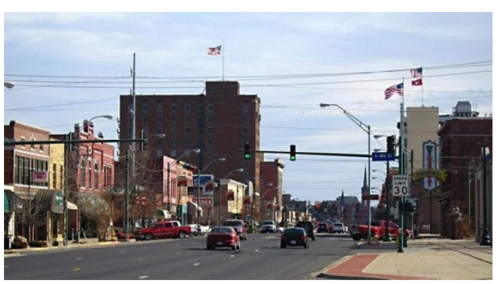
City of Fort Smith

Water and Sewer Operations Efficiency Study

February 2013



Final Report

Volume 1 of 2

Prepared by: HDR Engineering, Inc.

February 11, 2013

Ms. Mitzi Kimbrough
Internal Auditor
City of Fort Smith
623 Garrison Avenue, Room 522
Fort Smith, Arkansas 72902

Subject: Final Report of the City of Fort Smith Water and Sewer Utility Operations Efficiency Study

Dear Ms. Kimbrough:

HDR Engineering, Inc. (HDR) was retained by the City of Fort Smith to conduct a comprehensive water and sewer utility operations efficiency study. The intent of this study was to provide to the City an understanding of each utility's overall "efficiency" and to identify those areas where improvements may be made to improve efficiency and/or levels of service. In conducting this study, HDR used a systematic and comprehensive review process for the City's water and sewer utilities.

In providing this review, it is important to understand that "efficiency" may be defined in a number of different ways. The most obvious definition of "efficiency" is the improvement of an operation that leads to direct cost savings. While that type of "efficiency" is certainly a main focus of this study, "efficiency" can also be defined as an improvement to a process that may lead to improved levels of service, but not necessarily significant cost savings (e.g. improved financial policies that leads to a more efficient and consistent decision making process). Both of these types of "efficiencies" were considered within our review. At all times, the City should be focused on providing the highest level of service at the lowest reasonable cost. Both of these types of efficiencies capture the essence of level of service at the lowest reasonable cost.

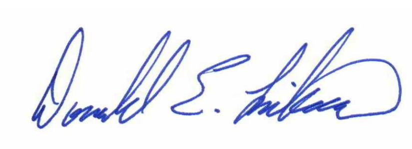
Our review utilized and relied upon a number of different methods to gather the data and information needed to reach this study's findings, conclusions and recommendations. Among the different methods utilized by HDR in conducting this study were interviews with key management and employees of the utilities, tours of the City's major facilities by HDR's operations experts, review of major planning, financial, and operating documents, and review of key (recent) operating data and information.

In summary, HDR found the utilities to be well-managed and operated. HDR has identified certain areas for potential improvement and cost savings, but HDR discovered no areas where “significant and immediate” cost savings could be captured.

HDR appreciates the assistance provided by the City and its employees in conducting this study. We found the City and its employees to be very open to this study and, as a result, greatly assisted HDR in conducting this study. In addition, as a part of this study, HDR also worked with the Citizen’s Advisory Committee which was specially convened to oversee and review this study. We enjoyed the opportunity to work with the Committee and believe the Committee was fully engaged in reviewing the findings, conclusions and recommendations of this study.

Thank you very much for the opportunity to provide this study for the City. Should you have any questions concerning this study, please do not hesitate to contact me.

Sincerely,
HDR ENGINEERING INC.



Donald E. Lindeman, P.E.
Senior Project Manager

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Appendices

1 EXECUTIVE SUMMARY

The City of Fort Smith, Arkansas retained HDR Engineering, Inc. (HDR) to conduct a water and sewer operations efficiency study. This study's goal was to identify areas in the Utility where efficiencies can be gained. HDR toured facilities, interviewed Utility staff, and reviewed documents and other existing data to get an understanding of the current efficiency level of the Utility. Then, based on this data and HDR's experience, efficiency was analyzed in the areas of organizational (business) structure, operations, planning, and the financial/rate processes.

HDR used The Capability Maturity Model to evaluate the Utility's current level of efficiency. This tool is used to demonstrate where HDR believes Fort Smith is currently positioned as an organization, and can be used to gauge future progress. The model shows that maturity can be generally described in five levels: Level 1 "No Defined Processes"; Level 2 Initial Approach; Level 3 Defined Approach; Level 4 Managed Approach; and Level 5 Optimizing Approach. The model does not suggest that every organization should be at Level 5 for all elements. As a matter of fact, the majority of water and wastewater utilities, as well as most companies in the United States, is between Level 2 and Level 3 for most business practices. Each area evaluated in this report was given a general efficiency rating:

- Organizational Structure – Levels 2-3, Initial to Defined Approach
- Water and Sewer Operations - Levels 3-4, Defined to Managed Approach
- Planning – Levels 3, Defined Approach
- Finance and Rates – Levels 2-3, Initial to Defined Approach

Specific efficiency opportunities have been identified which can aid the City in achieving efficiency goals. It is not the intent of this study to identify every single area where an improvement can be made. That is not to say, however, that potential efficiencies could not be captured from the smaller items or areas, but the final recommendations are those areas that capture the largest and most immediate gains in efficiency.

A number of efficiency improvement recommendations were compiled during the study. These recommendations can be found in the various sections of the report and the appendices. The highest priority recommendations are listed below.

HDR recommends that the Utility implement the following opportunities:

SECTION 3

- Develop an Asset Management Plan as part of the Utility Strategic Plan with demonstrated commitment from management and a system of continuous improvement.

- Include Asset Management information in the Capital Improvement Plan
- Create Levels of Service and a process for updating the targets as part of the Utility Strategic Plan.
- Improve the Utility Billing and Collection Process.
- Create a Succession Plan as part of the Utility Strategic Plan

SECTION 4

Water Recommendations

- An additional 1 log credit can be obtained for the Lee Creek Treatment Facility by utilizing a Watershed Control Program and a Combined Filter Performance standard, which do not require large capital projects to be undertaken.
- Respond more quickly to changing influent conditions through the addition of in-line raw water monitoring for turbidity and/or pH. These samples are currently lab tested and returned.
- A micro-turbine should be investigated to see if it is cost-effective to take advantage of the head from the Lake Fort Smith Water Treatment Plant.

Wastewater Recommendations

- Further investigation should be undertaken to see if using the in-line chlorine analyzer for sodium bisulfite could reduce the quantity of chemical used.
- The P St Plant could increase electrical efficiency through the addition of VFDs to blowers (if possible with operating conditions) and in-plant water pumps.

SECTION 5

- Assess project management and staffing needs.
- Examine unaccounted for water and better identify areas of unaccounted for water.

SECTION 6

- Continue collecting and developing performance measures. The Utility can compare its performance to its past performance as well as to similar Utilities. The Carnegie Mellon Capability Maturity Model can be used to assess the Utility's performance from year to year. HDR has provided an initial assessment that can serve as a starting point (refer to Appendix A). The Utility should collect data for the performance measures that have been identified for tracking.
- The City should develop a set of financial and rate-setting policies to guide the decision making processes for the utilities. Most importantly, at a minimum the policies should address:
  - ✓ Reserve funds and minimum target balances

- ✓ Funding renewal and replacement infrastructure projects at a minimum level equal to depreciation expense; gradually implementing this policy to avoid rate shock
- ✓ For financial planning purposes, establish a target DSC ratio, above the minimum required rate covenant
- ✓ Establish debt financing policies and targets, and review debt equity ratios.
- ✓ Consider system development charges (connection charges) for both utilities

- Develop a long-term financial planning model (e.g. 10 – 20 years) to better understand the financial and rate implications of the City’s long-term financing strategy and the issuance of debt.
- Continue to pursue outside funding sources for capital projects, grants and low-interest loans, to aide in keeping rates as low as possible.
- The rate model results presented to Council should provide an affordability test to help provide a context as to the appropriateness of the level of the rates.

2 INTRODUCTION AND OVERVIEW

2.1 INTRODUCTION

The City of Fort Smith, Arkansas engaged HDR to conduct a comprehensive water and sewer operations efficiency study. The objective of this study was to gain an understanding of the overall efficiency of the water and sewer utility by reviewing, in a systematic manner, the organizational (business) structure, operations, planning, and the financial/rate processes. Through this systematic review process, HDR was able to gain an understanding of the water and sewer utility's current level of operational efficiency.

HDR's review of the City's water and sewer utility has placed the utilities in the context of industry best management practices, along with the current trends of the industry. As a part of this study, HDR assembled a group of professional industry experts, with a wide variety of skill sets, to provide this review. The review utilized and relied upon a number of different methods to gather the data and information needed to reach this study's findings, conclusions and recommendations. Among the different methods utilized by HDR in conducting this study were interviews with key management and employees of the utilities, tours of the City's major facilities by HDR's operational experts, review of major planning, financial, and operating documents and review of key (recent) operating data and information.

2.2 DEFINING "EFFICIENCY"

"Efficiency" can be defined several ways. The most obvious definition of "efficiency" is the improvement of an operation that leads to direct cost savings. While that type of "efficiency" is certainly a main focus of this study, "efficiency" can also be defined as an improvement to a process that may lead to improved levels of service, but not necessarily significant cost savings (e.g. improved financial policies that lead to a more efficient and consistent decision making process). Both of these types of "efficiencies" were considered within this study. At all times, the City should be focused on providing the highest level of service at the lowest reasonable cost. Both of these types of efficiencies capture the essence of level of service at the lowest reasonable cost.

2.3 STUDY DEVELOPMENT

As the first step in the evaluation process, HDR conducted an initial series of interviews with key Fort Smith management team members, collected and reviewed data, and a held a series of workshop interviews focused on business processes. The business processes discussed can be generally organized as follows:

- Finance Billing and Collection
- Customer Complaints and Interface
- Condition Assessment
- Capital Improvement Project (CIP) and Financial Planning
- Maintenance Management Distributed Assets
- Mapping and System Information/Documentation
- Treatment Plant Operations and Maintenance (O&M) Management
- Regulatory Reporting and Regulator Interface Management
- Human Resources/Training/Safety
- Overflow Response - Corrective Action, Cause Analysis, and Sampling Reporting

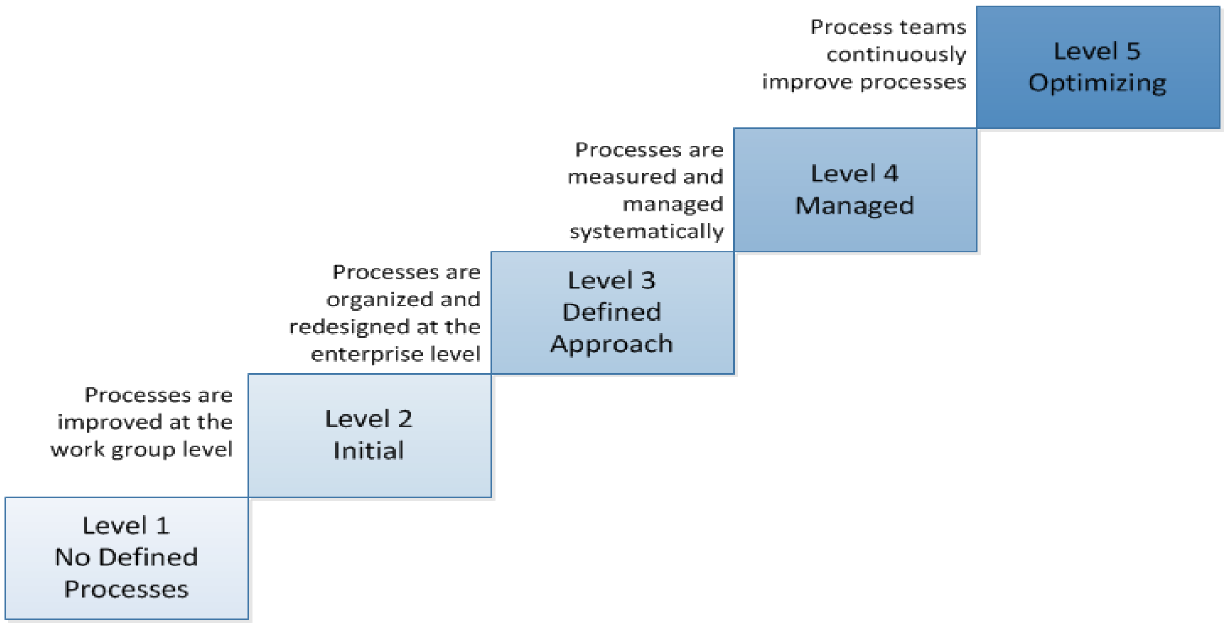
During the data review, interviews, and workshops with staff, the HDR team reviewed the organizational structure, operations, planning, and finance to better understand and define the levels of responsibility for managing the utility's activities, strategic goals, operations, and business processes. The information gathered was organized around thirteen utility business practice categories, which are listed below:

1. Business Strategy
2. Customers
3. Planning
4. Engineering
5. Communication
6. Operations
7. Asset Knowledge
8. Maintenance
9. Condition Monitoring
10. Capital
11. Administration
12. Financial
13. Business Information Systems

These 13 business practice categories were used as part of a maturity model to evaluate the efficiency of the Utility. The model HDR used in this evaluation is based on The Capability Maturity Model (CMM) (a registered service mark of Carnegie Mellon University). This tool is used to demonstrate where HDR believes Fort Smith is currently positioned relative to 138 specific evaluation elements, which make up the thirteen utility business practice categories. Figure 2-1 presents a schematic of the Capability Maturity Model. The model shows that maturity can be described as from having "No Defined Processes" (Level 1) to "Optimizing" processes (Level 5). The model does not suggest that every organization should be at level 5 for all elements. As a matter of fact, the majority of water and wastewater utilities, as well as most companies in the United States, are between Level 2 and Level 3 for most business practices.

For some elements it may be desirable to be at a Level 5, where as being at Level 2 for others may be appropriate and acceptable.

Figure 2-1 – The Capability Maturity Model (Carnegie Mellon University)

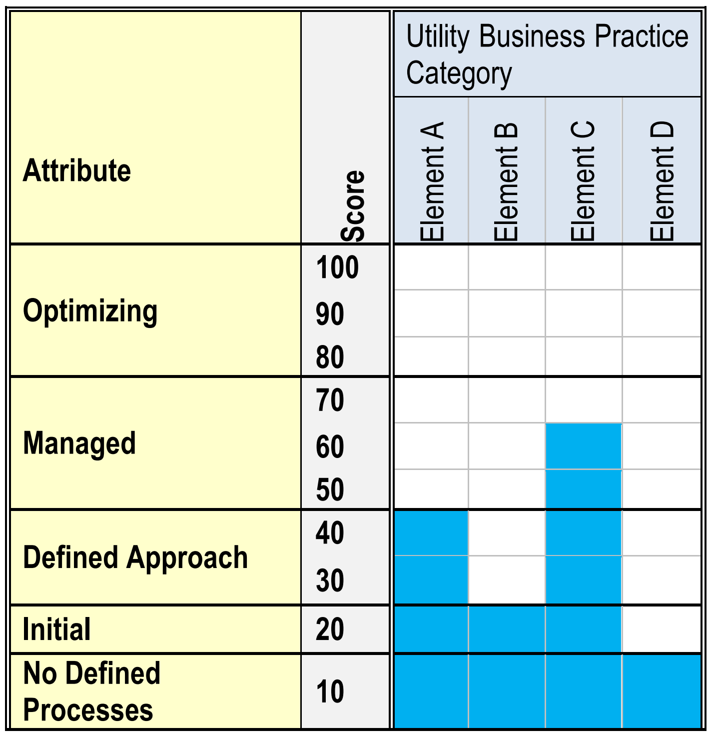


Level 5	Optimizing	Processes continuously improve and refinements are made with documented standards and procedures
Level 4	Managed	Processes are managed with quantitative measurements defined and used for setting quality standards
Level 3	Defined Approach	Most processes organized with defined systems supported with a repeatable approach that is documented and communicated within the organization
Level 2	Initial	Some organized processes, but without a systematic approach
Level 1	No Defined Processes	Total unawareness of the processes within the organization

Based on the data received from the City, and HDR's experience in conducting these studies, a maturity model was developed for Fort Smith for the 13 different business practice categories. An example of how the information for each category was evaluated is presented in Figure 2-2 and explained in the following discussion. The ranking of the Utility for the 13 business practice categories is discussed in the subsequent sections. The entire evaluation for all 13 categories can be found in Appendix A.

Using the available information, a ranking was given to each category element. When the individual elements are evaluated overall, they provide an idea or relative basis of where the Utility is with regard to a specific business category. It is important to note that debating if a single element should be given a specific score is not as important as looking at the overall trend across the elements. In addition, as previously mentioned, many elements may only require operating in the "Defined Approach" and "Managed" Levels, meaning that a score of "30" in many cases may be acceptable and appropriate. Trends identified from the elements are a "snapshot" of where HDR believes the City's utilities are today. Goals can be added to the maturity model matrix, to chart progress (annually) and help the utilities determine where it wants to operate at in the future, and begin thinking about the means of achieving those goals.

Figure 2-2 – Example of the Maturity Model Developed for Fort Smith



HDR has identified, in this report, specific efficiency opportunities that can aid the City in achieving efficiency goals. It is not the intent of this study to identify every single area where an improvement can be made. That is not to say, however, that potential efficiencies could not be captured from the smaller items or areas, but the final recommendations are those areas that will capture the largest and most immediate savings or improvements.

2.4 OVERVIEW OF THE REPORT

This report is divided into a number of different sections. These sections discuss the main areas of each utility reviewed in the efficiency study, along with the recommendations of the study. An overview of the various sections is as follows:

- Section 3 – Review of Organizational Structure
- Section 4 – Review of Water and Sewer Operations
- Section 5 – Review the Planning Process
- Section 6 – Review of Finance and Rates
- Section 7 – Citizen’s Advisory Committee
- Section 8 – Summary of Recommendations

3 REVIEW OF ORGANIZATIONAL STRUCTURE

3.1 INTRODUCTION

The first area reviewed within the City of Fort Smith (City) water and sewer utilities (Utility) was the organizational structure. An organizational structure is the framework in an organization that identifies lines of authority, communication and responsibility. The structure is for the individuals as well as the business units. The organization should be structured in such a manner as to efficiently achieve its overall strategic goals. This is accomplished by identifying the organization strategic goals, communicating them to all levels of staff, providing the tools to meet the goals, and providing performance measures for each job that allows feedback on progress.

The Utility's overall organization structure is a formal hierarchy. Formal hierarchies are typical in public organizations. They provide a basis for understanding authority levels and responsibilities, as well as delegation and lines of commands. Groups within the Utility also exhibit characteristics of functional structures, divisional structures, and matrix structures. The structure helps facilitate efficiency through specialized sets of tasks that focus on specifics of water or wastewater, as well as enhancing collaborating on cross functional activities.

For this study, the organizational structure was evaluated on the strategic level, business process level, and staffing level to better understand and define the levels of responsibility for each, look at how people see and value their roles in performing processes, and meeting the strategic goals, and identifying potential improvements.

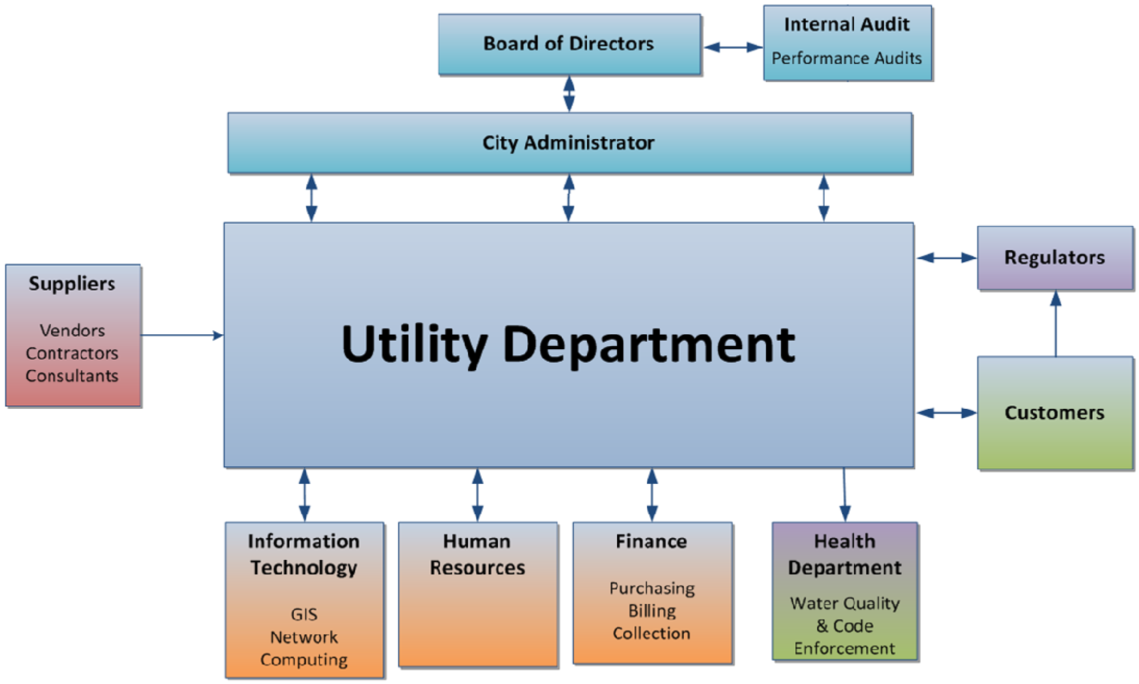
3.2 STRATEGIC LEVEL

The strategic level includes development of overall goals, identifying levels of core services, and monitoring organizational performance. The strategic goals and high level business processes within an organization affect it at the highest level. An important part of this review was to look at how accountability was managed and to see how people use information systems to meet the goals of the organization. This section discusses the current positive business practices and major management and implementation obstacles of the Utility. The areas that were reviewed are in terms of business plans, business goals, levels of service, and organizational performance.

3.2.1 Interdepartmental and External Relationships

When evaluating the efficiency of a utility, it is first useful to define the business roles, interactions, and responsibilities, as these contribute to the utility's overall efficiency. Key interactions need to happen at multiple levels in order for the utility to function. Figure 3-1 provides an overview of the priority interfaces.

Figure 3-1 Fort Smith Utility Department Key Business Interactions



Internal City support services are provided to the Utility by Human Resources, Finance, and Information & Technology Services departments. External entities such as vendors, contractors and consultants also provide support services to the Utility. The Utility provides services directly to its customers. There is also an interface between the Utility and regulators (i.e. State of Arkansas). This interaction includes the Utility regularly providing information to the Health Department for compliance monitoring. The Utility also has strong interfaces with the Internal Audit Department, City Administrator, and the Board of Directors.

3.2.2 Business Plans

The Utility is developing a Strategic Management Plan, which will include meeting regulatory requirements, developing target levels of service, and strategies to manage service expectations. This Strategic Management Plan should outline the direction for the Utility in 5, 10, or 20 year increments. The strategic plan is an important document to be used to measure efficiencies in an organization, thereby ensuring that the organization makes progress towards its maturity goals. A strategic plan considers not only how utility issues may affect the local economy and business sectors, but how their activities may affect the Utility. Stakeholder involvement and support is essential for the strategic plan to be successful, this includes elected officials, customers, Utility staff, and outside service providers.

Master plans also support the Utility's Strategic Plan. Up-to-date master plans are important and should include capital improvement plan (CIP) recommendations. From the master plans and annual system needs analysis, an annual CIP should be developed. More detailed information on CIP development can be found in the Planning Section (Section 5).

3.2.3 Business Goals

The Utility currently has business goals to meet customer expectations and government regulations at a reasonable cost. The Utility uses State-defined levels of service (regulatory requirements), but does have stated service level goals.

The Utility has indicated that one of its goals is to have continued communication and input from its customers and stakeholders. The Utility has a redesigned web site in place for external communication as well as links to social media. The website social media communicate information about each utility, its business, and current information on water quality, industrial users, and the City's water conservation policy. The City also successfully communicates regulatory requirements monitored by the Utility's Laboratory Services and Industrial Sewer Monitoring by reporting to the U.S. Environmental Protection Agency (USEPA) and the Arkansas Department of Environmental Quality (ADEQ).

3.2.4 Levels of Service

Levels of service are communicated through water quality reports issued annually, which meet regulatory requirements and inform citizens of the quality of water being provided. The level of service for the wastewater utility is currently being defined through an administrative order with the USEPA and ADEQ.

Proper planning for future regulatory requirements and identifying potential risks are important in defining levels of service targets. This planning and risk identification will help avoid problems that could prohibit the Utility from meeting its level of service goals in the future. Proper risk mitigation includes maintaining and improving the system over time to be in the best position for meeting future regulatory requirements.

3.2.5 Strategic Level Summary

The overall efficiency rating for the strategic level business operations is a "Defined Approach". The Utility has defined level of service goals and is working to meet regulatory requirements for wet weather. Risk quantification would allow the Utility to progress to a more "Managed Approach". Below is a summary of key points regarding the Strategic Level review:

- The organizational structure of the Utility is a formal hierarchy with internal groups of divisions, and matrix structures. The organizational structure allows for:

  - delegation of responsibilities and authority to effectively perform complex activities,
  - defining lines of delegation and communication,
  - specialization, and collaboration,
- Key relationships that contribute to the Utility's overall efficiency include:
  - Customers,
  - Board of Directors,
  - Human Resources,
  - Finance,
  - Information & Technology Services,
  - Internal Audit, and
  - Administrator departments,
  - External vendors,
  - Contractors, and consultants; and regulatory agencies.
- The Utility is developing a Strategic Management Plan to align long-term activities and resources on strategic goals that support the Utility mission.
- The Utility currently has business goals to meet customer expectations and government regulations at a reasonable cost, but does not formally define levels of service outside regulatory requirement.
- The Utility has no documented plan for identifying and quantifying risk.
- Information about customer service and the various metrics is not normally communicated back to the customer, other than in the annual report type of format for water quality.
- Customer surveys are not typically done or found to be necessary.

See Section 3.5 for strategic level recommendations.

3.3 BUSINESS PROCESS LEVEL

The business process has a strong emphasis on how work is done in an organization. It includes process goals, how the processes support the organizational and process management.

3.3.1 Key Processes

3.3.1.1 Engineering

Engineering is a business process that addresses the physical assets of the Utility which includes the areas identified in the following sections.

3.3.1.1.1 Project management

Project management includes project prioritization, construction management, and tracking. The Utility has a staff of three engineers dedicated to project management with a fourth position open. Currently the staff project engineers have to deal with day-to-day activities and do not have time to look at long-range planning. With projected infrastructure improvements, it appears the Utility is understaffed to manage all the work on the books. To complicate this issue, there is no additional office space for staff at the Kelly Highway Facility.

3.3.1.1.2 Collection system and distribution system maintenance

The Utility performs most of its own maintenance on the sewer collection and water distribution systems, but can call in private utility contractors as needed. In addition to actually performing the work, maintenance includes the management of the staff and maintenance of the fleet.

Maintenance also includes preventative programs. These include industrial sewer pretreatment, water meter replacement, and root cleaning programs. The industrial pretreatment program is active, while root cleaning program appears to be less emphasized, likely due to the volume of work. A Fats, Oils, and Grease (FOG) program is not yet established, and there is currently no preventative maintenance program for roots. Finally, meter change out staff appears to be insufficient to keep up with program requirements.

3.3.1.1.3 Planning

The need for or asset replacement or projects is anticipated in advance and arises from master plans. New assets are created based on needs of the users or as the result of a historical problem. Master plan is generally done every 10 years with three criteria; integrity, expansion, and capacity. There is both a Water Master plan (1998) and a Sewer Master plan (1993 and being updated this year (2012)).

A more thorough discussion of planning can be found in Section 5.

3.3.1.1.4 Condition assessment

Condition assessment includes condition scoring, tracking, strategy, and corrective actions taken. Efficiency in this area is not having infrastructure in excellent condition; rather, it is understanding the existing conditions and having a method of repairing and replacing failing infrastructure in a timely and cost effective manner.

There is a general condition assessment program for sewer lines in place as part of the administrative order. This involves things like closed circuit televising (CCTV) sewer lines to identify defects. The administrative order calls for an evaluation of infiltration and inflow (I&I) and prioritization of needed improvements that are identified.

Closed circuit televising (CCTV) of sewers is done during sewer evaluation projects and on an as-needed basis. Defects are not captured in Lucity unless they are severe enough to require a work order. Cleaning is normally done as part of the CCTV work.

There does not appear to be an active condition assessment program for water infrastructure. At this time, there is no tracking of the condition of waterlines as they are exposed for repair or new service installation. Crews will take a coupon of the waterline, during a tap for a 2" or larger service, but it is not clear how this information is used. What is known is that a significant portion of the distribution system is over 100 years old. There are currently no plans to replace this pipe.

