ORANGE WATER AND SEWER AUTHORITY

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.

AGENDA
WORK SESSION OF THE OWASA BOARD OF DIRECTORS
THURSDAY, DECEMBER 10, 2015, 6:00 P.M.
OWASA COMMUNITY ROOM

The Board of Directors appreciates and invites the public to attend and observe its meetings. For the Board's Work Session, public comments are invited on only items appearing on this agenda. Speakers are invited to submit more detailed comments via written materials, ideally submitted at least three days in advance of the meeting to the Clerk to the Board via email or US Postal Service (aorbich@owasa.org/400 Jones Ferry Road, Carrboro, NC 27510).

Public speakers are encouraged to organize their remarks for delivery within a four minute time frame allowed each speaker. Additional time may be allowed at the discretion of the Board of Directors.

The Board may take action on any item on the agenda.

Announcements

a. Announcements by the Chair
   - Any Board Member who knows of a conflict of interest or potential conflict of interest with respect to any item on the agenda tonight is asked to disclose the same at this time.
   - Update to the Standing Committees of the Board of Directors

b. Announcements by Board Members
   - Update on the December 2, 2015 Inter-local Energy Collaboration Working Group Meeting (Terri Buckner)
   - Update on the December 7, 2015 Community Engagement Committee Meeting (Ruchir Vora)
   - Update on the December 10, 2015 Human Resources Committee Meeting (Robert Morgan)

c. Announcements by Staff
   - Update on the 2015 Customer Survey (Ed Kerwin)

Discussion

1. Draft Advanced Metering Infrastructure Feasibility Study (Dan Przybyl/Todd Taylor/Don Schlenger, Don Schlenger and Associates, LLC)
2. Discussion of Cost Allocation Study (Stephen Winters/Andy Burnham, Burton and Associates)
3. Discuss Draft Executive Director's Performance Goals (John Young/Ed Kerwin)
4. Review Board Work Schedule (John Young/Ed Kerwin)
   a. Request(s) by Board Committees, Board Members and Staff
   b. 12 Month Board Meeting Schedule
   c. January 14, 2016 Work Session
   d. January 28, 2016 Board Meeting

Summary of Work Session Items

5. Executive Director will summarize the key staff action items from the Work Session

Agenda Item 1:

Draft Advanced Metering Infrastructure (AMI) Feasibility Study

Purpose

The draft AMI Feasibility Study seeks to identify the optimal technology for reading meters in OWASA's service area. Historically meter reading has been a labor intensive manual process. However, technological advances have opened the door to automation. Automated Meter Reading (AMR) (short range drive-by system) and AMI (fixed network) systems can collect meter readings via radio, significantly reducing the time and effort required to obtain this data. OWASA has been in the process of slowly converting to an AMR system. However, the industry is trending towards AMI technology and OWASA has been unable to fully capture the benefits of AMR with our current implementation strategy.

Background

During the September 25, 2014 Board meeting, the Board authorized staff to issue a request for qualifications and to select the best qualified firm for consulting services for the potential implementation of an AMI system. Don Schlenger and Associates (DS&A) was selected for this project through a nationwide, qualifications based selection process and began their work in July 2015. DS&A's first task is to prepare a Feasibility Study, which the Board will consider prior to deciding whether to move ahead with system procurement. The draft AMI Feasibility Study is attached for the Board's review. Don Schlenger and staff will be seeking feedback from the Board on this draft at its December 10, 2015 work session.

Methodology

The draft AMI Feasibility Study analyzes the performance of alternative strategies against the current AMR implementation process. The Board and staff directed DS&A to evaluate the following alternatives:

1. AMR deployed rapidly throughout OWASA's service area
    a. Replace with new equipment (New AMR)
    b. Continue with current equipment (Old AMR)
2. AMI deployed rapidly throughout OWASA's service area (AMI)
3. AMI deployed rapidly over a portion of OWASA's service area; AMR rapidly deployed elsewhere (Hybrid)

DS&A interviewed staff, reviewed policies and procedures, and mapped processes to gain a better understanding of the current situation to identify opportunities for process improvements via technological advancements.

The draft AMI Feasibility Study thoroughly analyzes the economic as well as non-economic performance (i.e. social and environmental) of each alternative. Economic performance is evaluated by inserting available data and assumptions into a discounted cash flow model to

generate net present values (NPVs) and internal rates of return (IRRs) for each alternative. Key assumptions in the model were reviewed by staff to ensure they reflect the conservatism with which we approach all endeavors. Non-economic performance is assessed through the weighting of the impact and importance of sustainability criteria. The draft Feasibility Study also assesses project risk through a subjective rating table where staff assigned degrees of probability and assessed the impact of a variety of project risk factors for both AMR and AMI.

Results

The draft AMI Feasibility Study demonstrates that AMI, while initially more expensive and riskier than some of the other alternatives, is the optimal solution for reading meters in OWASA's service area. AMI has a significant advantage over the other alternatives in terms of non-economic performance. AMI also outperforms the alternatives financially by yielding the only positive NPV and the highest IRR. Risks associated with AMI are elevated, however, these differences are negligible and the risks can be mitigated. The following table summarizes the results of the analyses:

Alternative	Non-economic[1]	Cost (Millions)	NPV 15 Year@3.5% (Millions)	IRR 15 Year	Risk
1a - New AMR	54	$4.52	($0.58)	0.8%	Low
1b - Old AMR	54	$3.55	($0.10)	2.9%	Low
2 - AMI	223	$5.43	$0.73[2]	6.0%	Low/Med
3 - Hybrid	4	$5.41	($0.64)	1.0%	Low/Med

Study Recommendations

Based on the results of the draft Feasibility Study, DS&A recommends that OWASA immediately abandon its current program and initiate the procurement of a rapidly deployed AMI system for the entire service area. OWASA must develop and implement the risk mitigation plans as prescribed in the draft AMI Feasibility Study to ensure successful project implementation. Various policies and procedures also need to be changed in order to take full advantage of the new system.

Action Requested

[1] Staff scored various criteria with regards to importance (1 to 9, indicating low to high importance, respectively) and together with the DS&A team assigned an impact score for each of the alternatives using a range from -10 to +10 (indicating major drawback to major benefit, respectively). These figures are the cumulative scores for each alternative.

[2] Savings from the salvage value of the replaced meters, and discontinuance of the current meter replacement and future AMR replacement reduces the net project cost by ~$2.5 million.

- No formal action is needed at this time.

- We are seeking the Board's feedback regarding the draft AMI Feasibility Study.

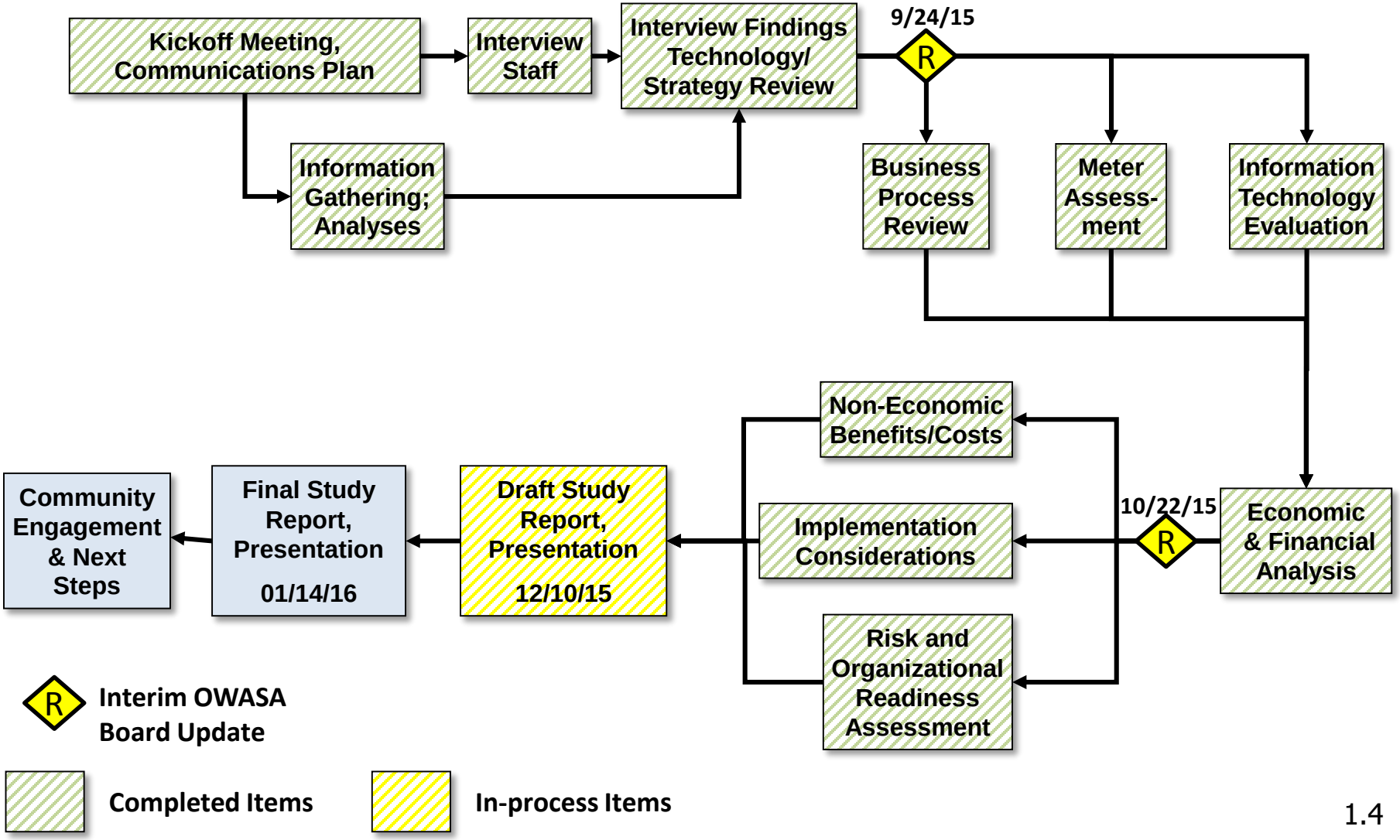
Information

- Project Flowchart

- Draft AMI Feasibility Study

- AMI Feasibility Study Report Supplement

OWASA AMI Feasibility Study Tasks



Don Schlenger and Associates, LLC

DS&A

Draft Report to

Orange Water and Sewer Authority

OWASA

Advanced Metering Infrastructure (AMI) Feasibility Study

November, 2015



Orange Water and Sewer Authority
AMI Feasibility Study

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Acronyms Used in this Report

