

## **CHAPTER 8 – ASSET MANAGEMENT**

### **8.1 Introduction**

An additional task of the WRMP was to educate and engage GWA personnel in the concepts of asset management. Three specific areas of asset management have been addressed:

1. Several training workshops were held to provide an overall understanding of asset management and more detailed knowledge of its basic concepts and components.
2. Brown and Caldwell facilitated a business case evaluation of a potential future CIP project selected by GWA staff.
3. A series of interviews were held with key GWA leaders to define the current status of the organization, based on the Asset Management Program Evaluation (AMPE) methodology.

### **8.2 Asset Management Training Workshops**

Five asset management workshops were held with key GWA staff members. All five PowerPoint presentations from the workshops are included in Appendix 1G of this document. A brief description of each workshop and the topics covered are listed below:

#### **8.2.1 What IS Asset Management?**

This session introduced the most basic concepts of asset management: service levels, cost, and risk. The presentation focused on the formal definition of asset management and dealt with risk as the determining factor between service levels and cost.

#### **8.2.2 Customers and Service Levels**

This session, built on concepts introduced in the first session, further expanded the idea of customer focus and specified service levels.

Various ways of setting service levels worldwide were discussed. Trade-offs between service levels and costs were presented with an example from Australian experience. Performance indicators were discussed in the context of performance management.

The concept of achieving an optimal service level at the lowest community cost was discussed, and an example was given. Finally, examples of service levels were discussed for both water and wastewater services.

#### **8.2.3 The Business Case Evaluation**

This session moved from customers and service levels to life cycle costs.

The concept of a business case evaluation (BCE) was introduced, and its background given. This discussion was followed by an explanation of present value and net present value, including instruction on using Excel for the calculations.

A real-life BCE was then described in some detail so that the attendees could see and understand how a BCE works in a facilitated environment. The benefits of this BCE were clearly described.

#### **8.2.4 Managing Risk**

In this session, participants explored the role of risk assessment in making asset decisions. The meeting was interactive, and various aspects of risk management were demonstrated.

An introductory slide show further developed the concept of risk cost of ownership and included two case studies. The slide show was followed by three participative case studies for team discussion, analysis, and presentation.

### **8.2.5 Community Costs and Benefits**

In this last session, the concept of BCEs was expanded to include costs to the community that are not reflected in the direct costs of service. The underlying principle is that, as a public utility, GWA tries to deliver the service levels its community requires while minimizing overall costs of service. Such costs not only include those reflected in service rates but also the impacts GWA may have on the community's quality of life.

The discussion and case studies specifically addressed the costs of water service interruptions, sanitary sewer overflows, traffic disruptions, and inconveniences to homeowners from street excavations in front of their homes. It emphasized that these costs arise not only from asset failures, but also (more positively) from proactive attempts to prevent failures.

### **8.3 Business Case Evaluation**

Following the asset management training workshops, GWA staff was asked to suggest a potential CIP project to use as an example for an actual BCE. Their selected project was the Transmission Line Project. Because of time constraints, only rough costs could be used in the evaluation, and it is not recommended that the outcome of the BCE be used in any GWA decision-making processes. *An actual BCE would require more quantitative analysis than this example was given.* However, even with the time constraints, the life cycle costing was quite thorough. Risk costs were derived where thought appropriate, and additional social costs were discussed.

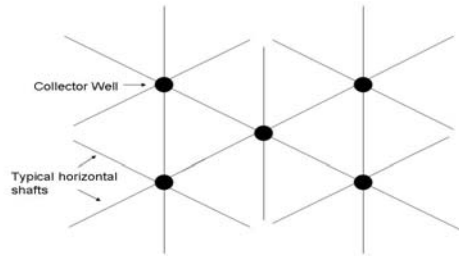
After some dialog, the actual driver, or cause, of the Transmission Line Project was defined as a safety issue and possibly a regulatory issue. GWA explained that based on future demands, sufficient contact time may not be obtained after chlorine injection within their current piping configuration. Given the higher forecasted demands on the system in the future, this could create a safety/water quality concern. If such a concern was realized, it would cause regulatory actions and possibly result in fines. The proposed project would allow for chlorine injection directly into the transmission pipeline, giving adequate contact time prior to distribution as required by regulations.