3.3.1.1.5 Data management

Data management is handled through several different systems. The primary systems are Lucity, GIS, AutoCAD, and Microsoft Office products. A disconnect exists between Lucity, GIS, and AutoCAD which prevents data from being easily accessible for analysis and maintenance activities. Information systems are discussed in more detail later in this section.

3.3.1.1.6 Inventory

Inventory is known to varying degrees within the Utility. Inventory for line maintenance activities is well known and tracked in Lucity. This allows critical parts to be re-ordered when required and prevents excessive storage and product expiration. It allows for timely ordering of additional spare parts.

It was reported that the water and sewer treatment plants have spare parts on hand, but are not tracked to the same degree in Lucity or stored in designated locations at each plant. Spare parts lists do not appear to be kept up-to-date.

3.3.1.1.7 Customer complaints

Customer complaints currently come from multiple locations, including the Finance Department a utility System Caution Center calls, the Utility's website, the laboratory, or the City crews in the field. Complaints may be logged in the Utility Billing System or Lucity, depending on the origin. There is currently no method to track a complaint's origin or time from the time it comes in to when the complaint is resolved. There is currently no way to measure customer service efficiency. Staffing is limited to take calls, and staff receives many calls unrelated to the Utility.

3.3.1.2 Meter Reading/Billing/Collection

Customer service, meter reading, billing, and collection are the most common ways in which the utilities interact with the customer. The meter reading, billing and customer information system, and collections are all handled by separate entities. Their general functions and relationships are described below:

3.3.1.2.1 Utility Responsibilities

- ✓ Customer Service

Overall, there are several areas in which the Utility is doing well regarding customer service. It was apparent from HDR's conversations with City staff that the Utility wants to be easy to work with, and wants to go above and beyond in this area. The Utility is also updating its website, which when completed, can be a resource used to answer frequently asked questions.

It is important to note that the Finance Department also handles customer service matters regarding turning on or off water service, establishing and closing customer accounts, and handling customer complaints.

✓ Meter Reading

Meter reading is an important function in all utilities. Accuracy and timing of readings are typically perceived by customers as key issues. Efficiency is determined in this area by measuring customer satisfaction, as well as the accuracy of metering and billing. Meter reading is conducted by the Utility. There are eight full time meter readers covering 158 assigned routes which are periodically rotated through. Meter readers enter meter data into Itron handheld computers. Meter readers have accuracy goals of no more than two reading errors per day, which provides for some ability to measure performance.

✓ Meter Installation and Repair

New meter installation is handled by the Utility. Tap requests are initiated at the Utility Records Office by builders, contractors, or customers. The Records Office sends a tap order to the Water Line Maintenance Supervisor and the Finance Department. The order is carried out and data is entered into Lucity and the Utility Billing System (UBS).

The need for meter repairs can be identified through meter readings, customer complaints, or staff observations in the field. The repair request is forwarded to the Utility where it is carried out. Data for the repair is entered into the UBS.

There is overlap in responsibility between the Finance Department and the Utility. Issues with meters in the field are sometimes handled by first-responders from the Finance Department. If it is an issue beyond their capability, they will notify to the Utility.

✓ Service Terminations

Service terminations are conducted by the Utility in rural areas and when meters larger than 2-inch are involved. The Finance Department requests the Utility terminate the service, after service termination, the Utility sends the information to Finance to close the customer account.

3.3.1.2.2 Finance Responsibilities

- ✓ New Customer Account Requests

  Requests for new customer accounts are taken and entered into the UBS. A meter installation request is created and sent to the Utility if the meter removed from the meter box was larger than 5/8-inch. The Finance Department will set up a time to turn on the water, activate the account and get the initial meter reading.

  The Finance Department refers all requests for new taps to the Utility.

- ✓ Maintenance Requests

  The Finance Department is the first responder for customer billing complaints regarding a customer's meter. They will resolve the issue unless it is beyond their capability, in which case the Utility is notified.

- ✓ Service Terminations

  Service terminations are the primary responsibility of the Finance Department. Terminations are routinely handled without assistance from the Utility for 2-inch and smaller meters within Fort Smith and the South Sebastian Service Area. When the meter is in a rural area or is larger than 2inches, the Finance Department requests the Utility terminate the service, after which, the Utility sends the information to Finance to close the customer account.

- ✓ Collection

  The Collection Department verifies the bills have been paid. Billing information is input into the UBS by the Finance Department.

3.3.1.2.3 Data-Tronics, Inc. Responsibilities

The billing and customer information system is handled through a 3rd party vendor, Data-Tronics, Inc. Data-Tronics has been used since 1974 at a cost to the Utility of approximately $600,000 per year. The Utility uploads meter readings from the Itron meter reading system into the Data-Tronics Utility Billing System (UBS). The UBS allows Data-Tronics to generate bills, and the UBS is integrated with the City's accounting system that is also provided by Data-Tronics. Data-Tronics uses Arkansas Business Freight to print and send the bills to the Utility's customers.

3.3.1.3 Information Systems

Business information systems are those systems that allow employees to carry out their duties each day. Systems include hardware, software programs, and how these software programs are implemented into the activities of the utility.

Communication within the Utility is critical, and it appears that generally staff has the technology they need to perform their duties. Staff has reliable computers, new operating systems and Microsoft Office Products, and a reliable internet system. Files and information are shared via a shared drive and SharePoint server. Most users have mapped common drives on their computers for easy file transfer.

Lucity is the computerized maintenance management system (CMMs) used by the Utility. This high-powered system was installed in 2009 and in some instances, it appears the system is used effectively. One example would be the line maintenance teams. Lucity is used for work orders, tracking of the cost of materials, and inventory tracking.

One of the key roles of information systems in a utility is the organization and storage of asset knowledge. Assets need to be identified, categorized, and entered into information systems. Asset criticality within the Utility is intuitively known, but not always documented. Documentation would protect the Utility from losing institutional knowledge when there is staff turnover.

Currently, the Utility has several information systems which are used to document assets. The primary software programs are Lucity, ArcGIS, and AutoCAD. All three of these systems could work together (AutoCAD can be imported into GIS which can serve as the geodatabase for Lucity), however, at the current time they are still being used independently of each other. Staff also reported that there are not enough people to input data into Lucity, or to map the system in GIS. Without a larger emphasis on data collection and entry, an in-depth asset management system cannot function properly.

3.3.2 Procedural Documentation

Documented operating procedures are crucial in utilities with aging staff. Documentation of procedures allows the utility to "capture" the knowledge of the existing staff. This protects the utility and the knowledge contained within it when employee turnover occurs. Procedural documentation allows new employees to more quickly understand processes and reproduce them.

The Utility and Finance Department have documented procedures and use them for new services, billing and collections. The documentation is in the form of flow charts, which takes one through the steps encountered in new services, billing and collections. Examples include requesting a new water meter service, or paying a bill by credit card over the phone. A new staff member could see these charts and with minimal training, have a decent idea of the process. There are other examples of procedural documentation throughout the City, including the process of reverse bidding for chemicals.

Procedural documentation can also be applied to the support services outside of the organization. For example, the development of a Standard Operating Procedure (SOP) defining electronic data submission standards (AutoCAD or GIS Standards) could be prepared and given to consultants, so the Utility would have consistency in the electronic data.

3.3.3 Business Process Summary

The overall efficiency rating for the business process operations is a “Defined Approach”. The Utility and Finance Department have defined procedures and protocols for such items as the billing and collections process. The Utility is also doing some condition assessment planning and documentation as part of the administrative order. Standardizing more procedures and capturing additional data in the Utility’s existing information systems would allow the Utility to progress to a more “Managed Approach”. Below is a summary of key points regarding the Business Process Level review:

- The Utility has a Water Master plan and a Sewer Master plan that are being updated.
- The Utility has a general condition assessment program for sewer lines.
- Utility personnel perform most of the maintenance on the water and sewer infrastructure, maintenance of the fleet, and management of staff.
- Eight full time meter readers read 158 routes each month with a goal of only 2 errors per day.
- There are three Utility engineers, which is insufficient to manage the pending, projects.
- There is no additional office space at the Kelly Highway facility.
- Water meter change out staff is insufficient to effectively change out old meters.
- A significant portion of the distribution system is over 100 years old, there is no active condition assessment program or a plan to replace the water distribution system.
- The sewer industrial pretreatment program is active and root cleaning less active. There is no preventative maintenance program for roots in sewers.
- The Utility does not have a sewer Fats, Oils, and Grease (FOG) program.
- The Capacity, Management, Operation, and Maintenance (CMOM) program appears to be understaffed.
- The Utility generally has the technology needed, such as reliable computers, new operating systems and Microsoft Office Products, a reliable internet system, file server, and SharePoint server.
- The Utility uses Lucity, ArcGIS 10.2, AutoCAD and stand-alone data bases for data management, but these systems are not fully integrated with each other.
- There are not currently enough resources to set up and manage GIS within the Utility. This limits effective in-depth asset management.

- Lucity effectively tracks parts inventory for line maintenance activities, but not for the treatment plants.
- The Utility and Finance Department have documented procedures and use them for new services, billing and collections.
- Customer complaints currently come in to multiple locations in both the Utility and the Finance Department and are logged in the Utility Billing System (UBS) or Lucity; however, a complaint cannot be tracked from the time it comes in to when it is resolved.
- There is currently no way to measure customer service efficiency.
- The Utility cannot analyze incoming calls, such as, number of calls, customer wait time, rings before answering, missed calls, etc
- The Utility is doing well in several areas of customer service (e.g., easy to work with, responding to customers); but Utility staffing is insufficient to handle the quantity and diversity of calls, many of which are unrelated to the Utility.
- Utility Control Center personnel have very limited space to work.
- Meter repair work orders can originate at both the Utility and Finance Department and are identified through meter readings, customer complaints, or staff observations in the field
- New service taps and responding to meter leaks are primarily handled by the Utility.
- Billing complaints, collections, and service activation and termination are primarily handled by the Finance Department. There is a sense of reluctance to turn off water service for delinquent accounts.
- Billing services and customer information are handled by the Finance Department using the UBS.

See Section 3.5 for business process level recommendations.

3.4 STAFFING LEVEL

Staff has a set of defined job-related goals and also has roles in a variety of processes that include performance measurements and feedback to meet the organizational goals. The review of staffing includes examining employee performance, succession planning, and training. Staffing efficiencies are primarily focused on enhancing communication within an organization.

3.4.1 Performance

The goal of any organization is to have efficient and effective employees. This requires a process of continual improvement, goal setting, and evaluation. The formal instrument organizations use for continual improvement is a performance appraisal. Once strengths and weaknesses are identified, an organization can begin to train its employees in their areas of need, and then, at a minimum, evaluate them on an annual basis.

3.4.1.1 Performance appraisals

Employees need feedback on their job performance. A lack of feedback is often interpreted as an approval of performance or attitude. Performance appraisals are the tool used to compare the employee's performance to the requirements of the job and provide positive or negative feedback. Thus, an appraisal is only valuable if the employee understands his/her expectations. A quality performance appraisal should contain the following items:

- Assessment of work performance against established expectations
- Justify caution of salary changes
- Establishment goals for the next period
- Identification and discussion of employee's work-related concerns
- Review of career objectives

A performance appraisal is also an excellent time to discuss training opportunities or additional resources which would better allow him/her to perform their job.

Employers should be able to assist employees with career development, establish measurable goals, measure the achievement against the goals, recognize employee achievement, and provide solutions for the employee if goals are not met. Adequate opportunity should be provided for employees to improve their performance. Communication (either written, verbal, or both) should be used to inform the employee of their performance between formal appraisals, especially if positive change is not occurring.

The Utility uses the City's Employee Evaluation Program to provide each employee formal feedback on his/her individual job performance and set goals for the next year. The employee provides his/her self-evaluation to the immediate supervisor, who uses the employee's input to draft the supervisor's evaluation of the employee's performance. The supervisor forwards the draft evaluation up the Utility hierarchy for collaboration at all management levels. After the draft evaluation is revised to its final state, the supervisor reviews the evaluation with the employee to assure the employee understands the evaluation and ways to enhance performance. This becomes the employee's official annual performance evaluation and in part determines salary or wage changes.

3.4.1.2 Training

Training consists of on-the-job training as well as a developed orientation and training program for new hires to improve their odds of success. While not all employees will be successful, the lack of documented training and communication of expectations for employees are often cited when there are difficulties between employees and supervisors.

Training must first start with a commitment from management to devote the necessary budget to provide a quality program. Part of having a quality training program is having standard operating procedures to present information in a clear and concise way; one that makes efficient use of training time.

Topics of training programs can vary from OSHA and safety requirements (which the Utility currently participates in) to those required by a City or State Agency, or those required by a specific employer. Other training programs can be job-specific. Training topics can also originate from employee suggestions during performance appraisals. It is important that training be available, and that when appropriate, employees are cross trained. Cross training helps spread institutional knowledge and provides flexibility to an organization in the case of an extended employee absence, particularly in smaller utilities.

The Utility provides new employee orientation, on-the-job training, and for some positions, specialized formal training. The City also provides an employee education benefit to encourage employees to further their knowledge through formal education.

New hires receive both a general orientation and specific safety training. The Human Resources Department provides employee general orientations. This includes training on City policies, employee benefits, and general conditions of employment. The Utility's Training and Safety Coordinator provides safety training specific for the position that the employee fills. Topics include personal protective equipment, confined space entry, chemical right to know, and worksite traffic control. Employees transferring into a position also receive the appropriate safety training for that position.

Additional safety training is provided to employees from time to time as needed. This includes training for lift truck operators, overhead crane operators, excavation safety, emergency response, CPR, defensive driving, dog safety, workplace harassment, etc.

Also, specialized formal training is available to employees who are required to obtain or maintain specific certifications or licenses. This includes water and wastewater licenses, professional engineer licenses, and backflow preventer licenses.

3.4.2 Succession Planning

Utilities have a higher than normal risk when they have a high average worker age, with many long term employees (less than 10 years till retirement), minimal training budgets, lots of institutional knowledge, and no plan for transferring the knowledge. This risk is that the knowledge, efficiencies, and even the ability to function as a competent organization could be lost if certain key members of the organization were to leave at once. Implementing a succession plan is one key to easing the transition as employees retire.

The first step is to develop a succession plan, outline its key objectives and priorities, and implement. The Utility has a significant amount of institutional knowledge that needs to be recorded. Knowledge regarding repair procedures, current maintenance practices, location of valves, age of certain infrastructure, and location of underground facilities is critical to document and preserve for future employees. There are a number of ways to capture this knowledge, including:

- Videotaping and photographing repair procedures
- Teaming experienced staff with younger members
- Job rotation/cross training
- Double fill positions where staff are planning on retiring
- Updating maps or as-constructed drawings

Succession planning and the opportunities for training that result are available only for a time.

3.4.3 Organizational Staffing Summary

The overall efficiency rating for the business process operations is a "Defined Approach". The Utility currently conducts annual performance reviews, in which each employee is assigned a score. Input is taken from the employee and then modified by the supervisor. The Utility also provides paid training to its staff, and has a training log for each staff member. The Utility could mature to a more "Managed Approach" through the development of a succession plan. Below is a summary of key points regarding the Organizational Level review:

- The Utility's workforce is getting older and many people could start retiring in the next few years.
- The Utility encourages cross training within programs but has no formal cross training plan.
- The City does not have a succession plan.

See Section 3.5 for organizational staffing level recommendations.

3.5 ORGANIZATIONAL STRUCTURE PRIORITY RECOMMENDATIONS

Section 3 of this efficiency study reviewed the organizational and business practices within the context of the Utility organizational structure. It was not the intent of this study to identify every single area where an improvement might be made. That is not to say that potential efficiencies could not be captured from the smaller items or areas, but the City should begin with those areas that will capture the largest and most immediate savings or improvements. Over time, the City can work on identifying the smaller areas for efficiency improvements and savings as part of its continuous improvement effort. Refer to Appendix B for non-priority recommendations.

HDR has identified the following priority recommendations summarized from the strategic level, business process level, and staffing level evaluations in Table 3-1. Each recommendation includes advantages, challenges/risks, and estimate capital cost and annual return, as appropriate. Due to the limited scope and depth of this study, some recommendations might require a detailed study or additional analysis to better understand and refine the needed capital improvements, potential costs of investment, and the potential savings.

Table 3-1 - Organizational Structure Priority Recommendations

Overall Recommendation	Recommendation	Advantages	Challenges/Risks	Capital Cost	Annual Return
Develop an Asset Management Plan as part of the Utility Strategic Plan with demonstrated commitment from management and a system of continuous improvement.	Allocate the resources necessary to conduct the Asset Management Team's (AMT) work through the first full year. A plan should be developed to integrate GIS with Lucity and should include the cost for data migration (example: AutoCAD to GIS), testing and staffing to support the system.	Efficient data management is the first step necessary for condition and risk assessments	Requires employee time and buy-in from organization; lack of current staffing/knowledge	Mgmt Team Assumptions: Team of 4; Consists of Sr. Proj Eng, Utility Tech, Records Coordinator, and Construction Supervisor at average hrly rate of $24/hr per Wage Study Pay Grade; 4 hrs/month/person = $5,000/yr; 2 FTEs for first year at $24/hr = $100,000; $105,000 Total	Uniform input requirements for Utility Department
Include Asset Management information in the Capital Improvement Plan	Implement a formal asset management plan and risk quantification for the capital improvement plan.	Asset management and risk quantification plans will allow the utility to assign its resources based on a quantifiable and repeatable process.	Asset management and risk quantification requires time and effort, especially to gather data (quantified in other recommendations)	Cost of plan would likely be approximately $500,000	May increase capital budget if it is found that assets are not being replaced on time. Annual cost savings in operation budget could approach 20% per year
	Lucity should be connected to a geodatabase and integrated with GIS.	Fully integrating Lucity and GIS would maximize the program's capabilities and consolidate data. Data would be more accessible.	There are not currently enough resources to set up and manage GIS within the Utility.	1 FTE at a mid-level pay grade	10% efficiency in labor cost for analysis or roughly $10,000 per year; Payback period of 6 years.
	Information systems need to transition to having a primary role in supporting asset management practices.	Asset management practices are only as good as the knowledge the decisions are based upon. Information systems provide access and organization for the institutional knowledge.	Time and money are required to set up the information systems. Asset management practices must be established.	$125,000 to develop an asset management program	May increase capital budget if it is found that assets are not being replaced on time, currently. Annual cost savings in operation approximately 20% per year; Payback period of 7 yrs.
	Pilot test and evaluate the use of handheld technology to improve data entry and integrity of data within GIS. The input of data can cost as much as the software system. For example, handheld devices can be used to locate infrastructure in the field, and the data can be loaded directly into the GIS system.	Directly input information from the field into GIS system	Equipment is costly; Need to determine accuracy needs; some training would be required	Accuracy affects cost; Most accurate Tremble handheld (with software) is $10,500; costs decrease if multiple handhelds are purchased	Increased data entry into Lucity will result in more accurate records.
	Develop a requirement for standardized submittals to the Utility. Construction plans should be provided to the City in a format that can be readily input into GIS.	Standardization saves time and effort; allows City to more easily import data	Must come up with agreeable protocol; Must find staff time/money to create protocol; must find way to get input from all employees and software vendors	1/4 FTE at mid level grade with provisions for review by upper management	Savings of $5,000 per year in not having to coordinate/revise data to fit data management systems; Payback period of 2 yrs.
	Provide operation and maintenance staff SOPs to ensure data provided from maintenance activities can be easily input into asset management databases.	Standardization saves time and effort; allows City to more easily import data	Must come up with agreeable protocol; Must find staff time/money to create protocol; and get employee buy-in.	1/8 FTE at mid level grade with provisions for review by upper management	$2,500 per year; Payback period of 2 yrs.
Create Levels of Service and a process for updating the targets as part of the Utility Strategic Plan.	Develop specific service level targets for the water and sewer utilities. Capture the required data to begin measuring service level targets.	Setting level of service targets allow the utility to determine goals for the service it provides, receive feedback on the service it provides, and compare it to the costs of providing different levels of service.	Requires some data, including customer expectations and cost of service.	Developing a level of service analysis, acquiring data and determining levels of service targets would cost approximately $20,000	Prioritization of goals and actions would reduce risk by $20,000 per year
Improve the Utility Billing and Collection Process.	Re-evaluate the implementation of AMI and how it would impact customer service and revenue over an 8-10 year period. Focus first on those areas which require the longest time per account.	AMI would provide significant improvements in efficiency in the meter reading process, and provide the City with greater ability to communicate consumption information to its customers, which can be beneficial in encouraging conservation via customer feedback.	City would need to conduct a detailed study of the various AMI technologies and select the most appropriate system (e.g. drive-by vs. fixed network). The funding and financing of AMI could be a major hurdle to implementation.	Total capital cost can vary significantly depending upon the technology selected and whether meters are replaced, or simply a meter interface unit added. Other AMI studies have indicated capital costs in a range of $450 - $550 per meter (includes a new meter).	Other systems have shown a 15% to 30% return on investment. A more detailed evaluation of the City's system, needed investments, and cost savings would be needed to confirm those anticipated levels of return on investment. Other water systems evaluated have shown a payback period of 10 to 15 years depending on the specific technology investment and operational savings. The assumed useful life of a metering system is 20 years.
Create a Succession Plan as part of the Utility Strategic Plan	Establish a commitment of management to preparing, funding, and implementing a succession plan. The Plan shall include a scope, method of prioritizing positions, potential employees to fill positions, opportunities for apprenticeship training, procedures which should be documented, and the format of that documentation.	Succession plans help limit the strain on an organization when key members of that organization retire or leave. Succession plans help to distribute institutional knowledge to more employees.	Succession planning requires initial investment to set up the plan. Then, the plan must be implemented and communicated as required. The plan requires periodic updates to remain relevant.	$40,000 to develop a succession plan.	Savings realized in time delay to fill position as risk reduction of $10,000 per year; Payback period of 4 yrs.

An implementation plan for each of the priority recommendations listed in Table 3-1 follows:

1. **Develop an Asset Management Plan as part of the Utility Strategic Plan with demonstrated commitment from management and a system of continuous improvement.**
   Steps to Develop an Asset Management Plan:
    1. Define the commitment of City management in a written statement that will be communicated to staff.
    2. Create an Asset Management Team (AMT) and define the AMT's purpose and structure in a written document. Create a resource plan to manage Asset Management initiatives that sets the plan scope, assignments, budget, schedule, and success measures.
    3. Allocate the resources necessary to conduct the AMT's work through the first full year. A plan should be developed to integrate GIS with Lucity and should include the cost for data migration (example: AutoCAD to GIS), testing and staffing to support the system.
    4. Develop an asset management program brief and distribute to all staff.
    5. Document asset decisions and follow a repeatable process. Develop an asset management procedural manual. The manual should include threshold dollar amounts, for which asset improvements require a business case evaluation (BCE) in order to obtain the Board of Director's approval. This process outline should show how the results of the BCE are communicated to decision-makers within the City and outline the decision maker's approval and denial process with regards to moving forward with the BCE decision. Asset decisions below the threshold level would be made by management staff.
    6. Develop a process to support comprehensive, accurate, and transparent reporting of total life cycle costs. Fort Smith should ensure that life cycle costs support sewer and water valuation and depreciation.
    7. Integrate asset management with the Utility Strategic Plan that is being developed.

2. **Include Asset Management information in the Capital Improvement Plan**
   Steps include:
    1. Prepare a standard operating procedure (SOP) for how the Utility will develop and manage asset plans. The SOP should include what is done now and what needs to be done.
    2. Prepare a SOP that describes the process for asset tracking and how to update asset plans.
    3. Develop a template to be used by staff when performing asset management evaluations.
    4. Develop a condition monitoring scoring system and process for tracking asset condition to predict failures of assets.

5. Ensure repair and replacement actions are properly recorded in the fixed asset register (Lucity).
6. Define regularly scheduled times to update asset management plans at either the asset class level of the individual asset level.
7. Incorporate in the CIP a process based on the need for a new asset or the repair and replacement of an existing one (asset management plan) that includes risk analysis and community impact costs.
8. Design a training program for implementation.

3. Create Levels of Service and a process for updating the targets as part of the Utility Strategic Plan.

Steps for the creation of levels of service and level of service updates:

1. Define the levels of service goals and a method of establishing, measuring, and reporting on the Utility's performance against stated service levels.
2. Communicate the service level goals to all staff.
3. Create a reporting structure within the Utility to show staff members how the Utility has performed each quarter against relevant service levels and performance targets.
4. Ensure planning documents are written to meet the stated service level requirements for the planning period.
5. Update the customer information system and the financial accounting systems to track and report on the performance and costs of maintaining defined service levels.
6. Establish a process to review service levels and monitor information on actual impacts and community costs (for example, what would the social or community impact be if response to an overflow was either increased or decreased).
7. Create a communication plan to inform the stakeholders of the performance of the Utility against defined service level goals and long-term cost targets.

4. Improve the Utility Billing and Collection Process.

The steps to improve the billing and collection processes and to improve the flow of revenue are as follows:

1. Re-evaluate the implementation of automatic meter infrastructure (AMI) and how it would impact customer service and revenue over an 8-10 year period. Focus first on those areas and meter reading routes outside the Fort Smith city limits which require the longest reading process time per account.
2. Evaluate and, if necessary, improve the process for retiring accounts that result in negative financial reporting.
3. Meet with various customer types and develop the best options for supporting on-line payment. The AMI would support varying billing and payment options.

4. Complete a business case evaluation to look at bringing the finance, customer information and the billing and collection software functions into the Utility. This would include:
    a. Redefining departmental roles and responsibilities
    b. Cost for software
    c. Internal staffing (training, management, operations)
    d. Additional facility accommodations

5. Create a Succession Plan as part of the Utility Strategic Plan

1. The creation of a succession program should be as follows:
2. Establish a commitment of City management for preparing, funding, and implementing a succession plan. Identify the scope of the plan, and how to prioritize the positions. For example, positions could be prioritized by those which have critical institutional knowledge and are likely to retire in the next 5-10 years.
3. Use performance appraisal documentation to identify those employees most likely to fill future vacancies.
4. Identify opportunities for apprenticeship training. For example, a water plant operator may require working directly with their successor for a period of time as part of the succession plan training.
5. Identify in each division and program, those procedures which should be documented to maintain institutional knowledge. Define the methods and format of documentation.
6. Update the plan every five years or more often as required.

4 REVIEW OF WATER AND SEWER OPERATIONS

4.1 INTRODUCTION

The City's existing water and sewer facilities were examined to identify potential process efficiencies. Specifically, the water and wastewater treatment facilities were evaluated to determine the chemical consumption, power usage, and residual disposal costs. Then, possible plant efficiencies were identified based on data, site visits, and discussions with Utility staff. The staffing levels at the plants were also evaluated and compared to AWWA benchmarks established for similar utilities.

4.2 WATER

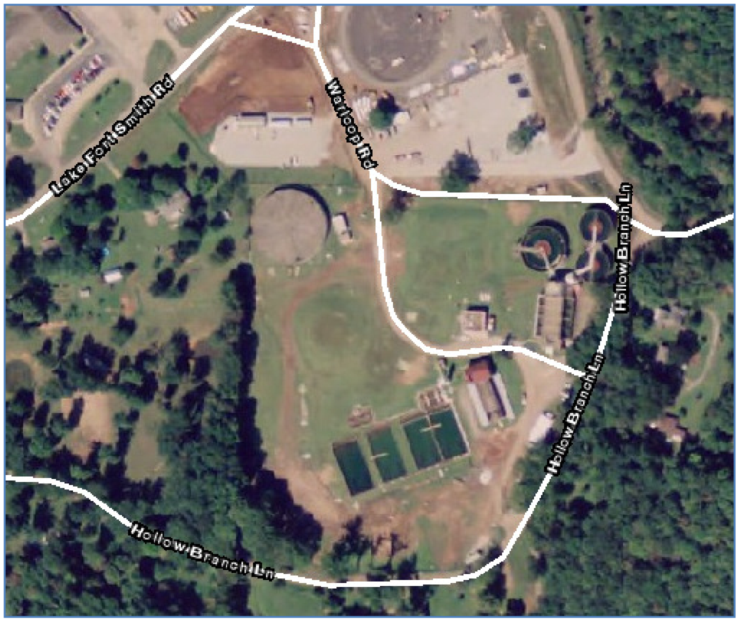
4.2.1 Lake Fort Smith Water Treatment Plant

The Lake Fort Smith Water Treatment Plant (formerly the Mountainburg Water Treatment Plants) is under construction to upgrade the coagulation, flocculation, sedimentation, filtration and Chlorine contact processes which will increase plant capacity to 40 MGD. The upgrades also include new instrumentation and analyzers. The plant takes its source of supply from Lake Fort Smith, which also has undergone recent improvements and dam modifications to increase the storage volume of the lake.