ALD -	Acoustic Leak Detector
AMI -	Advanced Metering Infrastructure
AMR -	Advanced Meter Reading
CIS -	Customer Information System
CSR -	Customer Service Representative
DCU	Data Collector Unit
DS&A -	Don Schlenger and Associates
EMF -	Electric and Magnetic Field
FTE	Full-time Equivalent
GIS -	Geographic Information System
IVR -	Interactive Voice Response
IRR -	Internal Rate of Return
IT -	Information Technology
KPI -	Key Performance Indicator
MDMS -	Meter Data Management System
MHz	Megahertz
MIU -	Meter Interface Unit
NaaS -	Network as a Service
NPV -	Net Present Value
OWASA -	Orange Water and Sewer Authority
SaaS -	Software as a Service
TBL -	Triple Bottom Line
UNC	University of North Carolina

Section 1. Executive Summary

Orange Water and Sewer Authority's (OWASA) approximately 21,300 water meters are read monthly using a combination of manual reading and mobile automatic meter reading (AMR). For several years, OWASA has been installing AMR devices (Mueller HotRod radios) for all new meters, including those installed under its small meter 20-year age changeout program or in conjunction with other meter replacements, and those installed in new developments. Continuing this approach would result in the eventual saturation of OWASA's meters with AMR; however, at the recent rate of installation, this would take about 12 to 14 more years.

OWASA has been concerned that the current AMR system implementation strategy is likely not the most cost-effective or best long-term metering solution for the utility and its customers. As part of a strategic initiative included in the OWASA Board of Directors' *Strategic Plan for Fiscal Years 2014 – 2017*, OWASA decided to undertake a study of the feasibility of implementing an advanced metering infrastructure (AMI) system as an alternative to the current approach. AMI technology enables meters to be read frequently over a fixed radio network. Many utilities now have or are considering deploying AMI systems. AMI would enable OWASA to obtain hourly readings from customers' meters and make this data available to OWASA employees and customers. AMI can provide near real-time reads for transfer of service and alerts about usage on vacant accounts, and possible leaks and wastage. This can increase the effectiveness of customer service representatives (CSRs) and reduce the volume of customer calls and the number of field visits while enhancing customer service. AMI could also augment OWASA's non-revenue water management.

OWASA retained Don Schlenger and Associates (DS&A) to complete the AMI feasibility study. The study evaluated three key alternatives: (1) AMR (either using a new system or continuing with the HotRod system), (2) AMI, and (3) a hybrid solution consisting of a limited AMI network covering the meters of the UNC main campus and medical institutions as well as the Chapel Hill/Carrboro central business district. (Under the hybrid alternative, the remaining meters not covered by this network would be converted to AMR.) The alternatives were evaluated in comparison to OWASA's current extended meter changeout and AMR deployment program.

DS&A developed discounted cash flow models to evaluate the key alternatives. The models incorporate the cost of AMI/AMR capable meters, radio transmitters and data collectors, software to store the data and make it available to users, project management, and operation and maintenance. A new project would replace OWASA's existing program for meter replacement and AMR deployment, so there would be an offset to capital cost. Savings from an AMI system would come primarily from reductions in personnel and vehicle costs (mainly by redeploying Utility Mechanics who read meters). A new metering system would require 3-6 months of preparation, and one year of deployment. The models calculate the net present value (NPV) of the costs and savings for each alternative over 15 years using a discount rate tied to OWASA's borrowing costs, as well as the internal rate of return (IRR). Summary results of the analyses are as follows:

	AMR (New)	AMR (w/HotRod)	AMI	Hybrid
Capital Cost, $M*	4.52	3.55	5.43	5.41
Existing Program Offset, $M	2.44	1.96	2.44	2.44
Annual O&M, $M	0.03	0.03	0.16	0.03
Annual Savings, $M	0.14	0.14	0.47	0.22
NPV 15Yr@3.5%, $M	(0.58)	(0.10)	0.73	(0.64)
IRR 15 year	0.8%	2.9%	6.0%	1.0%

*including 5% contingency

The economic analysis indicates that full deployment of AMI throughout OWASA's service area has the greatest NPV and IRR.

While economic analysis of AMI deals with hard, direct costs and benefits, other factors (economic benefits and costs that accrue to others and/or are difficult to quantify, as well as social and environmental impacts) were considered. For example, when compared to AMR, AMI enables much more timely identification, notification, and reduction of leaks in customers' premises, which can enhance OWASA's sustainable water management and service affordability efforts. By reducing the number of vehicles used for meter reading and field service, OWASA would reduce related greenhouse gas emissions. By providing more timely and actionable information to customers, OWASA can alleviate stressful situations for certain customers and increase overall satisfaction and goodwill among its customers. These and other non-economic factors were enumerated, weighted and scored on a relative basis for each of the alternatives by OWASA staff and DS&A. As with the economic evaluation, the relative scores of the non-economic factors also strongly favor AMI over the alternatives. On the basis of the economic analyses and the consideration of non-economic factors, DS&A recommends that OWASA implement an AMI system instead of continuing its current slow AMR conversion.

AMI and AMR projects entail some risk. Technology risks include premature equipment obsolescence, excessive or premature component failures, incompatibility with future meter registers, inadequate performance of the system, insufficient safeguards to secure customer (and utility) information, and loss or corruption of critical data. Business risks include instability of vendors, issues related to redeploying employees, lack of employee and customer buy-in, business case assumptions that change or fail to materialize, unanticipated cost increases, lack of ongoing system support and maintenance, and failure to integrate the system with other utility information systems and change processes to completely take advantage of the technology.

Most of these risks can be prevented or mitigated through careful planning, good leadership, stakeholder engagement, well-written requests for proposals and contracts, thorough due diligence on vendors, and adequate OWASA staffing and support. Continuing risk assessment and management is an essential dimension of AMI project success. If OWASA decides to proceed with implementation of AMI, it should develop and continuously update a risk register to identify and prioritize AMI-related technological risks and business risks, and a risk management plan to prevent or mitigate risks.

AMI is a major investment. To be successful in implementing AMI, OWASA should prepare itself in several ways. It should adopt best customer service practices as a foundation for effectively using AMI. In addition to surveying and understanding contributions and barriers to satisfaction, OWASA should establish and measure process-oriented key performance indicators

(KPIs), such as first call resolution percentage, related to the customer experience and efficiency of operations. OWASA managers need to be responsible for performance against KPI targets.

There needs to be close collaboration and communication among OWASA's Information Technology (IT), Customer Service and Distribution Operations field staff. OWASA managers should adopt policies that leverage AMI to help cost-effectively deliver customer service, and cost-based charges for service that could more effectively be handled by using the AMI system.

If OWASA were to deploy AMI, it should streamline its business processes where possible. AMI will produce huge volumes of information that if properly managed, can provide many benefits to the utility and its customers. OWASA must ensure its customer and field service staff are sufficiently computer-literate and trained in maximizing the value of the information provided by the AMI system. They need to be confident in their ability to assist customers (including customers who are not computer-literate) and resolve billing and other service issues using system data. Customer Service Representatives (CSRs) need to be empowered and encouraged to try to resolve problems without "rolling a truck." Both office and field personnel need to be adequately monitored and supervised to ensure they are being effective.

To leverage an AMI investment, OWASA must rely on other technologies, such as its outbound phone system, and keeping customer contact information (cellphone numbers, email addresses, etc.) up to date. To prepare for AMI, OWASA should develop a comprehensive implementation plan, which would consist of various sub-plans covering network deployment, IT integration, installation control, stakeholder communications, human resources planning and change management.

DS&A and OWASA did not engage with OWASA customers during the feasibility study. Given the potential benefits, costs, and implementation requirements for AMI, and the potential for AMI to transform OWASA's relationship with and services for its customers, it is essential that as it decides whether or not to implement an AMI system, and then proceeds with such a project, OWASA develop and implement a community engagement plan to ensure a successful project.

Section 2. Introduction

Orange Water and Sewer Authority (OWASA), a public, non-profit water, sewer, and reclaimed water agency, provides service to residential and commercial customer accounts over an approximately 35 square mile area through approximately 20,800 small (⅝" through 2" diameter) and about 240 large (3" - 8" diameter) water meters.

Starting around 2005, OWASA has installed approximately 8,400 Mueller Systems Hersey® meters with encoder registers capable of being read by AMR or AMI technology. The remaining meters are a mix of multi-jet and positive displacement meters from various manufacturers including AMCO, Rockwell/Sensus, Neptune, and Master Meter. OWASA's large meters are primarily turbine meters with single registers, although there are some compound (multiple register) meters in the system. OWASA has also installed approximately 8,400 Mueller Systems HotRod® AMR transmitters. OWASA's non-AMR meters have straight odometer-style registers that must be read manually.

In addition to age, OWASA's meter replacement program has been prioritized based upon safety concerns, accessibility difficulty, new construction, and labor efficiency improvements. AMR units are installed when meters are changed out and when new meters are installed. At OWASA's recent rate of meter replacement, it would take 12-14 more years to replace all the meters in the system with AMR/AMI capable meters. Moreover, meter replacement and AMR installation is not strictly tied to saturating existing meter reading routes. As a result, some meter reading routes contain a mix of visually read and AMR-equipped meters, which is less efficient than if routes were homogenous. OWASA has a number of AMR-equipped meters that are read manually because they are on manually read routes.

