for failure investigations and subsequent training and modifications to operation and maintenance procedures to incorporate lessons learned and improve performance. Identify responsible staff for conducting investigations and coding failure modes.

Develop/document and formalize a process for root cause analysis, and failure investigation approach (e.g., FMECA). Provide training to staff on failure investigation. Incorporate investigation outcomes into preventive maintenance programs. Implement process and identify responsibility for handling investigation and mitigation of asset related failures, incidents and emergency situations. Implement process for determining preventative actions and communicating results of the investigation. Implement process to systematically analyze historic events and investigation of root cause(s) to determine corrective action following poor asset performance.

Deliverable/Output: Summary technical memorandum that includes business process workflows for performing failure analysis and root cause investigations; development of failure modes and codes for implementation into the computerized maintenance management system; identify training requirements and conduct training on improved workflow processes.

Schedule: 2019-Q1 to 2019-Q4

Planning Time Frame (Priority): Medium

Task PM3 Redesign the Performance Assessment Workflows and Implement Continuous Improvement Including External Benchmarking

Description: Update reported performance measures to include performance against LOS for well facilities, storage, distribution and transmission assets. Participate in external benchmarking activities and adjust LOS as appropriate over time.

Develop/document Performance Monitoring & Reporting workflows based on leading practice and existing processes. Identify roles/responsibilities, communication and training needs, data requirements and technology needs. Implement updated / redesigned Performance Monitoring & Reporting processes and associated practice elements: fill required roles, conduct communication and training, manage data and knowledge, configure technology, and manage performance. Train staff on continuous improvement processes and techniques. Ongoing continuous improvement initiatives, monitoring & rewards recognition, review / update and document performance against metrics. Implement regular internal reviews and benchmark against other Districts/Utilities.

Participate in periodic external utility AM Benchmarking.

Deliverable/Output: Summary technical memorandum outlining the continuous improvement process, including external benchmarking

Schedule: 2020-Q1 to 2020-Q4

Planning Time Frame (Priority): Long

Task SS1 Develop and Implement an AM Governance Structure that Supports Both Corporate and Service Area Objectives

Description: Identify AM responsibilities and update position descriptions as necessary. Position descriptions will be aligned with the SAM Framework program elements, including data collection, condition assessment, risk assessment, performance management, business case development and development of tactical AMPs.

Deliverable/Output: Updated and new position and job descriptions.

Schedule: 2018-Q1 to 2018-Q4

Planning Time Frame (Priority): Short/Medium

Task SS2 Review Staff Skills and Experience and Implement AM Training Programs to Develop Appropriate Skills

Description: Assess staff experience and skills and develop succession plans for knowledge transfer throughout the organization. Develop and implement training programs for implementing each of the AM initiatives and the asset management program as a whole. Initial priority will focus on AM awareness and high priority implementation tasks including development of tactical AMPs and condition assessment.

Deliverable/Output: Training Plan, Training and Change Management Strategy, Training Delivery

Schedule: 2018-Q3 to 2019-Q2

Planning Time Frame (Priority): Medium

Task SS3 Update and Implement a Consistent Asset Register and Standards for Activity Data Tracking

Description: Review and update asset register content and format to support AM initiatives as necessary. Review and update asset hierarchy, unique identifiers, asset description/names and Maintenance Strategy Groups (MSGs) and update to support AM initiatives as necessary. Review and update (if necessary) data security and backup procedures to maintain integrity of data over time.

This implementation task will include:

- Review the definition of an asset used currently by MWU and make recommendations as appropriate for changes or modifications to existing inventory.
- Review the existing asset inventory and existing logic for hierarchy structure (e.g., parent – child relationships).
- Develop an asset register using available data. Additional data collection will be conducted as part of the development of asset management plans being developed in implementation task P2).
- The updated asset register will include the following data attributes for each asset:
 - Unique Identification Number - Review the existing asset identification convention and make recommendations on potential changes. Integrate with the work being performed as part of the Cityworks CMMS implementation.
 - Asset Description/Name - Each asset in the asset register will be assigned an asset description/name that is consistent with other record information to help end users identify assets in the field based on the asset register. Integrate with the work being performed as part of the Cityworks CMMS implementation.
 - “TYPE” – Each asset will be assigned an asset “TYPE” and “SUBTYPE” for use when assigning Management Strategy Groups (MSGs).

Deliverable/Output:

- Asset hierarchy, naming, and data needs technical memorandum
- Asset register

Schedule: 2017-Q4 to 2018-Q4

Planning Time Frame (Priority): Short

Task SS4 Incorporate AM Requirements Into CMMS

Description: Develop and implement standard operating procedures for data and management of data including developing asset data attribute standards required for AM program decision making.

Deliverable/Output: Summary technical memo including data standards, attribute field requirements, incorporation of business logic for AM decision making and reporting requirements.

Schedule: 2018-Q1 to 2018-Q4

Planning Time Frame (Priority): Medium

Task SS5 CMMS Implementation

Description: On going Cityworks implementation.

Deliverable/Output: Functional work order system

Schedule: 2017-Q1 to 2018-Q4

Planning Time Frame (Priority): Short

Task SS6 Develop & Implement a Utility Wide AM Knowledge Management Program

Description: Develop requirements and process for a Document Management System. All core asset and activity knowledge (both static and dynamic) is captured in appropriate databases and supported by an Electronic Document Management System (EDMS) or other supporting technology solution. Tacit knowledge around the lifecycle is proactively captured from experienced staff members and documented electronically. Staff actively creates new knowledge, while refining, sharing and using existing knowledge on a regular basis.

This task will include:

1. Develop an AM Knowledge Management Strategy
2. Conduct an assessment of the key knowledge areas needed to sustain the District's AM practices
3. Update existing business processes, SOPs, Standards etc. and add new as necessary
4. Develop and maintain a master list of these key documents – establish update intervals
5. Select and implement a supporting Electronic Document Management System(EDMS) – review how well MS SharePoint meets MWU's needs
6. Capture documentation in MS Share Point (or the EDMS if a new one is selected)

Deliverable/Output: Document Management System

Schedule: 2021-Q1 to 2021-Q4

Planning Time Frame (Priority): Long

Task SS7 Develop Interfaces to CMMS and Existing Core Systems to Support AM Requirements

Description: Determine what interfaces are required to collect and report out AM data and information from CMMS. Information systems are linked to provide readily accessible and up-to-date data. This allows for effective planning, core service delivery, and performance monitoring/decision making with respect to assets. Change management should be initiated early in the process to maximize staff use of the software.

This task will include the following steps:

1. Develop appropriate interfaces to the CMMS to support AM requirements, in which:
 - i) Cost centers have been structured to allow meaningful categorization of costs at an appropriate level of detail.
 - ii) Costs (including O&M) are attributed to asset level in the asset hierarchy.
 - iii) Data derived from the CMMS are independent, are stored, managed & reported on.

- iv) Workforce competency, qualifications, training and recruiting are accessible during the work order planning/scheduling phases.
2. Link materials management functionality (purchasing and inventory) in CMMS to the planned Financial System to allow materials costs to be tracked to the asset level
3. Review existing informal stores and reassess the need for formal stores based on asset criticality and parts lead times.

Deliverable/Output: CMMS Interfaces (TBD)

Schedule: 2018-Q2 to 2019-Q1

Planning Time Frame (Priority): Medium

Task SS8 Implement DSS for Integrated Capital Planning

Description: Select and implement an integrated capital and maintenance planning system (Decision Support System, or DSS) to support the following functions:

- Predictive models are used to estimate asset failure in terms of capacity, reliability, condition, performance and outages / emergencies.
- Life cycle costs are modelled for different asset options to support comparison of renewal and investment alternatives.
- The ability to model COS/LOS and risk to better inform the budgeting process.

Deliverable/Output: Functional Requirements Document for a DSS; RFP for selecting a DSS; DSS Software Purchase; DSS implementation

Schedule: 2018-Q4 to 2019-Q3

Planning Time Frame (Priority): Medium

Task AAMPI1 Ongoing AM Support and Coordination (E.G. Life Cycle Cost Analysis, Continuous Improvement, Management of AM Implementation)

Description: This task is for the management and coordination of the asset management program. This is also shown in the figure showing the required FTEs. Initially coordination and management will be divided between the various implementation tasks, however there will be some additional effort required to coordinate between tasks. As the implementation of the program continues the FTE requirements will increase to provide ongoing support of the program including tasks associated with data analytics, ordination between Capitol planning and operations and maintenance, and other related tasks such as continuous improvement.

Schedule: Ongoing

Planning Time Frame (Priority): Short/Medium/Long

Appendices

Appendix A – MWU Strategic AM Program Team Charter

Madison Water Utility Strategic Asset Management (SAM) Program and Team Charter

Program and Team Charter

Utility Mission

We are entrusted by the people of Madison to supply high quality water for consumption and fire protection, at a reasonable cost, while conserving and protecting our ground water resources for present and future generations.