The Lake Fort Smith Water Treatment Plant provides water to the Fort Smith water distribution system as well as several contract users. The plant currently treats an average day flow of 15-17 MGD. Peak day flows at the plant have been reported up to 32 MGD. Plant capacity is limited to 34 MGD until the 27-inch transmission main is replaced with a 42-inch main. The treatment process consists of coagulation/sedimentation and filtration. The basic processes are listed below:

Figure 4-1 shows an aerial view of the Lake Fort Smith Water Treatment Plant.

Figure 4-1 – Lake Fort Smith Water Treatment Plant



4.2.1.1 Chemical Consumption

The Lake Fort Smith Water Treatment Plant is conventional filtration plant and thus uses several chemicals in the treatment process. Ferric sulfate is used as a coagulant, polymer as a flocculent aid, potassium permanganate for taste and odor control, lime for pH adjustment, and chlorine is added for disinfection. Table 4-1 lists the various chemicals used at the plant, as well as their annual quantity and annual cost. The annual costs are based on a year from September, 2010 through August, 2011. Detailed cost breakdowns are available in Appendix C.

Table 4-1 – Lake Fort Smith WTP Chemical Quantities and Costs, September 2010 – August 2011

Chemical	Vendor	Annual Quantity[1]	Unit	Unit Price	Annual Cost[1]	Percent of the Cost
Hydrated Bulk Lime	Arkansas Lime Company	440	TON	$189.39 + Service Fee	$91,900	15%
Chlorine	Brenntag Southwest	120,000	LBS	$0.425	$51,000	9%
Potassium Permanganate	Carus	13,230	LBS	$3.25	$43,000	7%
Soda Ash	Harcros	576,420	LBS	$0.235 - 0.2245 (Varies)	$144,400	24%
Ferric Sulfate	Kemira	1,716	TON	$159.99	$274,500	45%
Polymer[2]	N/A	0	N/A	N/A	$0	0
Total Annual Cost:					**$604,800**	**100%**

Notes: [1]Annual Quantity and Cost are from the period September, 2010 through August, 2011
[2]Polymer was described as being used in the treatment process; however, records of its use were not found

Ferric sulfate accounts for the largest portion of the chemical usage, with the chemicals for pH adjustment (lime and soda ash) also representing large portions of the total cost. Chlorine gas and potassium permanganate represent less significant portions.

4.2.1.2 Power Consumption

The City's electrical service provider for the Lake Fort Smith Plant is Oklahoma Gas and Electric Company (OGE). OGE applies several rate structures to the wastewater utility, including a General Service Rate, Power and Light Rate and Municipal Water Pumping Rate (Closed as of December, 2011). Rates are approved by the Arkansas Public Service Commission.

The previous year's electrical usage was examined for the Lake Fort Smith and Lee Creek Water Treatment Plants, as well as the pump stations in the distribution system. The period examined was September, 2010 – August, 2011. Table 4-2 lists the electrical costs by facility. The Lee Creek Plant accounts for 60% of the electrical costs. This is primarily due to the cost of high service pumping. The Lee Creek Plant requires high service pumping to convey the water to the distribution system, while the Lake Fort Smith Plant, due to topography, can often allow finished water to flow to the distribution system with much lower electrical cost.

Table 4-2. Electrical Cost by Water Facility, September, 2010 – August, 2011

Facility	Annual Cost	Percentage of Annual Cost
Lake Fort Smith	$93,035	12%
Lee Creek	$485187	60%
13 Pump Stations	$224,744	28%
Total:	**$802,966**	**100%**

The Lake Fort Smith WTP had a total cost of electricity from September 2010 to August 2011 of $93,035. During that time frame the WTP used 1,406,986 KWH at an average cost of $0.0673 per KWH.

Staff at the plant indicated that the demand charge on the plant is relatively high and that the demand charge has a significant effect on the power bill. The automated control system manages pumping so electrical usage can be managed and demand charges minimized.
Electrical usage of major equipment connected with each account (or plant process) can be monitored. The equipment with major electrical loads is listed in Table 4-3.

Table 4-3. Major Electrical Loads at the Lake Fort Smith WTP

Plant Process	Number	Horsepower
Filter Backwash Air Blower	1	75
Filter Backwash Pump	2	60
Contract Users Pump Station	3	60
Finished Water Pump Station	1	350
Finished Water Pump Station	2	500

4.2.1.3 Residual Disposal

Both water treatment plants have lagoons for dewatering the residuals. In each plant, the residuals are composed of blow-down from the clarifiers and from filter backwash which is then sent to a holding basin. The decant water from the sludge holding basins is then returned to the river. The residuals are removed annually and the material is taken to the landfill. A cost for residual handling was not broken out by plant, so Table 4-4 includes both the Lake Fort Smith and the Lee Creek Plants.

Table 4-4. Residual Handling Costs for the Lake Fort Smith and Lee Creek Water Treatment Plants

Year	Cubic Yards	Residuals Handling Costs	$ Cost/Cu. Yard
2010	8,000	$177,100	$22.14
2011	11,000	$320,120	$29.10

4.2.2 Lee Creek Water Treatment Plant

The Lee Creek Water Treatment Plant has a capacity of 15 MGD. The plant underwent upgrades in 2000 to provide 23.5 MGD during the construction of the Fort Smith Plant, but continued production of 23.5 MGD would exceed the water supply firm net yield. Thus, for planning purposes, the plant should be considered to have a 15 MGD average annual capacity.

The plant raw water supply comes from the Lee Creek Reservoir. The water source is generally of good quality with low total organic carbon (TOC), low alkalinity, and turbidity values between 5 and 10 NTUs. The City also owns and operates a low head hydropower generation dam on the reservoir.

The Lee Creek Plant provides water to the Fort Smith water distribution system as well as several contract users. The plant is treating an average annual day flow of around 7-9 MGD. The treatment process consists of coagulation/sedimentation and filtration.

Figure 4-2 shows an aerial view of the Lee Creek Water Treatment Plant.

Figure 4-2 – Lee Creek Water Treatment Plant

4.2.2.1 Chemical Consumption

The Lee Creek Plant uses several chemicals in the lime softening treatment process. A list and brief description of each follows, and Table 4-5 summarizes the quantity and cost of each chemical (see Appendix C for more details):

- Hydrated Lime – used to raise the pH of the water, thereby reducing corrosion potential
- Alum product-coagulant
- Chlorine – used in gaseous form as the disinfectant
- Potassium Permanganate – used for taste and odor control
- Powdered Activated Carbon – used for seasonal taste and odor control; also useful in removing pesticides and other organics in surface water
- Polymers – used as coagulant aid
- Sodium Hydroxide

Table 4-5 – Lee Creek WTP Chemical Quantities and Costs, September, 2010 – August, 2011

Chemical	Vendor	Annual Quantity[1]	Unit	Unit Price	Annual Cost[1]	Percent of Total Cost
Hydrated Bulk Lime	Arkansas Lime Company	311	TON	$189.39 + Service Fee	$65,100	15%
Chlorine	Brenntag Southwest	72,000	LBS	$0.425	$30,600	6%
Potassium Permanganate	Carus	59,540	LBS	$3.25	$193,500	39%
Sodium Hydroxide	Brenntag Southwest	220	GAL	$1.85	$407	0%
Powdered Activated Carbon	Brenntag Southwest	12,000	LBS	$0.56	$6,720	1%
Polymer (S/W 102)	Water Tech, Inc.	120,820	LBS	$0.514	$62,100	13%
Alum/Polymer (CF 150)	Klar Water, Inc.	492,700	LBS	$0.287	$141,400	28%
Total Annual Cost:					**$499,800**	**100%**

Notes: [1]Annual Quantity and Cost are from the period September, 2010 through August, 2011

Sixty-Seven percent of the plant costs for the period were made up of the coagulant polymers and the potassium permanganate. Lime and chlorine represent noteworthy expenditures, while powdered activated carbon and sodium hydroxide costs are very minimal.

4.2.2.2 Power Consumption

Table 4-2 lists Lee Creek as representing 60% of the electrical costs for water treatment and distribution for the period of September, 2010 – August, 2011. As discussed before, this is due in part to the pumping requirements of the plant. This is also, in part, due to the higher cost per KWH for electricity at Lee Creek WTP. The plant is served by the Arkansas Valley Electric Co-Op Corporation. The City paid $485,187 for the time period. Currently, the City is paying approximately 7.57 cents/KWH on average, compared with 6.73 cents/KWH at the Lake Fort Smith Plant.

The Arkansas Valley Electric Co-Op Corporation breaks out the billing to show the "energy charges" versus the total bill. Because of this, it is easier to see the invoice total compared to the energy charge, and the effect the demand charge is having on the bill. As with the Lake Fort Smith Plant, City staff can manage pumping so they can manage electrical usage and demand charges. The equipment with major electrical loads is listed in Table 4-6.

Table 4-6. Major Electrical Loads at the Lee Creek WTP

Plant Process	Number	Horsepower
Raw Water Pump Station	1	150
Raw Water Pump Station	1	300
Raw Water Pump Station	2	500
Filter Backwash Air Blower	1	150
Filter Backwash Pump	1	75
Finished Water Pump Station	3	700

4.2.2.3 Residual Disposal

Refer to Section 4.2.1.3.

4.2.3 Pump Stations

The pump stations in the distribution system were also evaluated for chemical, electrical, and residual disposal costs. There are no chemical or residual costs for the pump stations. Total Electrical costs for the pump stations can be found in Table 4-2. Table 4-2 shows that the City requires approximately $225,000 per year in electrical costs for distribution system pumping, however, no single pump station is responsible for more than 5% of the overall electrical costs for water distribution and treatment.

4.2.4 Water Treatment and Distribution Staffing and Benchmarking

4.2.4.1 Understanding Percentile Ranges and Median

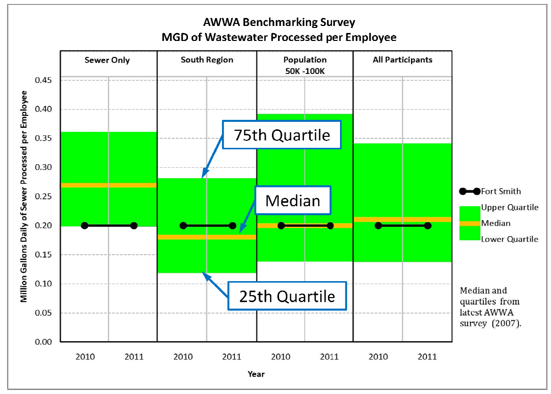
When evaluating staffing levels, it is sometimes advantageous to compare the levels to regional or national averages. The American Water Works Association (AWWA) has authored the book Benchmarking: Performance Indicators for Water and Wastewater Utilities: Survey Data and Analyses Report, in which they compiled statistics from utilities across the country related to utility operation and efficiency.

Utilities can be similar in several ways including region, service population size, and services provided. The categories the City should be compared with are as follows:

- South Region (of which Arkansas is a part)
- Service Population Size: 100,001 – 500,000
- Results for a "Combined Utility" (as opposed to one that only supplies water or wastewater services).
- All Participants

In some cases, the performance measures have been placed in the context of a percentile range of values with a median value. To aid the reader in understanding this statistical method, a 25th

percentile and 75th percentile is simply two points within a range of values. If you have one-hundred (100) values and sort them from smallest to largest and then find the 25th value of the range and the 75th value, that is the 25th and 75th percentile. Essentially, this percentile range has eliminated the bottom 25% of the values and the top 25% of the values. The range of the 25th and 75th percentile is deemed to reflect the reasonable range of values, while eliminating the "outlier" value.



Within the percentile range is a median value. A median is the mid-point of the range of values. It is not the simple average of the range of values, but rather in a range of 100 values, it is the 50th value. The median simply means that half of the values fall above and below the median.

It is important to note that a "median value" is just that – the middle value. It does not necessarily represent the "best" or "most efficient" value. What is more beneficial is to see if the City falls in the 25th to 75th percentile, and where-about in the percentile it falls. This is used to help understand if the City's staffing levels or expenditures are in-line and reasonable with other utilities in the various categories.

4.2.4.2 Water Treatment and Distribution Staffing

The Lake Fort Smith and Lee Creek Water Treatment Plants each has 11.45 Full Time Equivalent (FTE) assignments, per the staffing levels documents provided by the City (refer to Appendix D). Ten of the 11.45 FTE's are the chief plant operator (1) and other plant operators (9). Each plant is staffed with a minimum of two people 24 hours per day, per City policy. The plant staff is knowledgeable and has good housekeeping practices. Their duties include the following:

- Basic maintenance activities (check oil levels, etc.)
- On-site lab work including pH, hardness, turbidity, alkalinity, and bacteriological testing
- Routine 2-hour sampling and process checks
- Mowing and lawn care of property owned by the Utility

The water distribution system has approximately 74 FTE assignments (refer to Appendix D). The duties of these water personnel are as follows:

- Laboratory services
- Water line maintenance
- Meter reading and maintenance
- Water line maintenance administration
- Water equipment maintenance

Some of the plant maintenance activities are shared between the operations and maintenance staff within the wastewater group, specifically electrical maintenance on pump motors. In addition, plant operations staff does complete several routine maintenance tasks which is an efficient maintenance method and good use of the personnel.

4.2.4.3 Water Treatment and Distribution Benchmarking

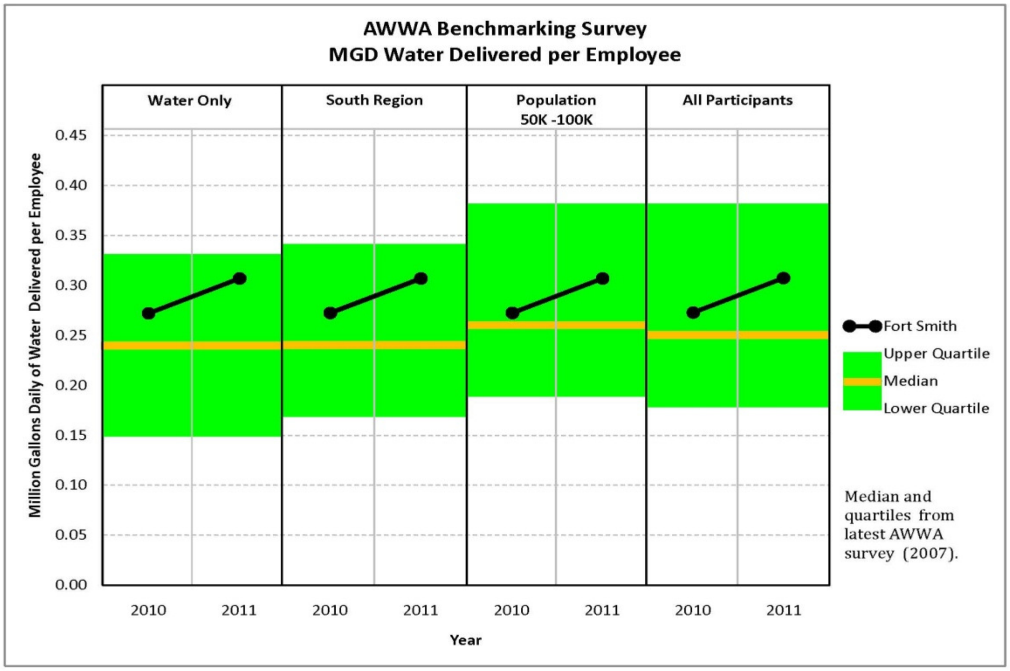
Water treatment plant staffing can be compared based on MGD of water delivered per water system employee. MGD of water delivered is defined as the amount of water delivered to the distribution system from both water treatment plants in 2011. The number of water staff is defined as the total number of FTEs for both water treatment plants and the distribution system. It does not include employee time from engineering and construction of new facilities. The calculation is presented below is for 2010, documentation for benchmarking can be found in Appendix D.

$$\frac{26.5\ MGD}{97\ FTEs} = 0.27\ MGD/FTE$$

The value can be compared to the median, 25th, and 75th percentile values of similar utilities.

Figure 4-3 shows that the MGD of water delivered per employee value is slightly above the median value in each category, meaning the City is producing slightly more MGD per FTE than the median value. However, the value is well within the 75th percentile. This result suggests the City is near the appropriate number of staff for the amount of water delivered.

Figure 4-3 – MGD of Water Delivered per Employee (Median Range, 25th-75th Percentile)

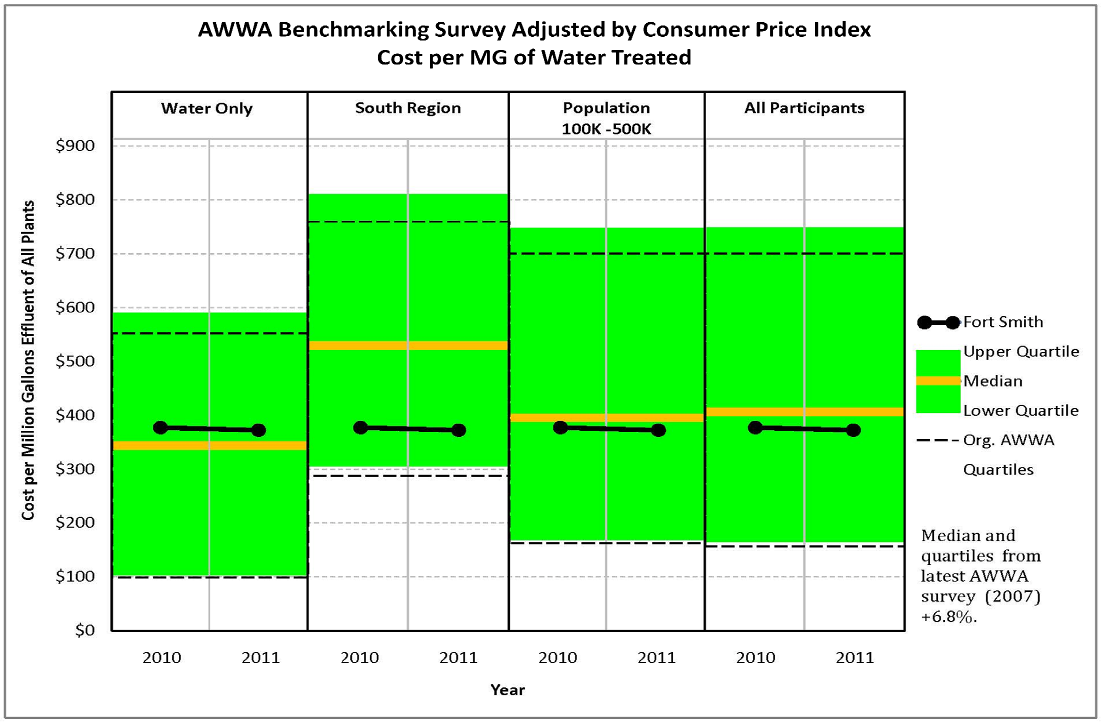


The cost of treating water per MG produced can also be benchmarked. The cost associated with water treatment includes the cost of chemicals, electricity, residual conditioning, and labor. The costs of chemicals, electricity, residual conditioning, and labor were provided under Program 5604 in the 2011 Fort Smith Budget Supplement. The calculation was provided by the City, documentation for benchmarking can be found in Appendix D.

$$\$377/MG$$

Figure 4-4 shows that the cost per MG of water produced is near the median values in all categories. Generally all values are just above or below the median. This result suggests the City is treating water at a reasonable cost, and staffing levels for treatment are likely appropriate.

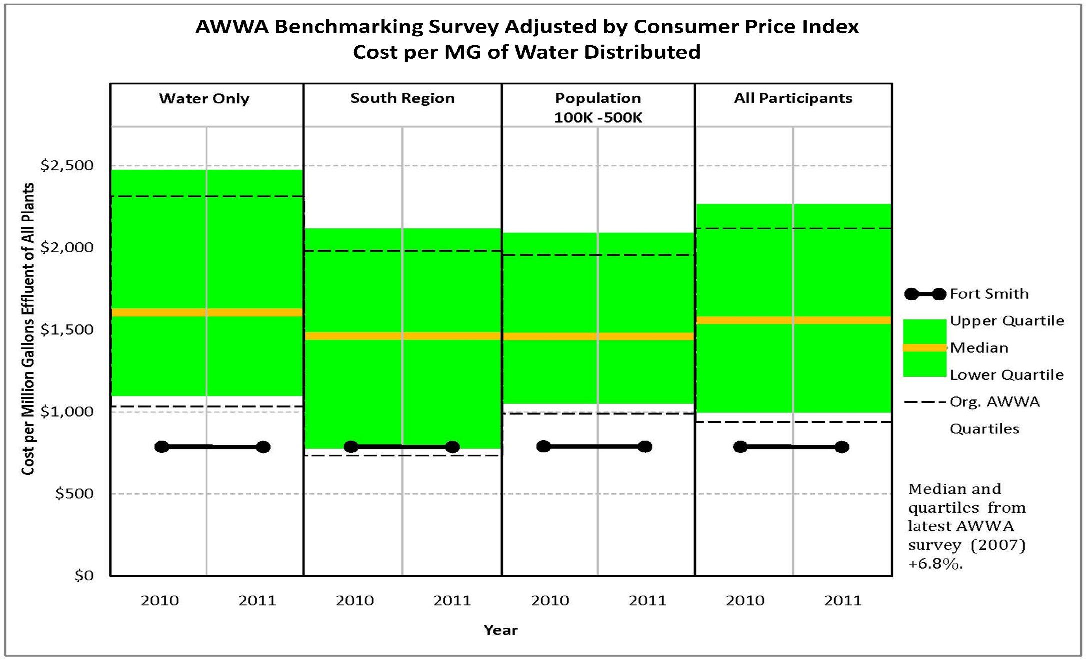
Figure 4-4 – Cost per MG of Water Treated (Median Range, 25th-75th Percentile)



The cost of delivering water per MG can also be benchmarked. The cost associated with water distribution includes the cost of treatment as well as the operation and maintenance costs for pump stations and water line maintenance. The operation and maintenance values were determined from the 2011 Fort Smith Budget Supplement. Programs in the budget supplement shared between water and wastewater were divided based on the labor FTE assignments provided by the City. The calculation is presented below, documentation for benchmarking can be found in Appendix D.

Figure 4-5 shows that the cost per MG value is below the median value for all of the categories, and all are near the 25% percentile. This result suggests the City is treating and distributing water at a quite reasonable cost, and the staff levels are likely appropriate. Since the operation and maintenance is shared with the sewer department, however, these values should also be compared with the results in the next section.

Figure 4-5– Cost per MG of Water Distributed (Median Range, 25th-75th Percentile)



4.2.5 Water Treatment Summary

The Utility is performing well in the area of water treatment. A general efficiency rating of "Defined Approach" to a "Managed Approach" is appropriate (refer to Appendix A). In general, chemicals are used efficiently, the affect of high electrical demand charges are known, residuals are handled appropriately, and staffing levels appear appropriate when compared with AWWA benchmarking data.

- The Lee Creek WTP (LCWTP) uses conventional filtration treatment.
- Per EPA's LT2ESWTR the LCWTP must provide additional 1 log information of Cryptosporidium.
- The City has scrutinized chemical consumption to optimize usage.
- City uses reverse bidding for chemical costs which has reduced chemical unit costs over the last several years.
- The LCWTP accounts for an approximated 60% of the electrical costs, primarily due to the need for high service pumps that pump to the distribution system.
- Lake Fort Smith WTP (LFSWTP) accounts for only 12% of the electrical costs.
- 13 water pump stations account for 28% of the electrical cost for water.
- The current residuals handle method for both WTPs is likely the most efficient.
- Plant staffing production of water per employee, cost of production per MG, and cost per MGs of distributed water all appear appropriate based on benchmarking.

See Section 4.4 for water operations system recommendations.

4.3 WASTEWATER

4.3.1 P Street Wastewater Treatment Plant

The P Street Wastewater Treatment Plant was constructed in 1966 to provide primary treatment of wastewater. Secondary treatment and disinfection facilities were added in 1978. In 1986, grit removal and aeration upgrades were made. The latest upgrades were made to improve the wet weather screening/pumping and high rate treatment. Figure 4-6 shows the P Street Wastewater Treatment Plant.

Figure 4-6 – P Street Wastewater Treatment Plant

The plant is currently treating 8 MGD average dry weather flow, with a capacity of 12 MGD. Wet weather flow can approach 83 MGD. The plant receives flow from the P Street Pump Station, Pump Station No. 5, and the Mill Creek Pump Station. The plant has the following processes:

4.3.1.1 Chemical Consumption

The plant uses several chemicals in the treatment process, a list and brief description of each follows, and Table 4-7 summarizes the quantity and cost of each chemical:

- Quicklime –used to stabilize the solid residuals before disposal, when required. As of 2011, the State of Arkansas allowed wastewater solids to be land filled without stabilization, and no purchases have been made since the end of 2010.
- Caustic Soda – Odor control

- Chlorine – used as the disinfectant at the plant. Chlorine gas is mixed with water and injected into the chlorine contact basin.
- Sodium Bisulfite – used to dechlorinate the wastewater prior to discharge to the receiving stream. The chemical is flow paced, meaning the higher the flow, the more chemical is added.
- Dry Polymer (Clarifloc) – used to condition solids for dewatering on the belt presses. Staff indicated that 9 to 11 pounds of dry polymer are used per dry ton of sludge.
- Ferric Sulfate – used as a coagulant in high-rate treatment
- Odor Control Maintenance (Bioadd) – biological odor control at the headworks of the plant. Works very effectively
- Sodium Hypochlorite – Odor Control

Table 4-7 – P Street WWTP Chemical Quantities and Costs, September, 2010 – August, 2011

Chemical	Vendor	Annual Quantity[1]	Unit	Unit Price	Annual Cost[1]	Percent of Total Cost
Quicklime[2]	US Lime Company	423	TON	$176+Service Fee	$76,800	31%
Caustic Soda[3]	Brentag Southwest	0	N/A	N/A	$0	0%
Sodium Hypochlorite[3]	Brentag Southwest	0	N/A	N/A	$0	0%
Chlorine	Brentag Southwest	96,000	LBS	$0.425	$40,800	16%
Sodium Bisufite	Brentag Southwest/Thatcher	192,847	LBS	$0.1214	$23,400	10%
Sodium Bisufite	Brentag Southwest/Thatcher	34,828	GAL	$1.70	$59,200	24%
Dry Polymer (Clarifloc)	Polydyne Inc	14,850	LBS	$1.59-$2.13 (varies)	$26,600	11%
Ferric Sulfate	Kemira Water Solutions	184,617	LBS	$0.09	$16,600	7%
Odor Control Maint.[4]	BioAdd, L.L.C.	2	Monthly Fee	$1250.00	$2,500	1%
Total Annual Cost:					**$245,900**	**100%**

Notes: [1]Annual Quantity and Cost are from the period September, 2010 through August, 2011
[2]Quicklime has not been purchased since the end of 2010; refer to Residual Disposal
[3]Chemical was last purchased prior to September, 2010; refer to Appendix C.
[4]Invoices from BioAdd, L.L.C. were not found beyond October, 2010

For this time period, quicklime and Sodium Bisulfite accounted for approximately 2/3 of the total chemical costs for the plant in the time period. Since quicklime is no longer used for sludge stabilization, sodium bisulfite accounts for the largest single chemical cost at the plant.

4.3.1.2 Power Consumption

The City's electrical service provider for all wastewater facilities is Oklahoma Gas and Electric Company (OGE). In this study, the previous year's electrical usage was examined for all wastewater facilities. The period examined was September, 2010 – August, 2011. Table 4-10 lists the electrical costs by wastewater facility. The P and Massard Street Wastewater Treatment Plant account for over 80% of the electrical cost from the wastewater utility to the City. Thus, they should be examined further for possible efficiencies. The Massard Wastewater Treatment Plant and pumping station facilities are discussed in subsequent sections of this report.

Table 4-8. Electrical Cost by Wastewater Facility, September, 2010 – August, 2011

Facility	Annual Cost	Percentage of Annual Cost
P St WWTP	$273,918	41%
Massard WWTP	$280,248	42%
P St Pump Station	$57,100	9%
Sunnymede	$7,943	1%
#2 Mill Creek	$30,390	5%
#5 Walnut	$5,527	1%
#6 Fort Lane	$3,281	0%
#13 Zero St	$8,211	1%
Total:	**$666,617**	**100%**

The P Street Plant billing statements were examined on a monthly basis to understand the variability of usage during the year. The annual electrical cost for the P Street WWTP is $273,918. The usage in kilowatt hours (KWH) is 4,329,620, amounting to an average KWH cost. Currently, the City is paying approximately 6.33 cents/KWH on average.

Interviews and a site visit were conducted at the P Street Wastewater Treatment Plant to identify possible efficiencies. Staff at the plant indicated that the demand charge on the plant is relatively high and that the demand charge has a significant effect on the power bill. As a result, the staff remains cognizant of electrical demand and tries to monitor it, although load monitoring is not currently tied into SCADA.