OWASA's normal meter reading methods typically provide a "snapshot" of the total registration on the meter, which when compared to a previous snapshot yields the total volume of consumption over the intervening period. Meters are currently read to the 1,000's place and customers are billed for use in 1,000 gallon units. Normal meter reading does not provide customers with any additional information. Human error occasionally leads to mistakes in some manual readings and potentially the related bills. OWASA's current meter reading methods, coupled with its existing customer service processes and policies, require numerous field visits for rereads, investigations, initiation and termination of service, collections, and other issues.

Many utilities around the country have implemented or are considering AMI technology as a way to improve the quality and efficiency of their meter reading, billing, and related customer service functions, and to support more sustainable management of their water resources. AMI uses a network of fixed data collectors to remotely read the meters throughout the service area. With AMI, meters are typically read hourly and the data transmitted to the utility's offices from one to several times per day, with this information available to employees and customers. AMI could enable OWASA to greatly increase the cost effectiveness of its reading, billing, customer service and collections processes while enhancing customer service and providing valuable information for distribution system operation and planning.

OWASA recognizes the potential benefits that AMI technology can provide, and is concerned that the current AMR system implementation strategy is likely not the most cost-effective or best long-term metering solution for the utility and its customers. As part of a strategic initiative included in the OWASA Board of Directors' *Strategic Plan for Fiscal Years 2014 – 2017*, OWASA decided to undertake a study of the feasibility of implementing an AMI system as an alternative to the current approach.

Following a qualifications-based consultant selection process, OWASA retained Don Schlenger and Associates (DS&A) to complete the AMI feasibility study. This report presents the study results, and includes a thorough analysis of the feasibility of AMI (taking into consideration the full costs and benefits associated with acquiring, deploying, operating and maintaining, and using a system) that addresses OWASA's current and future needs in meter reading, customer service and water use efficiency. The information presented should enable the OWASA Board and staff to understand the resources and factors critical to successful implementation, the business process and organizational changes that would enable smooth installation and realization of the potential benefits of the investment, and the risk factors associated with full-scale AMI and how to avoid or mitigate them.

This report evaluates the feasibility of converting all of OWASA's meters to AMI in a short period of time (perhaps one year), converting all of its meters to AMR or converting to an AMR/AMI hybrid system. It provides estimates of the capital requirements and the impact on net operating costs of key metering system alternatives over the next twenty years. The report also attempts to catalog non-monetary benefits and costs related to these alternatives, as well as risks and other procurement issues.

In preparing this report, the DS&A team interacted extensively with OWASA's managers and staff. This was accomplished through a series of workshops focused on the customer service and metering related business processes that would change with AMI. In addition, there was follow-up correspondence, discussions and work sessions. DS&A also considered the feedback and guidance received from the OWASA Board of Directors at the September 24, 2015 and October 26, 2015 Board meetings

Section 3. AMR/AMI Technology and Its Benefits

Advanced metering systems provide information from water meters and other devices to a remote central location. Today's advanced metering systems available to OWASA are exclusively radio based. Decreasing costs and advances in encryption technology allow multiple devices to share common frequencies. Different radio based products operate on either licensed or unlicensed frequencies. A license covers the use of a specific frequency in a given area. The licensed band normally permits a higher power signal, which enables greater distance between the transmitter and receiver units. Unlicensed radio frequency systems operate under greater government-imposed frequency and power level constraints. Moreover, since the same band is shared by other applications (cordless telephones, security systems, etc.), specialized modulation and encryption techniques are incorporated in most unlicensed systems to minimize interference.

Advanced metering systems are typically characterized by the technology and reading method used to get the data from the transmitter at the meter, known as a meter interface unit (MIU)[1], to a nearby data collection unit (DCU); this is known as the "first hop." For example, if data is captured by a 900 MHz low-power one-way transmission from an MIU to a local fixed data collector, then that is used to characterize the system, regardless of how data collectors communicate with the utility's offices or with each other. It is the combination of technology (hardware and software) in the meter, the MIU and the network infrastructure that creates functionality.

3.1 Mobile AMR

AMR allows meters to be read from handheld or vehicle-mounted DCUs that are in relatively close proximity to the meter. Mobile reading systems can be cost effective for normal on-cycle meter reading. Data is retrieved from a handheld unit either by placing it in a data cradle or removing a storage device (typically a memory card). Data is typically retrieved from the mobile unit by a similar medium, or a laptop computer is connected to the mobile DCU in the vehicle to store the readings.

Normally, a vehicle-mounted AMR data collector can capture all readings within proximity of its antenna while driving at a rate of 25-35 miles per hour. The number of vehicle-mounted collectors needed is a function of how the driving routes are configured, the frequency of reads desired, the need for backup units, etc. Figure 1 depicts a typical mobile AMR receiver.

[1] Each manufacturer has its own name acronym for the MIU (e.g., MXU, NTU, MTU, ERT).



Figure 1. Mobile AMR data collector

3.2 AMI

AMI systems use fixed location DCUs and a communications network to transfer accumulated data from MIUs, located at the meters to a control computer at the utility's offices or the vendor's facilities. Meter readings, obtained as often as hourly from each meter, are typically sent to a meter data management system (MDMS), from which they may be accessed by the utility's customer information system (CIS) and other systems, and made available to customers through a web portal. Ancillary devices, such as acoustic leak detectors or remote controlled shut-off valves, may be connected to the MIUs. The components of an AMI system are shown in Figure 2.

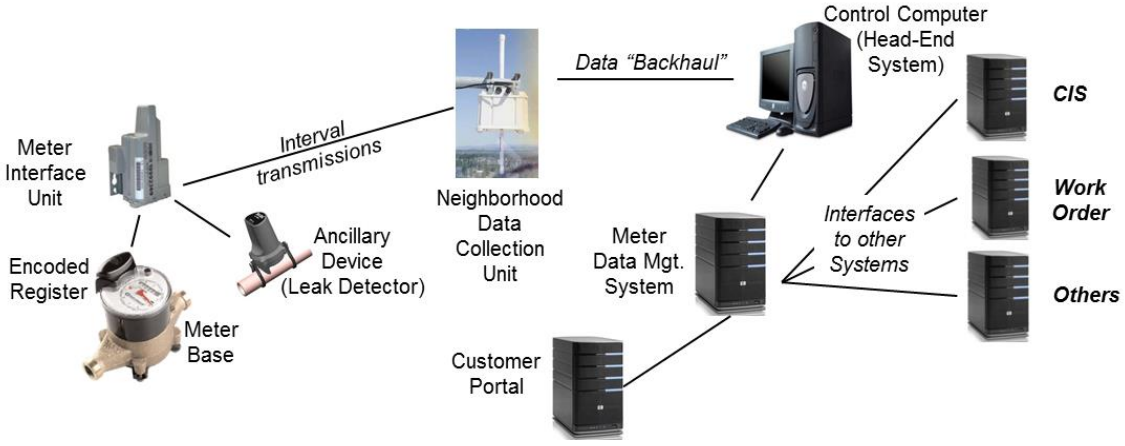


Figure 2. Advanced metering infrastructure components

While some AMR systems collect a single read from the MIU upon query from a nearby DCU, or simply when the DCU is within radio range proximity, many AMR systems and all AMI systems collect interval (e.g., hourly) data. The interval data may be synchronized (that is, all readings are taken at the same time).

AMI systems may be characterized as "one-way" or "two-way." Most AMR systems, such as the one used by OWASA, are "one-way" while many AMI systems may be characterized as

"two-way." One-way systems simply collect signals sent at intervals from the MIUs. Other sensors, such as acoustic leak detectors, can passively gather information and send it along periodically. Two-way systems are capable of sending signals from the control computer ("headend system") to the MIUs as well, enhancing functionality. For example, two-way systems enable the system to obtain "near" on-demand reads, as well as send control signals, firmware updates and time synchronization signals to the MIUs. Actuators, such as remote shut-off valves, behave in response to instructions sent from the AMI system's headend computer. Most of a water utility's needs for an AMI system can be provided by one-way systems providing frequent readings. However, two-way systems enhance some functions, such as "on-demand" reads.

3.3 AMR and AMI Deployments among Water Utilities

AMI systems tend to cost 10% to 20% more than AMR systems since the former require a fixed network of data collectors, more complex software and backhaul communications. The costs of MIUs for mobile AMR and fixed AMI systems have become nearly identical. AMR has higher operating costs, since meter readers must still drive the routes. While an AMR system can provide tamper and leak flags, and even consumption history, this information is obtained only when the meter reader drives by, or stops to upload data from a specific meter.

Because of the greater capabilities of AMI systems, and the decreasing cost differential between AMR and AMI, North American water utilities are increasingly choosing AMI over AMR. Between 2005 and 2014, sales of water AMI MIUs grew from less than one third to more than two-thirds of total units sold, and the percentage of meters on fixed AMI radios grew from 6% to 38%, as shown in the following two figures (Source: *The Scott Report on AMR and AMI Deployments*, 2015).