Purpose

The asset management development effort is a multi-year phased initiative focused on improving the Madison Water Utility overall efficiencies and effectiveness in delivering services to its customers. This program will focus on infrastructure assets. The following Vision, Mission and Program Measures of Success will guide overall implementation.

Vision

Consistently meet our established levels of service targets/goals at sustainable and responsible asset lifecycle costs and acceptable levels of risk. Individually and as an organization, lead and be known as best in class in asset management in Wisconsin and nationally. As an organization, meet MWU Board policies and City, State, and Federal requirements.

Mission

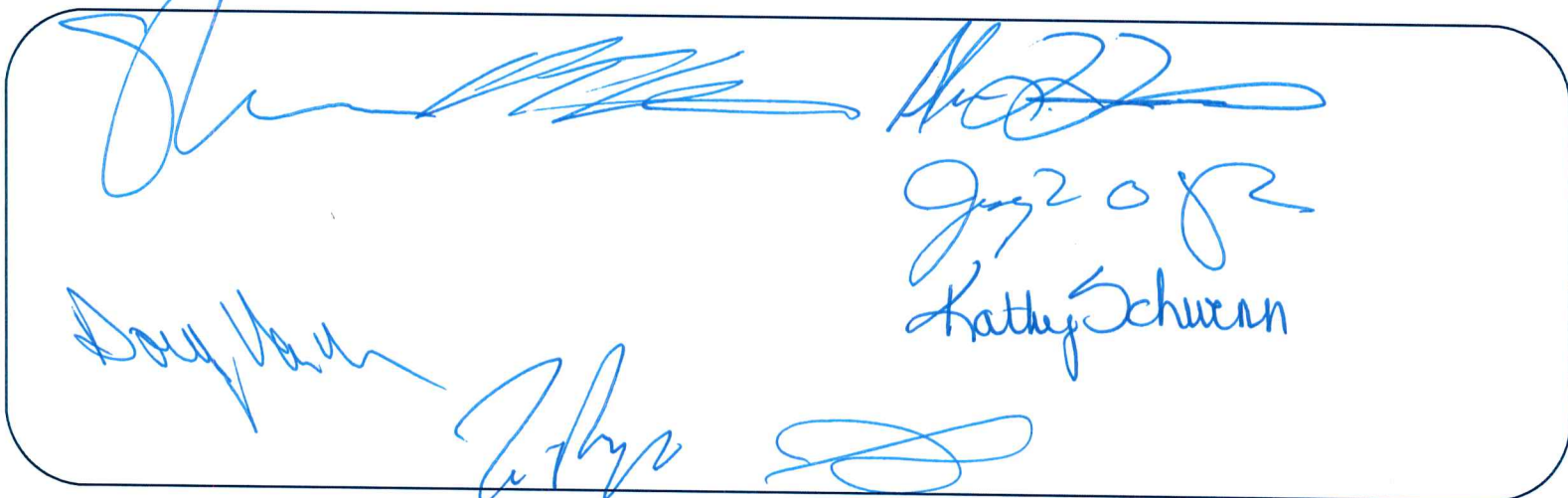
This asset management program will be implemented over a multi-year period, and will be sustained into the future to provide customers ongoing service excellence and cost effectiveness through:

- Asset knowledge management
- Optimized organizational decision-making
- Protection of the environment
- Responsible financial stewardship (sustainable, equitable, affordable)
- Promotion of health and safety
- Transparent decision making
- Staff capability development and training – agility in making improvements

Program Measures of Success

- ✓ Integrate information across MWU
- ✓ Make information available to all customers
- ✓ Establish asset management requirements
- ✓ Quantify actual asset condition and associated risk profile
- ✓ Continuously improve the Utility's long-term asset planning
- ✓ Achieve consistent and accurate performance monitoring and reporting based on objective asset data
- ✓ Develop and analyze potential capital projects
- ✓ Develop and analyze potential maintenance activities
- ✓ Achieve benefits/cost efficiencies
- ✓ Understand, articulate and refine Levels of Service as the strategic performance metrics for asset management
- ✓ Ensure that confidence in MWU's proposed budget recommendations by rate decision-makers is high
- ✓ Measure, monitor, and encourage organizational buy in and the practicing of the Utility's AM principles
- ✓ Increase and retain institutional knowledge through asset knowledge management and training/capabilities development of staff

Endorsements



Appendix B – Madison Water Utility Gap Assessment

WERF and AwwaRF SAM-GAP

ASSET MANAGEMENT GAP ANALYSIS AND BENCHMARKING

Confidential Results for Madison Water Utility only

About This Report

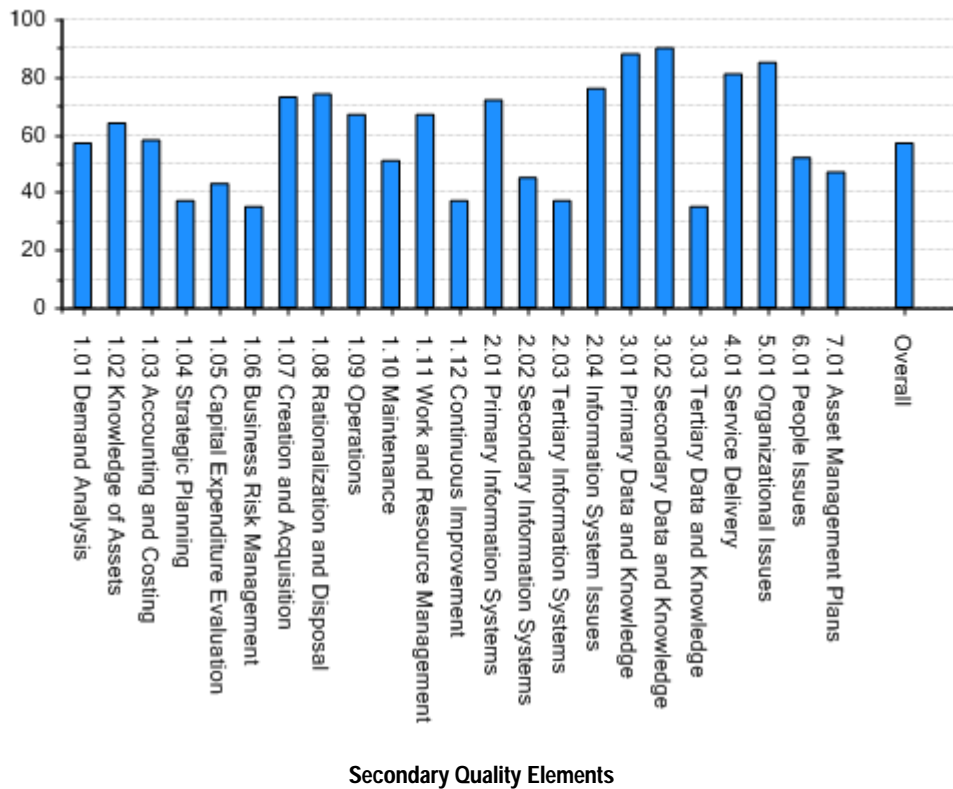
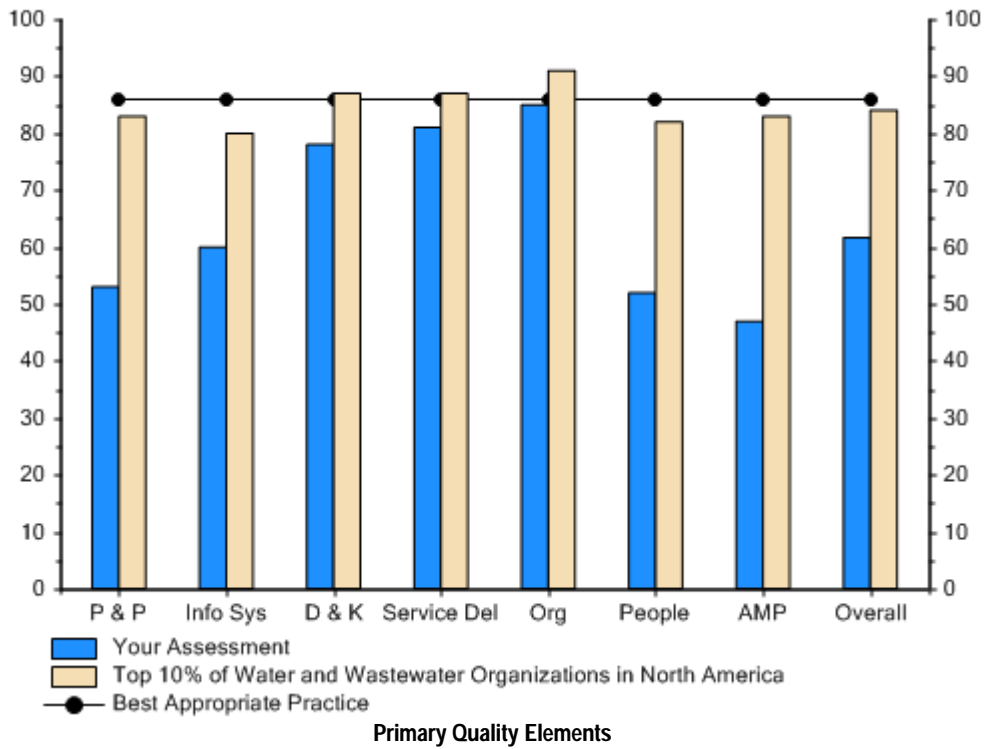
- This report presents the results of your self assessment of your agency's asset management AM practices – your SAM-GAP “gap analysis”. A “Gap Analysis” is a systematic process to characterize or “profile” an organization's current asset management business practices. **A gap analysis measures where an organization is in its AM practices relative to where it wants to be within a specified period of time.** The gap, as one might expect, is the distance between the “as is” of the current environment and the top 10% scores of US and Canadian utilities held in the database.
- SAM-GAP facilitates clear identification of a utility's AM practices relative to the top 10% highest scoring water and wastewater utilities in the US and Canada, most importantly, what is reasonable and relevant for your utility. Recognize that it is a place to begin planning for each utility based on unique needs and drivers as some gaps are more important than others.
- The gap analysis serves two fundamental functions - it guides future action toward a measurable “state of practice” for your utility and it benchmarks progress along the way toward that goal. Both functions are important if your utility is to achieve a long-lived transition to a management paradigm and culture that is centered on an asset management perspective.
- Asset management can be seen as an interaction of seven core organizational "quality elements". Quality elements are fundamental components of an organization's business model that drive the sustained success of the organization. Over the past twenty years, seven core elements around which the practice of asset management is effectively organized have been identified worldwide and include: 1) life cycle processes and practices, 2) information systems, 3) data and knowledge, 4) service delivery, 5) people issues, 6) organizational issues and 7) asset management strategies and planning.
- This report is comprised of two elements:
 1. A bar graph profile of the level of practice as recorded in your organization that is benchmarked against the 10% highest performing, utilities in the US and Canada who have assessed themselves, and
 2. A bullet-formatted listing of suggested task elements (organized around the seven elements listed above) for your consideration for strengthening your asset management practices derived from the profile. These task elements are intended to serve as a starting point for developing an asset management improvement roadmap for your organization.