Each billing statement for the P Street Plant contains several accounts, allowing the City to see the portions of the process that represent the largest use of power. This information is useful, as it allows the City to more clearly track power usage and more easily understand the consequences (good or bad) of process modifications to electrical usage.

Electrical usage of major equipment connected with each account can be monitored. The equipment with major electrical loads is listed in Table 4-9.

Table 4-9. Major Electrical Loads at the P Street WWTP

Plant Process	Number	Horsepower	Comments
Influent Pump Station	2	111	Dry Weather Pumps
Influent Pump Station	3	215	Wet Weather Pumps
Influent Pump Station	4	60	Peak Flow Pumps
Aeration Blowers	3	350	
Aeration Blowers	1	300	
Channel Air Blowers	2	75	
Return Sludge Pump Station	4	40	
Return Sludge Pump Station	2	100	
Effluent Pump Station	1	200	Required During River Flooding Only

4.3.1.3 Residual Disposal

The P Street WWTP can create a Class "A" sludge with the addition of lime. Since 2011, however, the State of Arkansas is allowing treatment plant sludge to go to landfills without stabilization, eliminating the need for the addition of lime. The only cost is the State-required tipping fee. A cost breakdown for residual handling was not broken out by plant, so Table 4-10 includes both the P Street and the Massard Creek WWTPs costs. Note that the reduction in cost does not include the reduced chemical savings on quicklime discussed previously.

Table 4-10. Wastewater Treatment Plants Residuals Handling Costs

Year	Wet Tons	Tipping Fees/ Landfill Payments
2009	15,011	$350,000
2010	15,135	$350,000
2011	9,122	$0

4.3.2 Massard Creek Wastewater Treatment Plant

The Massard Creek Wastewater Treatment Plant (WWTP) was also constructed in 1966 and included primary and secondary clarifiers, trickling filters, and chlorine disinfection. Significant upgrades to the facility in were made in 1986, including additional clarification, aeration improvements, and sludge handling improvements. The latest upgrades were made in 2000. Figure 4-7 shows the Massard Creek Street Wastewater Treatment Plant.

The plant is currently treating approximately 7.8 MGD average dry weather flow, with a capacity of 12 MGD. The plant has a peak wet-weather capacity of 20 MGD. The plant receives a portion of its flow from the Sunnymede and Zero Street Pump Stations, as well as the City of Barling.

Figure 4-7 – Massard Creek Wastewater Treatment Plant

4.3.2.1 Chemical Consumption

The plant uses several chemicals in the treatment process, a list and brief description of each follows, and Table 4-11 summarizes each amount and location in the process:

- Quicklime – lime is used to stabilize the solid residuals before disposal
- Caustic Soda –odor scrubbing
- Sodium Hypochlorite – odor scrubbing
- Dry Polymer (Clarifloc) – used to condition solids and as a coagulant
- Sulfuric Acid

Table 4-11 – Massard Creek WWTP Chemical Quantities and Costs, September 2010 – August 2011

Chemical	Vendor	Annual Quantity[1]	Unit	Unit Price	Annual Cost[1]	Percent of Total Cost
Quicklime[2]	US Lime Company	273	TON	$176+Service Fee	$49,500	63%
Caustic Soda[3]	Brentag Southwest	0	N/A	N/A	$0	0%
Sodium Hypochlorite[3]	Brentag Southwest	9,313	GAL	$1.20	$11,200	14%
Dry Polymer (Clarifloc)	Polydyne Inc	14,400	LBS	$1.18	$17,000	22%
Sulfuric Acid	Kemira Water Solutions	750	LBS	$0.05	$375	1%
Total Annual Cost:					**$78,100**	**100%**

Notes: [1]Annual Quantity and Cost are from the period September, 2010 through August, 2011
[2]Quicklime has not been purchased since the end of 2010; refer to Residual Disposal
[3]Chemical was last purchased prior to September, 2010; refer to Appendix C.

Quicklime accounted for approximately 2/3 of the total chemical costs for the plant in the time period, but has been discontinued due to residual disposal arrangements described in Section 4.3.3.1. The polymers and Sodium Hypochlorite are expected to make up the majority of the Massard Creek Chemical costs in the future.

4.3.2.2 Power Consumption

Table 4-2 lists the Massard Creek WWTP as the highest user of electricity for the period of September 2010 – August 2011. The usage in kilowatt hours (KWH) is 4,674,880, amountint to an average KWH cost of $0.0599. Currently, the City is paying approximately 5.99 cents/KWH on average.

Interviews with staff indicated that concerns about the demand charge at the Massard Creek WWTP are similar to those at the P Street WWTP, although the average cost per KWH is slightly lower at Massard (5%).

Much like the P Street WWTP, the electrical billings are broken out by accounts for the Massard Creek WWTP, which can be used to more easily track usage. There are five accounts listed on each of the billings, four tied to Fort Smith and one tied to Barling; however, the different services are not described in detail on the statements.

Electrical usage of major equipment connected with each account can be monitored. The equipment with major electrical loads is listed in Table 4-12.

Table 4-12. Major Electrical Loads at the Massard Creek WWTP

Plant Process	Number	Horsepower	Comments
Influent Pump Station	3	280	
Aeration Blowers	3	75	
UV Disinfection System	1 System	NA	156 Volt, 3 Phase, 60 Hertz, 81 Amps

4.3.2.3 Residual Disposal

Refer to Section 4.3.1.3 – Residual Disposal.

4.3.3 Lift Stations

The City has 24 lift stations throughout the collection system. Chemical usage is primarily for odor control at the Sunnymede lift station the and cost is approximately $50,000 annually. Electrical costs are small compared to the electrical costs for the wastewater plants, as shown in Table 4-8. Total annual costs to run the lift stations is $113,000, and no single lift station accounts for more than 5% of the annual electrical cost, with the exception of the P Street Pump Station. Residual costs were reported to be negligible.

4.3.4 Wastewater Collection and Treatment Staffing and Performance Measures

4.3.4.1 Wastewater Collection and Treatment Staffing

The P Street and Massard Creek WWTPs have a total of 29.9 Full Time Equivalent (FTE) assignments, per the staffing levels documents provided by the City (refer to Appendix D). The P Street WWTP has 17.45 FTEs while Massard Creek has 12.45. Twenty-one of the 29.9 FTEs are the chief plant operator (2) and other plant operators (19). Each plant is staffed with a minimum of two people 24 hours per day as a safety measure and per City policy.

The wastewater collection system has approximately 58 FTE assignments (refer to Appendix D). The duties of the wastewater collection system personnel are as follows:

- Sewer Treatment Administration
- Laboratory services
- Sewer Equipment Maintenance
- Industrial Sewer Monitoring
- Sewer Line Maintenance
- Sewer Line Construction
- Sewer Line Maintenance Administration
- Other Equipment Maintenance

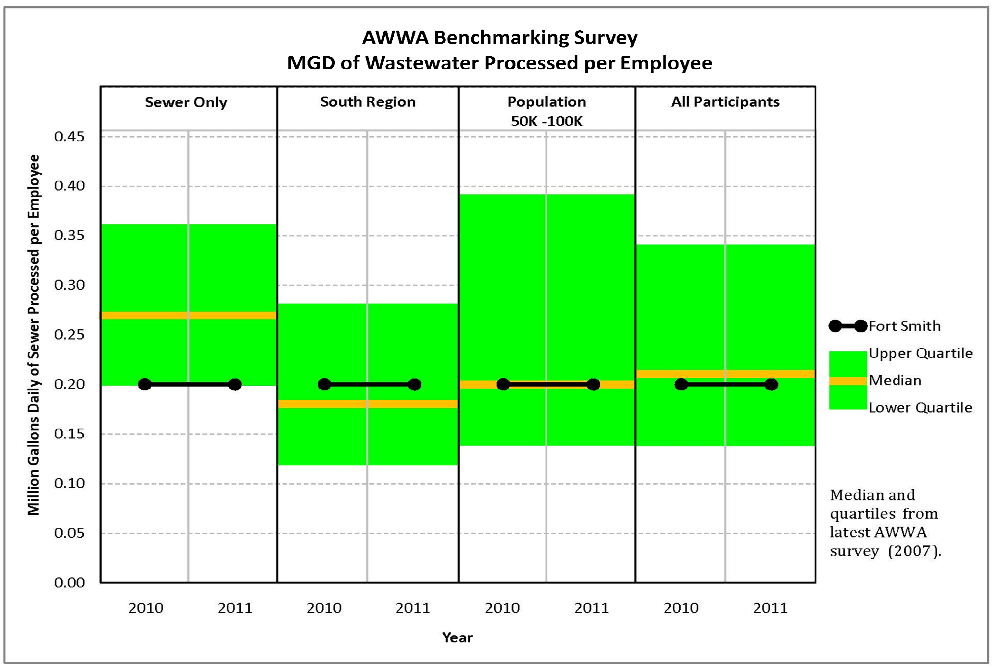
4.3.4.2 Wastewater Collection and Treatment Benchmarking

Wastewater treatment plant staffing can be compared based on MGD of wastewater processed per wastewater system employee. A MGD of wastewater processed is defined as the average amount of wastewater processed per day by both wastewater treatment plants in 2011. The number of wastewater staff is defined as the total number of FTEs for both wastewater treatment plants and the collection system. It does not include employee time from engineering and construction of new facilities. The calculation is presented below, documentation for benchmarking can be found in Appendix D.

The value can be compared to the median, 25th, and 75th percentile values of similar utilities, as was done for the water system. The City serves fewer wastewater customers, so the population comparison category falls to "50,000 to 100,000" customer range.

Figure 4-8 shows that the 0.20 value is near the median value in most categories, meaning the City is using slightly more persons per MGD of wastewater processed as median value. The value maybe lower than the median, in part, due to the City operating two plants at separate locations and staffing them around the clock. In addition, the City does have significant industrial flow to the WWTP. This typically increases the operating requirements. This information would suggest the City is near the appropriate number of staff for the amount of wastewater processed.

Figure 4-8 – MGD of Wastewater Processed per Employee (Median Range, 25th-75th Percentile)

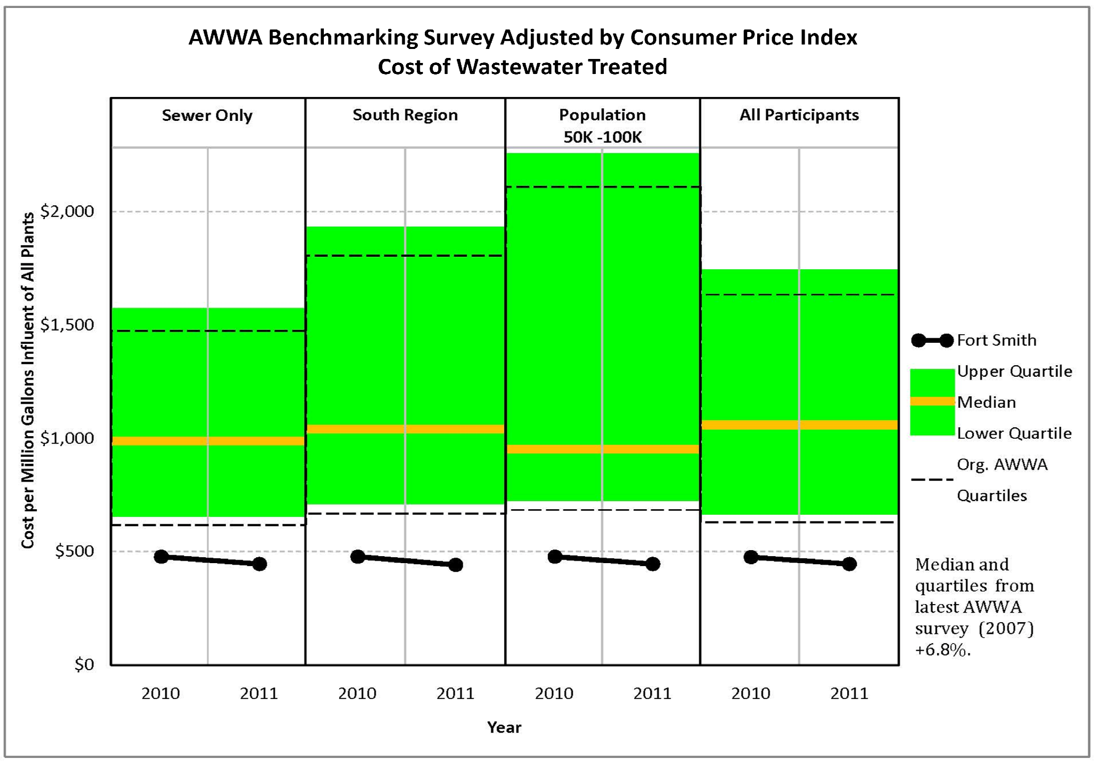


The cost of treating wastewater per MG was also benchmarked. The cost includes the cost of chemicals, electricity, residual conditioning, and labor. The cost does not account for the disposal of residuals, but do include residual conditioning. Costs were provided under Program

5603 in the 2011 Fort Smith Budget Supplement. The calculation was provided by the City, documentation for benchmarking can be found in Appendix D.

Figure 4-9 shows that the cost per MG value is below the 25th percentile. This means that the City is treating wastewater at a reasonable cost; however, these results should be analyzed with Figure 4-10, as the boundary between maintenance activities (which are not included here) and the cost for wastewater treatment can sometimes be somewhat blurred. Figure 4-14 shows the total operations and maintenance cost per MG of wastewater processed, and is not limited to treatment. Still, Figure 4-9 suggests the City is treating wastewater at a reasonable cost, and staffing levels for treatment are likely appropriate.

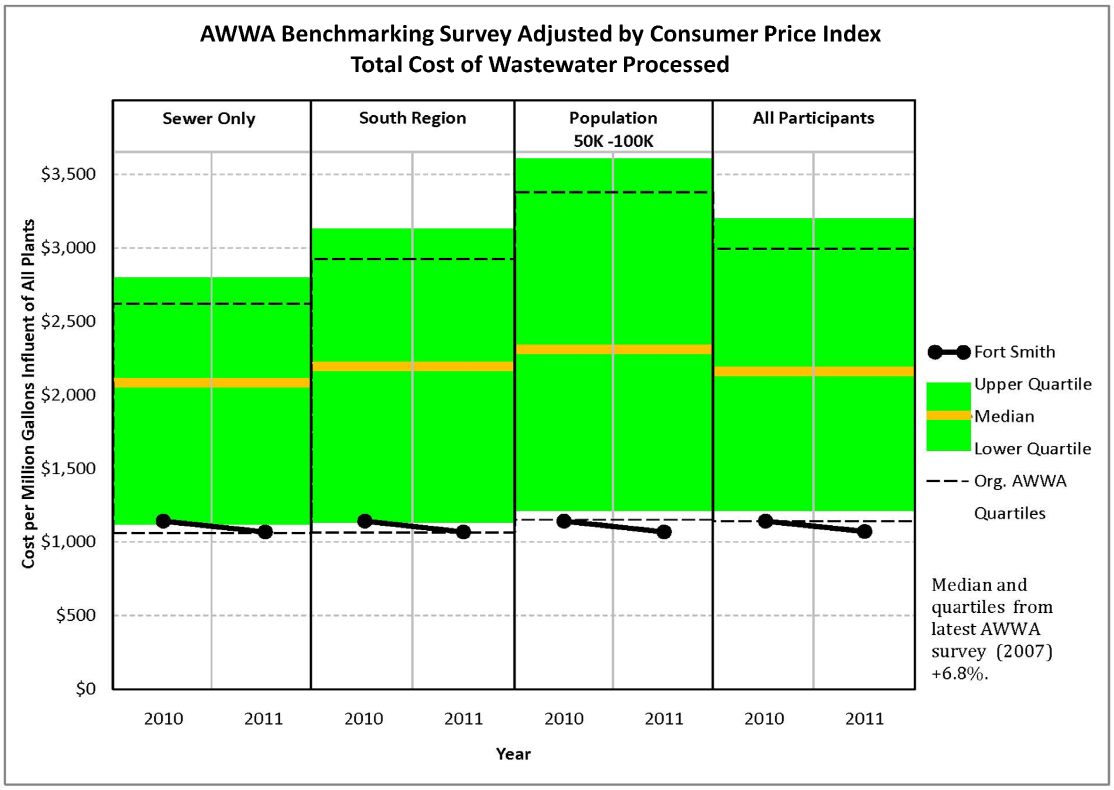
Figure 4-9 – Cost of Wastewater Treatment per Million Gallons (Median Range, 25th-75th Percentile)



As discussed, the total cost of processing wastewater per MG can also be benchmarked. The cost associated with wastewater processing includes the cost of treatment as well as the operation and maintenance costs for lift stations and line maintenance. The operation and maintenance values were determined from the 2011 Fort Smith Budget Supplement. Programs in the budget supplement shared between water and wastewater were divided based on the labor FTE assignments provided by the City. The calculation is presented below, documentation for benchmarking can be found in Appendix D.

Figure 4-10 shows that the total cost per MG value is near the bottom of the 25th percentile for the South Region, but below the median value in all other categories. All categories show that the City is at or below the 25th percentile. This result suggests the City is processing wastewater at a reasonable cost, and the staff levels are likely appropriate.

Figure 4-10 – Cost of Wastewater Processed per Million Gallons (Median Range, 25th-75th Percentile)



4.3.5 Wastewater Treatment Summary

The Utility is performing well in the area of wastewater treatment. As with water treatment, a general efficiency rating of “Defined Approach” to a “Managed Approach” is appropriate (refer to Appendix A). Chemicals are procured and used efficiently, electrical costs appear to be reasonable; although demand charges are high, residuals are now disposed of in a very cost-effective manner, and staffing levels appear appropriate when compared with AWWA benchmarking data.

- The P Street and Massard WWTPs use primary and secondary wastewater treatment followed by disinfection and solids handling.
- The P Street WWTP’s primary chemical usage is sodium bisulfite.

- The Massard WWTP's primary chemical usage is polymer.
- P Street and Massard WWTPs use over 80% of the electricity for wastewater treatment.
- Wastewater treatment lift stations account for less than 20% of electrical usage.
- The current residuals handling method is the most cost efficient.
- WWTP staffing, production of wastewater per employee, cost of production per MG, and cost per MG of collected wastewater appear appropriate based on benchmarking.

See Section 4.4 for wastewater treatment recommendation.

4.4 SUMMARY OF OPERATIONS RECOMMENDATIONS

This section of the report reviewed the City's water and sewer operations. Table 4-13 summarizes the water and wastewater recommendations for additional efficiency.

Table 4-13 - Water and Sewer Operations Priority Recommendations

Overall Recommendation	Recommendation	Advantages	Challenges/Risks	Capital Cost	Annual Return
Water System					
An additional 1 log credit can be obtained for the Lee Creek Treatment Facility by utilizing a Watershed Control Program and a Combined Filter Performance standard, which do not require large capital projects to be undertaken.	Develop a Watershed Control Program and a Combined Filter Performance Standard for an additional 1.0 log credit at the Water Treatment Plants.	These programs will help the Utility meet the LT2ESWTR regulation, which requires an additional 1.0 log removal without a capital upgrade. Development of Watershed Control Program is underway.	Installation of turbity meters on the filters will be required.	$5,000/installed meter; plus cost of studies for regulatory approval.	Return will include meeting EPA requirements; could be compared to capital improvements to remove an additional 1.0 log.
Respond more quickly to changing influent conditions through the addition of in-line raw water monitoring for turbidity and/or pH. These samples are currently lab tested and returned.	Monitor influent conditions with equipment that can report in real-time.	Real-time information could be used to more adequately dose chemicals, which could result in saving excess chemical.	Real-time adjustment of chemical dosing requires installation of equipment as well as	$5,000/installed instrument	A 1% reduction in chemical would result in a savings of $11,000 annually at the water treatment plants.
A micro-turbine should be investigated to see if it is cost-effective to take advantage of the head from the Lake Fort Smith Water Treatment Plant.	A microturbine should be investigated to see if it is cost-effective to take advantage of the head from the Lake Fort Smith Water Treatment Plant.	Makes use of the hydraulic energy already available in the pipeline	Consideration for how energy would be used; coordination with local electrical utility as to if it could be added to the grid.	$30,000 - $50,000 for an initial study	Payback would be defined in the study
Wastewater System					
Further investigation should be undertaken to see if using the in-line chlorine analyzer for sodium bisulfite could reduce the quantity of chemical used.	Evaluate decreasing bisulfite usage at the P St Plant by installing in-line chlorine analyzers.	Flow pacing bisulfite based on chlorine demand can reduce chemical usage, saving money	Requires capital improvements including: Sets of chlorine analyzers, SCADA monitoring, bisulfite pumping rates need to be based on chlorine analyzer output	Requires evaluation of existing chlorine analyzers' physical location and output, evaluation of the metering pumps, and some additional programming	Depends on decrease from amount added at present; a 5% reduction in bisulfite would result in a savings of 4,300/yr at the P St. Plant
The P St Plant could increase electrical efficiency through the addition of VFDs to blowers (if possible with operating conditions) and in-plant water pumps.	Evaluate the potential of decreasing electrical loads at the wastewater treatment plants by installing VFDs on the blowers at the P Street Plant.	VFDs can decrease electrical usage and thus operating costs.	VFDs require dissolved oxygen monitoring within the basins which dictate air demands. The instruments will require maintenance.	VFDs are approximately $65,000 per blower; automation would also be required to integrate the dissolved oxygen probes with the VFDs.	A 5% savings would result in a $6,500/yr/blower; savings may be higher than 5% - would require further study; Payback period of 10 yrs.
	Evaluate the potential of decreasing electrical loads at the wastewater treatment plants by installing VFDs on the plants' service water pumps.	VFDs can decrease electrical usage and thus operating costs	Capital project; need location to house the VFD with adequate HVAC	$12,000 (assuming an electrical room with appropriate HVAC is available and the VFD is for a 40 HP motor)	If 40 HP motor runs continuously, electrical savings per plant would be approximately $1,700/yr[1]; Payback period of 7 yrs.

Notes: [1]VFD Calculations based on energy savings calculator available at: https://duke.myenergycalculators.com/Vfd

5 REVIEW OF THE PLANNING PROCESS

5.1 INTRODUCTION

The purpose of the planning process is to logically and clearly identify the system's operational, technical, managerial, and financial capability needed to achieve and maintain levels of service, customer satisfaction, and compliance with relevant local, state, and federal plans and regulations.

The planning process influences and directly impacts the short and long-term efficiencies in the organization. As a part of this efficiency study, the City's past planning practices and planning studies were reviewed. The planning process includes:

- Development and maintenance of water and sewer master plans, which project anticipated future (service) population, water demands, and sewer flows.
- The Capital Improvement Plan (CIP) creation process which considers the master plan's recommendations and the method of incorporating those recommendations into a CIP.
- The CIP must, at a high evaluation level, examine the City's financial capability to fund the CIP and be "affordable".
- Operation and Maintenance Planning as part of infrastructure replacement.

The importance of the planning process can not be understated. Millions of dollars of investment in the City's water and sewer systems are made on the basis of the forecasts and projections contained within the planning process.

5.2 DEMAND FORECASTS

The first step in planning is to be as accurate as reasonably possible in population and water demand and wastewater flow projections. There are a number of different methods that may be used to project demands. These methods range from a simple escalation of historical demands to as sophisticated as econometric demand forecasting. City planning documents were reviewed to determine how the City forecasts population growth, water demand, and wastewater flow, and if the forecasting method could or should be improved.

5.2.1 Population Projections

The City has two planning documents that discuss, in detail, population projections and the methods of obtaining them. The studies are titled the Long-Term Water Demand Projections (Burns & McDonnell, 2009), and the Master Plan for Water & Sewer Service in the Southern Growth Area & Chaffee Crossing (Mickle Wagner Coleman, 2010). Each study uses slightly different methods to estimate population.

The Long-Term Demand Projections report was written in preparation of the upgrades to the Lake Fort Smith Water Plant. The report found that the historical annual growth rate for the area based on U.S. Census data from 1930 to 2008 is 0.865% per year (Burns & McDonnell, 2009). However, the report also found that the average exponential growth rate of the service population over the last 17 years was 1.0% per year. The updated value was found by determining the number of connections and the average number of customers per connection (household), which was determined to be 2.65.

The study also references previous population projections and presents a recommended growth rate through the year 2060. The report suggests that a linear model adding only 3,662 persons per year to the service area is the most applicable. Table E-1 in Appendix F lists all methods evaluated with an annual percentage growth rate, for comparative purposes only.

The 0.97% growth rate selected for the study is in-line with historical growth rates for the area, and is more conservative than reports published in the early 2000's, which do not take into account the recent economic slowdown. The report also goes into some detail as to which areas (by county) are likely to have more population growth, allowing the City, if desired, to apply county-specific growth rates to areas of interest.

Another report addressing population projections is the Master Plan for Water & Sewer Service in the Southern Growth Area & Chaffee Crossing (Mickle Wagner Coleman, 2010). This report is written to plan for facilities in the City's targeted growth areas. This report compares historical population projections as well as two versions of the Updated Bi-State Metropolitan Planning Organization (Bi-State MPO). The methods evaluated can be found in Table E-2.

The selected value was 0.83%, the low projection of the updated Bi-State MPO. Much like the data from the Long-Term Demand Projections report, the report errs on conservative growth rates. While the two projections differ by 0.14% (0.97% and 0.83%), they both appear reasonable.

5.2.2 Water Demand Projections

Water demands are projected by examining several factors, including: population trends and projections, per capita water usage, system losses, and water losses in the treatment process. Generally, water demand increases not only because the population increases, but also because the per capita water usage also increases. However, with the recent trend toward sustainability, many communities are finding that water use per person (gallons/person/day) has remained level, or in many cases even declined. This trend could be due to a number of reasons, including low flow fixtures in homes, reduced lawn watering, and more efficient use of water in industry. It is likely that the recent economic slowdown is also playing a part in reduced per capita usage.

The City's planning documents projecting water demand were reviewed to ensure that they are taking into account these trends, and that the projections are not overly aggressive or too conservative. Overly aggressive projections can lead to the premature construction or rehabilitation of facilities, the cost of which must be passed on to ratepayers. Overly conservative estimates can result in undersized facilities, or a delay in the construction of necessary facilities. The documents reviewed include the Long-Term Demand Projections report (Burns & McDonnell, 2009), which updated the Water System Master Plan (Burns & McDonnell, 1993) and Study of Water System Improvements to Supply Chaffee Crossing's Continued Growth (Sickle Wagner Coleman, 2011).

5.2.2.1 Historical Demands

The Long-Term Demand Projections study used the population projections described in the previous section to project customers in both the Fort Smith area and in the wholesale areas to the year 2060. Then, it evaluated the per capita usage based on historical water demand values. The historical (2002-2008) per capita usage rate in gallons/capita/day (gpcd) was 165.4 for both Fort Smith and the wholesale customers. Fort Smith averaged 181.5 gpcd, while the wholesale customers averaged 143.0. Refer to Table E-3 in Appendix F for the historical per capita flows.

The per capita usage in Fort Smith is greater than the per capita usage by the contract or 3rd party customers. A typical per capita usage rate for Arkansas is 133 gal/person/day (Qasim et al., 2000), and coincides more closely with the contractual and 3rd party customers' usage. A high per capita water use is typical of systems that have a high industrial component to their demand, have excessive water losses, or both. Information provided by the City on historical flow by customer class shows that approximately 20% of flow in the Fort Smith service area is industrial. For most water systems, 20% of flow is a fairly large percentage or proportion for industrial customer use and likely is the cause of the higher per-capita usage. Since the per capita flow values are based on metered sales (refer to Table E-3), water loss cannot be considered in these figures.

Table 5-1 shows historical flow rates by person or meter connection to the residential, commercial, industrial, and irrigation customers of Fort Smith. The impact of industry on the per capita flow is evident, as Table 5-1 shows residential customers use on average only 76.5 gal/person/day.

Table 5-1 – Historical Fort Smith Retail Customer Water Usage Rates (Burns & McDonnell, 2009)

Year	Residential gal/person/day	Commercial gal/meter/day	Industrial gal/meter/day	Irrigation gal/meter/day
2001-2008 Average:	76.5	914	65,646	626

The Long-Term Demand Projections report also examined historical water loss percentages, peaking factors, and water losses from treatment. The historical (2002-2008) water loss percentage is approximately 12% (see Table E-4 in Appendix F). The historical peaking factor is 1.51. It appears that water loss has decreased significantly since 2006, and 12% is a reasonable water loss value, with 10% being a rule-of-thumb average for a system of this size. A peaking factor of 1.51 is an average value and again reflects the large percentage of flow used for industry, which typically has less variation than residential and irrigation demands. Water losses from water treatment were assumed to be 5% in the report.