Once the actual driver was defined, open discussion of potential solutions to this problem began. GWA staff suggested a total of six alternatives as potential solutions. These included the actual proposed project, as well as a "Do Nothing" alternative. After working through the six alternatives, participants dropped two of them from the list because of fatal flaws. The remaining four alternatives were investigated in more detail. Specifically, a 30-year life cycle cost analysis was performed on each alternative to determine its present value. Again, all the life cycle costs used in this analysis were order-of-magnitude values estimated by attending GWA staff. As an example of the costs, refer to Appendix 1H for a breakout of each alternative. The six alternatives are summarized in Table 8-1, Summary of Alternatives List, followed by a brief description of each.

Table 8-1 – Summary of Alternatives List

<i>Agency:</i>	Guam Waterworks Authority	Results (\$000s)	
<i>Project/Problem:</i>	Regs/Safety issue	Capital Cost	30-yr NPV
Alternative 1	Do Nothing (FF)		(\$611,012)
Alternative 2	Transmission Lines	\$214,000	(\$834,017)
Alternative 3	Water Tanks at Well Sites (FF)	\$16,500	(\$619,760)
Alternative 4	Water Tanks/Treatment at Well Sites	\$106,500	(\$714,480)
Alternative 5	Collector Wells	\$115,250	(\$538,639)
Alternative 6	Reroute Delivery line for CT time	\$150,000	(\$739,007)
Alternative 7	(not used)		
Alternative 8	(not used)		
Alternative 9	(not used)		
Alternative 10	(not used)		
Alternative 11	(not used)		
Alternative 12	(not used)		
<i>Year of analysis:</i>	2006		
<i>Escalation rate:</i>	3.00%		
<i>Discount rate:</i>	6.00%		

- **Alternative 1 – Do Nothing:** This alternative had fatal flaws, and therefore no detailed analysis was completed. GWA staff believed that operating their potable water system as it is without improvements would result in customer safety issues and potential fines from regulatory authorities. It is also against GWA policies to knowingly operate any facility in a deficient manner.
- **Alternative 2 – Transmission Lines:** This is the actual proposed project. GWA would construct transmission pipelines that would allow adequate chlorine contact time within the transmission pipelines themselves prior to water distribution.
- **Alternative 3 – Water Tanks at Well Sites:** This alternative also had fatal flaws. Due to the high number of well sites currently operated by GWA, it was deemed too expensive. In addition, most well sites do not offer sufficient space in which to build an associated water tank that would facilitate adequate chlorine contact time.
- **Alternative 4 – Water Tanks/Treatment at Well Sites:** This alternative was evaluated for the purposes of the BCE exercise. This alternative would allow for the installation of some tanks at selected well sites and also allow for small self-contained treatment facilities at other sites.
- **Alternative 5 – Collector Wells:** This alternative is a potential project solution currently being evaluated by GWA on a preliminary basis. The project would entail drilling approximately six large-diameter wells and then tunneling six horizontal shafts just above sea level. The shafts would spread out from the well shaft like spokes on a wheel, with a selected horizontal shaft connecting to another vertical well. These horizontal shafts would allow ground water to flow back to the vertical wells which would then be pumped up to the ground surface. Tanks and treatment would then take place at the six vertical well sites. A visual representation is shown on the following page.



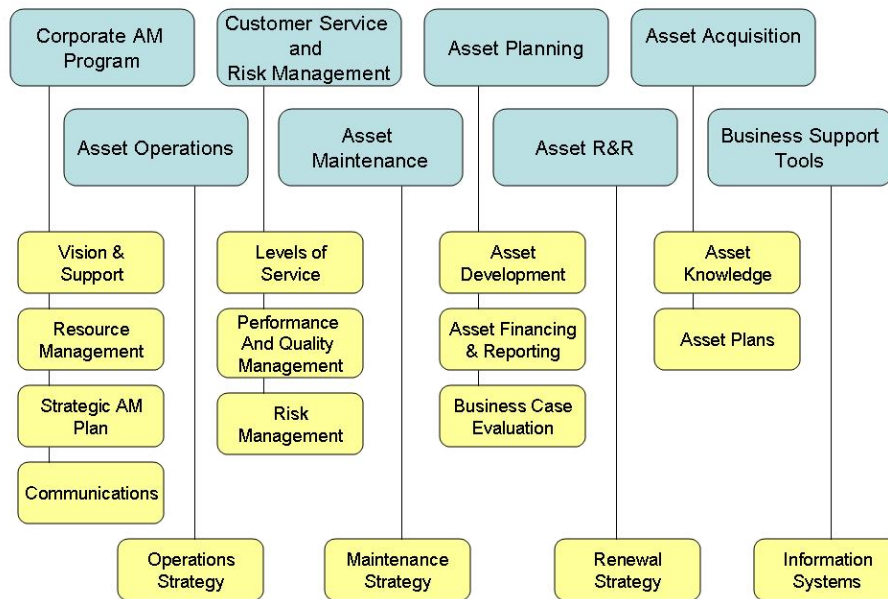
- **Alternative 6 – Reroute Delivery Lines to Allow Sufficient Chlorine Contact Time:**  
 This alternative would reroute the delivery pipelines to allow additional contact time prior to distribution.