Developing an asset management improvement program roadmap using SAM-GAP

- Not all “world class best practices” are affordable by or even applicable to every local government or agency. The important thing is to identify “best appropriate practices” - those world-class practices *that fit your organization's unique needs - and to customize a work plan and measure progress against that benchmark.*
- The seven elements have proven particularly effective in assisting utilities to organize a simple work plan to strengthen asset management practices. Keep in mind that all seven elements are interrelated - a basic balance among the elements is necessary if cost effective improvement is to be achieved. We suggest that the same review team that scored current practices review the profile and begin to identify those areas of most need – and greatest return in terms of lifting asset management practice.
- Note that just because a score is relatively low does not necessarily mean that that area is the best candidate for strengthening. Look instead for those areas that most directly and immediately impact current investment decision-making processes (investment here includes operations and maintenance

as well as capital) – investments that are most relevant to your own unique circumstances.

Overall Benchmark



Gap Analysis

| Quality Elements | Weighted Gap | Rank |
|--------------------------------|--------------|------|
| Process and Practices (P&P) | 33.0 | 3 |
| Information Systems (Info Sys) | 26.0 | 4 |
| Data and Knowledge (D&K) | 8.0 | 5 |
| Service Delivery (Service Del) | 5.0 | 6 |
| Organizational Issues (Org) | 1.0 | 7 |
| People Issues (People) | 34.0 | 2 |
| AM Plans (AMP) | 39.0 | 1 |

Processes and Practices

Processes and practices form the basis for all asset management activities within an organization. Therefore, without clearly defined and documented procedures, the ability for your organization to conduct consistent practices are greatly reduced. These processes should cover the entire life cycle of the asset and the individual practices that will be required for different asset types. For example, condition assessment is a common process for all assets, but the actual applied practice will differ for each asset type. Improvements within this area are listed below.

Demand Analysis

The key improvements in this area include:

- Review, document, and implement processes for breaking up demand into key drivers and understanding their influences on demand, including how the organization monitors the impacts of growth, changes in key stakeholders, and demographic changes.
- Review, document, and implement processes for undertaking, analyzing, and responding to customer and stakeholder surveys.
- Review, document, and implement processes for defining and maintaining levels of service, including how the organization determines levels of service through customer consultation.
- Review, document, and implement processes for predicting future trends in demand for services based on historic records, future predictions, and external influences.

Knowledge of Assets

The key improvements in this area include:

- Review, document, and implement processes for defining the level of detail of asset information that is collected and managed. For example, should it be down to the maintenance managed item (MMI).
- Review, document, and implement processes defining the collection and management of asset attribute information as part of a data standard, including the assigning of roles and responsibilities.
- Review, document, and implement processes for determining which assets should have data about their performance collected and for undertaking the collection. This should include the creation of a written data standard for condition assessments.
- Review, document, and implement processes for determining which assets should have data about their utilization collected and for undertaking the collection. This should include the creation of a data standard.

Accounting and Costing

The key improvements in this area include:

- Review, document, and implement processes for undertaking asset valuations. This methodology should include quality control procedures to ensure the appropriate accuracy is achieved.
- Review, document, and implement processes for determining the effective or residual lives of assets while taking into account the physical and economic renewal or usefulness.
- Review, document, and implement processes for tracking and reporting operational costs against the asset register items at an appropriate level .

- Review, document, and implement processes for tracking and reporting maintenance costs.
- Review, document, and implement processes for determining future renewal liabilities for at least the next 20 years.
- Review, document, and implement processes for determining business risk exposure related to decaying facilities or assets.
- Review, document and, implement processes for determining what historical cost data should be collected on individual assets and how it is to be reported, archived, and eventually abandoned.

Strategic Planning

The key improvements in this area include:

- Review, document, and implement processes for predicting likely failure modes for individual assets or their components, including identification of the most imminent failure mode.
- Review, document, and implement processes for undertaking risk assessments of asset failure for inclusion within the planning process, including the likelihood and consequence of a particular asset failing.
- Review, document, and implement processes for making optimized asset renewal decisions in order to choose the most economical solution at the right time.
- Review, document, and implement processes for assessing the life cycle cost of new asset decisions, including capital, maintenance, and operational costs.
- Review, document, and implement processes to systematically identify cost reduction or service-level improvement opportunities.
- Review, document, and implement processes for systematically and efficiently producing asset management plans.
- Review, document, and implement processes for working with customers, regulators, and other stakeholders during long term strategic planning.
- Review, document, and implement processes for demonstrating the links between capital/operating expenditure programs and overall business goals. For example, demonstrating the links between the asset management program and corporate plans.
- Review, document, and implement processes matching the asset management plan and forecasted expenditure with available financial resources during the budget rationalization process to ensure the best value is achieved by the available budget.

Capital Expenditure Evaluation

The key improvements in this area include:

- Review, document, and implement a corporate-wide policy for the evaluation of capital expenditure projects, including the definition of roles and responsibilities.
- Review, document, and implement processes for categorizing the cause of expenditure into growth, renewal, regulatory/level of service, and business efficiency areas.
- Review, document, and implement processes for linking the sophistication and extent of evaluation processes to the level of expenditure by the use of more extensive and sophisticated evaluation techniques for larger investments and risks to the business.
- Review, document, and implement processes for linking service demand and income/benefits generation to the level of expenditure.
- Review, document, and implement processes to ensure the quality of operation and maintenance expenditure cost estimates used in capital expenditure evaluation.
- Review, document, and implement processes for investigating alternative options for the lowest life cycle option, including consideration of deferred, recast, or eliminated capital projects, managed risk, and 'do nothing' options/'non-asset' solutions.
- Review, document, and implement processes for economic evaluation of capital projects and develop the organization's policy on the methods to be adopted, including Net Present Value, Internal Rate of Return, etc.

Business Risk

The key improvements in this area include:

- Review, document, and implement a policy for the evaluation of all business risk exposure on an organization-wide basis, including the definition and allocation of appropriate roles and responsibilities.
- Review, document, and implement processes for risk identification relevant to the whole organization and each business unit, including strategy, finance, information technology, engineering, and operations and maintenance.
- Review, document, and implement processes for quantifying the likelihood and consequences of failure into either a simple points score or full economic costs.
- Review, document, and implement processes for analyzing risks, including the ranking of risks in order to identify which assets, business functions, or parts of the business represent the greatest risk.
- Review, document, and implement processes for managing and tracking the risk reduction program.