5.2.2.2 Future Demands

The Long-Term Demand Projections report (Burns & McDonnell, 2009) projected per capita flow rates based on historical values. Table 5-2 shows the average historical Fort Smith retail customer water usage rates as well as the values selected for projection. The residential, commercial, and irrigation per capita flow values are assumed to remain at the indicated levels through 2060. The industrial rate is expected to decrease slowly over time. The report states that no apparent trends were determined for residential and irrigation per capita usage, and thus it was projected as a constant. The industrial and commercial historical values indicate a decline in water usage, and so a constant commercial rate and relatively constant industrial rate are conservative, according to the report.

Table 5-2 – Historical and Projected Fort Smith Retail Customer Water Usage Rates (Burns & McDonnell, 2009)

Year	Residential gal/person/day	Commercial gal/meter/day	Industrial gal/meter/day	Irrigation gal/meter/day
2001-2008 Average:	76.5	914	65,646	626
Projection:	78 (Constant)	850 (Constant)	70,000[1]	625 (Constant)

Note 1: 70,000 gal/meter/day is projected to decrease by 100 gal/meter/day to the year 2060, at which time the projected industrial flow is 65,000 gal/meter/day

The contract customer usage rate projections were determined somewhat differently, as the customer classifications were unavailable for contract customers. The method generally consisted of determining the historical water usage rate and then applying a statistical analysis to it to determine trends. The statistical evaluation of the trend identified confidence intervals. In general, the upper 90% confidence interval value was selected as the constant future per capita usage rate for that entity.

The Fort Smith service area and the contract customer usage rates were combined with population projections to determine projected water sales into the future. Table 5-3 shows the projected population, water sales, and per capita usage for 2020, 2035 and 2060. Note that since the per capita projections are constant (with the exception of industrial flow in the Fort Smith Service area), the projected water sales are essentially increasing at the same rate as the population. The per capita usage is only decreasing because of the industrial usage rate described in Table 5-2.

Table 5-3 - Projected Population, Flow, and Per Capita Usage for Fort Smith and Contract Customers (data from Burns & McDonnell, 2009)

Year	Projected Population	Projected Metered Water Sales (MGD)	Per Capita Usage
2020	193,621	28.60	147.7
2035	227,375	33.33	146.6
2060	283,586	41.15	145.1

To determine the amount of water treatment capacity needed in the future, water system losses, water treatment losses, and peaking factors were projected though 2060. System water losses were projected to remain constant at 11.5%, which is consistent with the seven year average (refer to Table E-4). The water treatment plant losses were also assumed to remain at 5%. The peaking factor was projected to be a constant 1.7. The 1.7 value is the high end of the 90% confidence interval based on a historical average of 1.5.

Table 5-4 lists the projected future raw water demand for the system, accounting for the projected metered water sales, water losses, and treatment losses. The figures show that by 2060, Fort Smith will need almost 50 MGD in average day flow. The maximum day demands with the projected peaking factor of 1.7 are also shown.

Table 5-4 - Projected Fort Smith Raw Water Demand Requirements (Burns & McDonnell, 2009)

Year	Raw Water Avg. Day Flow (MGD)	Raw Water Max Day Flow (MGD)
2020	34.0	57.8
2030	37.8	64.2
2040	41.5	70.6
2050	45.2	76.9
2060	48.9	83.2

Upon completion of the Lake Fort Smith Plant upgrades, Fort Smith will have 55 MGD of treatment capacity between their two plants. Water treatment capacity could become and issue in 5-10 years, especially if peaking factors are larger than anticipated.

The average per capita demand for the service area was 165.4 from 2002 to 2008 (Burns & McDonnell, 2009). The 165.4 gallons per capita flow rate is a number that could be used for planning purposes, when the exact mixture of development is not yet known. The Study of

Water System Improvements to Supply Chaffee Crossing's Continued Growth (Sickle Wagner Coleman, 2011), uses 170 gal/person/day as the residential average day demand with a peaking factor of 2.3. The study also uses 750 gallons/acre/day for industrial and commercial developments, with a peaking factor of 2.5.

In general, the Study of Water System Improvements to Supply Chaffee Crossing's Continued Growth has a similar average day flow demand projections as the Long-Term Demand Projections study. However, it does have peaking factors that are 50% larger than the Burns & McDonnell (2009) report. The peaking factor described in the Sickle Wagner Coleman study may be appropriate for a specific study area, especially if the development is to be upscale or if past records of water use in the area indicate high peaking.

The two planning documents examined are relatively consistent in their per capita projections; however, they have peaking factors that vary by 50%. The Burns & McDonnell study (2009) uses 1.7 as a peak day/average day flow ratio projection. However, the Mickle Wagner Coleman report (2011) uses 2.5 as a peak day/average day flow ratio. The historical peaking factor for the City's overall system is 1.5 and a normal range is 1.2 to 2.0 (Reynolds et al., 1996). Local conditions may dictate using larger peaking factors in certain areas for planning, and may have come into play in this particular study.

Water Loss Study - The City undertook a water distribution system audit in 2003. The Water Distribution System Audit (JBS, 2003) describes how the City made significant billing system upgrades to monitor the number of service points as opposed to individual customers. The report also described recommendations for improvements in the areas of billing, metering, operations and maintenance, and rates.

Water Conservation Efforts - The City has a documented conservation program, which is available on the City's website. The conservation program consists of three phases: Normal Conditions, Phase I Drought Conditions, and Phase II Drought Conditions.

During normal conditions, the City has placed irrigation and unattended use restrictions on homeowners, as well as on potable water uses for construction and hydrant discharges. Phase I and Phase II conditions go into effect based on lake levels. The intent of these phases is to limit water use during times of drought to conserve the source of supply. The Long Term Water Demand Projections report indicates that it would require a prolonged drought for the Phase I and Phase II restrictions to, "...measurably affect annual water use". The 2009 report did not consider any reduction in long-term water use due to conservation measures by the City.

5.2.2.3 Demand Projection Summary

Overall, the City has water demand planning documents in place that reflect current market trends and project flows for a significant period of time. Per capita flow demand projections reflect market tends indicating that per capita flow will not increase over time. The Long-Term Demand Projections study also used upper 90% confidence limits to estimate the per capita usage rate, which protects the Utility from estimates that are too conservative.

See Section 5.5 for planning recommendations.

Projections were primarily calculated based on historical trends, which are summarized below:

- Historical per capita usage in Fort Smith is high; likely due to a large industrial demand in Fort Smith
- Water loss, while slightly higher than the rule-of-thumb 10%, is at an acceptable level, but there is room for improvement
- The historical peaking factor is relatively low (1.5), which is likely a function of the large industrial demand.
- The City's overall water planning process appears to be sound and reasonable.

5.2.3 Wastewater Flow Projections

Wastewater flows are generally functions of water use, collection system type, collection system condition, subsurface conditions, and climate. Generally, older systems in wet regions have higher wastewater flows due to a larger amount of infiltration and inflow (I&I). Unlike water demands, regional trends in wastewater flow are difficult to summarize. In general, as per capita water demands stabilize, one would expect that dry-weather flow to also stabilize. However, infiltration and inflow, as well as the factors listed above can influence the dry weather flow to the point that these trends may not appear.

The City's primary wastewater planning document is the Wastewater Management Plan and supplemental updates (CDM, 1993, 1997, 1999). It is understood that the City is updating the wastewater management plan in 2012. In addition to the wastewater management plans, the City is in the process of characterizing wastewater flows in several basins and has begun infiltration and inflow (I&I) rehabilitation in several locations. This proactive approach to decrease wastewater flows is prudent in the event a consent decree with the United States Environmental Protection Agency and the Arkansas Department of Environmental Quality must be negotiated.

5.2.3.1 Historical Flows

The wastewater utility currently serves the City of Fort Smith as well as the cities of Barling and Arkoma (CDM, 2007). In 2008, the combined population of the service area was approximately 91,000 (Burns & McDonnell, 2009). At the projected growth rates, the 2012 population of the service area should be approximately 95,000. Projected service area growth rates are presented in Table 5-5, and are based on the population projections presented in Section 5.2.1.

Table 5-5 – Wastewater Service Area Growth Rates

Year	Fort Smith	Barling	Arkoma	Total Sewer Customers
2008	84,375	4,318	2,181	90,874
2012	88,000	4,550	2,290	94,840
2015	94,400	4,970	2,480	101,850
2020	105,400	5,680	2,800	113,880

The analysis of historical flows in the basins is based on the Wastewater Management Plan, which describes flows at treatment facilities. Table 5-6 shows the historical wastewater flows to the P Street and Massard WWTPs. Historical dry weather flows were recorded at the plants. Historical wet weather flows were determined with calibrated models that estimate what the flow would have been at the plant had overflows not occurred in the system. Wet weather flow peaking in excess of 10 times the average dry weather flow is typical of older separated collection systems in need of rehabilitation.

Table 5-6 – Historical Wastewater Flows for the P St. and Massard Wastewater Treatment Plants (CDM, 1997)

Flow Condition	P St. Plant MGD	Massard Plant MGD	Total MGD
Avg. Dry Weather Flow[1]			
1990	6.96	5.38	12.34
2011	7.67	8.00	15.67
Peak Dry Weather Flow			
1990	11.73	9.17	20.90
Peak Wet Weather Flow[2]			
1-YR Return Period, 1990	78.6	44.7	123.3
5-YR Return Period, 1990	107.2	60.4	167.6

Notes: [1] 2011 Data based on estimates provided by the City; not from CDM, 1997
[2] Peak Wet Weather Flows presented are modeled flows that would be expected at the plant if overflows were not occurring in the system

As can be seen in Table 5-6, the City has historically experienced high wet-weather flows. The City was issued an administrative order by the USEPA to make collection system and WWTP improvements. To address this, the City has upgraded the P Street Wastewater Treatment Plant to treat wet weather flows. The City has begun flow monitoring in 2001, and has since started to rehabilitate sub-basins within the system to reduce I&I. According to the 2010 Flow Monitoring and Analysis Final Report (RJN Group, 2010), I&I reduction is being effective.

Based on Tables 5-5 and 5-6, the per capita flow rate in 2011 is approximately 165 gallons/person/day. Collection systems without excessive infiltration and inflow are expected to have a per capita wastewater flow near 120 gallons/person/day (Metcalf & Eddy, 2003). As stated in previous sections, this value may be too low for Fort Smith, where 20% of the water usage is for industrial applications. It is possible that the increased efforts by the City to remove I&I will be successful in keeping the per capita wastewater flow constant or even perhaps decreasing it over time.

5.2.3.2 Future Flow Projections

It is understood that the City is updating the wastewater management plan in 2012. Due to the timing of this study, that report will not be reviewed and thus the review of projections is of limited use. The updated wastewater management plan should examine the City's current population forecasting documents to maintain planning consistency. It should also use flow projections that take into account I&I improvements over the last ten years and anticipate any future I&I projects.

If current per capita flow rates were to remain constant, the City would have an average dry weather flow of 18.8 MGD in 2020. The current wastewater capacity is 22 MGD. These flows and the timing of facility improvements should be confirmed in the 2012 wastewater management plan update.

The most recent wastewater management planning document is the Master Plan for Water and Sewer Service in the Southern Growth Area & Chaffee Crossing (Mickle Wagner Coleman, 2010). This area is expected to generate nearly 8 MGD on the maximum day in the next 25 years. To determine flows, residential areas were assumed to generate 100 gallons/person/day. This standard design value was verified in the report using flow monitoring from existing Fort Smith residential areas. These areas produced between 59-82 gal/person/day. A commercial and industrial flow rate of 750 gal/acre/day was used for planning purposes. This value appears lower than would be expected for commercial and industrial development (Metcalf and Eddy states typical values are between 800 and 1,500 gal/acre/day (2003)), but was verified in the report by examining nearly 850 acres of existing development. Peaking factors for residential, commercial, and industrial areas were made using standard practices that also account for normal levels of infiltration and inflow based on modern construction techniques.

5.2.3.3 Wastewater Flow Projection Summary

Overall, the City has many planning documents including wastewater management plans, flow monitoring reports, basin-specific flow monitoring and I&I reports, facility upgrade plans, and I&I "progress" reports. These documents are all useful, but need to be coordinated with an updated wastewater management plan, which HDR understands is to be updated in 2012. The

City is working to address the administrative order from the USEPA, and has made progress in that regard.

General industry trends for wastewater flow are difficult to determine, as wastewater flows are system specific. At the time of this report, the latest version of the wastewater master plan is from 1999. The Administrative Order from the USEPA has been the guide for the capital projects over the last ten years.

Historical trends for Fort Smith indicate the following:

- Historical per capita dry weather flows in Fort Smith are somewhat high; likely due to infiltration and inflow and perhaps industrial usage
- Wet weather flows are historically 10 times greater than average day dry weather flow, indicative of an aging separated system with I&I problems
- I&I reduction is proceeding and is having a positive effect on both wet weather and dry weather flows (RJN Group, 2010).

See Section 5.5 for planning recommendations.

5.3 CAPITAL PLANNING

The water and wastewater management planning documents take the demand forecasts and then translate them into capital infrastructure. This section discusses how the recommendations from the master plans are taken, analyzed, and implemented as capital improvement projects. The "need" for improvements could be characterized in different ways, including:

- System Capacity
- System Reliability
- Age of Infrastructure
- Regulatory Requirements

The City's method of taking the planning documents, evaluating the "need", and then implementing projects was reviewed. Also, the methods of planning were evaluated to see if O&M solutions, where potentially viable, were considered (e.g. explore the potential trade-off between an O&M procedure and a capital project to improve or maintain water quality). Opportunities for gains in planning efficiency will be presented.

5.3.1 Current Planning Process

The current planning process used by the City was identified through staff interviews. In general, City staff has a defined approach to create the capital improvement plan, which includes several steps in the process. These are summarized below:

1. Review of historical data and analysis, including master planning documents

2. Review all projects (ongoing and future)
3. Estimate construction cost
4. Compare cost to available funding amounts
5. Prioritize projects with committee of 2 to 3 knowledgeable senior staff members

There are advantages and disadvantages to the current method of capital improvement planning. One advantage of the current process is that projects are matched to funding amounts, which shows fiscal responsibility to the ratepayers. Also, using a committee of the most knowledgeable staff members ensures those who know the most about the system are involved in decision making.

There are areas for improvement in the current planning process, which could improve the efficiency of the utility as a whole. The current system utilizes one kind of "defined approach", meaning there is a process in place to make the decisions necessary to form the CIP at the present time. However, the repeatability of this approach could be improved on. The current system relies on a few knowledgeable staff members to apply their experience with the City's utility systems to make the best decisions for each utility. However, there does not seem to be a written formal process for making these decisions such as a level of service goal, asset management, or risk quantification.

Without risk management systems, the utilities currently have no way to quantify if repair of an asset or replacement will be most cost effective, other than relying on past experience or on a consultant's report findings. Some operation and maintenance projects have been explored and are being implemented, such as rehabilitation of the sewer system for I&I control. Therefore, it is observed that the Utility is taking into account the possibility of repair versus replacement, but must rely on outside opinions for this information.

An additional concern expressed by Utility staff is the lack of a funding policy. In other words, the Utility has to justify the need to receive funding, and then fight for it, since there is no formal policy on which to rely. Staff also mentioned that management resources are limited to manage projects, which also plays into how projects within the CIP are chosen for implementation.

The City lacks a clear funding policy for renewal and replacement projects (See Section 6). As a result, utility management must prioritize and justify projects on an annual basis and work around a very limited amount of funding in relation to overall funding needs. When rate adjustments are not fully supported at the Board level, the first piece of funding to be reduced or eliminated, in order to minimize rates, is the capital improvement funding component.

5.3.2 Capital Planning Summary

The City has a defined approach for developing a capital improvement plan.

- Projects are matched to funding amounts.
- The system relies on a few knowledgeable staff members' experience.
- There does not appear to be a formal operating procedure to have a repeatable capital planning process.
- There is not a risk management system in place to quantify whether infrastructure repair or replacement is required.

Rate affordability is discussed in Section 6.7

5.4 FINANCIAL CAPABILITY

The planning process can not ignore the reality of the financial impacts of the capital improvement plan. Failure to meet the simple test of financial capability implies the need to go back into the planning process and develop a plan that is financially viable. Arkansas requires a review of "financial capacity" which contains a forecast of all future capital needs and operating expenses . . ." The level of detail involved in the financial capability test and how well that information is communicated within the planning document was reviewed. The financial capability test is not a formal "rate study" or "financial plan", but is an important screening test for the City to understand the potential future impacts of the capital improvement plan.

5.4.1 Current Financial Capability Test Process

Currently, the City funds CIP projects though a combination of water and sewer revenue bonds and Sales and Use Tax Bond Construction Funds. The Sales and Use Tax Bonds were issued to, in part, help address wet weather improvements due to the EPA administrative order. The City's utilities currently have a AA- bond rating. Revenue bonds are repaid over time though water and sewer rates while the sale and use tax bonds are paid via sales tax revenues.

The City's utilities have been successful in anticipating certain future needs and finding funding methods (bonds) to address them. The current capital planning process takes into account financial capability to a large degree. Interviews with staff indicate that financial capability testing is conducted before projects are fully prioritized. This meets Arkansas requirements and provides the City with an understanding of their ability to fund the planning CIP. While not ideal, this is common among utilities and is used out of necessity – as there typically is never enough money to complete all the improvements.

5.5 SUMMARY OF PLANNING RECOMMENDATIONS

This section of the report has reviewed the City's planning process. A number of different observations were provided. Overall the City's efficiency rating for planning ranges from "Defined Approach" to "Managed". Table 5-7 summarizes HDR's priority recommendations for Planning.

Table 5-7 - Planning Priority Recommendations

Overall Recommendation	Recommendation	Advantages	Challenges/Risks	Capital Cost	Annual Return
Use the asset management program to assist in capital planning.	Identify infrastructure at risk to be included as repair and replacement projects in the CIP.	Asset management and risk quantification plans will allow the utility to assign its resources based on a quantifiable and repeatable process.	Using asset management and risk quantification process requires buy-in from decision makers, requires a significant effort to start the program.	Section 3 describes costs for the asset management program; once implemented there is no additional cost to use it in the CIP planning process.	May increase capital budget if it is found that assets are not being replaced on time. Returns need to consider the decreased risk to the Utility.
Assess project management and staffing needs.	Project management needs should be evaluated.	Evaluation of project management can confirm if staff is being over/under utilized and if more staff are required. Study can be done in conjunction with performance reviews.	Staff do not typically report being underworked. Requires management time.	No Capital Investment	Typical return on improving project management system and procedures is a reduction in project overruns at 10% of Capital Project Costs
Examine unaccounted for water and better identify areas of unaccounted for water.	Revisit the recommendations from the JBS report. Test production and wholesale meters annually; testing could be performed by the City or contracted out.	The 2003 JBS Report indicated that 115 meters generate more than $8,000 each in revenue annually; 28 of which generate more than $23,000 each annually; detecting faulty meters early prevents the loss of revenue	Monitoring and replacing meters costs money; review the results of recent tests to determine if conducting the tests is financially beneficial	$0	The JBS Report estimated that testing 28 meters semi-annually and 87 meters annually would cost $250/meter or $36,000 in 2003. Finding an error of 1% in these meters would equate to approximately $58,000 in savings, based on 2003 values.
	Review Low-Use Accounts	Continual review of accounts can alert the Utility to problems with meters when they fail and prevent loss of revenue	Review of records takes time; although minimal time	$0	Depends on results of reviews; review of accounts is a good practice for a Utility regardless of payback.
	Monitor accounts with meters greater than 2 inches to identify significant consumption changes (possible meter failures)	Continual review of accounts can alert the Utility to problems with meters when they fail and prevent loss of revenue	Review of records takes time; although minimal time	0$	Depends on results of reviews; review of accounts is a good practice for a Utility regardless of payback.

Risk Quantification and Asset Management in the CIP Process

Risk quantification through asset management should be considered as part of the capital improvement planning process. Asset management programs are an important undertaking, and require assistance from all levels of the Utility. Asset management plans require updated data located in accessible data management systems, and standard methods for depreciating the asset over time. Risk quantification requires a good asset management system along with a standard method for quantifying risk and applying that risk to each asset. Once this process is complete, staff has a quantified view of all their assets and the identification of vulnerability. This approach then allows long-term planning, a method for justification of funding sources, and a repeatable approach that can be used by the Utility for the long-term. A brief discussion of asset management plans and risk quantification follows.

The requirements and makeup of asset management and risk management programs vary by entity and utility. In general, the goal of an asset management plan is to optimize decisions about a broad range of infrastructure, using information based on economics, operations, and engineering (Bloetscher, 2011). A good asset management plan takes aspects of infrastructure reliability and converts them into an economic evaluation, which can be used for cost-effective decision making. The term "infrastructure reliability" is broad, but can include the following:

- Quality of equipment installed
- Quality of construction
- Adequacy of design
- Condition assessments
- Potential for disruption
- Vulnerability of failure
- Risks to public health
- Safety of staff

An asset is defined as a single item which a utility owns that contains value. The definition of a "single item" is sometimes difficult for a utility to discern. There is no right or wrong answer, however the more systems are broken down, the more valuable the assessment management plan and risk assessment will be. For example, a single item could be defined as a filtration facility. This is acceptable, however many components of a filtration system have a very long life, much longer than the transfer pumps or electrical equipment within the facility may have. When it is time to determine the "risk of failure", identifying a transfer pump, its variable frequency drive, and its motor, is more useful than trying to determine risk for an entire process.

There are three general steps to assess the infrastructure of a utility. These steps are taken from Utility Management for Water and Wastewater Operators, which is published by the American Water Works Association (AWWA).

Step 1 – Identify the Asset (Gather Information)

- Find Utility owned property and existing facilities from maps and property records and verify the utility-owned property records.
- Visit each site and verify the on-site assets. Note condition of the assets. Determine initial cost, installation date, quantity of item, and material, if possible. Use staff knowledge where possible to estimate gaps in the data.
- Update the utility infrastructure from facility plans.
- Update the mapping records.
- Determine installation date of assets through as-built drawings and institutional knowledge.
- Verify records of utility insurance documents
- Create a list of inventory, including all assets that are to be evaluated.

This step is aided by having appropriate data management systems, especially Lucity and GIS, as the data contained within them is the foundation of this step. The more easily the data can be extracted and compiled from these systems, the easier the evaluation of the assets will be.

Step 2 – Determine the Condition of the Asset (Evaluate the health of all assets)

The key to this step is to use a defined and uniform process to evaluate the assets.

- A prerequisite for this step is an inventory list containing the items discussed in Step 1
- Develop a protocol or ranking system by which to conduct condition assessment
- Conduct field observation on assets that can be seen, assign a condition score to each
- Record information on work orders, especially for underground infrastructure, to begin to develop a "picture" of the health of the underground system. This should include information from valve exercising, CCTV reports, etc. Note that "age", while useful to know, should not be the only factor used to determine the health of underground infrastructure.
- Determine a method for dividing up the underground system (i.e. separate water lines by area or year installed (all water lines above 12" installed from 1975-1980), or perhaps a combination of these). A condition score will be assigned to the division.
- Assign condition scores to the divisions of underground infrastructure.

Step 3 – Depreciation of the Asset

Depreciation is conducted to give the utility an idea of the value of the asset, and may give insight as to if repair or replacement of the asset should be undertaken though a life-cycle cost analysis. Straight-line depreciation is common, but not the only acceptable method. Actually, assets depreciate slowly at the beginning, and then quite rapidly towards the end of their lives. Assets should be depreciated over time, with a value of "zero" being given to any asset that is obsolete, even if it is still within it's useful life.

- A prerequisite for this step is an inventory list with current condition assessments discussed in Steps 1 and 2.

- Define the method the utility will use to calculate depreciation.
- Define the "useful life" of an asset. Estimates of "useful life" are presented below, but should be adjusted based on local knowledge within the Utility (Bloetscher, 2011)
  - ✓ Concrete Structures: 100 years; refurbishment every 20-30 years
  - ✓ Steel Storage Tanks: 100 years; refurbishment every 10-15 years
  - ✓ Steel Treatment Structures: 50 years; refurbishment every 10-20 years
  - ✓ Water Mains: 60+ years (use local knowledge, may vary by pipe material)
  - ✓ Sewer Lines: 50-100 years (use local knowledge, may vary by pipe material); assume repairs (slip-lining) required every 20-30 years
  - ✓ Personnel Access Openings: 50 years
  - ✓ Mechanical Equipment: 15 years or less
- Depreciate each asset.

Once the asset management plan has been established, and the condition assessment conducted (Steps 1 and 2 from the asset management plan), the risk assessment may be completed. Risk assessment is really just two components: 1) the likelihood that a failure may occur and; 2) the impact of the failure. The information necessary to determine the likelihood of a failure occurring should be obtained from Step 2 of the asset management. A protocol for assigning a numeric score to the "probability of failure" should be written and should include considerations for condition, age, capacity, and level of service desired. Ultimately, the score will be somewhat subjective, but the protocol should serve as a guide and be followed. This step can make great use of the employee knowledge of the system.

The impact of the failure is defined as what effect the failure might have on the utility, its customers, or both. Examples of consequences of failure follow:

- Public Health and Safety Risk
- Regulatory Compliance Compromised
- New Growth Needs Not Met
- Property Damage
- Cost of Repair
- Service Disruption
- Public Relations
- System Redundancy
- System Security

These consequences should be assigned weights, and a score should be determined for the "impact of a failure" to each asset. Then, the likelihood of failure and the impact of failure can be combined and assets can be ranked. Table 5-8 gives a simplified example of a risk assessment for three components of a water system.

Table 5-8 – Example of Asset Replacement Priority Table (Based on Bloetscher, 2011)

Asset	Age	Customers Served	Condition	Probability of Failure	Probability of Failure Score (1-10) (10 is most vulnerable)	Consequences of Failure	Consequences of Failure Score (1-10) (10 is highest consequence)	Risk Score (1-100)	Priority
High Service Pump	20	35,000	Fair	Medium	5	Low; Has Redundancy with Newer Equipment	2	10	3
Cast Iron Watermain 12" to 14" installed in 1940-45 in North Part of Town	68	45,000	Poor	Medium/ High	7	Medium/ High	7	49	1
Water Storage Tank	60	80,000	Poor/Fair	Low/ Medium	4	Medium/High	4	16	2

This particular evaluation gives one example of how risk can be quantified and priority can be assigned. The "Probability of Failure" score comes from the asset assessment, as well as the other factors (capacity, level of service goal) described previously. Note that "failure" is an event that would render the system useless, not a leaky water main. Step Three of the Asset Management Plan is used to determine the economics of replacing the line or repairing each leak as it occurs based on depreciation and life cycle costs. The "Consequence of Failure" score is the risk component. This numeric factor must take into account all of the risk factors discussed previously. This is just one very simple example of how a risk analysis could be conducted.
It is very likely that the results of the risk analysis will be in many ways what the utility would expect – (i.e. "I could have told you we needed to replace the pump motor, it's 30 years old!"). However, the defined, repeatable approach allows the utility to anticipate future needs, assigns priority rankings to improvements, presents a solid case for funding, and is transferable to new leadership when transitions are made.

Once priority is assigned, Step 3 from the asset management plan should be utilized to see what the most cost effective method of addressing the problem is. Depending on the depreciation of the asset, it may make more sense to repair the asset, and extend the service life. Other assets may require replacement. A life-cycle cost analysis should be performed to determine the appropriate improvement.

6 REVIEW OF FINANCE AND RATES

6.1 INTRODUCTION

Adequate and appropriate funding of a utility is an important element in achieving operations efficiency. At the same time, having clear policy guidance to financially manage the utility is important. As a part of the City's efficiency study a number of different areas were reviewed with respect to the financial planning and rate setting process for the City. At the same time, various performance measures (benchmarks) were reviewed.

As a part of this operations efficiency review, HDR reviewed the following financial planning and rates issues:

1. Review of Selected Performance Measures
2. Review of the City's Financial/Rate Setting Policies
3. Review of the City/Utility's Financial Planning Process
4. Review of the Level and Adequacy of Infrastructure Replacement Funding
5. Review of Debt and Rate Financing of Utility Infrastructure
6. Rate Affordability
7. Consideration of the Impacts of Growth and System Development Charges

As a part of this study, HDR did not review or critique the City's prior rate adjustment proposals. Rather, the purpose of this review was to consider the adequacy of the planning and policy process of establishing utility rates.

6.2 REVIEW OF SELECTED PERFORMANCE MEASURES

Utilities often use performance measures, performance indicators or benchmarking to measure or compare efficiency. Technically, there is a distinction between performance measurement and benchmarking, although the terms are often interchanged. Performance measures are a particular value or characteristic designated to measure input, output, outcome, efficiency, or effectiveness. In contrast to this, benchmarking is the comparison of similar processes or measures across organizations and/or sectors to indentify best practices, set improvement targets, and measure progress. For example, a performance measure would be the number of customer complaints per 1,000 customers. The benchmark would be a detailed breakdown of the steps or processes used to address a customer complaint and the industry "best practices" related to how complaints are categorized and handled.