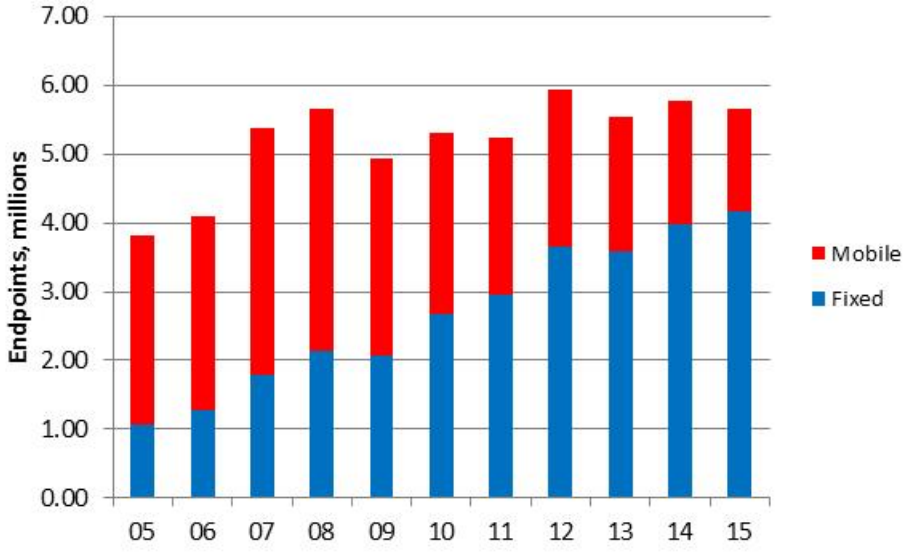


Figure 3. Annual shipments of AMR (mobile) and AMI (fixed) endpoints (MIUs) to North American water utilities

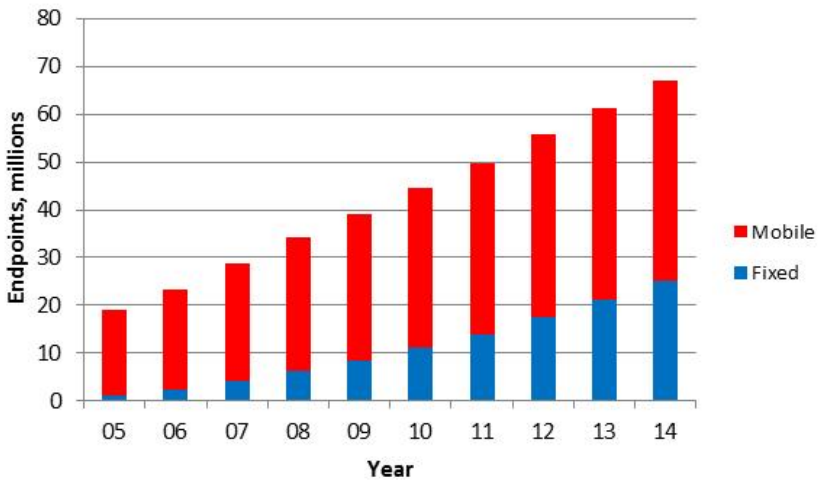


Figure 4. Numbers of AMR (mobile) and AMI (fixed) endpoints (MIUs) installed among North American water utilities

3.4 Benefits of AMI

The primary objectives for acquiring an AMI system would include reducing the cost and improving the effectiveness of its metering and customer service operations as well as improving customer satisfaction by streamlining and enhancing service. An AMI system would enable OWASA to accomplish these objectives by:

- Providing OWASA personnel with more detailed and timely information about what is taking place at customers' meters, including usage on inactive accounts and evidence of possible leaks and wastage. This information is generated close to when it occurs, as opposed to weeks later when the meter reader drives by with an AMR receiver or walks by with a handheld data entry device.

- Providing customers easy access to their consumption data through a web portal. This can reduce the volume of calls to OWASA Customer Service related to meter readings and concerns about high bills.

- Improving the effectiveness of OWASA customer service representatives (CSRs) in dealing with customers by providing them with detailed consumption histories and better analytical tools, so they can informatively discuss issues with customers, possibly resolving the concerns without costly field visits.

- Significantly reducing the number of visits made by OWASA field service personnel (Utility Mechanics), since many are related to reading verifications, requests for investigations, checking for consumption on inactive accounts, initial and final readings, and other issues related to meter readings and billing. With AMI, readings are automatically obtained by the system, as needed, without truck rolls.

- Reducing employee safety risks, as there would be far fewer truck rolls and vehicle miles driven, and there would be much less need for field personnel to enter large meter vaults.

- Enabling proactive customer service practices. For example, with AMI, OWASA could detect unusually high consumption that might be due to leaks or wastage and could notify customers before they get the bill.

- Improving cash flow by reducing arrears, bad debts and collection efforts, to the extent that these are caused by "surprise" high bills. Detailed consumption information could also potentially reduce the opportunities for customers to dispute bills.

- Reducing high bill adjustments, since with AMI customers can be held responsible for excessive consumption as soon as OWASA has identified it and notified them.

- Reducing theft of service by enabling OWASA to observe evidence of possible theft (tamper flags, sudden decrease in consumption between regular billing dates, etc.) and monitor accounts that have been shut off to ensure they stay off.

- Supporting more flexibility in meter reading cycles. For example, customers on fixed incomes could be offered the opportunity to be billed at the beginning of the month, since their reading and billing dates would not be constrained to geographic sequence. This might help reduce arrears.

- Helping OWASA more efficiently manage its meters. For example, by analyzing the consumption patterns through meters, the system could help identify meters that may be under-registering before normal change-out or servicing, or meters that may be oversized.

- Managing non-revenue water ("NRW") more effectively, by enabling the deployment of acoustic leak sensors in the distribution system, facilitating close-to-real-time comparisons of the water delivered to the distribution system compared to the water being consumed over the same time period, and streamlining the calculation of non-revenue water percentages.

- Helping OWASA monitor backflow. High resolution meters and frequent monitoring can detect small and large backflow events in real time. Small events might indicate marginal pressure problems or even main breaks. Large events might indicate problems that could affect distribution system water quality.

- Providing better demand data for improved forecasting, facilities planning, rate setting, etc.

3.5 Indirect Benefits

AMI can provide external and "softer" benefits, such as:

- Improving overall equity among customers by eliminating the extra expense to read, bill and service some customers at the expense of others.

- Helping OWASA detect distribution system losses sooner, thereby reducing the inconvenience to customers and the general public related to leak repair, the costs of leak repair, and the cost of treating and pumping non-revenue water. AMI supports more

sustainable water management, and can serve as the backbone for implementation of system-wide smart water and wastewater utility monitoring and control technologies.

- Reducing traffic congestion and greenhouse gas emissions from OWASA's vehicles by reducing the number of required field service visits.

- Increasing job satisfaction among OWASA staff by providing them with continuous, current information that should enable them to be more insightful, proactive, productive and effective.

- Increasing the confidence of customers and other stakeholders in OWASA and its operations, and enhancing OWASA's public perception.

Section 4. Alternative Metering System Strategies for OWASA

The radio transmitters used in OWASA's HotRod AMR system are expected to last 15 years. Continuing the gradual deployment of HotRod AMR units in conjunction with meter changeout for age will eventually saturate OWASA's service area. While this approach enables some economies of scale in installing AMR units in conjunction with meter changeouts and avoids the "disruption" of a large-scale deployment project, it creates inefficiencies in meter reading and customer service associated with mixed meter reading methods on meter reading routes, entails that some customers are provided a different level of service (e.g., the ability to obtain detailed consumption profile data) than others, and puts OWASA in the mode of perpetually installing AMR equipment.

Based on the data provided by OWASA staff, the results of employee interviews during the study, further discussions with OWASA managers and the OWASA Board of Directors, as well as DS&A's own experience, three metering system scenarios were identified for evaluation. Each scenario has certain advantages and disadvantages, benefits and costs.

4.1 AMR Deployed throughout OWASA's Service Territory

OWASA would deploy an AMR system throughout its service territory (Alternative 1), either a new system (Alternative 1a) or its current HotRod system (Alternative 1b). Existing AMR/AMI-compatible meters would be left in service. Newer manually read meters would have their registers replaced with AMR/AMI-compatible encoder registers (see Figure 1). Older manually read meters would be completely replaced. The advantages of this option are:

- It would require no network of data collection units, nor the cost of installation, operating and maintaining those units
- It would require little or no additional software development to interface to OWASA's billing system
- It would require no additional staff, and could reduce the number of meter reading positions and their expense
- It would provide some additional data for OWASA customer service staff and customers, since historic data could be retrieved on-site from meters in the field, as needed.

The disadvantages of this option are:

- An AMR system would provide no real time information, such as leak or tamper detection, and would do little to enhance customer service, such as averting high bills. OWASA would still be dealing with "after the fact" reactionary rather than proactive customer and meter management.
- OWASA staff would still have to drive routes and make field visits for billing and off-cycle meter reads.

Completing the HotRod deployment as opposed to acquiring a new AMR system would avoid prematurely scrapping AMR radios, and would have lower capital costs. Replacing the existing system with a new one in a short time period will capture economies of scale and ensure a uniform age and version of components, but will entail retiring some existing assets prematurely. Some major brands of AMR equipment are convertible to AMI should OWASA later decide to install a fixed data collection network and software.

A mixed system consisting of two different (and incompatible AMR technologies) is generally inferior to a homogenous system. A system deployed over several years results in a poorer payback period compared to deploying a system rapidly (that is, in one year or less). This is because of better price points with larger component order quantities, economies of scale in installation mobilization, and capturing savings sooner.

4.2 AMI Deployed throughout OWASA's Service Territory

OWASA would deploy AMI throughout its service area (Alternative 2). This would require deploying a set of fixed data collectors, as well as more sophisticated software (a meter data management system and customer portal), and integrating these systems with OWASA's CIS and Geographic Information System (GIS). New MIUs would be required. Software deployment and integration as well as network installation would probably take six months, and field deployment twelve months. OWASA's meters would be upgraded similarly to the AMR scenario. This option would provide all the benefits of AMI enumerated in Sections 3.4 and 3.5.

The disadvantages of this option include:

- It is the most expensive of the alternatives.
- It requires the highest level of effort on the part of OWASA staff to integrate the system with OWASA's other IT system, adopt new customer service processes and policies, and operate the system.
- It requires more OWASA employees be redeployed to other functions.

4.3 AMI Deployed over a Portion of OWASA's Service Area; AMR Elsewhere

OWASA would deploy a limited AMI network covering the meters of the UNC main campus and medical institutions as well as the Chapel Hill/Carrboro central business district (Alternative 3). This network would encompass most of the high cost-to-read water meters as well as meters of many (student) rental housing units, which tend to require more field visits by OWASA service representatives. The remaining meters not covered by this network would be converted to AMR. The advantages of this option include:

- It captures the benefits of AMI in the most meter-dense part of the service area, where there are the greatest ratios of meters to DCUs.