Creation and Acquisition

The key improvements in this area include:

- Review, document, and implement processes for project management, including the financial and timely delivery of a project. These processes should also cover the mitigation of risks associated with the delivery of the project.
- Review, document, and implement processes for 'value engineering' to ensure the optimum design is adopted.
- Review, document, and implement processes for ensuring optimum maintainability/operability of assets under design/acquisition. This can be achieved through design reviews undertaken by the operations and maintenance staff.

Rationalization and Disposal

The key improvements in this area include:

- Review, document, and implement processes for rationalizing the existing asset portfolio in order to identify assets for disposal, mothballing, or transfer.
- Review, document, and implement processes for disposing of assets, including the updating of all relevant asset records.

Operations

The key improvements in this area include:

- Review, document, and implement processes for developing and maintaining operating procedures.
- Review, document, and implement processes for handling customer and stakeholder complaints, including the way they are tracked through the business from receipt to resolution.
- Review, document, and implement processes for maintaining and developing Emergency Response Plans, including for what events and for what level and criticality of asset should these be completed. These should also include how new assets are automatically included, how often are they reviewed, and what triggers the need for upgrades.
- Provide for the systematic and timely creation of emergency response plans for all service areas to the appropriate level of detail.

Maintenance

The key improvements in this area include:

- Review, document, and implement a corporate-wide maintenance policy.
- Review, document, and implement processes for maintenance planning, including how each asset/asset type will be maintained.
- Review, document, and implement processes for maintenance scheduling.
- Review, document, and implement processes for recording and reporting maintenance costs.

- Review, document, and implement processes for reviewing and analyzing maintenance programs.
- Review, document, and implement processes for developing maintenance strategies that cover all assets and incorporate the overall business drivers for maintenance, capital, and system performance.

Work and Resource Management

The key improvements in this area include:

- Review, document, and implement processes for prioritizing work orders, including the allocation of "criticality" scores.
- Review, document, and implement processes for controlling inventory or stock, including the pre-ordering of spares to complete scheduled work orders.
- Review, document, and implement processes for planning future workload and required resources.

Continuous Improvement

The key improvements in this area include:

- Review, document, and implement a knowledge management base for Asset Management that covers all life cycle AM functions.
- Review, document, and implement process diagrams and flowcharts for all life cycle AM functions.
- Review, document, and implement processes for internal quality assurance or audit in relation to life cycle asset management.
- Review, document, and implement processes for externally auditing and/or benchmarking of Asset Management practices.
- Review, document, and implement systematic processes for identifying cost reduction opportunities across the entire organization.
- Review, document, and implement processes for implementing and reporting of Asset Management improvement programs.

Information Systems

Information Systems comprise the electronic or paper systems for retrieval of asset-related data. The efficiency of your organization is highly dependent upon these systems. Information systems come in a variety of forms, including card/paper based systems, computer spreadsheets, stand alone databases, or centrally administered and developed electronic systems.

Primary Information Systems

The key improvements in this area include the review, updating, and possible installation of the following systems:

- Financial System - storage of asset costing information including invoicing and timesheet hours.
- Customer and/or Property Records System - customer and property details including address and service usage.
- Complaints or Enquiries System - tracking, reporting, and work-flowing of customer complaints.
- Maintenance Management System - management of maintenance activities and scheduling.
- Operations and Maintenance Manuals Storage System - storage and tracking of operations and maintenance manuals.
- Emergency Response Plans Information System - storage and tracking of emergency response plans.
- Job Resource Management System - creating and updating of work orders.

Secondary Information Systems

The key improvements in this area include the review, updating, and installation of the following systems:

- Knowledge Management System - storage of papers, guidelines, manuals, etc.

- Inventory Spares and Purchasing System - tracking quantity and purchasing of spare parts.
- Condition Assessment and Records System - storage of asset condition ratings.
- Predicting Asset Capacity and Utilization - capacity modeling tools for design and control simulation.
- Asset Failure Prediction - prediction of reliability, condition, performance, and outages.

Tertiary Information Systems

The key improvements in this area include the review, updating, and installation of the following systems:

- Risk Assessment Information System - undertaking and storage of risk assessment results.
- Data Warehouse - storage, management, and reporting of data from other information systems.
- Optimized Renewal Decision Making Modeling System - optimal prediction of renewal timing.
- Life Cycle Cost Modeling System - modeling of assets' options for all life cycle costs.
- Mobile Computing - Pocket PC's, laptops, and tablet PC's used in the field.
- Project Management Support Tools - tracking of timing of deliverables and resources.

Information System Issues

The key improvements in this area include:

- Review and improve the system friendliness to allow users to learn applications quickly and experience little frustration.
- Review and improve information system integration to reduce data duplication and allow data to be accessed from other systems.
- Review and improve access and response time of information systems to an acceptable level.

Data and Knowledge

Data and knowledge about assets that an organization holds form the basis of every decision that is made by that organization. The extent and quality of your organization's data are therefore directly related to the quality of your organization's decision-making.

Primary Data and Knowledge

The key improvements in this area include the review, collation, and updating of the following:

- Asset Hierarchical Structure - level to which asset information is collected.

Secondary Data and Knowledge

The key improvements in this area include the review, collation, and updating of the following:

- Maintenance Data - extensive maintenance history including activity and timing.

Tertiary Data and Knowledge

The key improvements in this area include the review, collation, and updating of the following:

- Risk assessments data - risk calculation recorded against assets including likelihood and consequence of failure.
- Cost history data - cost history of maintenance and operation activities.
- Data for costing of options - cost summary for standards techniques, activities, and rehabilitation options.
- Life Cycle Cost Histories - stored history of life cycle cost calculations.

Commercial Tactics

Commercial Tactics form the basis for the implementation of asset management planning in the field through internal or external service providers. Good commercial tactics are necessary for your organization to drive efficiency in all life cycle functions from conception to disposal.

The key improvements in this area include:

- Review, document, and implement processes for ensuring good feedback of data and knowledge from service providers.
- Review, document, and implement processes for monitoring the performance of sub-contractors, including the completion of regular performance reviews.

- Review and improve information and communication systems to support contract administration.

Organizational Issues

The organizational structure of your business determines its ability to optimize resources in order to deliver an efficient outcome and provide flexibility in line with the changing needs of the customer. This section relates to the way the organization supports asset management and its effective service delivery.

The key improvements in this area include:

- Review and develop clearly defined Asset Management roles and responsibilities for all staff members.

People Issues

People, their skills, and their attitudes drive the business to achieve its goals and deliver services in a efficient way. Your organization is your people, and the outcomes that you deliver are therefore dependent upon them.

The key improvements in this area include:

- Review and develop skill and age matrices that demonstrate a working knowledge of the profile of the organization.
- Set up a policy and process to conduct staff attitude and culture surveys in order to develop a change management program that strives to achieve a 'can do' attitude throughout the organization.
- Review, document, and implement processes to manage and implement successful change (efficiency and effectiveness) throughout the business.
- Review, document, and implement processes for reviewing whether the appropriate skills are available in both Asset Management and project work.
- Review, document, and implement processes for managing human resources across the business to predict the level of staffing and skills required in the future.
- Review, document, and implement processes for the development and implementation of training programs to suit the business' Asset Management needs.
- Review, document, and implement processes for the management of knowledge throughout the business.

Asset Management Plans

Asset Management Plans are the collation of all asset management practices within an organization and form the basis of the external interface with customers and regulators. Without a robust and substantiated Asset Management Plan for all your assets that clearly outlines level of service and cost, your organization will lack both direction and focus.

The key improvements in this area include the review and updating of the Asset Management Plans (AMP's) and the inclusion of the following:

- Develop Asset Management Plans for each service provided by the organization.
- Record all current standards and level of service, both internal and external.
- Complete a state of the asset portfolio report to present best available knowledge of the assets, including age, condition, performance, value, cost, and location/layout .
- Complete detailed projection of future demands and levels of service.
- Complete detailed assessment of future predicted failure modes for all asset in the portfolio.
- Complete assessment of the consequences of asset failure for each of these failure modes.
- Complete optimal renewal strategies for individual assets, facilities, and systems.
- Review all business processes used to identify, evaluate, and validate new capital expenditure to assure best appropriate practices are in place.
- Review and develop Asset Management Plans so that they include operations and maintenance programs.
- Develop alternative options for asset improvements, including non-asset solutions and the 'do nothing' option.

- Develop suitable customer consultation programs and feedback loops as part of the AMP process.
- Develop a process for linking all recommended activities in the AMP to strategic business goals in order to rationalize the recommended investment program in the perception of customers and regulators.

Summary

GHD WERF and AwwaRF have developed this self-assessment program to give your organization an indication of how you compare to Best Appropriate Practice (BAP) and how your AM programs compare to the top ten percentile of US and Canadian utilities.