As shown in Table 8-1, Alternative 5 (the Collector Wells project) yielded the lowest 30-year present value. If all the costs for construction, equipment, O&M, permitting, and associated risks, were complete and accurate, the Collector Well Project should be chosen because it would deliver the service level GWA’s customers want and do it at the lowest life cycle costs of all the alternatives evaluated. Note: the collector well alternative is at the preliminary stage of feasibility analysis to determine if it is a viable alternative to more common transmission and distribution system construction. Additional discussion on this alternative is included in Section 8.5 of Volume 2, Chapter 8 – Water System Facilities.

#### 8.4 Asset Management Program Evaluation

The framework used for the assessment of GWA’s business process review was based on a methodology called AMPE. AMPE is structured into eight key groupings. Within these groupings, there are 16 topic areas and a total of 112 individual elements, as presented in Appendix 1I. The AMPE structure is depicted in Figure 8-1, AMPE Structure.

Figure 8-1 – AMPE Structure



The AMPE is intended to identify key asset management-related business processes and systems within GWA. In most U.S. water and wastewater agencies, such processes are not well defined or documented.

The results of the interviews held with key GWA staff were used to compile the current status of the organization. This reflects the organization's current policies and procedures when compared to the best practices of mature asset management organizations. The responses to all 112 elements by each interviewed GWA staff member were averaged and entered into the gap chart, Figure 8-3. The values representing the current status of the organization in each element is visually depicted on the gap chart. The next step is to define the "vision" of GWA. "Where does GWA wish to be in the next 3 to 5 years in terms of each of the elements listed?" Once GWA management defines their vision for each respective element, it will also be entered into the gap chart. The "gap" is the difference between where the organization is today (current status) and where they wish to be in the future (their vision). The gap chart will visually reflect those areas that require additional efforts and those that are on track.

The following addresses each topical group in the evaluation and defines its function in an asset management program.

#### **8.4.1 Corporate Asset Management Program**

Defines the support and direction from the corporate level as well as asset management-related areas that normally apply corporate-wide.

- Vision and Support – As with all significant programs, a strong corporate vision of asset management will indicate GWA's direction and reinforce the adoption and implementation of this vision among division managers and associates.
- Resource Management – Required resources must be made available to staff by top management to facilitate progress in improving the asset management program. Key staff members must be appointed to asset management leadership positions and given the authority to lead an asset management team.
- Strategic Asset Management Plan – A strategic asset management plan must be developed and be highly visible in order for GWA to have clear, achievable asset management goals.
- Communications – A communications program must be in place to ensure that stakeholders are continually apprised of asset management progress and benefits.

#### **8.4.2 Customer Service and Risk Management**

Customer levels of service must be clear and communicated to the customer. All variations in the levels of service must also include cost/benefit analysis and reflect changes in the associated risk.

- Levels of Service – The level of service supplied to the customers should be at the level they desire, not more and not less. A mature asset management organization will have a negotiated customer service level contract.
- Performance and Quality Management – A performance and quality management program must be developed, based on defined service levels and cost targets and supported by appropriate performance indicators. The program must include a mechanism for incorporating updates and improvements in performance indicator targets over time.

- Risk Management – Risk must be managed to allow levels of service that meet customer desires, and are delivered at the lowest life cycle cost and at acceptable levels of risk.

#### **8.4.3 Asset Planning**

New assets must fulfill established service levels, meet expected life cycle costing, be integrated into asset plans, meet existing fiscal constraints, and be validated through use of the BCE process.

- Asset Development – New assets must be evaluated, based on established service levels and life cycle costs of ownership, and integrated into the asset management plan.
- Asset Financing and Reporting – Funding and sustaining the system requires long-term forecasts of capital costs for expansion, refurbishments, and replacements. Transparent reporting of infrastructure value, condition, future needs, and funding policies are increasingly important to the financial community.
- Business Case Evaluation – BCEs are used for all capital decisions, not just CIP projects, but for O&M and replacement and renewal (R&R) decisions as well. All expenditures should be brought back to present values to ensure that the lowest life cycle cost is chosen.