- It captures the benefits of AMI for the vast majority of OWASA's vault meters, which require two-person reading crews and are more expensive to read, and for many of OWASA's service locations that involve the highest customer service cost (for example, high turnover properties).

The disadvantages of this option are:

- AMR MIUs are similar in cost to AMI MIUs, so customer service benefits and operational efficiencies would go uncaptured at no great savings.

- OWASA would be providing two different levels of service to customers.

- Business processes for CSRs and Utility Mechanics could be confusing.

Section 5. Potential Impact on Customer Service Operations

As with most water utilities, OWASA routinely performs several customer service functions that involve a visit to the customer's premises to read the meter as well as perform other functions. The key processes include: on-cycle reading for billing, move-outs and move-ins (that is, final reads and terminating and initializing service for a customer at a location), billing disputes, and delinquencies. With an AMI system, OWASA would have a meter reading from each customer's meter from one to several times per day, thereby enabling it to revise its procedures, reducing calls to customer service, field visits and clerical time. It could improve its responsiveness to customers and resolve issues faster by providing timely information. It could reduce some customer problems, such as "surprise" high bills.

5.1 Meter Reading for Billing

OWASA's small meters are typically housed in below-grade polymer or concrete meter boxes. Large meters are typically either housed below-grade in concrete vaults, located inside buildings, or installed above-ground. All meters are read monthly by six meter readers, and about 5% must be reread due to abnormal readings or customer requests. OWASA uses handheld and vehicle-deployed Mueller EZReader® devices for AMR meter reading. OWASA uses a Cogsdale Corporation customer service and utility billing system.

A small percentage of reads cannot be obtained by meter readers, because the meter can't be located or the meter is blocked from visual or AMR read. There is a 9-10 day interval between when meter readings for billing are obtained and when the bills for those readings are generated. During this period, OWASA's billing clerks run routines in the billing system to flag accounts with consumption significantly greater than last month's or last year's consumption. Where there are large variances, they will create service orders for Utility Mechanics to re-read the meters and leave high consumption door tags at the customers' premises. The billing clerks will also run an application on OWASA's PhoneTree interactive voice response (IVR) system to call these customers about high consumption.

OWASA's billing clerks also run a report to identify accounts designated as "Vacant" that have water use. These are used to generate service orders for Utility Mechanics to hang a blue disconnection warning tag on the customer's premises. If the customer whose premises was tagged with the disconnection warning doesn't respond by the next day, the billing clerk will create a disconnect service order to shut off the service.

Once the bills are computed, billing clerks will review very high and low bills. They can hold individual bills until a reread service order is completed. Reread service orders may be issued if the previous and current bills are estimated, the previous read was very low and the current read is unusually high, or for other anomalies.

With AMI, the number of skipped reads and rereads should be substantially reduced. With AMI, there is virtually no chance that the meter would have been read incorrectly. The pre-bill audit processes can be streamlined and made more effective, and the workload volume reduced. There is little reason to reread the meter before billing, unless the consumption or the bill was absurdly

high. Reading dates can be moved closer to billing dates. With AMI, high consumption can be monitored for all accounts on a continuous basis by the MDMS, and customers notified as soon as high consumption is detected, as opposed to after the reading for billing (which could be many days after the occurrence of high consumption) which would result in a high bill. The number of bills that are kicked out for review can be reduced since the number of situations that would create a high bill in the first place would be reduced.

With AMI, the IVR high consumption notification process would be tied to the high use detection algorithm in the MDMS. OWASA should ensure that customers realize they are responsible for providing current contact information (telephone number, cellphone number for text message or email address for email notification) to enable OWASA to notify them of leaks or high consumption. With this process in place, there is little reason for Utility Mechanics to tag houses about high consumption.

With AMI, detecting usage on vacant accounts doesn't have to wait until the next normal reading cycle. The AMI MDMS can flag the account after a set number of days, catching these situations and enabling OWASA to respond sooner.

If OWASA decides to implement AMI, it should consider adopting a policy that customers are responsible for providing up-to-date contact information so that OWASA can notify them of a leak or high consumption; for customers that don't provide it, OWASA might choose to have a policy of not adjusting a subsequent high bill for which OWASA provided prior notification.

With AMI, OWASA could notify customers of leaks and high bills following the process suggested in Figure 5 and Figure 6. A potential process for handling consumption-related billing disputes is shown in Figure 7.