The key issues outlined above will provide you with the basic information, which you need to address in order to achieve the improvement processes. Acting on these issues will bring your organization to an acceptable level in the management of your infrastructure assets.

Should you require any additional information please contact GHD, Andrew Sneesby email andrew_sneesby@ghd.com.au

Scoring

The table below shows how you scored your organization.

| 1 Processes and Practices - 1.01 Demand Analysis | | |
|---|---|---|
| <p>1.01.01 For managing historic records of customer and stakeholder demands on the utility system. (eg How does the organization determine what data that reflects historical demand to collect, how it is to be maintained, and who should be responsible to maintain it?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 4 [5]</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.01.02 For breaking up customer demand for services into key drivers and understanding their influences on future demand. (eg. Does the organization understand the impacts on customers of demographic changes in customer base, growth, aging infrastructure, key stakeholders, state and nature of economy, pending or proposed changes in regulations, etc)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.01.03 For undertaking, analyzing and responding to customer and stakeholder surveys. (eg. Are surveys conducted and information reported on for future demand forecasting analysis on a recurrent (at least every three years) basis?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.01.04 For defining levels of service. (eg. customer response time, permit compliance, odor levels, etc. Are "Customer Charters or Contracts" developed and maintained? Are customer survey results used to set levels of service?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

| | | |
|--|---|---|
| <p>1.01.05 For predicting future trends in demand for services based on historic and external influences. (eg. Does the organization undertake demand predictions developing pessimistic and optimistic scenarios?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1 Processes and Practices - 1.02 Knowledge of Assets</p> | | |
| <p>1.02.01 For defining the structure of the asset register and the level of detail of asset information that is collected and managed down to the maintenance managed item (MMI). (eg. Is there a defined hierarchical registry structure that is followed consistently? Is the structure and level of detail regularly reviewed?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.02.02 For defining the collection and management of asset attribute information. (eg. Is there a data standard defining this and how is the standard maintained? Is it clear what information is required to be collected on assets?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.02.03 For determining what assets to collect condition data on, when these assessments should be undertaken, and for determining the potential remaining useful lives of the assets. (eg. Are there written protocols defining how these are to be done? How are these protocols maintained? Is accurate data regularly and systematically gathered?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>1.02.04 For determining what assets to collect performance and reliability data on and for undertaking the collection. (eg. Does the organization know how well each asset is performing? How reliable it is? Is there a data standard defining this? Is there a systematic review of performance and reliability? Are problem assets systematically identified and addressed?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.02.05 For determining what assets to collect utilization on and for undertaking the collection. (eg. How often or extensively is an asset used? Is there a data standard defining this? Is there a systematic review of utilization?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 [1] 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1 Processes and Practices - 1.03 Accounting and Costing</p> | | |
| <p>1.03.01 Processes for undertaking asset valuations. (eg. Are asset valuations undertaken at the asset level and is the method documented? Is there a method to assess the quality of that valuation?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.03.02 Processes for determining the effective lives or remaining useful lives of all assets in the register. (eg. Are effective lives determined for each asset? Are remaining useful lives calculated on a periodic basis? Do these lives reflect the asset's actual operating environment?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>1.03.03 Processes for tracking and reporting operational costs. (eg. Are these costs capable of being aggregated from a suitably low asset level up to a facility level and reported on?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.03.04 Processes for tracking and reporting maintenance costs. (eg. Are these costs available at a "maintenance managed item" (work-order) level? Are they capable of being rolled-up to a facility or asset level and being reported on?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.03.05 Processes for determining future renewal liabilities. (eg. Is the projected future expected expenditure for renewal of assets calculated for at least the next 10 - 20 years?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.03.06 Processes for determining residual business risk exposure. (eg. Is predicted operational risk exposure that is due to the aging and consumption of assets calculated? Is it incorporated into the organization's budget process?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.03.07 Processes for determining what historical cost data should be collected on individual assets and how should this be archived. (eg. Can all historic costs associated with a critical asset be retrieved and reported?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

| 1 Processes and Practices - 1.04 Strategic Planning | | |
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| <p>1.04.01 Processes for predicting expected failure modes for all assets. (eg. Does the organization understand the likely failure modes – that is, how the asset is likely to fail - for individual assets? Does it understand which of the major failure modes is most imminent? Does it link the imminent failure mode with projecting remaining useful life?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.04.02 Processes for undertaking risk assessments of asset failure for inclusion within the planning process. (eg. What is the probability and consequence of a particular asset failing?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.04.03 Processes for making optimized asset renewal decisions by identifying the most economical renewal (repair, refurbish, replace) solution and point in time to renew an asset. (eg. Does the process include all feasible options for life extension? Does it include life cycle cost analysis?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.04.04 Processes for assessing the life cycle cost of new assets. (eg. Are all capital, maintenance, and operational costs that are associated with a specific asset systematically accounted for? Are these costs archived in a readily retrievable manner?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>1.04.05 Processes to identify cost reduction or service level improvement opportunities. (eg. Do the budget and rate setting processes specifically and systematically consider the trade-offs among level of service, cost of service, and business risk?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.04.06 Processes for producing Asset Management Plans from a strategic perspective (the quality of these plans are dealt with elsewhere). (eg. Is the generation of a periodic enterprise asset management plan a systematic and efficient process? For facility asset management plans?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.04.07 Processes for working with customers, regulators and other stakeholders during long term strategic planning. (eg. Is there a systematic process for informing customers and stakeholders of strategic asset issues and investment alternatives and for seeking and incorporating feedback from them?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.04.08 Processes for linking capital and O&M expenditure programs with overall business goals in triple bottom line terms (social, economic and environment). (eg. Are there clear and demonstrable links between the asset management program and organizational budgets? Between organizational Levels of Service targets and their impact on the community, financial condition of the utility, and environmental impact?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.04.09 Processes for budget rationalization. (eg. Is the asset management plan with its forecasted expenditures systematically matched with available financial resources? Does the Asset Management Plan actually tie to the organization's budget at the line item level?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

| 1 Processes and Practices - 1.05 Capital Expenditure Evaluation | | |
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| <p>1.05.01 Policy for the evaluation of capital expenditure projects (CIP). (eg. Does an organization- wide uniform policy and clear CIP process exist? Does it ensure a business like approach to capital investment decision making? Does it define roles and responsibilities for key activities?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.05.02 Processes for categorizing the strategic drivers of capital expenditure. (eg. Are capital expenditure categorized into growth, renewal, regulations / levels of service and business efficiency investment categories?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.05.03 Processes for linking the sophistication and extent of the evaluation processes for a specific project to the level of expenditure and the risk it represents to the organization. (eg. Are more extensive evaluation techniques used for larger investments and higher risks to the business?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.05.04 Processes for linking service demand with the level of expenditure necessary to achieve long term sustainability. (eg. Has the organization developed a budgeting process that reports each capital investment project in terms of its impact on stakeholders in terms of meeting service demand? Does the budget process clearly denote the project's capacity for generating income on a long term sustainable basis?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>1.05.05 Processes for evaluating supply or program delivery options. (eg. Are various methods of delivery - such as Internal or external resources, private / public partnerships, design and construct - considered and evaluated for each project?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.05.06 Processes to ensure the appropriate quality of operation and maintenance expenditure cost estimates (budgets) used in capital expenditure evaluation. (eg. Are maintenance and operation costs related to a specific CIP project forecast over the expected life of the asset?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.05.07 Processes for investigating and recording alternative options to the lowest life cycle cost option for capital expenditure projects for use in budget rationalization activities. (eg. Are "out of the box" solutions such as "do nothing", project deferral, "manage the risk", and "non-asset" solutions and the like considered and recorded as options?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.05.08 Processes for economic evaluation of all capital and recurrent investment projects, including a clear policy by which each project should be evaluated. (eg. Are Internal Rate of Return, Benefit Cost Ratios, and the like in present value terms considered for all projects?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