It is important to note that the City is committed to continuing the performance measure process after this study is completed. The City's comparison to other utilities, while interesting, is not the critical perspective. The most important perspective is that of "continuous improvement" and measuring against a utility's own performance will yield the most meaningful and valuable results from a management perspective. Given that, this study has provided a framework for the performance measures to be used by the City going forward.

6.2.1 A Brief Discussion on Performance Measures

The City currently does not have formal performance measures or indicators in place that are tracked for the utilities. As part of this study, a limited set of performance measures were selected for the water and sewer utilities and compared to other similar utilities. In establishing performance indicators, it is important to:

- Select measures that are tailored to the utility's particular needs and ones that support the City's strategic objectives and mission.
- Start with a small set of measures across broad categories and increase the number and specificity of the measures over time.
- Track to measures over time to evaluate progress from year to year
- Engage the organization in developing, tracking and reporting measures, but have one key individual in the role of championing and coordinating the effort
- Select and use measures in a positive way to improve decision making and focus resources and attention, not just to monitor, report and control.
- Develop an effective process to evaluate and respond to results.

6.2.2 Performance Measures Selection Process

HDR proposed a number of performance measures for the City's consideration from the American Water Works Association (AWWA) Benchmarking – Performance Indicators for Water and Wastewater Utilities: Survey Data and Analyses Report, 2005[1] and the American Water Works Research Foundation publication Benchmarking Water Utility Customer Relations Best Practices[2].

In addition, the City completed a comprehensive process of evaluating performance measures. The City reviewed a total of 96 individual performance indicators, which are grouped together into 65 separate categories. Many of the performance measures considered were from the AWWA Benchmarking Report. Through this process the City prioritized ten (10) operational performance measures for long-term use and two (2) financial/customer service performance measures for the utilities. The City based the prioritization on the goals and objectives that are the most important objectives to the mission of the utilities. All of the operational performance indicators selected are in the AWWA Benchmarking Report.

The AWWA Benchmarking Report describes 22 formal performance measures for benchmarking, with some of the measures broken out into several sub-measures as well. Each

[1] American Water Works Association (AWWA), Benchmarking: Performance Indicators for Water and Wastewater Utilities: Survey Data and Analyses Report, by Angela K. Lafferty and William C. Lauer, 2005.
[2] American Water Works Association Research Foundation (AWWARF), Benchmarking Water Utility Customer Relations Best Practices, 2006.

performance measure provides a description, formulas for calculations and data summarized by region of the U.S., population size served, and whether the utility is water, wastewater or combined. The City's twelve (12) performance measures are listed below.

- Drinking Water Compliance Rate (% Days)
- Sewer Overflow Rate
- Distribution System Water Loss (%)
- Sewer Treatment Effectiveness Rate (%)
- Water Distribution System Integrity
- Direct Cost of Water Treatment per MG
- Direct Cost of Sewer Treatment per MG
- Residential Cost of Water Service (Monthly for 7,500 gal)
- Technical Water and Sewer Quality Complaints per 1000 Customers
- Customer Water and Sewer Service Complaints per 1000 Customers
- Cost / Bill
- Bad debt or write-offs as a percentage of total annual billings

Each of these performance measures are described below, along with the benchmarking data from the AWWA Benchmarking Report, as well as benchmarking data from a survey conducted by HDR to obtain these same performance measures from similar or comparable utilities.

6.2.3 Benchmarking Survey and Study Results

HDR developed a survey for each participating utility (water and sewer) to determine their response to the 12 performance measures, two of which the City selected to be used in the study. . HDR used the AWWA 2010 Water and Wastewater Rate Survey[3] to determine utilities of similar size in population served, daily gallons sold (MGD), and/or utilities also located in Arkansas and/or the Southern U.S. region, as defined in the AWWA Benchmarking Report. It is important to note that the City's utilities fall into two different population ranges used in the AWWA Benchmarking publication: 100,000 – 500,000 population for water and 50,000 – 100,000 for sewer. On a combined basis, the utilities will be included within the range for the water utility of 100,000 to 500,000 population served.

The following 10 utilities were identified based on three primary criteria: Arkansas utilities, similar sized utilities, and in particular those that are also in the Southern U.S., as identified in the AWWA 2010 Water and Wastewater Rate Survey.

[3] American Water Work Association, 2010 Water and Wastewater Rate Survey, 2011.

City	Service Population	Participant
Dalton, GA	92,000	
Lancaster, SC	94,000	
Decatur, AL	98,000	
Rogers, AR	101,000	X
Pueblo, CO	108,000	X
Provo, UT	121,000	
Savannah, GA	133,000	
Welcome, NC	150,000	X
Fayetteville, AR	245,000	X
Bentonville, AR	35,000	X

[1] Service populations for all utilities are from AWWA 2010 Water and Wastewater Rate Survey, except for Bentonville, which is from the 2010 Census. The service populations represent the population of the utilities serving those areas. In some cases the jurisdiction population differs from the population provided in the AWWA Rate Survey by location. Some local utility populations are quite different than Fort Smith's; however, these are local municipal utilities, worthy of gaining benchmarking data.

These jurisdictions were contacted and nine utilities indicated an interest in participating. Some of the areas have different agencies providing water and sewer services. For example, Pueblo, Colorado sewer services are provided by the City while water is provided by Pueblo Water, a special district.

6.2.4 Caveats to the Survey of Performance Measures

Of the ten utilities surveyed, HDR received five utility responses by the time of the preparation of this report. In gathering this data, HDR and the City noted the challenges and difficulty in attempting to collect comparable utility data. First, some utilities simply did not want to participate given their limited time and resources. Next, regardless of the quality of the survey form, a surveyed utility may not provide complete, accurate or correct data. While the AWWA Benchmarks provide a clear definition of the performance measure the difficulty may be in the local collection and interpretation of that data. For example, the performance measure of "customer complaints per 1,000 customers" is open to interpretation as to what constitutes a "customer complaint". Finally, as was discovered at Fort Smith and many of the surveyed utilities, data may simply not be accumulated in a manner to allow for a response to the surveyed performance measure. For example, the performance measure of cost per bill requires the accumulation of costs in a detailed manner to allow for an accurate response.

For the above reasons, care should be taken to not "over-analyze" the data or potentially reach incorrect conclusions concerning the efficiency or lack of efficiency by Fort Smith. Most importantly, this study has provided a clear framework and a set of performance measures to allow the City to continually measure their own performance, while creating targets or goals for improved performance.

The City is committed to continuing the performance measure process after this study is completed. The City's comparison to other utilities, while interesting, is not the critical perspective. The most important perspective is that of "continuous improvement" and measuring against a utility's own performance will yield the most meaningful and valuable results from a management perspective.

6.2.4.1 Water Utility Performance Measures

The performance measures described below are organized by utility, first the water utility, then the sewer utility, then combined utility measurements. Each performance measure definition and calculation metric is provided, along with commentary, as appropriate. The City of Fort Smith provided the calculations for the City's responses. It is important to note that the AWWA Benchmarking Report is published in 2005 and is the most recent publication with this data. However, given the vintage one must consider that the AWWA data is likely stated in 2004 or 2005 dollars and the data and information and the other surveyed utilities are likely stated in 2010 or 2011 dollars. Fort Smith has reported 2010 data. Details from each of the utilities who responded to the survey are provided in Appendix F of this report.

1. Drinking Water Compliance Rate (% of Days)

Purpose: This performance indicator quantifies the percentage of time (based on days each year) that a water utility has met all health related regulatory drinking water standards and requirements of the U.S. National Primary Drinking Water Regulations. It is measured in number of days of full compliance with these regulations, divided by days in the year, as follows:

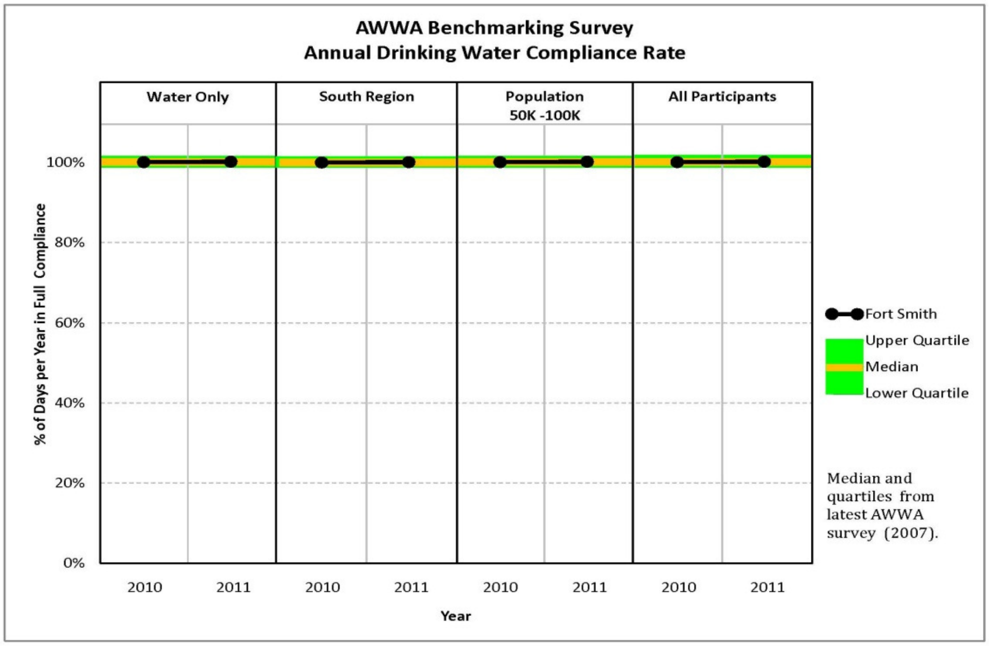
Metric:

$$\frac{100 * (\text{number of days in compliance})}{365 \text{ Days}}$$

Importance: This performance measure is important since it measures regulatory compliance against required drinking water standards.

Fort Smith felt that this was the most important measure because it determines how effectively the City is able to meet its most important purpose, to provide safe and adequate drinking water to the service population.

Figure 6-1 Percentage of Days in Regulatory Compliance



As would be expected, all the utilities responding to the AWWA Benchmarking survey are in 100% compliance with drinking water regulations, as shown in Figure 6-1.

2. Distribution System Water Losses

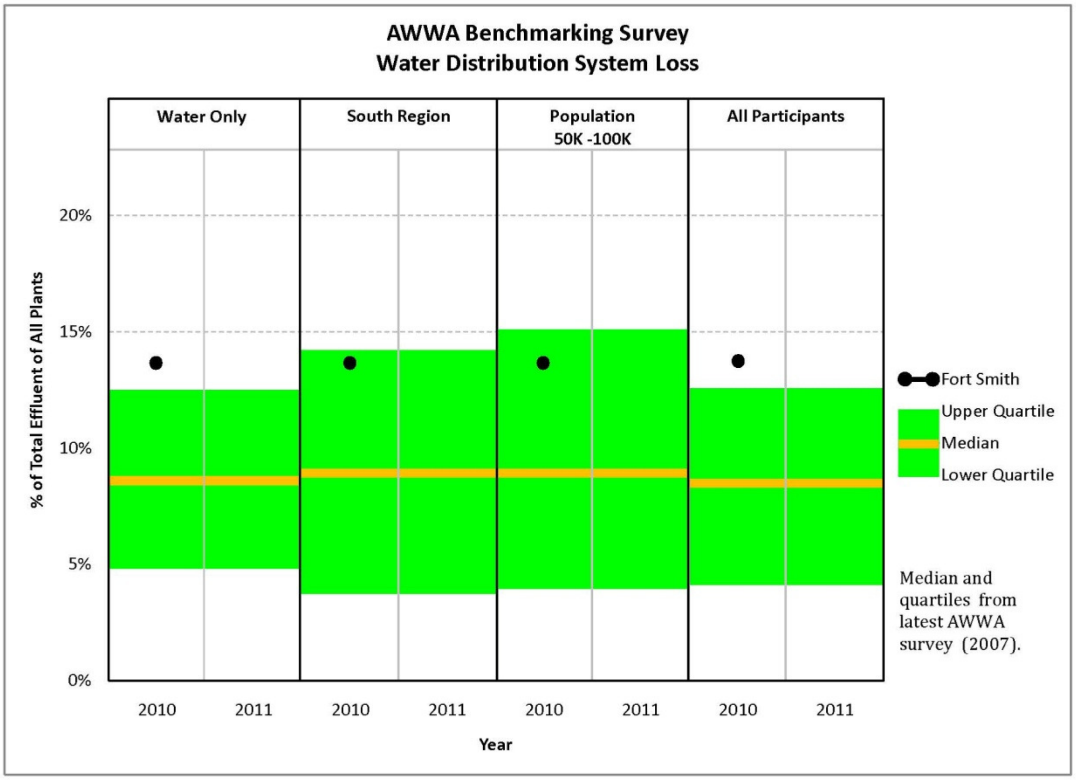
Purpose: This performance indicator quantifies the percentage of produced water that does not reach customers and is not otherwise used (authorized unbilled water). It is measured by dividing the total volume distributed less billed volume and authorized unbilled volume by the total volume distributed, as shown below.

Metric:

$$\frac{\text{volume distributed} - \text{billed volume} - \text{authorized unbilled volume}}{\text{volume distributed}}$$

Importance: Lost water reflects the proportion of non-revenue (lost) water to revenue/authorized use water. More importantly it measures the amount of water that incurs the cost to be treated, pumped and distributed, yet is "lost" in the system. All water systems will have system losses and unaccounted for water, but an efficient water system minimizes their losses and unaccounted for water to help minimize overall O&M costs. Figure 6-2 presents the results for this performance measure.

Figure 6-2 Percentage of Total Distributed Water Lost – Water Losses



The water losses reported for Fort Smith appear to be higher than the medians of those utilities reporting to the AWWA Survey. The level of losses by Fort Smith is at the upper range of the 75^{th} percentile but certainly not unreasonable. Losses of less than 10% are considered a very "tight" water system. It is important to understand that there are a number of different ways in which losses (unaccounted for water) occurs, and it is not simply a function of "leaky" pipes. For example, the flushing of distribution mains are an example of water that is used for O&M activities, yet considered a water loss.

3. Number of Water Main Leaks and Breaks per 100 Miles of pipe

Purpose: This performance indicator quantifies the number of breaks and leaks per 100 miles of distribution water main system. It is measured by dividing the total number of breaks and leaks by the total miles of water mains divided by 100, as shown below.

Metric:

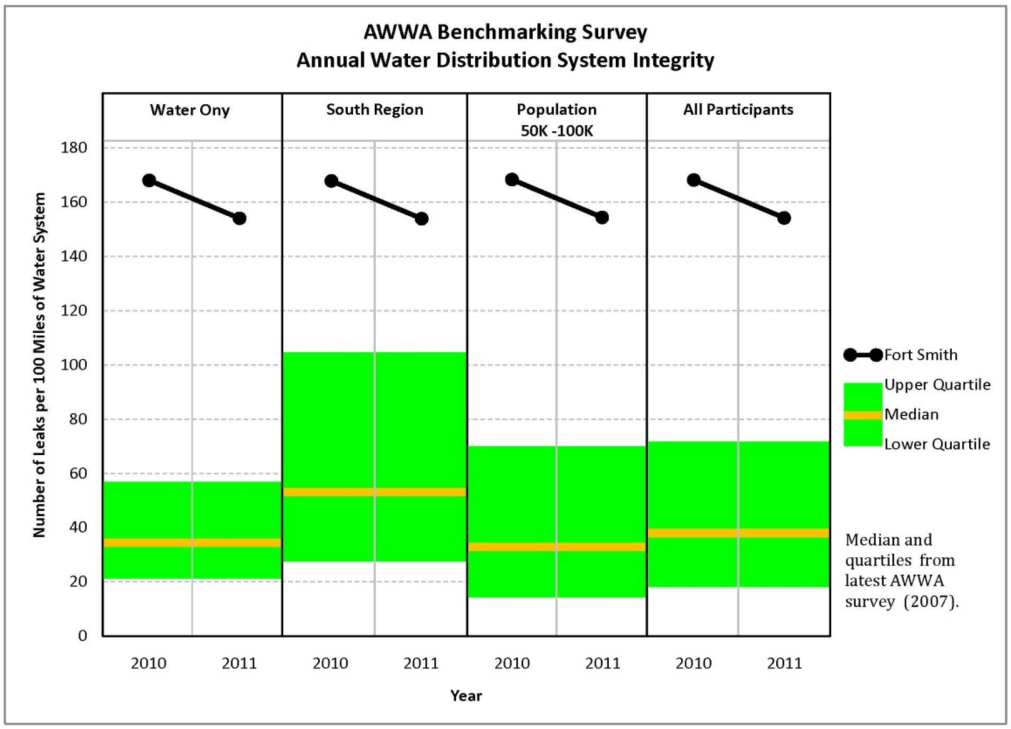
$$\frac{\text{annual number of main leaks + breaks}}{\text{(total miles of water mains/100)}}$$

Distribution system water mains include all pipes, valves, hydrants, etc. conveying treated water from the treatment facilities to the end point of utility control at customer service connections. Any service line piping beyond that point is not part of the distribution system, and is typically owned by the customer.

Importance: The number of main leaks and breaks may be an indicator of the condition of the distribution system and the adequacy of the repair and replacement of that system. A high level of leaks and main breaks will create higher water system losses and the potential of customer interruptions in service.

Figure 6-3 presents the results of the water main leaks and breaks.

Figure 6-3 Distribution System Integrity: Number of leaks and breaks per 100 miles of water main



The prior measure of water losses indicated a high level of losses compared to the AWWA benchmarking. One source of water system losses is main leaks and breaks which may help to partially explain the level of losses. However, before reaching that conclusion, it is important to understand that some utilities may define, report and track leaks and breaks differently, which can certainly account for differences in this performance measure.

It is important to understand that the number of leaks and main breaks is a function of a number of items such as age of the system, pipe materials and adequacy of funding to properly maintain (repair/replace) the distribution mains. An asset management study which includes condition assessments can be used to better understand this issue of the proper and adequate repair and replacement of the distribution system.

4. Total direct cost of treatment per million gallons of distributed water

Purpose: This performance indicator quantifies the total direct cost of treatment divided by the million gallons of water distributed, as shown below.

Metric:

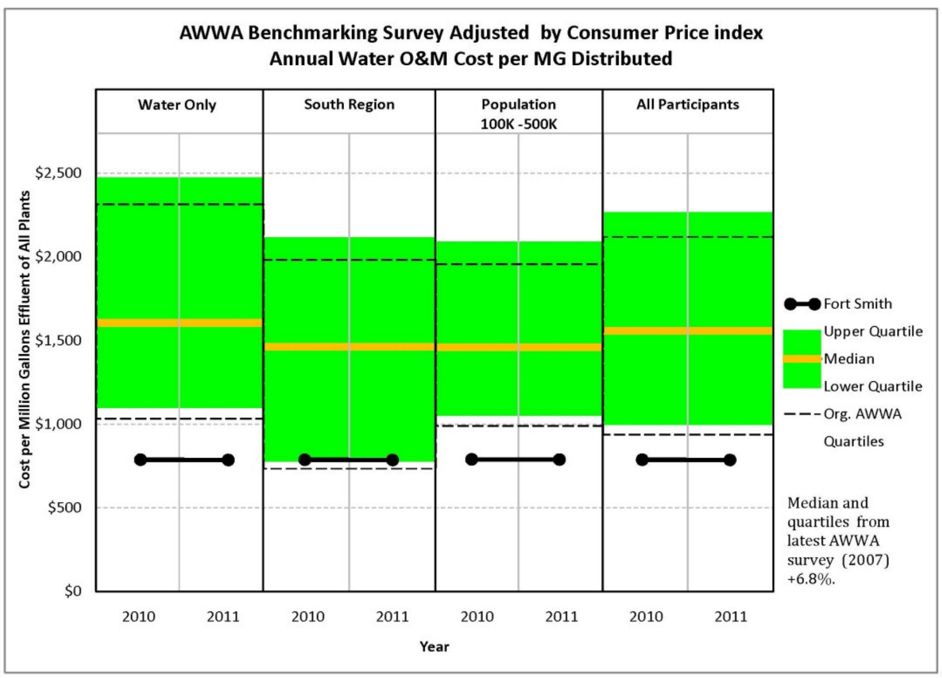
$$\frac{\text{total direct O\&M treatment expenses}}{\text{million gallons distributed}}$$

Direct costs for treatment include only those costs associated with treatment, including salaries, benefits, and direct expenses for services and items only within the treatment facilities, not those pumping costs associated with delivery to or from the water treatment facilities.

Importance: The direct cost of treatment is one of the major cost inputs into the production and delivery of potable water. Proper management and control of this function can significantly impact the overall total costs of the production of treated water.

Provided below in Figure 6-4 is a summary of the AWWA surveyed data.

Figure 6-4 Water Treatment Cost Per Million Gallons Distributed



The City's direct water treatment costs at or below the 25th percentile. This would seem to indicate efficiency in the treatment process. However, it does not indicate whether additional savings can be achieved in the treatment process.

5. Residential cost of water service – per 7,500 gallons of water usage

Purpose: The measure of 7,500 gallons is a typical "average household usage" used in rate surveys and comparisons. This indicator allows Fort Smith to compare its residential cost for a typical amount of water per household with comparable utilities. This measure is based on a 3/4-inch meter with 7,500 gallons of usage in a month.

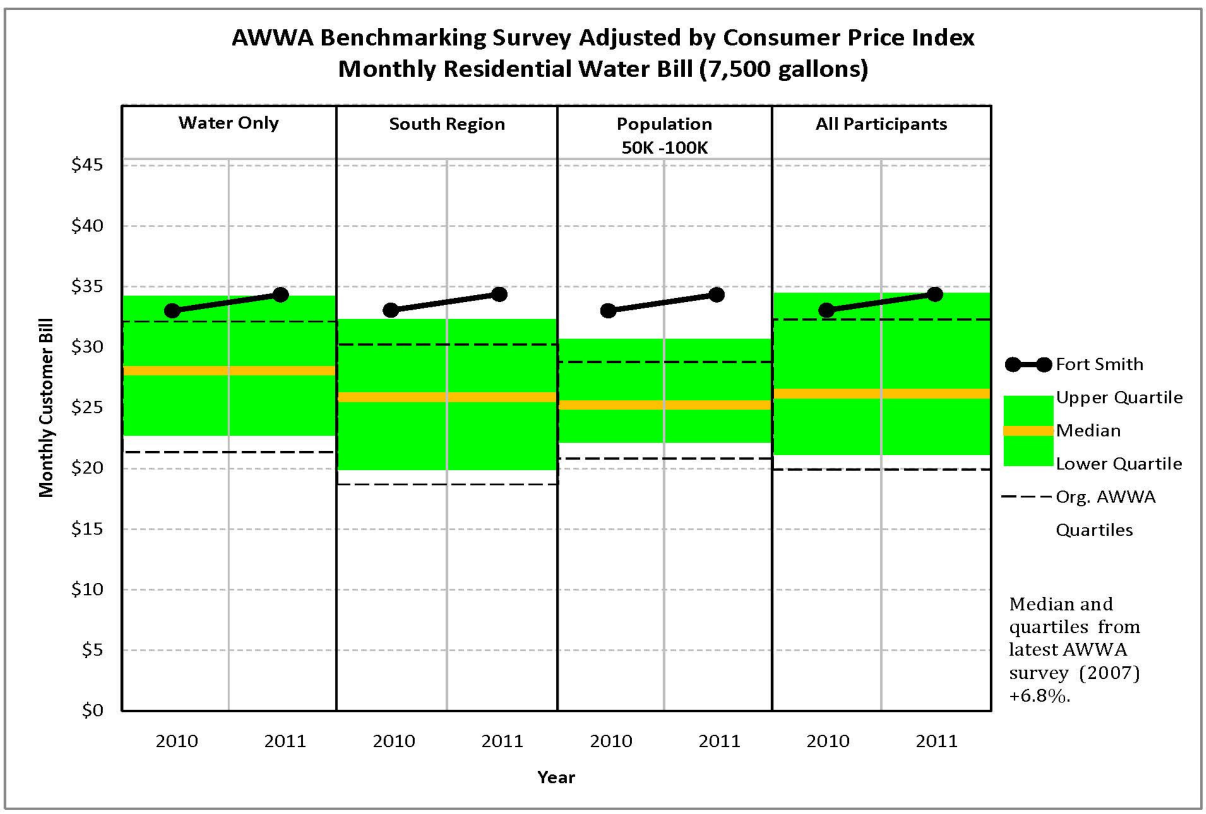
Metric:

Monthly cost of residential water use, for a 3/4-inch meter with 7,500 gallons of water

Importance: This measure provides a comparison between what customers ultimately pay for water at a certain defined and fixed quantity. This may not be an important or reasonable measure of "efficiency" since a City Council or Utility Board can artificially keep rates low, at the expense of the proper and adequate operation and maintenance of the water system.

Figure 6-5 presents the results of the monthly water bill comparison.

Figure 6-5 Residential Monthly Water Bill, 3/4-inch meter and 7,500 gallons usage



Given the aged data, if AWWA conducted this same survey today (2012) one would expect the AWWA median to be slightly below $30 per month (assuming 3% annual inflation). A May 2011

Circle of Blue article indicated that water rates in 30 U.S. metropolitan areas rose an average of 9% in 2010 alone, much higher than CPI. With that understanding, the monthly rate for Fort Smith would likely be within the range of comparable utilities. However, even with that explanation, this performance measure does not necessarily reflect an "apples to apples" comparison between utilities in terms of O&M and capital infrastructure funding levels and the overall adequacy of funding.

6. Technical water quality complaints per 1,000 customers

Purpose: This performance indicator quantifies the total number of technical water quality complaints, such as taste, odor, or other aesthetic related complaint, per 1,000 active customers, as shown below.

Metric:

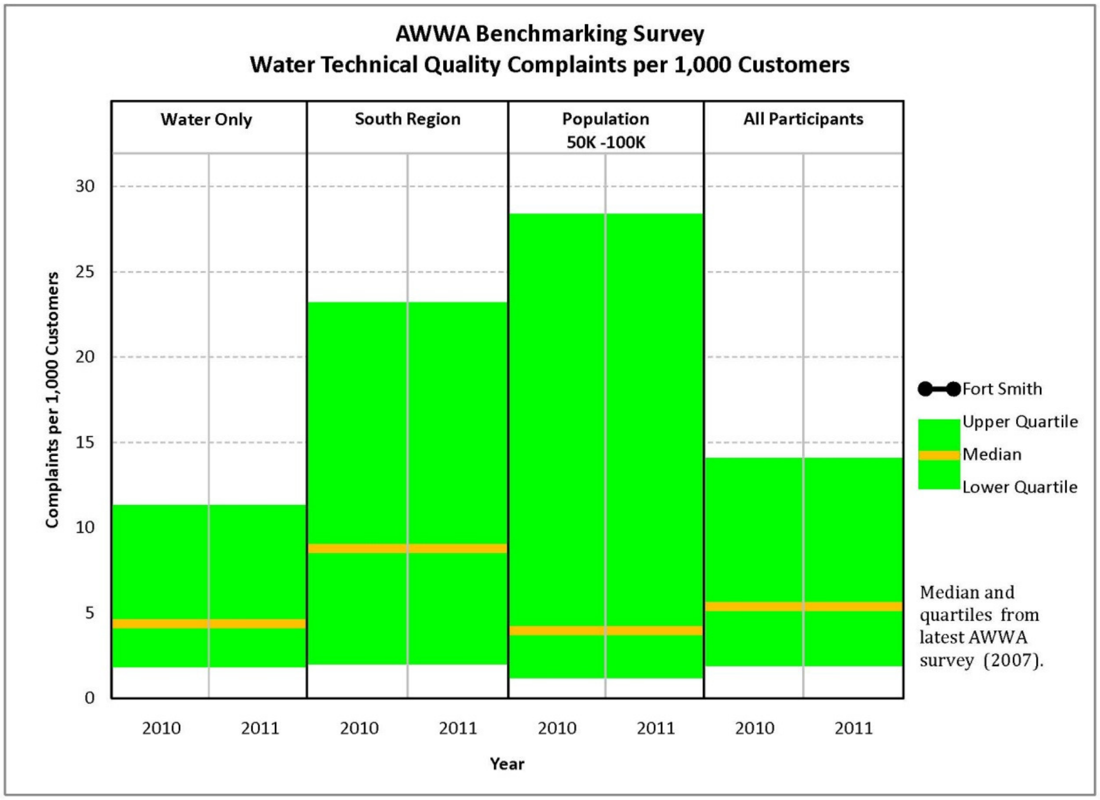
$$\frac{1{,}000 * \text{number of technical quality-related complaints}}{\text{number of active customer accounts}}$$

Active accounts are those that are billed for all or some of the months in a reporting period. Complaints may be relayed to the utility orally or in writing. A complaint is a request for action.