#### **8.4.4 Asset Acquisition**

New assets must be evaluated based on established service levels and life cycle costs of ownership, and then integrated into the asset management plan.

- Asset Knowledge – The asset management plan must include a complete listing of all assets and associated attributes, criticality, vulnerability, and other key data elements to support life cycle asset management.
- Asset Plans – As a basis for asset management, asset plans define the resources needed, together with their costs, through the entire life cycle.

#### **8.4.5 Asset Operations**

Operating performance must meet established service levels, and the operating costs must fit into life cycle cost expectations.

- Operations Strategy – Assets must fit into the organization's overall operating strategy, thereby minimizing life cycle costs. The strategy must be transparent to ensure that staff all work together to maximize efficiencies. In addition, a continuous review process must be in place to modify operations when changes are required.

#### **8.4.6 Asset Maintenance**

Maintenance cost and condition histories are analyzed and compared with asset plans to optimize asset life, minimize costs, and provide information to update asset plans throughout the asset's life.

- Maintenance Strategy – A maintenance strategy should be in place to ensure that consistent practices are being applied across the organization. Maintenance practices should be based on criticality, risk, and condition of assets.







**8.4.7 Asset Replacement and Renewal Strategy**

R&R strategies shall be used to ensure that accurate scheduling of capital refurbishments and replacements are completed.

- Renewal Strategy – Cost, condition, and criticality considerations are used to define and schedule refurbishment and replacement decisions.

**8.4.8 Business Support Tools**

Each component of a well-developed asset management process is supported by one or more business applications. These applications are used to manage information, facilitate the decision-making process, and communicate results to the asset management teams.

- Information Systems – This describes the IT components required within an organization to support an asset management program. These components include the management, technical resources, physical IT architectures, data repositories, and applications needed.

**8.4.9 Scoring**

The scoring of current business processes is based on the five ranking categories listed in Table 8-2.

**Table 8-2 – Ranking Categories**

Rank	Category	Description
5	Optimizing	Continual improvement, refinement of processes, standards, and procedures.
4	Managed	Quantitative measurements are defined for processes and quality standards.
3	Defined Approach	Defined repeatable approach that is documented and communicated within the organization.
2	Initial	Reactionary and without a systematic approach.
1	Unaware	Currently no activity within the organization.

**8.5 Recommendations**

Although GWA does not have an established asset management plan, considerable progress has been made in the last few years. Staff are energetic and willing to learn new tools that will help them perform their duties more efficiently. In focusing efforts in the short term, three main areas presented themselves for consideration and were shared with leadership upon completion of this task.

**8.5.1 Computerized Maintenance Management System**

GWA currently has a computerized maintenance management system (CMMS) on line, which was purchased from JD Edwards. The system is up and running but is not used except for some asset data registry. Two options exist to improve this situation at GWA. One option is to obtain additional staff training on the JD Edward CMMS and require staff to use it. The other option is to evaluate and purchase a newer Windows or Web-based system that will seem more familiar or user-friendly to staff. In addition, existing database systems must be integrated to facilitate seamless information flow throughout GWA.

### **8.5.2 Additional Asset Management Training**

Training for GWA leadership and staff on asset management principles, concepts, and procedures should be continued. A strategic asset management plan must be created and implemented as soon as possible in areas where maximum returns on investment can be highlighted.

### **8.5.3 Complete AMPE Visioning Process**

GWA leadership is planning on working together to create the vision for their organization. Once this is completed, the AMPE gap chart should be updated with the vision goals and the gaps defined. At that time, GWA can review the gaps and focus efforts in those areas they deem appropriate. In the next year or two the AMPE process should be repeated. The current status “scores” would be updated to reflect efforts GWA has made in the various areas. The vision “scores” may or may not be revised depending on GWA’s goals. In comparing the previous gap chart to the current chart, GWA will see areas where progress has been made and also identify areas where additional resources may be required to achieve their vision. This undertaking will enable GWA to continuously move forward into becoming a mature asset management organization.

## **8.6 Conclusions**

GWA has made some progress in the responsible management of its assets. An evaluation of its current asset management program has been completed. GWA management must now establish its vision goals to focus the utility’s efforts on continuing to improve its asset management capabilities.