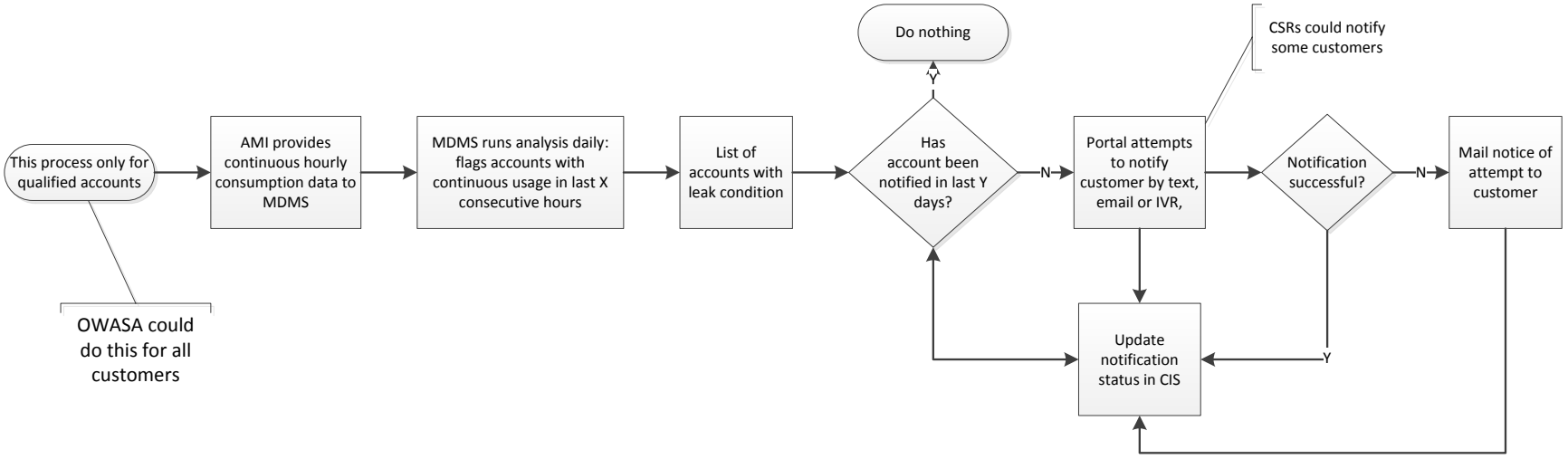


Figure 5. Suggested leak notification process with AMI

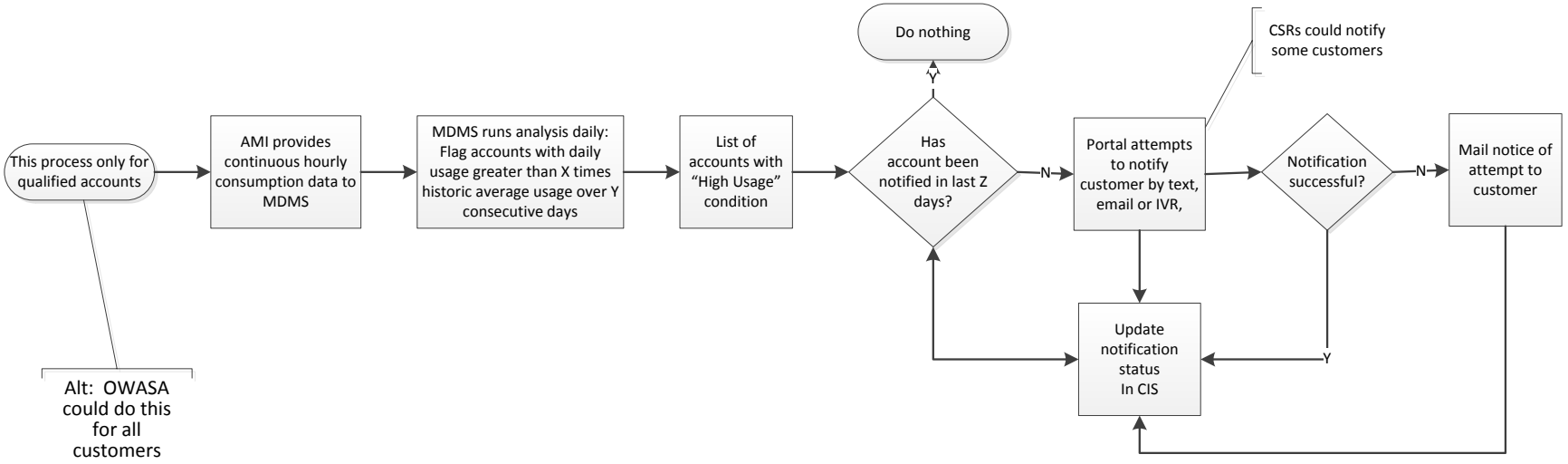


Figure 6. Suggested high usage notification process with AMI

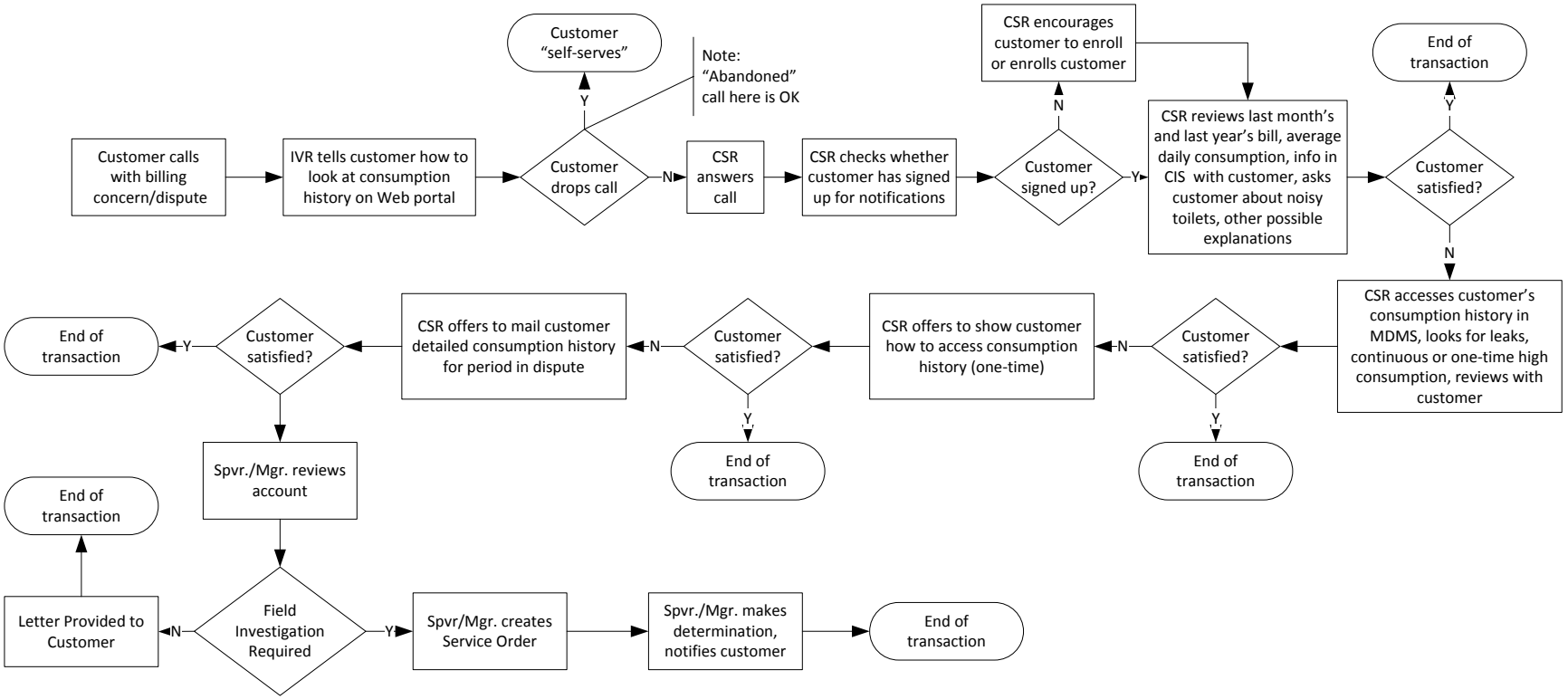


Figure 7. Suggested consumption dispute call scenario with AMI

5.2 Transfer of Service

OWASA handles about 3,000-3,500 requests to connect service per year (about 15% of customer accounts, which is a high percentage compared to other water utilities). The number of requests per month can vary by a factor of 5. This is not unusual considering OWASA serves a large college community with a highly transient customer base.

Generally, in every case where OWASA has a disconnection order but no corresponding order to start a new account at the same location for a different customer, the service would be shut off. When OWASA sets up a move-in customer account, it ends the previous customer's account, updates the move-out customer's billing address details, issues a final bill and collects a payment as needed. A transfer of service when OWASA has information about both the move-out and move-in customers triggers a service order to read the meter.[2]

Without an application from a new customer, the water service is transferred to "Vacant" status when the move-out customer terminates service. When the property is in Vacant status, no monthly service charge is collected. OWASA still reads the meter on its normal schedule to check for theft or to deal with the customer that has moved in and failed to call. OWASA obtains a report from the billing system that identifies usage on Vacant accounts. If there has been usage, an OWASA Utility Mechanic will go back out and shut-off and lock the meter service.

When a customer applies for service, the CSR sets up the account and creates a service order to turn on the service. A Utility Mechanic will read the meter, turn on the service, and wait to be sure there is no water running through the meter. If the meter flow indicator is not moving, the Utility Mechanic checks the meter box, makes notes of any issues, and closes the service order. If the meter flow indicator is moving, the Utility Mechanic knocks on the door. If there is no answer, the Utility Mechanic turns the service back off and leaves a tag on the door telling the customer to call the Customer Service Office. When the service order is returned, the CSR enters the reading in the CIS. Closing the service order transfers the service to the new customer from either the account of the move-out customer or from Vacant status.

In cases where the old customer was a tenant, the service might be transferred to the account of the property manager/owner if OWASA has a property management agreement on file indicating that the property manager wants the service kept on.[3] Otherwise, the account is disconnected. In cases where a tenant moves out and OWASA is not informed, the bill may go unpaid. The service will eventually be transferred to Vacant status and a shutoff service order created.

In FY 2015, a total of 3,725 "Transfer and Connect" service orders were generated, requiring field visits. Customer Service also generated 814 "Disconnect" service orders and 1,162 "Just Connect" service orders issued. There were about 2,240 service orders for obtaining transfer meter readings without the need for service disconnect.

[2] If a customer calls and says, "I've already moved in," OWASA would bill the new customer from the last regular reading obtained.
[3] OWASA has about 1,000 such agreements.

Under OWASA's current policy, monthly service charges do not apply during periods when an account is in Vacant status. As a result, OWASA loses about $178,000 per year in service charge revenues from services that were transferred to Vacant status.

AMI would allow OWASA to significantly streamline the move-out/move-in processes. With AMI, OWASA would be able to eliminate most of the service orders to obtain transfer readings. CSRs would save time creating service orders and entering the data from completed service orders into the billing system. Instead, they would simply request a reading from the AMI system for a particular date. OWASA could pass these savings onto customers through reduced charges for transferring services. Figure 8 suggests a potential new transfer of service process.

For situations where a customer wished to terminate service and OWASA does not have information about an incoming customer, it could leave the service on for several days, particularly during the busy student housing turnover season, since it would have a meter reading every day. If no one requested service initiation at that address, after a period of time, a Utility Mechanic could then shut the water off.[4] Using this approach, OWASA could eliminate a significant percentage of the "just disconnect" service orders.

Taking advantage of the AMI system's ability to provide daily readings, OWASA could tighten its policies on allowing customers to vacate an account. For many utilities, as long as service is being delivered to the property, the owner of the property is responsible for all charges, including any applicable fixed monthly charges. If it adopted such a policy, OWASA would be able to assign responsibility for the charges before and after a transfer of service based on the meter reading on the day the property ownership changed (that is, when the deed was recorded). With this policy, OWASA would be able to eliminate many "just disconnect" and "just connect" service orders. The service would be left on unless a customer specifically wanted it turned off, and a service disconnect/connect fee covering the cost of the field visit could be charged. Neither the old nor new customers would have to worry about being charged for water for which the other party was responsible. Taken together, these policies could reduce OWASA's loss of service charge revenues, as well as the CSR time required for these tasks.

Some utilities require a landlord-tenant agreement for all situations where the landlord wants the tenant to pay the bill; the landlord is responsible for the bill if the tenant moves out without paying it. Having tenants pay the bill for the water and sewer service they receive helps them better understand the value and cost of those services, and provides a financial incentive to use water wisely. However, since tenants do not own on the property, landlords are responsible for fixing leaks and plumbing problems, with the expectation that tenants will provide the landlord with timely notification of a leak or potential problem with their water service. With AMI, OWASA could provide both the tenant and the landlord leak and high usage notification alerts in close to real time.

[4] During the winter months when there is a possibility of freezing water lines, OWASA could revert to the "immediate shut-off if vacant policy."

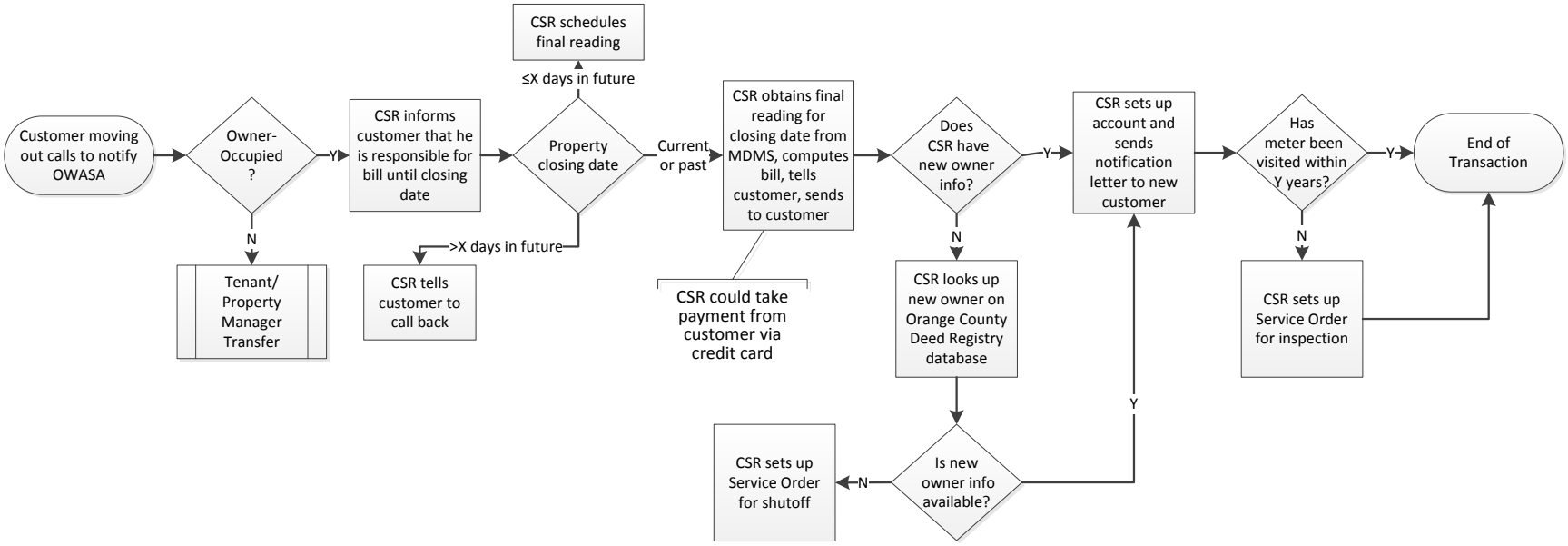


Figure 8. Suggested transfer of service process with AMI

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5.3 Arrears, Shutoffs and Collections

For accounts that go into arrears, OWASA commences a dunning, shut-off and collections process. OWASA starts by sending a late payment reminder notice, and The Customer Service Staff regularly runs a collections processing report in the CIS of accounts in arrears. A CSR then creates a file for the IVR system, which calls the customer on the same day that a late payment reminder notice is mailed. Usually this generates the greatest response from customers. Many customers pay their past due balance upon receipt of the notice.[5] If the customer's telephone number is not in service or OWASA doesn't have it, the receptionist will research the account and try to contact the customer.