Importance: Water quality in terms of taste, odor and other aesthetics is, in part, the customer's perception of the "quality" of the water delivered. Water quality can certain be measured from a regulatory perspective, but this measure is perception driven by the customer.

Figure 6-6 presents the results from the AWWA Benchmarking report.

Figure 6-6 Technical Water Quality Complaints per 1,000 Customers



As the City began to gather data for this performance measure it was discovered that the City's work order system does not distinguish between technical water quality work orders generated by customer complaints versus those work orders generated by addressing other issues. Therefore the data for this performance measure can be collected in the future by the City to gain a better measure of this particular issue. It should be noted that the City of Bentonville also does not collect data on water quality complaints that is easily extractable from their work order system.

7. Customer service complaints per 1,000 customers

Purpose: Very similar to the performance measure described directly above, this indicator quantifies the number of customer service complaints per 1,000 active customers. The difference is that water quality related customer complaints are isolated for measure #6, where as all other customer complaints are included within this performance indicator as shown below.

Metric:

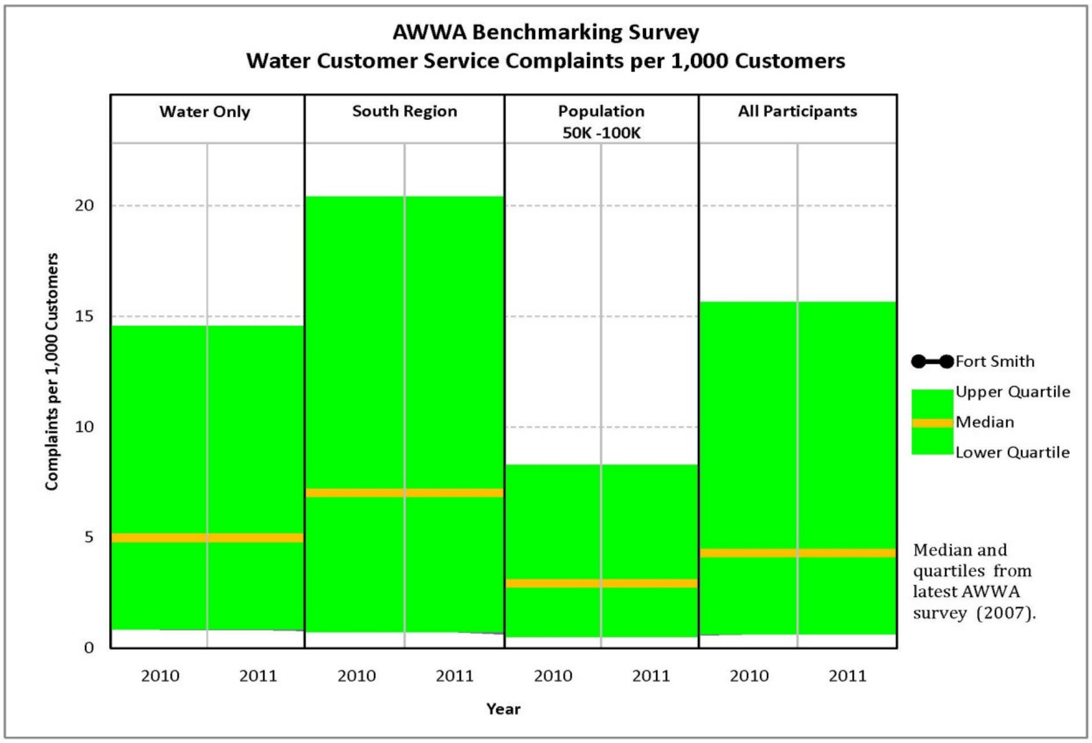
$$\frac{1{,}000 * \text{number of customer service complaints}}{\text{number of active customer accounts}}$$

The same definitions apply here for active customers, and complaints as noted above for performance measure number 6.

Importance: Customer service complaints are a measure of the overall quality of service. However, no distinction is made as to level, type or severity of the customer complaint.

Figure 6-7 presents the results from the AWWA Benchmarking Report.

Figure 6-7 Water Customer Service Complaints per 1,000 Customers



Again, this data was not information that the City could easily extract from their work order system. The City intends to adjust the work order system to be able to track this measure in the future. This could be seen as a combined utility measure. The City will need to determine if it wants to track customer service complaints separately for water and sewer or as a combined operation, and by type of complaint.

6.2.4.2 Sewer Utility Performance Measures

There are three performance measures the City selected for the sewer utility; three related to operations. HDR added the residential cost for sewer, since that data is typically readily available.

S – 1 Sewer Overflow Rate

Purpose: This performance indicator measures the condition of the sewer collection system and the effectiveness of routine maintenance to prevent sewer overflows, as shown below. It is important to note the definition of an overflow, and acknowledge that utilities may account for overflows differently. In the AWWA Benchmarking Report an overflow is defined as a discharge from a sewer through an access hole, clean-out, pumping facility, or customer floor drain if that discharge is related to limitations or problems with collection or treatment system components under the control of the utility. A single limitation can result in multiple overflows.

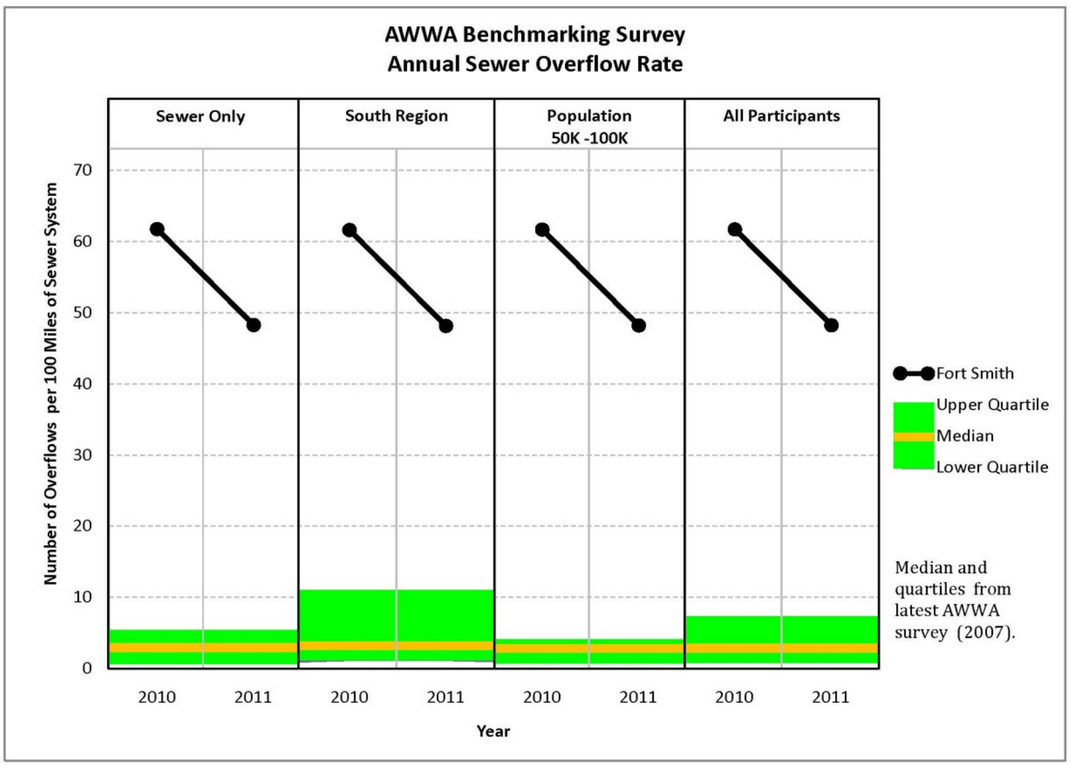
Metric:

$$\frac{100 * (\text{number of overflows})}{\text{total miles of collection system pipes}}$$

Importance: Overflow events are an important indicator of the condition and available capacity of the sewer collection system.

Provided below in Figure 6-8 is the AWWA surveyed information regarding the number of sewer collection system overflows.

Figure 6-8 Number of Overflows per 100 miles of Pipeline



Because sewer utilities are limited in number of sewer overflows permitted, and many strive for no or low number of over flows, Fort Smith felt that this was the most important performance measure for the sewer utility because it determines how effectively the City is able to meet one of its mission within the constraints of its operating permit. Sewer flows are uncontrolled releases of effluent. The measure does not account for the severity of the overflow. All overflows are considered equal. The City's overflow rate per 100 miles of pipe line is almost 5 times the amount shown in the chart, indicating a higher level of overflows than other systems. It is unclear what may be causing this high level and whether it is an isolated year (high wet weather flows). A focus of resources in this area could result in more efficient operations in the future.

S – 2 Sewer Treatment Effectiveness Rate

Purpose: This performance indicator determines the percentage of time (based on days each year) that a sewer utility has been in compliance with water quality effluent standards and operating permits during the reporting period. It is measured in number of days of full compliance with regulations, divided by days in the year, as follows:

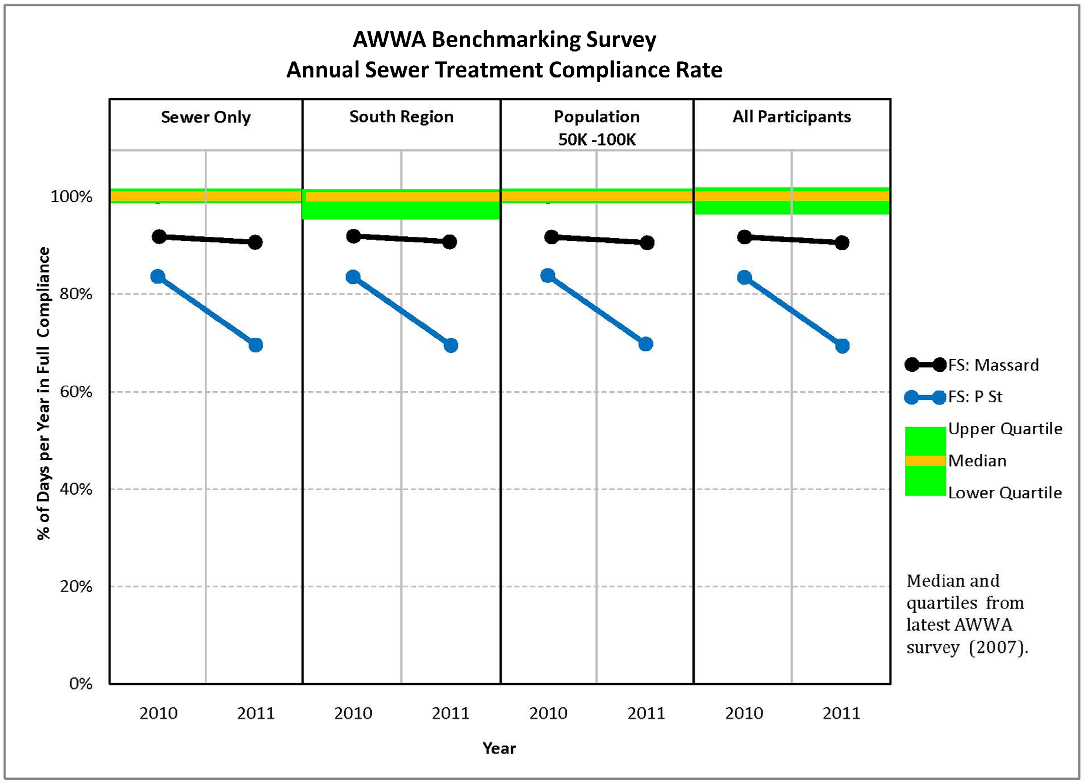
Metric:

$$\frac{100 * (\text{number of days in compliance})}{365 \text{ Days}}$$

Importance: An operating discharge permit is issued through the National Pollution Discharge Elimination System, or by a state enforcement agency. A percentage of 100% would indicate that the treatment plant had met regulatory standards for treatment. A percentage lower than 100% indicates that regulatory standards were not met and a violation of standards occurred.

Figure 6-9 presents the results from the survey for sewer treatment compliance.

Figure 6-9 Sewer Treatment Compliance Rate



The City's two treatment plants have differing compliance rates, both less than the 25th percentile of the AWWWA study. This performance measure indicates that the City is not in full compliance. The City is under a consent decree to address their deficiencies and is applying significant financial and technical resources to address this issue.

S – 3 Total direct cost of treatment per million gallons of flow processed

Purpose: This performance indicator quantifies the total direct cost of treatment divided by the million gallons of flow treated, as shown below.

Metric:

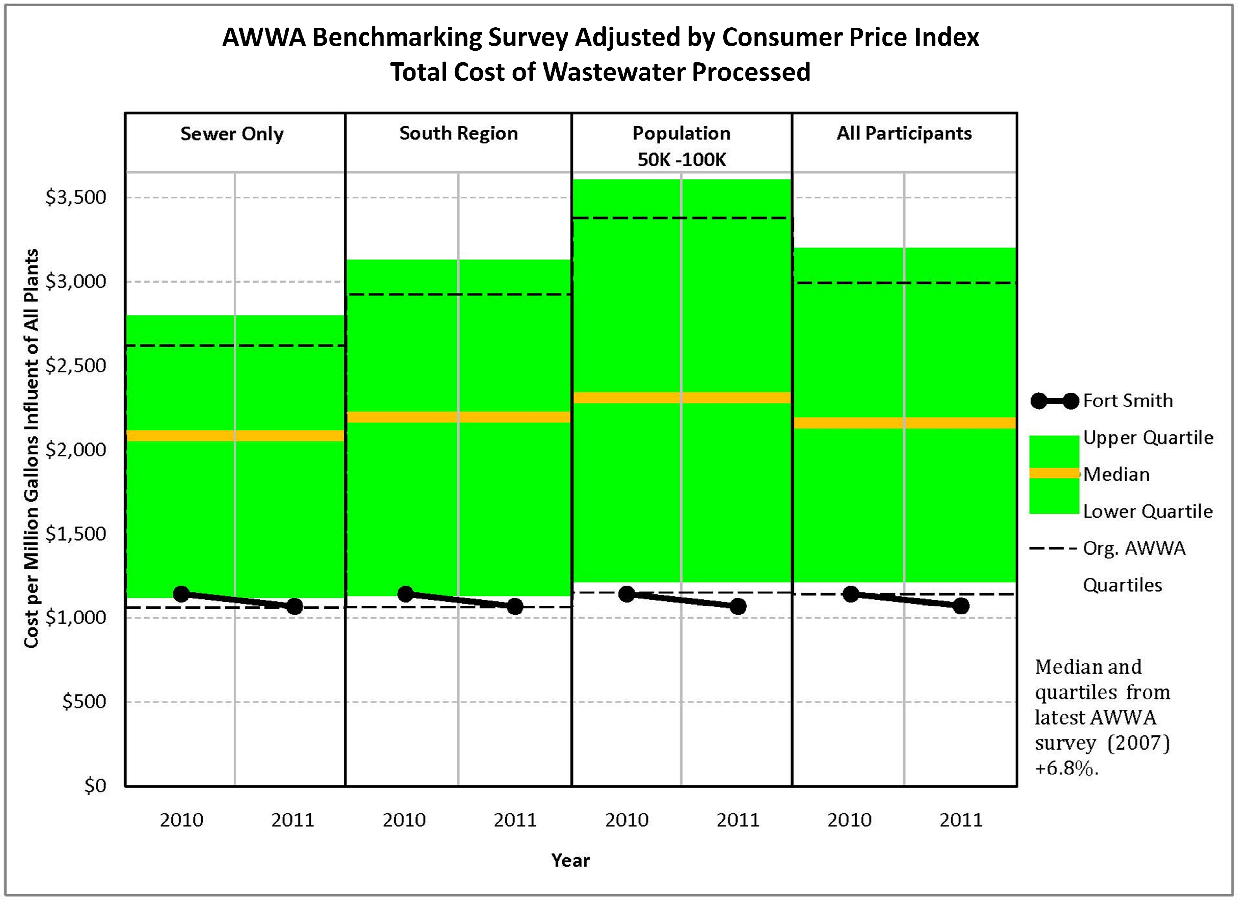
$$\frac{\text{Total direct O\&M treatment expenses}}{\text{million gallons treated}}$$

Direct costs for treatment include only those costs associated with treatment, including salaries, benefits, and direct expenses for services and items only within the treatment facilities, but nothing outside of the treatment facilities.

Importance: The cost of treatment is a major cost area for the delivery of sewer services. Proper management and control of this function can significantly impact the overall total costs of the treatment of wastewater.

Figure 6-10 presents the AWWA survey results of the direct cost of sewer treatment.

Figure 6-10 Direct Sewer Treatment Costs per MG



The average direct cost of treatment appears to be favorable for the City. However, much of the direct costs of sewer treatment are a function of the type or method of wastewater treatment. In addition, the treatment process is primarily regulatory driven, and as such, costs by utility can vary significantly.

S – 4 Residential cost of sewer service – flat fee or per 7,500 gallons of water usage

The final performance measure for the sewer utility is a comparison of the residential monthly sewer bill.

Purpose: This indicator allows Fort Smith to compare its residential monthly sewer bill with comparable utilities. If the utility does not have a flat fee, then the measure is based on 7,500 gallons of water usage in a month.

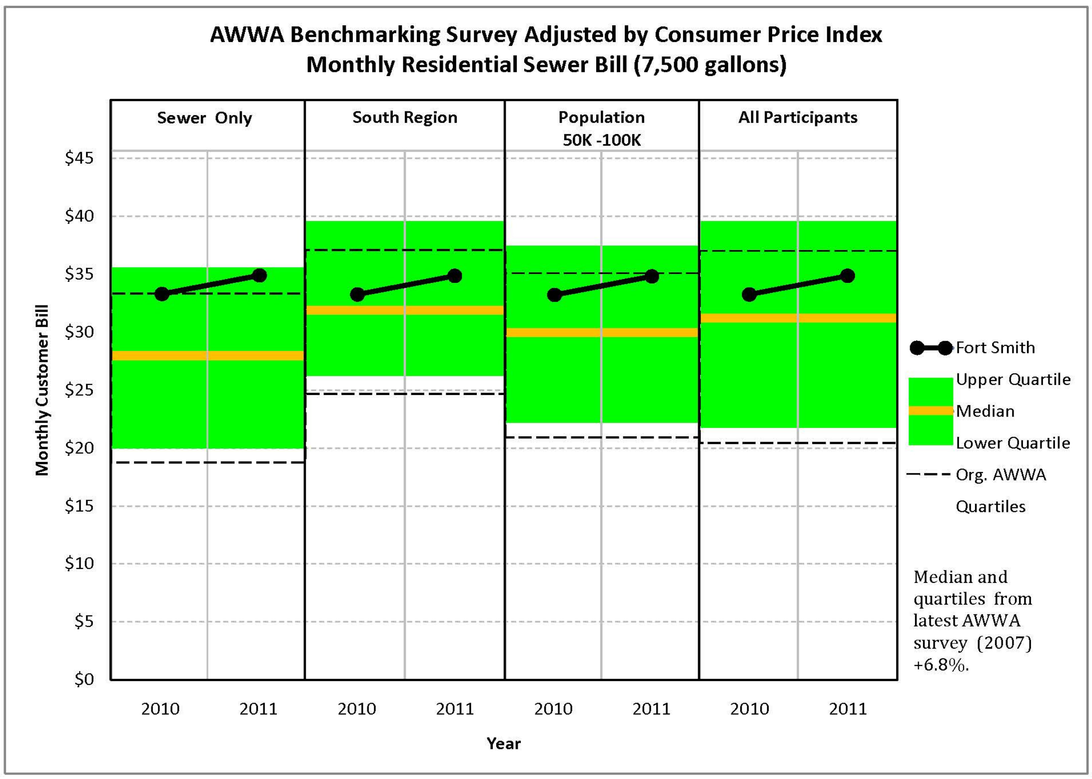
Metric:

Monthly cost of residential sewer service (per 7,500 of water usage if rate includes a consumption charge)

Importance: This measure provides a comparison between what customers ultimately pay for sewer service at a certain defined and fixed quantity. This may not be an important or reasonable measure of "efficiency" since a City Council or Utility Board can artificially keep rates low, at the expense of the proper and adequate operation and maintenance of the water system.

Figure 6-11 presents the results from the AWWA survey data.

Figure 6-11 Monthly Residential Sewer Bill, 3/4-inch meter, 7,500 gallons water usage



The AWWA Benchmarking Report did not have a statistically significant sample for sewer utilities in order to be able to include that comparison

6.2.4.3 Billing Performance Measures

There are two performance measures that the Finance Department selected for the utilities. Because the billing is performed on a combined utility basis, these are reported on a combined basis. Comparison data for these two performance indicators are from the AWWARF Study, Benchmarking Water Utility Customer Relations Best Practices. Within this study "Water Utilities" in some cases include utilities, such as the City's where water and sewer are combined.

B-1 Cost per bill

Purpose: This performance indicator quantifies the total cost of issuing all water utility customer bills by the total number of bills issued in the reporting period, as shown below.

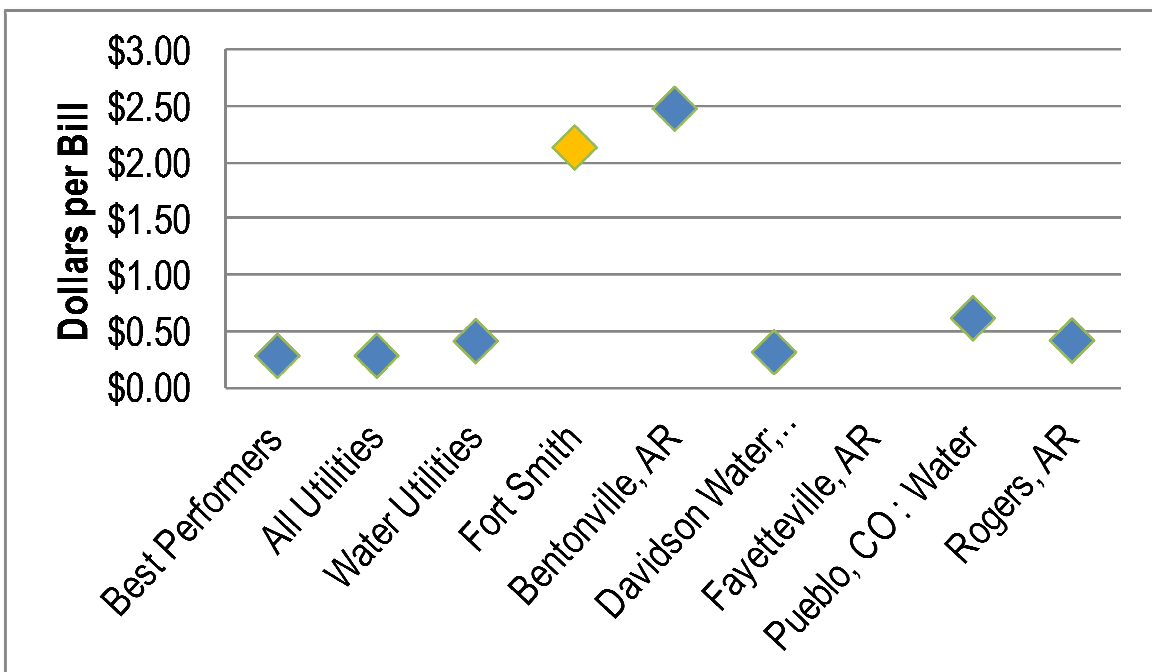
Metric:

$$\frac{\text{cost of produce annual billings}}{\text{total number of billings issued}}$$

Importance: This performance measure provides an understanding of the cost to produce a bill. However, it excludes the cost of meter reading and customer service, which are the major costs associated with billing and customer and dealing with any customer service issues.

Provided below in Figure 6-12 is a summary of the performance indicator for the monthly cost per bill.

Figure 6-12 Cost per Bill Issued



As can be seen, the cost of the AWWA surveyed utilities is relatively low, and again, reflects data from 2004. By comparison, the City's costs are significantly greater. However, the City does not currently capture costs in a manner that is comparable to the AWWA survey. The City's costs include customer service, which as noted previously, is a major component of the overall billing and customer service costs. Generally, HDR considers the total cost to read meters, send out a bill and provide customer service to be in the range of $3.00 to $5.00 per month. Given that, the City's costs certainly do not seem out of line with industry averages, when all of these cost components of the customer service and billing function are included.

B-2 Bad debt or write-offs as a percentage of total annual billings

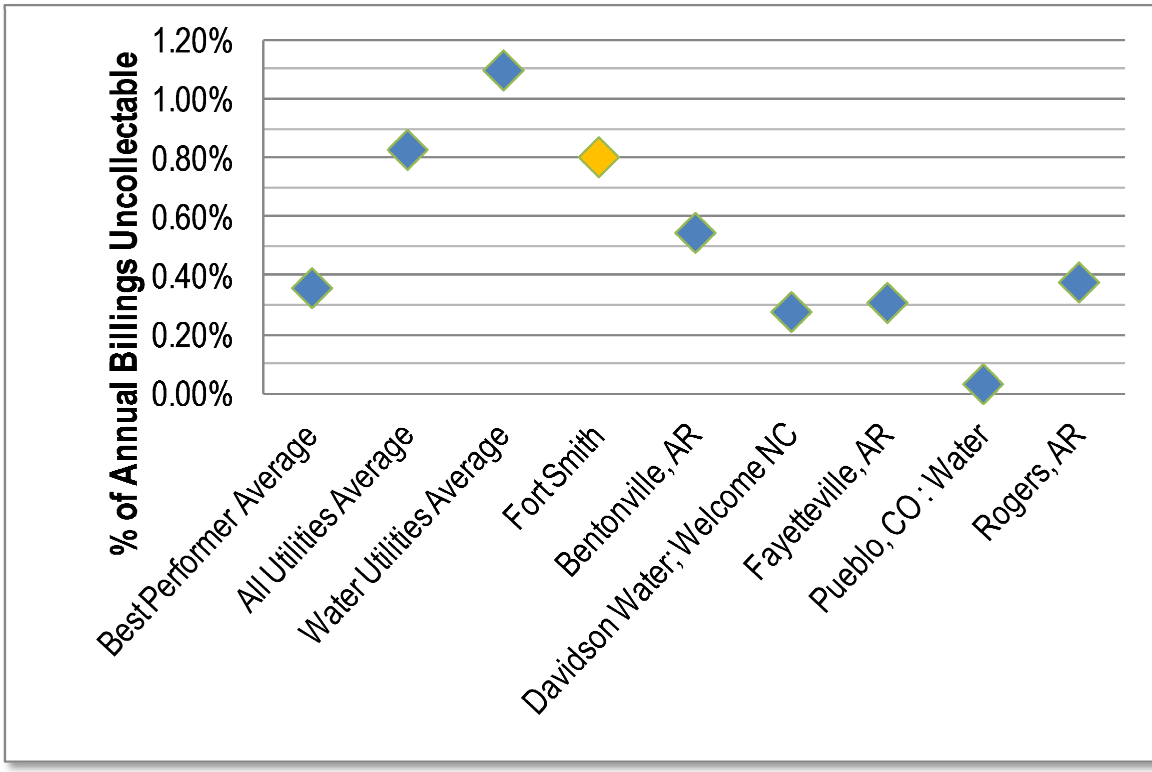
Purpose: This performance indicator divides bad debt (or write-offs) by the total annual billings to provide the utility with an understanding of how much potential revenue is lost in unpaid bills. This can provide information about the affordability of the utility service for the service area, the effectiveness of the billing cycle, and other important financial data.

Metric:

$$\frac{\text{total annual write-offs or bad debt}}{\text{total annual billings in same reporting period}}$$

Importance: Write-offs are typically determined on an annual basis, for bills that have not been paid, collections have been attempted, and the utility believes there is little or no opportunity of recovering these billed services. A high bad debt write-off can indicate a number of financial, rate or policy issues (e.g. notification, shut-off, etc.). Figure 6-13 presents the results from the AWWARF Study and the responding utilities.

Figure 6-13 Percentage of Total Billing Resulting as Uncollectable



Based upon the information recorded, it appears that the City's utilities have a bad-debt ratio that is very reasonable and appears to be well managed. A bad debt write-off percentage of less than 1% is very good. However, as noted above, bad debt write-offs can be a function of many things including the size of monthly bills, local income levels, late-payment policies, etc.

6.2.4.4 Performance Measurement Summary

This performance measurement review has accomplished a number of important items for the City. First, the performance measures as identified in this report will be used by the City going forward to monitor for continuous improvement. Next, this review has identified the difficulty in attempting to measure performance against other utilities. Many utilities are unwilling to participate in surveys, and then if they do, the data they provide may or may not be consistent with the data or definition that the City is using or attempting to capture. For those reasons, the City should internally focus on consistently measuring against themselves for purposes of continuous improvement.