1 Processes and Practices - 1.06 Business Risk Management

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| <p>1.06.01 Policy for the evaluation of all business risk exposure on an organization wide basis. (eg. Does a corporate wide business risk management policy exist? Does it clearly define roles and responsibilities for the key risk areas of strategy, finance, and operations?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.06.02 Processes for risk identification for the entire organization as a whole. (eg. Do the risks considered include at a minimum strategic, financial, information technology, engineering, and operational?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.06.03 Processes for quantifying probability and consequences of failure. (eg. Is this a simple point score or are full economic costs considered?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.06.04 Processes for analyzing risks, including the understanding of its make up and the ranking of the risks. (eg. Which part of the business represents the greatest risk? What is the greatest risk?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.06.05 Processes for managing risk reduction, including the assessment of mitigation options. (eg. Are identified risks linked to specific mitigation strategies and responsibilities? Are the risks and associated mitigation strategies tracked and reported?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

| 1 Processes and Practices - 1.07 Creation and Acquisition | | |
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| <p>1.07.01 Processes for the successful program management of the asset creation or acquisition program. (eg. Are projects systematically tracked from the strategic planning stage (project identification) through to the final service delivery including commissioning and handover?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.07.02 Processes for Contract Administration. (eg. Are processes in place for managing all the contractors necessary for the projects and their interface with the asset owner?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.07.03 Processes for Project Management. (eg. Are systematic processes in place for the financial cost control and timely delivery of a project and the mitigation of risks involved.)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 [1] 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.07.04 Processes for Value Engineering. (eg. Does the organization systematically incorporate "value engineering"? How is the optimum design assessed and adopted?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>1.07.05 Processes that ensure the optimum maintainability / operability of new assets is achieved. (eg. Are design reviews systematically and thoroughly undertaken by the operations and maintenance staff prior to final design. Are these reviews carefully assessed and appropriately incorporated?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 [1] 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.07.06 Processes for ensuring appropriate construction standards and quality control is achieved in all asset creation and acquisition work. (eg. Are systematic examinations of contractor work and other quality control mechanisms used?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.07.07 Processes for asset commissioning and handover. (eg. Is all required operational and maintenance information collected at time of commissioning, including as-constructed drawings, operations/maintenance procedures and manuals, and maintenance programs? Is the initial "burn-in" performance of the asset reviewed and recorded?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1 Processes and Practices - 1.08 Rationalization and Disposal</p> | | |
| <p>1.08.01 Processes for rationalizing the existing asset portfolio and disposal of unwanted assets. (eg. Are assets periodically and systematically reviewed to identify assets for disposal, mothballing, or transfer to improve business effectiveness, to reduce risk and cost, and to release funds for other purposes?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>1.08.02 Processes for disposing of assets. The processes for good governance and ethical behavior in the release of assets. (eg. Are these assets removed from the asset register and on other asset systems, - eg. financial records, CMMS, GIS - in a timely manner?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1 Processes and Practices - 1.09 Operations</p> | | |
| <p>1.09.01 Processes for developing and maintaining operating procedures. (eg. Are operating procedures periodically reviewed with respect to lowest life cycle cost at a target level of service/performance and risk?). Are new assets automatically added to the review?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.09.02 Processes (standard operating procedures) for the successful operation of all assets during normal and emergency operations. (eg. Do such procedures exist, and do they cover all areas and assets down to the maintenance managed item level?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.09.03 Processes for developing and maintaining operation manuals. (eg. Are new assets automatically included; are they periodically updated and purged?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>1.09.04 Processes to assure the quality of Operating Manuals and Standards. (eg. Are all manuals clear, complete, graphically effective, current, and relevant? Are updates timely?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.09.05 Processes for handling customer and stakeholder complaints. (eg. Are these tracked through the business from receipt to resolution? Is the customer kept informed of the progress of the complaint?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.09.06 Processes for the development and maintenance of Emergency Response Plans, including for what events and against what level and criticality of asset the plans are to be completed. (eg. Are new assets automatically included? How often are the Plans reviewed? Are "triggers" for the need for upgrades identified?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.09.07 Processes to assure quality of the actual Emergency Response Plans. (eg. Do such quality assurance processes exist and cover all asset services? Are they to the appropriate level of detail? Are they quickly available to relevant staff? Is staff trained in the Plans?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

1 Processes and Practices - 1.10 Maintenance

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| <p>1.10.01 Processes for setting a strategic level maintenance framework (such as Reliability Centered Maintenance, Zero Breakdown Maintenance, Six Sigma, etc.) that defines how the organization undertakes maintenance of its assets.(eg. Does such a corporate wide policy exist and is it tied to business goals and cost analysis?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 ="Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.10.02 Processes for maintenance planning. (eg. Is there a process for defining how each asset / asset type will be maintained? Is the basis for determining the maintenance procedure or activity for a single asset clear? Does this process cover all assets?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 ="Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.10.03 Processes for maintenance scheduling. (eg. Does the organization have a clear process to determine maintenance schedules or intervals for the prescribed maintenance activity for each asset?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 ="Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.10.04 Processes for monitoring and controlling the maintenance program. (eg. Is there adequate reporting and feedback from field staff and information systems to enable the complete understanding of what is happening to the assets?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 ="Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.10.05 Processes for recording and reporting maintenance costs down to the maintenance managed item level. (eg. Are asset costs reported and accessible? Is there a clear methodology on what is required?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 ="Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>1.10.06 Processes for developing and maintaining contents of maintenance manuals and instructions. (eg. Are new assets automatically included and how often are they reviewed? What is the process by which the responsible staff can update them? Is the format specified?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.10.07 Processes for assuring the quality of maintenance manuals and instructions. (eg. Do these exist and cover all business units/divisions and assets types?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.10.08 Processes for reviewing and analyzing maintenance programs. (eg. Have key maintenance performance indicators been adopted and reported? Are maintenance trigger points understood by all? Are maintenance strategies matched to condition and stage in the life cycle? Are "problem assets" periodically identified and associated failure modes assessed? Are failure codes relevant to the class of asset incorporated in the work order process? Is condition and other asset attribute data updated as work orders are executed and closed? Is the "return on maintenance investment" regularly calculated and reported?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.10.09 Processes for developing maintenance strategies that incorporate the overall business drivers for maintenance, capital investment, and system performance. (eg. Do strategic Levels of Service link directly to required asset performance levels and subsequently to maintenance planning and scheduling?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

1 Processes and Practices - 1.11 Work and Resource Management

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| <p>1.11.01 Processes for matching skills to the demand for services / activities and allocating resources across the organization. (eg. Is resource demand for designated maintenance skills matched with available supply? Is it across the organization?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.11.02 Processes for prioritizing work orders. (eg. Are work orders allocated based on a criticality score that measures the probability and consequence of failure?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 [1] 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.11.03 Processes for managing projects that involve multiple tasks and tracking of those costs. (eg. Are work orders recorded in a timely manner? Can cost tracking be assigned to a project in a manner accessible by users?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.11.04 Processes for managing inventory or stock. (eg. Are work orders linked to the required spare parts? Are these spare parts ordered in advance of completing the work order?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.11.05 Processes for planning future work load and required resources. (eg. Does the organization predict and balance future work load for different skills and numbers of staff for all life cycle functions?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

| 1 Processes and Practices - 1.12 Continuous Improvement | | |
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| <p>1.12.01 A knowledge management system that contains all the processes and practice materials described previously that is available to practitioners (eg. Does such a knowledge base exist – in paper or digital form? Does it cover all life cycle Asset Management functions and best practices? Is it periodically updated?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.12.02 Asset Management Process Diagrams and Flowcharts. (eg. Are internal Asset Management processes mapped? Do they cover all Asset Management functions? Are they readily available to staff?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 [1] 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.12.03 Processes for internal quality assurance. (eg. Are internal review processes in place to ensure that those best appropriate asset management practices adopted by the business are followed across all business units?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.12.04 Processes for externally reviewing and benchmarking Asset Management practices for both input (process) and output (cost activity) benchmarking. (eg. Does the organization undertake external input and output benchmarking for asset management best practices?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>1.12.05 Processes followed for identifying cost reduction opportunities. (eg. Does the organization have a process by which new ideas and suggestions are reviewed?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>1.12.06 Processes for implementing and reporting on the progress achieved with approved Asset Management improvement programs. (eg. Does the organization measure and track the progress of these programs?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>2 Information Systems - 2.01 Primary Information Systems</p> | | |
| <p>2.01.01 Financial System. (eg. The system to record and store asset costing information, chart of accounts, general ledger, approved budget appropriations, encumbrances, etc.)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.01.02 Customer and / or Property Records System. (eg. System to track customer and related served property details such as address, land use, parcel size, etc.)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |

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| <p>2.01.03 Complaints or Enquiries System. (eg. System to store and track customer complaints and enquires from receipt to resolution.)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.01.04 Asset Register System. (eg. System to assign unique asset identification numbers within an asset hierarchy and to store associated asset attributes for all assets that make up the asset system.)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.01.05 Plans and Drawings Information System. (eg. System to manage, store, and access the detailed drawings of all facilities and buildings.)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.01.06 Geographic Information System. (eg. System to spatially store asset locations and key attributes for all distributed and linear / networked assets including the base locations of assets.)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |

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| <p>2.01.07 Maintenance Management System. (eg. System to manage maintenance activities including activities / work orders / scheduling / controlling and costing for all assets down to maintenance managed item level.)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.01.08 Operations and Maintenance Manuals Storage System. (eg. Electronic System to store and track operations and maintenance manual materials.)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.01.09 Emergency Response Plans Information System. (eg. System to store and track emergency response plans, linked through to the asset register in accordance with the data standard.)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.01.10 Job Resource Management System. (eg. System to create and track work orders covering labor, plant, specialist tools and materials.)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2 Information Systems - 2.02 Secondary Information Systems</p> | | |