About 175 collections notices are generated for each bill cycle. OWASA performs almost 100 disconnects per month. If a customer pays the outstanding amount, the account will be turned back on the same day. If the customer pays before the Utility Mechanic arrives at the location, the service order is canceled and the water is not disconnected; however, the customer still incurs a service charge. Restorations of service are usually performed during normal business hours. OWASA dispatch personnel at the water plant can pull up a report to tell a customer who calls after hours what they need to pay to get turned back on, and what it would cost to get water turned back on after hours.

If the arrears are not resolved within 7 days after shutoff, the account is "finaled," and another service order is issued to read the meter. OWASA Utility Mechanics make about 75 field visits per month to monitor meters for accounts where the water service is still shut off. If the Utility Mechanic finds the water turned on, he will shut off and lock the service. However, the Utility Mechanic doesn't have a meter reading from the time the water was shut off, as it is not posted to the billing system or CityWorks, so he doesn't know if there was water use. If OWASA Customer Service determines there is usage on a vacant or shutoff property, a Utility Mechanic has to go out again to disconnect and lock the meter.

The Bad Debt Collections process starts after 90 days. Bad debts are turned over to collection agencies. Annual write off of uncollectible revenue is around $50,000.

In the case of a tenant who doesn't pay the bill, the tenant may still be in residence and the landlord may not want to be responsible for the water use, so any property management agreement (making the owner or property manager responsible for paying the bill) does not kick in. When a tenant is evicted, the property owner must notify OWASA.

With AMI, OWASA could notify customers of high usage before they received a high bill they could not afford to pay. However, high bills are probably responsible for 10% or less of arrears and collection activities.

With AMI, once a service was turned off, OWASA could monitor it every day without the need to send a Utility Mechanic out to read the meter. OWASA would know about the water usage as

[5] If a customer is having difficulty paying the bill, OWASA offers Deferred Payment Agreements and offers suggestions of local agencies who may offer emergency assistance.

soon as it occurred. This might reduce the number of field service truck rolls. If there was water use, someone would still have to go out to shutoff and lock the service. If it had the reading from the time of shutoff, OWASA could hold the occupant responsible for paying for that usage.

5.4 Impact on Staffing

As a result of deploying AMI and implementing most of the business process changes discussed above, OWASA would be able to redeploy six Utility Mechanic positions that are responsible for regular meter reading, as well as one crew chief position. In addition, it could save about a third of a full-time equivalent (FTE) among the Utility Mechanic positions responsible for rereads, investigation and collations efforts, as well as maintenance of the AMI system. This allows for periodic inspection of meter settings that have not otherwise been visited for any reason with a couple of years.

Because of the reduced workload, OWASA could be expected to reduce the number of positions in Customer Service by one.

As is the common practice among utilities that have implemented AMI, OWASA would handle these staffing changes through redeployment and normal attrition. These changes would not be expected to occur until the project has been largely completed.

Should OWASA decide to deploy AMI, DS&A recommends that it hire an additional person who would serve as AMI System Manager as well as Business Analyst. This person would be responsible for

- the operation of the AMI system to ensure it performed to expected levels
- training and mentoring OWASA staff in the use of the AMI system information
- developing simple applications and reports from the MDMS
- tracking and analysis of customer service performance metrics

Should OWASA deploy full-scale AMR, it could be expected to save two Utility Mechanic positions. Under the hybrid AMI/AMR scenario, it could be expected to save four Utility Mechanic positions.

Section 6. Benefit/Cost Analysis of Metering System Alternatives

Economic benefit/cost analyses were developed in Excel for four different scenarios. The scenarios are compared to a "baseline" consisting of OWASA's continued gradual AMR HotRod deployment (approximately 1,000 meters per year) and manual reading of non-AMR meters. The four scenarios modeled are as follows:

- Alternative 1a: Rapid deployment of mobile AMR technology throughout OWASA's service area. This approach would replace the existing HotRod devices installed on nearly 8,400 meters with MIUs that could be converted from AMR to AMI if an AMI infrastructure is deployed in the future. This alternative also includes the costs of retrofitting existing newer meters with AMR/AMI-compatible registers. The estimated costs of installing new AMR hardware and software and interfacing it to the CIS are included.

- Alternative 1b: Rapid deployment of the existing Mueller HotRod technology to the remaining nearly 13,000 meters currently read manually. (The HotRod AMR technology cannot be converted to AMI.) Existing meter reading hardware and software is assumed to be used, although another mobile DCU is added.

- Alternative 2: Rapid deployment of AMI throughout OWASA's service area. The estimated cost of installing the headend software, a MDMS and a web-based customer portal, and integrating those applications to the Cogsdale CIS, are included. The model incorporates calculations for OWASA-owned and operated software as well as vendor hosted and managed software.

- Alternative 3: Deployment of a limited AMI network covering the meters serving UNC and UNC Health Care facilities on the main campus, as well as the Chapel Hill/Carrboro central business district. The remaining meters not read by AMI would have new AMR technology installed. The total number of meters that would be read by AMI would be nearly 5,400, including most of the high cost-to-read meters. The remaining nearly 16,000 meters would be read by AMR. As with the rapid deployment of new AMR technology, AMR devices deployed under this scenario could be converted to AMI in the future. The estimated cost of installing the headend software, a MDMS and a web-based customer portal, and integrating those applications to the Cogsdale CIS, are included. The estimated costs of installing new AMR hardware and software and interfacing it to the CIS are included in this scenario.

Appendix A contains meter tables that show how the above-mentioned meter quantities were determined. Each scenario assumes that all Rockwell, Sensus and Master meters up to 2″ diameter and any other meters up to 2″ diameter installed prior to 1999 would be replaced (about 7,100 meters). Of the remaining approximately 14,200 meters, about 8,400 are AMR/AMI capable, and about 5,800 would be retrofitted with new registers. This approach aligns somewhat with OWASA's long term meter replacement strategy of having meters in the field that fall within a 20 year life.

The economic models were designed to easily facilitate examination of different strategies and facilitate changes in assumptions (for example, unit prices of components, and changes in project duration). The models incorporate several tables for capital costs, operating and maintenance costs, staffing and other savings, cash flow and savings projections over the planning horizon, and return on investment calculations. Key assumptions and highlights of the analysis for full AMI deployment are presented in the following paragraphs. The tables for full-scale AMI deployment (Alternative 2) themselves are in Appendix B.[6] Differentiations between the AMI scenario and the other three scenarios are noted where appropriate. All costs are in current (2015) dollars, with adjustments for inflation in future years.

The economic model assesses hard costs and benefits that can be quantified in monetary terms. Operational savings in meter reading, call center operations, billing and field service are incorporated, as are OWASA's avoided costs for ongoing implementation of a meter replacement/HotRod installation program (because the AMI contractor would have performed this work, and at the conclusion of the project all the meters would be relatively new).

6.1 Meter Populations with AMI

Table B1 of the AMI model identifies by size and type the meters that would be replaced, retrofitted with a new AMR/AMI-capable register, or that are already AMR/AMI capable. It is assumed that the 3-conductor wiring between the meters currently on AMR and the existing HotRod MIUs can be reused, thus saving the cost of a new register. For all meters not currently on AMR, it is assumed that the existing meter box lid will be replaced with a new composite to minimize RF signal blockage.

The quantities of meters replaced, retrofitted or left alone would be the same for each of the technology alternatives being evaluated.

6.2 Meter and MIU Costs

Tables B2 and B3 show the cost of the major AMI system components. Total endpoint and meter costs (Table B2), including MIUs, registers, replaced meters, and composite lids, are estimated to be about $2,785,000. For AMI, all approximately 21,300 meters will have new a MIU installed. All meters except compound meters have one register, and need an MIU with one "port" to connect to the meter register. Some manufacturers offer a two-port MIU to handle compound meters for a marginal additional cost. The unit costs for meters, MIUs and lids are extrapolated from recent bids at other utilities, conversations with vendors, unsolicited proposals to OWASA, and DS&A's experience.

Of the other alternatives, the only scenario with a different set of values in Table B2 is the AMR scenario in which existing HotRod MIUs are used. This results in 8,400 fewer MIUs being purchased during implementation.

[6] The economic analyses tables for the other scenarios have been provided to OWASA.

Table B3 presents the expected AMI endpoint installation costs, expected to total about $880,000. Recent bids at utilities similar in size to OWASA were used to estimate unit prices.

The only scenario with a different set of values in Table B3 is the AMR scenario in which existing HotRod components are used. This results in 8,400 fewer MIUs being installed during implementation.