While it is difficult to use this exercise to reach firm conclusions, HDR is of the opinion that the performance measures help to indicate that the City's overall utilities are relatively well managed and there are no indicators to suggest major problems or major deficiencies. Having said that, the performance did indicate some areas that the City may want to explore further. These include the following:

- The water distribution system has slightly higher than average water losses. This may be a function of many factors, but the performance measure of main breaks and leaks indicated a higher level than other utilities. This likely suggests the need for greater funding and focus on the water distribution system main repairs and replacements.
- The sewer system had a significantly higher level of overflow events. The City is currently working on controlling these over-flow events and over the years has made significant investments to meet the requirements of the consent decree.

HDR is of the opinion that the performance measures help to indicate that the City's overall utilities are relatively well managed and there are no indicators to suggest major problems or major deficiencies. There were areas identified that the City may certainly want to explore further.

The City should continue to gather data and review these measures over-time to monitor effectiveness and to measure improvements.

6.3 CURRENT FINANCIAL POLICIES

The adoption of a strong and complete set of written financial policies provides a foundation for the long-term financial sustainability of the utilities and provides the outside financial community with a better understanding of the City's commitment to managing each of the utilities in a financially prudent manner. At the same time, it provides to the City's Board of Directors with a consistent decision-making framework for establishing the City's water and sewer rates. Finally, rate-setting financial policies can provide the City's customers with an understanding that the utilities will be operated in a "business-like" manner. Financial and rate-setting policies are also integral to the process of developing a comprehensive rate study. Financial policies are intended to provide guidance in the financial planning and rate-setting process, and in the day-to-day financial management of the City's utilities.

The City has a set of financial policies to guide the overall financial management of the City as a whole. These financial policies appear to be targeted more toward the General Fund needs of the City. While some of the policies could be applied to the utilities, the utilities are enterprise funds, and as such, must be financially self-sustaining. For prudent utility management it is important to develop "utility specific" financial policies that provide guidance to the:

- Management of funds and maintenance of minimum reserve levels,
- Capital funding and financing, with a focus on renewal and replacement funding,
- Debt financing, and
- Rate setting process

A set of written financial/rate setting policies established for the City's utilities will be a major improvement and provide clearer guidance to utility management staff regarding the financial planning and rate setting process. Written financial policies provide a consistent framework for decision making, while moving the utilities to a more "business-like" approach. Financial policies are not meant to be set in stone, but like all policies should be reviewed on a routine basis to assure that the policies remain relevant and appropriate.

6.4 FINANCIAL PLANNING PROCESS

The financial planning process provides a foundation for informed decision-making of the financial elements of the City's utilities. HDR reviewed the financial planning process the City undertakes for each utility to consider how well it conformed to generally accepted industry practices, along with those areas where the financial planning process could be improved.

The City conducts a five-year financial (rate) planning process for the utilities. The use of a five-year planning horizon is not unusual for purposes of setting rates. Rates are generally set for no more than a five year period, and more typically, may be established on an annual basis.

The City has utilized outside consultants for their rate setting and wholesale "true-up" process. HDR received a hard copy of the true-up process the City's outside consultant performs. This copy appears to have included the use of the financial model components, with a four year historical look back, and the current "review period" year as the final year. The true-up process allows the City to see how the Utility compared to the rate projections.

We understand from talking with staff that the water utility model is also used to prepare a five-year projection. However, we were not provided with an electronic or hard copy of the model projections for review.

It appears that the City has a number of significant future capital improvements (an average of $8 million per year between 2012 and 2016 funded by revenue bonds, and an additional $5 million per year funded through sales tax bonds) and the need to plan for infrastructure renewal and replacement as the system ages, the City may want to lengthen the review period beyond the 5-year time period. The objective of a longer review period (e.g. 10 to 20 years) would be to view costs over a longer time frame and attempt to minimize rates over time.

The City continues to incur additional long-term debt and it was unclear to HDR whether the City has considered the long-term implications of continuing to fund capital improvements via long-term debt, while also attempting to minimize capital improvements funded from rates. At some point, and it is unclear when, the City will be over-burdened with outstanding debt and long-term debt service. A long-term financial planning process, beyond the existing 5-year approach will aid the City in better understanding the long-term implications of their current financing approach.

As a part of the financial planning process, a debt service coverage (DSC) ratio test is a simple financial measure of the utility's ability to repay long-term debt. More importantly, a DSC is a legal bond covenant in that the City has legally pledged to maintain their rates to meet or exceed this minimum. As the City continues to add long-term debt, the minimum DSC ratio test places more pressure upon the City's rates. In the Board's most recent rate adjustment discussion, the City was projected to fail meet this test and was adjusting the rates, in part, to meet this test.

The DSC will continue to be an issue for the City until such time that the need for long-term borrowing is reduced or eliminated, or the City moves to a stronger position related to rate funding of capital improvements. As the City increases their funding of capital improvements from rates, at the same time, the City will also be increasing their debt service coverage ratio. Development of a written financial policy regarding a minimum target DSC for financial planning purposes, along with a written policy on minimum funding for capital improvements from rates will jointly address this issue.

6.5 INFRASTRUCTURE REPLACEMENT FUNDING

In recent years there has been greater focus on the failing infrastructure within the U.S. The water and sewer utility industry is not immune from the concerns raised about failing infrastructure. Historically, governments and utilities have looked to the Federal government to provide grants or financial "life preservers". As everyone is aware, all levels of government, including the Federal government, are under increasing financial pressure. That means that local government and utilities will need to address their local infrastructure issues.

The problem with infrastructure funding is that many components of a utility system may have a life span of 30 to 75 years, yet the level of funding for the replacement of those items may be on a 150 to 300 year replacement cycle. Simply stated, utilities have significantly under-funded for the renewal and replacement of their existing utility infrastructure.

From a financial and rate setting perspective, it is important to establish at least minimum funding levels of renewals and replacements of utility infrastructure in order to be able to sustain existing levels of service. The funding of on-going renewal and replacement capital projects should primarily be from rate revenue. Whenever possible, the use of long-term debt issues to fund renewal and replacement projects should be minimized. Long-term debt is generally best used to fund major new capital infrastructure.

Generally accepted rate-setting principles include the practice of funding replacement of existing utility assets at a minimum level of depreciation expense, or alternatively as a percentage of the asset's original cost (e.g. 1.5%). Using 1.5% of original cost of an asset assumes a useful service life of approximately 65 years. In this sense, these assets are being renewed or replaced as their useful service life expires, and they are being funded by those customers currently benefitting from their use. Therefore, a minimum of depreciation expense should be funded from rates and replaced annually, or put into a replacement reserve for future replacements. Such a systematic process can be used to maintain the existing level of infrastructure in a financially sustainable manner. In actuality, there is a difference between an asset's depreciation expense and its *replacement* cost. Depreciation expense generally reflects the value of an asset that may have been purchase 20 to 30 years ago. Obviously the replacement cost of the asset will be much higher than the original cost of the asset. In many cases, the replacement cost of utility assets is typically at least twice the level of depreciation expense. Therefore, depreciation expense must be considered a *minimum* level of funding through rates for renewal and replacement.

HDR analyzed the City's current rate funding level of capital compared to current depreciation expense for each utility. The water utility funds, for the past few years, has funded between $200,000 and $500,000 toward capital, while the depreciation expense for fiscal year (FY) 2010 was $5.5 million. Most of the rate funding for capital was for equipment replacement, rather than applied toward infrastructure renewal and replacement. For the sewer utility, the total rate funding of capital over the past few years has been similar to that of water, funding equipment replacement needs, while infrastructure capital is funded with debt. The sewer utility's FY 2010 depreciation expense was approximately $3 million.

The City, during the time period reviewed by HDR, appears to be significantly under-funding the amount of capital improvements financed with rates (i.e. pay-as-you-go). This has long-term implications upon the City's infrastructure and the overall efficiency and operating costs of the system.

It is important for the City to begin to transition their rates to fund at a greater level for renewal and replacement capital projects. This will help to establish a more sustainable funding source for utility renewal and replacement.

6.6 DEBT/RATE FINANCING

In very simplistic terms, a utility has two ways in which it can fund a major capital project. The first approach is to simply pay cash for the project. This implies that rates or capital reserves are sufficient to meet the year-to-year cash-flow requirements of the City's capital projects. Alternatively, a utility may borrow funds (i.e. incur long-term debt) and repay that debt over an extended period of time (e.g. 20 to 30 years). From a financial planning perspective, two important items should be noted regarding these two methods of funding capital projects. First, generally some combination of rate and debt financing will provide the lowest rates over time. Simply stated, it is often difficult to pay for major capital projects directly from rates without the need for large significant adjustments to rates. Hence, the use of long-term debt not only eliminates the need for these large spikes in rates, but also spreads the cost of the capital project over the useful life of the asset via annual debt service payment, which some may argue is the most equitable method of assessing major capital infrastructure costs. The second important point to be made in this discussion is that while the use of long-term debt may be a more equitable method of assessing the costs of major capital projects, the reality is a utility can not borrow funds (i.e. incur long-term debt) for 100% of their capital projects. Some combination of rate funding (equity) and long-term debt will produce the least cost mix of funding/financing.

The City has relied heavily on debt financing for a majority of capital project funding. Some bonds are funded through sales tax bonds, as opposed to revenue bonds supported by the revenue of the utilities. One concern considered during this study is whether the City's citizens will continue to support sales tax bonds for utility infrastructure projects. As additional debt is issued, the City may need to have another vote to increase the sales tax to support the bond. At some point, "voter fatigue" will likely settle in and the City will need to consider other potential funding sources (e.g. revenue bonds). A financial policy establishing appropriate use of sales tax bonding would benefit the utilities and provide guidance to use of this particular funding source.

The City is interested in determining the most appropriate mix of long-term debt financing and equity (rate) financing. A long-term financial planning model (10 to 20 years) is the best tool for determining an appropriate debt to equity ratio for the City's utilities. As noted in the above discussion, the need to meet minimum debt service coverage ratios will reach a tipping point and the City will need to either increase rates to support more debt and the coverage ratio, or use other funding mechanisms that may not contain a DSC requirement (e.g. low-interest state loans).

Over-reliance upon long-term debt will reach a "tipping point" when the City needs to increase their rates simply to meet debt service coverage requirements. The City is currently at or near that point, yet the City has been significantly under-funding their capital improvement projects from rates, which directly effects the City's debt service coverage ratio (DSC).

Currently the City has an umbrella policy that debt should not exceed 25% of operating revenue. However, in the past two years this policy has been exceeded by 10%. Typically an "optimal" debt to equity ratio ranges between 40% debt to 60% equity and 60% debt to 40% equity. Using financial information from the City's FY 2011 financial statement, HDR calculated a debt to equity ratio of approximately 60% debt to 40% equity for the City's utilities. This debt/equity ratio implies that the City may be nearing the upper limits of their ability to fund long-term debt. There certainly are utilities that exceed the 60% debt ratio, but HDR is of the opinion that the 60% debt ratio is an important demarcation point for a municipal utility.

Utilities that are typically in this higher debt range have incurred large capital investments necessary to expand/maintain infrastructure or to meet regulatory requirements. If the City does not want to exceed this upper range, some adjustments in funding of capital will need to begin. If the utilities were to begin to work toward funding depreciation expense, a $1 million level of funding would mean approximately a 3.2% rate adjustment for the water utility and approximately an 8.2% adjustment for the sewer utility. This action would improve the DSC ratio while helping the City to maintain its bond rating.

6.7 RATE AFFORDABILITY

There are a number of different measures of "affordability" which is an important consideration to setting rates and in funding of capital projects. Measuring affordability may trigger more favorable funding terms or implementation time periods for regulatory related capital projects. In the past, consent decrees have largely ignored the financial/rate impacts to communities and the issue of affordability. This may be slowly changing. As an example, recent federal legislation has been introduced to amend the Federal Water Pollution Control Act to assist municipalities that cannot meet unfunded mandates to improve their wastewater infrastructure projects. If approved, the impact may extend repayment periods on loans, extension of time periods for implementation, and potentially, the availability of grant funding. While this legislation is not currently passed, it is important to understand the issue of affordability and how it may impact the City in the financing and funding of the legally mandated projects.

The Environmental Protection Agency (EPA), the Community Development Block Grant (CDBG) funding agency, the United States Department of Agriculture Rural Development (USDA RD) grant programs and state agencies tasked with implementing infrastructure funding programs each have various measures of affordability. In general, the guidelines that are used to measure affordability are typically based on a certain percentage of median household income (MHI) for the locale applying for the grant or low-interest loan funding. Affordability measures generally range from 1.5% to 2.5% of median household income. Affordability is also typically measured by these percentages on an individual utility basis. That is, if the monthly water utility bill is $35.00 and the median household income is $36,000, then the water utility rates represent 1.2% of the median household income. If the sewer utility were applying for grant or low-interest loan funding, it would be measured on its own. However, it is also important to be aware of the utility bill impact to a typical household from an affordability standpoint.

HDR developed an evaluation of the City's existing utility rates for an average utility household to determine if the City's rates "pass" the affordability test. In this test HDR used the existing residential rates for each utility and compared them to 1.5% to 2.5% of the Fort Smith median household income. Figure 6-14 below indicates that each utility individually passes all affordability tests at 1.1% of the median household income (that the monthly rates are less than 1.5% of median household income). That is approaching the first threshold, and most conservative measure, of affordability.

Figures 6-14 Water and Sewer Utility Rate Affordability Test

City of Fort Smith
Review of Utility Rate Affordability

		Range of Affordability		
		1.50%	**2.00%**	**2.50%**
Median Household Income	$36,200			
Annual Bill at Affordability Limit		$543.00	$724.00	$905.00
Monthly Bill at Affordability Limit		$45.25	$60.33	$75.42
Water Utility				
Residential rate: 3/4" meter, 7,500 gallons - 2011 was $23.77				
Average Rate - 2011 - 2015; 5-year period	**$33.07**	Pass	Pass	Pass
Percentage of median household income	**1.10%**			
Sewer Utility				
Residential rate: 3/4" meter, 7,500 gallons - 2011 was $25.51				
Average Rate - 2011 - 2015; 5-year period	**$33.61**	Pass	Pass	Pass
Percentage of median household income	**1.11%**			

Under any measure of "affordability" the City's water and sewer rates appear to be "affordable" on a community-wide basis. This implies that the City still has room to increase their rates before they would be considered "unaffordable" on a community-wide basis.

6.8 SYSTEM DEVELOPMENT CHARGES

System development charges (SDCs) are a one-time charge assessed against new customers connecting to the utility system, or existing customers that are significantly expanding their capacity use. System development charges are a means of balancing the cost requirements for new utility infrastructure between existing customers and new customers.

The portion of existing infrastructure and future capital improvements that will provide service (capacity) to new customers is included within the SDC. In contrast to this, a utility will have future capital improvement projects that are related to renewal and replacement of existing infrastructure in service. These infrastructure costs are typically included within the rates charged to the utility's customers, and are not included within the SDC. By establishing cost-based SDCs, a utility is taking the position that "growth should pay for growth" and existing utility customers should, for the most part, be sheltered from the financial impacts of system capacity expansion and growth.

Simply stated, SDCs are a contribution of capital to either reimburse existing customers for the available capacity in the existing system, or help finance planned future growth-related capacity improvements. At some utilities, SDCs may be referred to as impact fees, plant investment fees, etc. Regardless of the label used to identify them, their objective is the same. That is, these charges are intended to provide funds to the utility to finance all or a part of the "backbone" infrastructure needed to serve and accommodate new customer growth. Absent SDCs, the existing ratepayers (customers) assume the risk and a majority of the costs associated with growth. Most utilities have "tap" or "meter" fees which is simply the cost of the meter and service line. An SDC is to pay for the capacity of the backbone infrastructure (e.g. sewer treatment plant capacity, major interceptors, etc.).

At the present time, the City does not charge water or sewer SDCs to their customers. Some communities believe that SDCs hinder growth and may actually push growth to the outlying areas that do not have SDCs. The City has considered these fees in the past, but for policies reasons decided not to pursue or implement SDCs.

At the present time, the City does not impose system development charges (impact fees) for new water and sewer connections. Given the current financial and rate pressure upon the water and sewer utilities, this is a potential source of revenue that could be used to fund growth-related capital projects and/or debt service, and help to minimize the City's water and sewer rates, now and into the future. Each dollar of SDCs collected, may translate into a dollar less of long-term borrowing for the City's utilities.

As a point of reference concerning the fees, if the City had implemented SDCs in the past, the financial benefit would have been fairly significant. From 2006 – 2010, the City had 1,129 new residential connections. Assuming a combined water and sewer SDC of $2,000 per new connection, the City would have collected $2.3 million for growth related infrastructure. The $2,000 for a combined water and sewer SDC is not unreasonable and fairly comparable to the SDCs or impact fees charged by Rogers, Bentonville and Fayetteville[4].

[4] The combined water and sewer SDCs fees for these NW Arkansas utilities range from $1,387 to $2,900.

6.9 FINANCIAL/RATE SUMMARY

The overall financial and rates efficiency rating would range from a "Defined Approach" to "Managed."

- The City has identified performance measures to gage its future progress.
- The City's overall utilities are relatively well managed and there are no indicators to suggest major problems or deficiencies.
- The City has a set of financial policies to guide them but it appears to be targeted more toward the General Fund needs.
- The City conducts a 5-year financial rate planning process.
- The City has relied heavily on debt financing for a majority of capital project funding.
- The City has been under funding the capital improvement projects from rates.
- The City's water and sewer rates appear to be "affordable" on a community wide basis.
- The City does not impose system development charges at this time.
- The City continues to incur additional long-term debt and it is unclear whether the City has considered the long-term implications and the potential financial issues associated with continuing to fund the vast majority of major capital improvements via long-term debt.

6.10 FINANCIAL/RATE RECOMMENDATIONS

Based on the review of financial planning, policies and practices for the water and sewer utilities, HDR has the following observations and recommendations.

- Continue collecting and developing performance measures. The Utility can compare its performance to its past performance as well as to similar Utilities. The Carnegie Mellon Capability Maturity Model can be used to assess the Utility's performance from year to year. HDR has provided an initial assessment that can serve as a starting point (refer to Appendix A). The Utility should collect data for the performance measures that have been identified for tracking.
- The City should develop a set of financial and rate-setting policies to guide the decision making processes for the utilities. Most importantly, at a minimum the policies should address:
  - ✓ Reserve funds and minimum target balances
  - ✓ Funding renewal and replacement infrastructure projects at a minimum level equal to depreciation expense; gradually implementing this policy to avoid rate shock
  - ✓ For financial planning purposes, establish a target DSC ratio, above the minimum required rate covenant
  - ✓ Establish debt financing policies and targets, and review debt equity ratios.
  - ✓ Consider system development charges (connection charges) for both utilities

- Develop a long-term financial planning model (e.g. 10 – 20 years) to better understand the financial and rate implications of the City's long-term financing strategy and the issuance of debt.
- Continue to pursue outside funding sources for capital projects, grants and low-interest loans, to aide in keeping rates as low as possible.
- The rate model results presented to Council should provide an affordability test to help provide a context as to the appropriateness of the level of the rates.

The City should develop a set of financial and rate-setting policies to guide the decision making processes for the utilities.

HDR would recommend that the City develop specific and written financial policies for the City's water and sewer utilities. There are many benefits to the City and the Board from having (adopting) a set of written financial policies for the utilities. These include:

- Provide clear policy guidance to management and staff concerning the financial planning and rate setting process.
- Create a foundation for consistent and logical financial and rate decision making.
- Provide future Board's with an understanding of the policy basis for past Board decisions and rate adjustments.
- Demonstrate prudent and sustainable financial planning and management practices to the outside financial community and bond rating agencies.

In making this recommendation, there are several specific areas that HDR recommends the City develop utility financial rate-setting policies around. Those include, but are not limited to:

- **Minimum Funding of Reserves**: Establishing the specific reserves to be maintained by the utility (e.g. operating reserve, capital reserve, bond reserve, rate stabilization reserve, etc.) and the financial basis for the establishment of a minimum reserve level for each of the reserves (e.g. operating reserve = 90 days of O&M expenses).
- **Minimum Renewal and Replacement Funding:** Create a specific basis or method to establish a minimum level of funding from rates for renewal and replacement projects (e.g. ≥ annual depreciation expense, % of total plant investment, asset management plan, etc.).
- **Short-Term and Long-Term Debt Financing Policies:** Establish a clear policy concerning the appropriate use or types of projects to be funded with long-term or short-term debt. This may include the establishment of a specific debt/equity ratio, along with a minimum target debt service coverage ratio (e.g. 1.50 for financial planning purposes).
- **Growth and System Expansion Policy** – The cost of system expansion to create capacity for new customers connecting to the water or sewer system can be significant. Given that, it may be prudent for the City to establish a policy statement regarding growth and system expansion – i.e. should "growth pay for growth"? If the City determines that

"growth pays for growth" then a policy regarding the establishment of system development (capacity) charges should be established.

- **Accounting and Reporting** – Provide a policy statement regarding standards and practices for budgeting, accounting and reporting of the utilities.
- **Rate Reviews:** Establishing the frequency of rate review (recommended to be annual) and comprehensive rate studies (typically recommended to be at least once every five years)
  - ✓ Identifying the elements of a comprehensive rate study and the methodologies and approaches to apply to the City's utilities (note: there are contractual requirements for wholesale rate setting).

Develop a long-term financial planning model (e.g. 10 – 20 years) to better understand the financial and rate implications of the City's long-term financing strategy and the issuance of debt.

The City should develop specific financial policies regarding the use of long-term debt. This does not necessarily imply a specific debt/equity ratio, but rather, the situations or conditions around which long-term debt should be considered. The development of a long-term financial planning model (10 – 20 years) should be used to assess the full financial and rate implications of any new debt issue and its impact upon future CIP and rates. The City should strive to improve their debt service coverage ratio (DSC) to well above minimum covenant levels. This will require the Board to increase water and sewer rates beyond current levels.

The City should begin to increase the component within their water and sewer rates for the rate funding of capital improvement projects. As this component of the rates is increased, the City will have a greater amount of funding available to maintain existing infrastructure, while at the same time, reducing the City's reliance upon long-term debt issues for these types of capital improvement projects (R&R). An additional benefit of increased rate funding for capital improvement projects is a corresponding improvement in the City's debt service coverage ratio (SSC)

The rate model results presented to Council should provide an affordability test to help provide a context as to the appropriateness of the level of the rates.

The City should incorporate an affordability test into its rate setting process. This will help inform the Board of the rate impact on lower income households, possibly aide in development of low-income/elderly assistance programs or rates.

7 CITIZEN'S ADVISORY COMMITTEE

7.1 INTRODUCTION

The City of Fort Smith currently uses a Citizen's Advisory Committee, which functions as a lead to the community and the City's Board of Directors. The Citizen's Advisory Committee and the Utility have developed a level of trust, which is critical for a Utility and its customers.

Similar to the existing citizen's advisory committee model, a project-specific Citizen's Advisory Committee was organized for the Water and Sewer Operations Efficiency Study. The committee was kept informed about the progress of the report through periodic updates, reviewed the report, and provided recommendations.

7.2 MEETING SUMMARIES

Five meetings held involving the Citizen's Advisory Committee. They are as follows:

- Kickoff Meeting (October 18, 2011)
  - Defined Efficiency
  - Outlined the Advisory Committee's Roles and Responsibilities
  - Provided an Overview of the Scope of the Study
- Advisory Committee Update Meeting 1 (December 8, 2011)
  - Elected Advisory Committee Chairperson
  - Provided Overview of High Level Business Processes Section
  - Provided Overview of Planning Section
- Advisory Committee Update Meeting 2 (February 13, 2012)
  - Provided Overview of Operations Section
  - Provided Overview of Financial Section
- Advisory Committee Update Meeting 3 (November 15, 2012)
  - Provided an Overview of Report and Recommendations
- Joint Meeting of the Board and Advisory Committee (February 7, 2013)
  - Presented Report Recommendations from HDR and the Committee

Appendix G contains copies of each of the five presentations.

7.3 COMMITTEE RECOMMENDATIONS

Please refer to Appendix G for the recommendations from the Citizen's Advisory Committee, which are contained in the February 7, 2013 presentation.

8 SUMMARY RECOMMENDATIONS

8.1 RECOMMENDATIONS

The highest priority recommendations are compiled in this summary. Recommendations are ordered by report section. HDR believes the Utility should implement the priority recommendations listed below as a starting point to improve overall efficiency:

SECTION 3

- Develop an Asset Management Plan as part of the Utility Strategic Plan with demonstrated commitment from management and a system of continuous improvement.
- Include Asset Management information in the Capital Improvement Plan
- Create Levels of Service and a process for updating the targets as part of the Utility Strategic Plan.
- Improve the Utility Billing and Collection Process.
- Create a Succession Plan as part of the Utility Strategic Plan

SECTION 4

Water Recommendations

- An additional 1 log credit can be obtained for the Lee Creek Treatment Facility by utilizing a Watershed Control Program and a Combined Filter Performance standard, which do not require large capital projects to be undertaken.
- Respond more quickly to changing influent conditions through the addition of in-line raw water monitoring for turbidity and/or pH. These samples are currently lab tested and returned.
- A micro-turbine should be investigated to see if it is cost-effective to take advantage of the head from the Lake Fort Smith Water Treatment Plant.

Wastewater Recommendations

- Further investigation should be undertaken to see if using the in-line chlorine analyzer for sodium bisulfite could reduce the quantity of chemical used.
- The P St Plant could increase electrical efficiency through the addition of VFDs to blowers (if possible with operating conditions) and in-plant water pumps.

SECTION 5

- Assess project management and staffing needs.

- Examine unaccounted for water and better identify areas of unaccounted for water.

SECTION 6

- Continue collecting and developing performance measures. The Utility can compare its performance to its past performance as well as to similar Utilities. The Carnegie Mellon Capability Maturity Model can be used to assess the Utility's performance from year to year. HDR has provided an initial assessment that can serve as a starting point (refer to Appendix A). The Utility should collect data for the performance measures that have been identified for tracking.
- The City should develop a set of financial and rate-setting policies to guide the decision making processes for the utilities. Most importantly, at a minimum the policies should address:
  - ✓ Reserve funds and minimum target balances
  - ✓ Funding renewal and replacement infrastructure projects at a minimum level equal to depreciation expense; gradually implementing this policy to avoid rate shock
  - ✓ For financial planning purposes, establish a target DSC ratio, above the minimum required rate covenant
  - ✓ Establish debt financing policies and targets, and review debt equity ratios.
  - ✓ Consider system development charges (connection charges) for both utilities
- Develop a long-term financial planning model (e.g. 10 – 20 years) to better understand the financial and rate implications of the City's long-term financing strategy and the issuance of debt.
- Continue to pursue outside funding sources for capital projects, grants and low-interest loans, to aide in keeping rates as low as possible.
- The rate model results presented to Council should provide an affordability test to help provide a context as to the appropriateness of the level of the rates.

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9 REFERENCES

ADS Environmental Services, Inc., Long Term Flow Monitoring Project – Engineering Analysis, prepared for the City of Fort Smith, Arkansas, December, 2001.

Bloetscher, Frederick, Utility Management for Water and Wastewater Operators, published by the American Water Works Association, 2011.

Burns & McDonnell, Long Term Water Demand Projections – Letter Report. Prepared for the City of Fort Smith, Arkansas, 2009.

Burns & McDonnell, Water System Master Plan. Prepared for the City of Fort Smith, Arkansas, 1993.

Camp Dresser & McKee, Wet Weather Improvements – Phase II P Street Wastewater Treatment Plant. Prepared for the City of Fort Smith, Arkansas, May, 2007.

Camp Dresser & McKee, Wastewater Management Plan – Supplemental Report. Prepared for the City of Fort Smith, Arkansas, June, 1997.

Camp Dresser & McKee, Wastewater Management Plan. Prepared for the City of Fort Smith, Arkansas, September, 1993.

JBS Associates, Inc., Water Distribution System Audit – City of Fort Smith Arkansas. Prepared for the City of Fort Smith, Arkansas, December, 2003.

Mickle Wagner Coleman, Inc., Study of Water System Improvements to Supply Chaffee Crossing's Continued Growth. Prepared for the City of Fort Smith, Arkansas, September, 2011.

Mickle Wagner Coleman, Inc., Master Plan for Water & Sewer Service in the Southern Growth Area & Chaffee Crossing. Prepared for the City of For Smith, Arkansas, February, 2010.

RJN Group, 2010 Flow Monitoring and Analysis Final Report. Prepared for the City of Fort Smith Arkansas, February, 2011.