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| <p>2.02.01 Knowledge Management System. (eg. System to store papers, guidelines, manuals, policies in relation to life cycle Asset Management of the organization's asset portfolio etc.)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.02.02 Inventory Spares and Purchasing System. (eg. System to track quantity and purchasing of spare parts. This system is linked to the construction and maintenance / operations systems and staff needs.)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 [1] 2 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.02.03 Condition Assessment Records System. (eg. System to store condition data, and to analyze this with respect to the parameters or required levels of service.)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.02.04 Predicting Asset Capacity and Utilization. (eg. Capacity modeling tools are in place for determining / simulating current asset capacity, eg. Pipeline hydraulic capacity models, road traffic models, etc.)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |

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| <p>2.02.05 Asset Failure Prediction. (eg. Prediction of failure in terms of capacity, reliability, condition, performance and outages/ emergency failures. These allow the organization to model the full range of level of service failures.)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2 Information Systems - 2.03 Tertiary Information Systems</p> | | |
| <p>2.03.01 Risk Assessment Information System. (eg. System used for undertaking and storing risk assessments for both the consequences of failure and probability of failure.)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.03.02 Data Warehouse. (eg. System to store, manage and report on data derived from independent information systems. This system should be able to produce both recurrent and ad hoc reports.)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.03.03 Life Cycle Cost Modeling System. (eg. System for modeling the life cycle costs of different asset options and solutions for new assets where no spent costs are involved. It allows all supply options to be considered.)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |

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| <p>2.03.04 Mobile Computing Facilities. (eg. Pocket PC's, laptops and tablets PC's to be used by field operations and maintenance staff for rapid data entry and live access and updating of work orders.)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.03.05 Project Management Support Tools. (eg. Tools for tracking the timing and costing of multiple project tasks / resources to produce the deliverables required.)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2.03.06 Store/Stock Optimization Systems. (eg. Systems for optimizing the level of stores and spare parts to be carried for like assets across the organization.)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>2 Information Systems - 2.04 Information System Issues</p> | | |
| <p>2.04.01 User Friendliness Of Information Systems/Applications. (eg. Are the existing AM related information systems automated? Are systems/applications well used because they are easy to use, quick to learn and make data input / extraction easy?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |

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| <p>2.04.02 Information systems are well integrated. (eg. The information systems are linked and data can be accessed from different access / entry points, eg. GIS /CMMS. Only one point of data input is required.)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>2.04.03 Access and Response of Information Systems. (eg. Staff has ready access to the information systems and response times are acceptable for both data entry and update.)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems to access, 1 = Little convenient access, 2 = Some convenient access, 3 = Mix of convenient and not convenient, 4 = Mostly convenient, 5 = Entirely convenient</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = No systems, hence no response time, 1 = Unacceptable response times across all applications, 2 = Some acceptable response times, most not, 3 = Mix of acceptable and not acceptable, 4 = Mostly acceptable, 5 = Entirely acceptable</p> |
| <p>2.04.04 Information Technology System Strategy. (eg. Does a corporate strategy exist? Is it comprehensive and include Asset Management systems? Does it accommodate expected usage and the growth in Asset Management data and information, access and system response times etc.)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>3 Data and Knowledge - 3.01 Primary Data and Knowledge</p> | | |
| <p>3.01.01 Asset Categorization. (eg. Ability to group assets by type, location, material, facility etc. for reporting and manipulation.)</p> | <p>Completeness : 0 1 2 [3]</p> <p>0 = Assets are unable to be grouped, 1 = Assets can be grouped in one way only, 2 = Assets can be grouped in two or more ways, 3 = Assets can be grouped in any way</p> | <p>Accuracy : 0 1 2 3 [4] 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |

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| <p>3.01.02 Asset Hierarchical Structure. (eg. The level (maintenance managed item) to which asset information is collected and the ability to amalgamate asset costs and performance.)</p> | <p>Completeness : 0 1 2 [3] 4 5</p> <p>0 = None, 1 = Service type, 2 = Facility or system level, 3 = Asset type level, 4 = Asset level, 5 = Maintenance managed item level</p> | <p>Accuracy : 0 1 2 3 [4] 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| <p>3.01.03 Asset Spatial Data. (eg. Spatial data stored within GIS, especially all distributed linear assets and locations of larger facilities.)</p> | <p>Completeness : 0 1 2 3 4 [5]</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 1 2 3 4 [5]</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| <p>3.01.04 Drawing / Plans. (eg. Drawings and plans of assets and facilities.)</p> | <p>Completeness : 0 1 2 3 [4] 5</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 1 2 3 [4] 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| <p>3.01.05 Basic physical attributes. (eg. Size, material, installation date, model etc.)</p> | <p>Completeness : 0 1 2 3 4 [5]</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 1 2 3 4 [5]</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| <p>3.01.06 Asset valuation data. (eg. Current asset replacement values / historical value and depreciated values.)</p> | <p>Completeness : 0 1 2 3 [4] 5</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 1 2 3 [4] 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |

| 3 Data and Knowledge - 3.02 Secondary Data and Knowledge | | |
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| 3.02.01 Detailed physical attributes. (eg. Manufacturer, material, size, date deployed, spare parts and numbers etc.) | <p>Completeness : 0 1 2 3 4 [5]</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 1 2 3 4 [5]</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| 3.02.02 Asset condition data. (eg. Rating of asset condition data.) | <p>Completeness : 0 1 2 3 [4] 5</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 1 2 3 [4] 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| 3.02.03 Asset performance data. (eg. Recording and rating of asset performance.) | <p>Completeness : 0 1 2 3 4 [5]</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 1 2 3 4 [5]</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| 3.02.04 Maintenance Data. (eg. Detailed maintenance history including activity and timing.) | <p>Completeness : 0 1 2 3 4 [5]</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 [1] 2 3 4 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |

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| <p>3.02.05 Operations Data. (eg. Operations history and data on operational aspects of asset failure.)</p> | <p>Completeness : 0 1 2 3 [4] 5</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 1 2 3 [4] 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| <p>3.02.06 Works and / or resource management data. (eg. Data related to the management of the resource elements required to execute work including work force, skills, and materials availability, in both capital and operational activities.)</p> | <p>Completeness : 0 1 2 3 4 [5]</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : 0 1 2 3 4 [5]</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| <p>3 Data and Knowledge - 3.03 Tertiary Data and Knowledge</p> | | |
| <p>3.03.01 Risk Assessment (eg. Risk assessment data including probability and consequence of failure, and the subsequent business risk exposure down to the asset level.)</p> | <p>Completeness : [0] 1 2 3 4 5</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : [0] 1 2 3 4 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| <p>3.03.02 Cost history (eg. Full cost history of maintenance and operation activities together with depreciation and capital use charges where applicable down to the asset level.)</p> | <p>Completeness : [0] 1 2 3 4 5</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : [0] 1 2 3 4 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |

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| <p>3.03.03 Costing of options. (eg. Cost data for standard construction and renewal costs, including maintenance and operational activities and options down to the asset level.)</p> | <p>Completeness : [0] 1 2 3 4 5</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : [0] 1 2 3 4 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| <p>3.03.04 Life Cycle Cost Histories. (eg. Stored history of life cycle costs and analysis down to the asset level)</p> | <p>Completeness : [0] 1 2 3 4 5</p> <p>0 = 0% complete (no data), 1 = 35% complete, 2 = 50% complete, 3 = 65% complete, 4 = 80% complete, 5 = 95% complete</p> | <p>Accuracy : [0] 1 2 3 4 5</p> <p>0 = mostly inaccurate / out of date, 1 = 35% accurate / up to date, 2 = 50% accurate / up to date, 3 = 65% accurate / up to date, 4 = 80% accurate / up to date, 5 = 95% accurate / up to date</p> |
| <p>4 Service Delivery - 4.01 Service Delivery</p> | | |
| <p>4.01.01 Core and non-core business processes have been identified. (eg. Have business processes that are core to the business been identified as well as those not core to the business?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>4.01.02 Processes to ensure contracts packaged to achieve economic efficiencies in the short and long term. (eg. Does the organization have processes in place to optimize its contracts to get to get the lowest overhead costs and total costs of service delivery?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>4.01.03 Processes to ensure high quality contracts / specifications for contracts and service agreements. (eg. Do contracts deliver the full requirements of the organization and are they regularly updated?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>4.01.04 Processes for ensuring contractors have access to the required information and data. (eg. Can external contractors efficiently access data required to perform their tasks, with the integrity of the data protected?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>4.01.05 Processes exist for ensuring good feedback of data and knowledge back into the business from all contracted (external) and in-house (internal) service providers. (eg. Are service providers regularly providing feedback into the business? What is the quality of that information including completed work orders?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>4.01.06 Processes for monitoring the performance of sub-contractors. (eg. Are regular reviews and/or audits completed? Does the organization have a system to do this and link to performance based contract payments?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>4.01.07 Processes for assessing and selecting contractors. (eg. Is there a systematic process for different sized jobs? Is more than cost taken into account?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>4.01.08 Information and communication systems to support contract administration. (eg. Do the organization's information systems create an efficient environment in which contract scopes, approvals, and payments are significantly automated?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = No relevant information systems in place, 1 = Very few automated systems/applications in place, 2 = Some automated systems in place, most manual, 3 = Mix of automated and manual systems, 4 = Most work processes are automated, 5 = All work processes automated</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = No systems in place, hence no use, 1 = For the most part, the systems are archaic and outdated; poorly used, 2 = A few systems are well used, most are not, 3 = Mix of well used and not used, 4 = Most are well used, 5 = All are well used,</p> |
| <p>5 Organizational Issues - 5.01 Organizational Issues</p> | | |
| <p>5.01.01 Organizational commitment to Asset Management. (eg. Is this documented in corporate policy / business plans, organizational objectives and mission statements in such a way as to show its importance to the usiness?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>5.01.02 Single executive manager with defined Asset Management responsibility. (eg. Is it clearly documented who has the responsibility for asset decisions in the organization? Are the roles and responsibilities clearly defined throughout the structure?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>5.01.03 Asset Management roles and responsibilities. (eg. Are roles and responsibilities clearly defined right across and down the organization? Are they linked to job descriptions?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>5.01.04 Asset Management Coordinating Group or Steering Committee. (eg. Is there an Asset Management steering committee with links into the board and executive management?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>5.01.05 Asset Management team or coordination group. (eg. Does this group exist within the business?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>5.01.06 Asset Management manager or coordinator whose major role is to build organizational AM capabilities and provide staff support to the Asset Management Steering Committee. (eg. Does this position exist within the business?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>5.01.07 The corporate vision reflects a commitment to best practice in Asset Management. (eg. Does the organization display a documented vision for Asset Management?)</p> | <p>Level of practice : 0 1 2 3 [4] 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 3 [4] 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

6 People Issues - 6.01 People Issues

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| <p>6.01.01 Working knowledge of the organization's staff AM skills and knowledge. (eg. Has an employee asset management skill and knowledge matrix been developed?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>6.01.02 Good AM attitude and culture. (eg. Is the organization keen to apply AM practices down to the asset level? Is such application the cultural norm? Is the staff AM culture and attitude/enthusiasm treated as critical by the organization?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>6.01.03 Processes to manage and implement change through the business. (eg. How does the organization respond to change? What mechanisms have been put in place to assist the change process and organizational learning in asset management and make it part of the culture?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>6.01.04 Processes for reviewing whether the appropriate skills and staff numbers are available. (eg. Can the required AM skills be accessed? Are staff levels appropriate for implementing best practices?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>6.01.05 Processes for managing asset management human resources across the business. (eg. Are staffing skills and numbers known and predictions made of future needs? Are new staff inducted and trained in Asset Management to suit requirements? Is succession planning provided for?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>6.01.06 Processes for the development and implementation of asset management training programs. (eg. Are regular training sessions held? Have skill deficiencies been identified? Is training matched to the organization's business needs?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>6.01.07 Processes for the management of knowledge throughout the business. (eg. How does the business update and manage critical business and sector knowledge? How is this disseminated to staff?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7 Asset Management Plans - 7.01 Asset Management Plans</p> | | |
| <p>7.01.01 Asset Management Plans (AMP's) exist for each service provided. (eg. Separate plan for roads, potable water, wastewater, drainage, parks and gardens, buildings and facilities etc.)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7.01.02 AMP's include a record of current levels of service. (eg. Are these documented?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>7.01.03 AMP's include knowledge of the assets. (eg. Can the reader quickly understand the state of the assets including age, condition, performance, value, cost and location? The whole asset portfolio should be included.)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7.01.04 AMP's include projected (future) demands and levels of service. (eg. Does the organization have a vision of the future demands including growth / decline and levels of service? Are the key impacts identified?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7.01.05 AMP's include predictions of major failure modes. (eg. Are all failure modes identified including capacity, physical mortality, levels of service, and business efficiency? Could the organization save money if it vested in new technology?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7.01.06 AMP's include the risk exposure to the business of failure if the assets are not maintained and renewed. (eg. Are the probabilities of failure estimated? Are the consequences of not maintaining or renewing assets adequately quantified and summarized? Is the role of redundancy in business risk exposure understood and incorporated into the business risk exposure metric?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7.01.07 AMP's include optimal renewal strategies to extend the life of individual assets, facilities and systems. (eg. Are lowest life cycle cost renewal strategies identified and future funding requirements predicted?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

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| <p>7.01.08 AMP's include the capital projects necessary to service new customers or requirements. (eg. What new projects will be undertaken, when, and how much will they cost? Has the program been validated?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7.01.09 AMP's include operations and maintenance programs. (eg. Are the operational and maintenance strategies and their predicted costs rolled into this plan?)</p> | <p>Level of practice : [0] 1 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7.01.10 AMP's should include the most cost effective option for asset improvements. (eg. Have all asset options been considered, including non-asset solutions and the 'do nothing' option?)</p> | <p>Level of practice : 0 1 [2] 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 [2] 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7.01.11 AMP's should include reference to customer or stakeholders for consultation clearly showing them the future sustainable cost and levels of service over a period of at least 30 years. (eg. Are customer / stakeholders consulted with this information and is their feedback taken into account? Are full cost service projections provided that extend well into the future?)</p> | <p>Level of practice : 0 1 2 [3] 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : 0 1 2 [3] 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |
| <p>7.01.12 AMP's include links to the businesses goals which should be related to customer and stakeholder expectations.(eg. How does the plan demonstrate that it is meeting these business goals and customer expectations?)</p> | <p>Level of practice : 0 [1] 2 3 4 5</p> <p>0 = "Innocence", 1 = Aware but no practice, 2 = Low practice level, 3 = Modest practice level, 4 = Substantial practice level, 5 = "World class" practice level</p> | <p>Extent of practice : [0] 1 2 3 4 5</p> <p>0 = Never done, 1 = Ad hoc process rarely executed, 2 = Ad hoc process occasionally executed, 3 = Mixture of ad hoc and systematic process, partially documented, 4 = Mostly systematic process, pretty well documented, and regularly executed, 5 = Systematic, fully documented process, always executed</p> |

End of Report

Appendix C – AM Policy



Madison Water Utility - Asset Management Policy

Madison Water Utility's (MWU) guiding principles for asset management are the following:

- 1. Manage MWU's assets including current condition and remaining life.**
 - Know what assets MWU owns and for which assets MWU has responsibility or legal liability. Assets are recorded in an asset register down to a maintenance managed item level.
 - Monitor the condition, performance, use, and value of assets down to the appropriate level and against prescribed service levels and regulatory requirements.
 - Consider both tangible assets (e.g., pumps; pipes) and intangible assets (e.g., public trust, community partnerships) in managing MWU's portfolio.
- 2. Maintain a high level of service to MWU's customers and stakeholders.**
 - Understand customer and stakeholders requirements and expectations.
 - Understand and record the current levels of service provided.
 - Continually improve levels of service to meet future demands and expectations.
 - Communicate frequently and effectively to customers and stakeholders.
- 3. Understand and manage MWU's business risk exposure.**
 - Identify and focus on those assets that are critical to MWU's service levels and prioritize their management to prevent their failures.
 - Identify, understand, and manage the business risks associated with operating MWU's resources.
- 4. Prepare asset management plans for capital and operational strategies.**
 - Prepare asset management plans for MWU's assets.
 - Improve the effectiveness of predictive and preventative maintenance programs and move from a reactive to a proactive O&M environment.
 - Drive efficient work planning (daily/weekly/monthly/annual) with asset management plans.
 - Review and validate the asset management plans with summary updates annually.
- 5. Develop a long-term funding strategy.**
 - Develop funding strategies and identify appropriate asset renewal levels to sustainably manage MWU's assets.
 - Collaborate with other stakeholders to leverage the investment in asset management.
 - Link MWU's organizational and asset management strategic goals to asset related investments and action plans.
 - Use validation processes to evaluate planned investment in capital projects, maintenance programs, operations and associated support services, as well as their impact on rates (including business cases, decision support systems, etc.).
- 6. Embed sustainable asset management practices throughout the organization.**
 - Engage the entire organization to provide training on asset management processes and procedures appropriate to individual roles and responsibilities.
 - Establish defined roles and responsibilities to implement and sustain asset management practices.
 - Apply effective data and information technology solutions to support the asset management program.
 - Dedicate adequate resources to support the continued development and implementation of the asset management program.

ENDORSEMENTS

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