6.3 Avoided Costs Associated with OWASA's Existing Program

Table B4 estimates the costs that OWASA would avoid by not replacing meters for age and other reasons for ten years following the start of the AMI project, as well as not replacing HotRod MIUs which would exceed their expected battery lives during that period. These items would be replaced by an installation contractor as part of the AMI project.

Should OWASA decide not to implement AMI or a rapid deployment of AMR, it is assumed to reinstate its program of changing its meters for age and converting them to AMR at a presumed rate of about 1,000 meters per year. The meters that would be replaced first under this program are assumed to include the approximately 7,100 meters that would be replaced as part of an AMI or rapid AMR implementation. Another approximately 3,000 of OWASA's manually read meters would have been converted under OWASA's program over the following three years. The cost of composite lids would also be avoided. These meters would be converted to Mueller HotRod AMR, bringing the total of meters on HotRod to about 18,400 by 2026/2027. (OWASA's remaining 2,900 meters would be converted after the ten year period, and are not included in the cost offset calculation.)

HotRod MIUs are expected to have a life in service of 15 years. Therefore, were OWASA to continue with its meter replacement and AMR conversion program, approximately 2,440 HotRod units would have to be replaced at some point during the ten year period following the date an AMI project would have started, at a total material and labor cost of about $244,000.

Total avoided costs over the ten year period under these assumptions would be about $2,440,000. For the economic analyses, these costs are assumed to be distributed evenly over the period.

Tables B4a and B4b show the quantities of meters and HotRod MIUs that OWASA would not have to replace should it decide to implement AMI or a new AMR system, based on the age distribution of OWASA's existing meters and MIUs.

The rapid deployment of HotRod AMR units entails less avoided cost, since replacing older HotRod MIUs would then be part of OWASA's HotRod system maintenance cost during the 15-year economic evaluation period. Total cost avoidance in the HotRod AMR scenario would be $1,950,000 or approximately $195,000 per year.

6.4 Salvage on Replaced Old Meters

Table B5 presents the salvage value that the replaced meters are assumed to have in the metals recovery market. The dollar values used are based on recent proposals from other AMI and AMR

projects. They could change in the future based upon metal pricing at the time of implementation. Any salvage value obtained would be used to offset the new meter cost.

6.5 Network Hardware, Software and Vendor Project Management Costs

Table B6 presents the implementation cost to deploy an AMI network (DCUs and repeaters), hardware cost to program equipment in the field, a mobile collector to read meters on the network fringe or if the network should be down due to loss of power or other conditions, software and hardware associated with the fixed network headend, a MDMS, a customer web portal, and integration of these to the Cogsdale billing system.

The AMI scenario assumes an 18 month implementation. Estimated vendor project implementation cost (labor and expenses) as well as training for OWASA staff has also been included in this table. Total vendor project implementation cost for AMI is estimated to be about $1,475,000.

For the Hybrid AMI/AMR scenario, the total network, hardware, software integration and vendor project management costs are estimated to be about $1,275,000, because fewer DCUs and repeaters being deployed.

The two scenarios evaluating AMR rapid deployment differ from AMI because (1) a shorter time period is required to prepare for deployment, reducing the overall project length from 18 months to 15 months; (2) there are no network hardware costs; (3) software cost is limited to installing a more robust headend system and improving the Cogsdale integration for the larger volume of mobile reads.

Table B7 presents OWASA's cost to support the AMI project, consisting of staffing, vehicles, community engagement, legal, purchasing, and consulting assistance. The total cost is estimated to be about $800,000. The AMR scenarios have lower OWASA cost due to the shorter duration and lower legal, consulting, and community outreach costs.

6.6 AMI Operation & Maintenance Costs

After installation, AMI components will require routine maintenance, and a small percentage of the installed devices can be expected to fail each year. Table B8 addresses certain annual service costs to operate the AMI system. Communications between DCUs and the AMI headend system are typically operated over a cell phone network, entailing monthly communication fees. Essential AMI software requires annual service and licensing fees. Hardware servers need to be replaced every few years. DCUs and repeaters may be powered by AC or solar panels. Operating costs are expected to be around $120,000 per year.

The Hybrid AMI/AMR alternative would have slightly lower operating costs since less network equipment is deployed. AMR system operating cost is lower due to less software maintenance, and no network equipment. The labor cost for driving AMR meter reading vehicles is already accounted for in staffing savings.

Table B9 captures the cost associated with the failure of system components, including encoded register meters, wiring, handheld programmers, MIUs and DCUs, as well as normal DCU battery replacement. Some components such as DCUs could be covered under maintenance agreements with the vendor; however, some utilities purchase spare DCUs. MIUs are typically covered by extended warranties, with full-cost replacement during the first ten years and pro-rata replacement during the next ten years. Total labor, materials, and incidentals to maintain the system are expected to cost approximately $41,000 per year. The other scenarios have slightly lower maintenance costs due to fewer pieces of equipment in the field that can fail.

6.7 Staff and Other Cost Savings

AMI implementation will enable savings in staffing costs, as discussed in Section 5.4. The day-to-day office-side operation of the AMI system for regular periodic billing is not dissimilar from the operation of OWASA's current handheld meter reading system and would continue to be handled by a billing clerk or CSR. With AMI, OWASA should add a full-time position responsible for AMI system management, business analysis, application development and user training. Table B10 presents the anticipated net annual staffing cost savings, which is estimated to be approximately $350,000 once the system is completely deployed.

Anticipated savings would be lower for the other alternatives since less data and automated functions would be available to support customer service functions, thus requiring more truck rolls and larger staff to respond to actual and/or perceived issues.

Estimates of vehicle and other cost reductions are shown in Table B11. Annual vehicle costs include depreciation, operating and maintenance. Vehicle count is tied to staffing; OWASA could reduce its fleet by seven Utility Mechanic vehicles with AMR. Reduction in vehicle costs leak adjustments, lost revenue due to theft and tampering, and bad debt write-off are estimated to total about $125,000 per year.

6.8 Under-Registration Recovery from Meters

Table B12 calculates the revenue to be recovered from replacing old meters with new meters as part of an AMI project. OWASA tested a sample of its older small meters and found that the meters had not appreciably lost any accuracy. Based on OWASA's water sales and production numbers, meter performance testing results completed before and for this study, and the expectation that most of OWASA's existing meters will continue to be used regardless of the scenario selected, there is very limited potential for increased water sales associated with any of the alternatives evaluated in this report. Therefore, for the purposes of this analysis, the models conservatively assume no recovery of under-registration from the replacement of meters.

6.9 Multi-Year Discounted Cash Flow Analysis

Table B13 summarizes the cost and projected savings before applying contingency, inflation and spreading these costs over the planning horizon. The total capital cost of the AMI system net of salvage, would be about $5,175,000. The salvage value of replaced meters, and discontinuance of the current meter replacement and future HotRod MIU replacement reduces the net project cost to about $2,700,000. Annual O&M cost for the AMI system is estimated to be about

$160,000. Net annual savings is estimated to be about $300,000 per year, resulting in a simple payback (net project cost divided by net annual savings) of 8.6 years.

Tables B14 through B19 support the calculation of discounted cash flow, net present value, and internal rates of return for 15 and 20 year planning horizons. For the purposes of computing net present value and internal rate of return for the project, all capital costs are increased by a 5% contingency factor. Any labor related costs and savings are assumed to inflate at 2% per year. A multi-year installation period results in a "phasing in" of both costs and savings. Prior to the commencement of installation, there are project start-up efforts, such as interface programming and testing. The model assumes that network and software costs are all incurred in the second year of the planning horizon (2017) and that 75% of all the meters and MIUs are installed in that year and the remainder installed the following year. The full extent of savings would not occur until the year after that.

Over 15 years (the minimum expected life of the MIUs), on a cash-for-cash basis, without taking into account financing or depreciation costs, the internal rate of return (IRR) on the discounted net costs and savings for the AMI project is about 6.0 percent. At a discount rate of 3.5%, the 15 year net present value (NPV) of the project, is about $700,000.

Table 1, repeated below, summarizes the economic cost and benefits of the scenarios.

Table 1. Summary of Costs and Benefits of AMR and AMI Scenarios

	AMR (New)	AMR (w/HotRod)	AMI	Hybrid
Capital Cost, $M*	4.52	3.55	5.43	5.41
Existing Program Offset, $M	2.44	1.96	2.44	2.44
Annual O&M, $M	0.03	0.03	0.16	0.03
Annual Savings, $M	0.14	0.14	0.47	0.22
NPV 15Yr@3.5%, $M	(0.58)	(0.10)	0.73	(0.64)
IRR 15 year	0.8%	2.9%	6.0%	1.0%

*including 5% contingency

Section 7. Non-Economic (Triple Bottom Line) Benefits and Costs

In addition to understanding the hard, direct costs and benefits of alternative metering technologies, OWASA recognizes the importance of also considering the soft and indirect costs and benefits of those technologies. In accordance with OWASA's guidance, this feasibility study includes a Triple-Bottom-Line ("TBL") assessment[7] which encompasses the economic implications to all stakeholders, as well as a general, relative comparison of the environmental and social benefits and drawbacks of the various alternatives. Environmental concerns include impacts on natural systems, while social concerns include impacts on the public such as health, labor practices, human rights, etc.

Encompassing TBL factors in an AMI business case entails considering, in addition to the "hard" (that is, readily measurable in dollars) and internal (that is, able to be captured by OWASA) benefits and costs that are incorporated in the benefit/cost model, both: (1) hard benefits and costs to other external stakeholders; and (2) "soft" benefits and costs to the utility, other stakeholders and to the environment. In some cases, such soft benefits and costs can be estimated quantitatively. For example, the tons of greenhouse gas emissions (in carbon dioxide equivalents) reduced by having fewer vehicles on the road can be estimated, or improvements in customer satisfaction can be measured by surveys.

The social and environmental impact of the project depends on the utility's approach. For example, if OWASA takes longer to implement the project, or budgets and spends more to ensure successful retraining and/or to obtain temporary help during implementation, the adverse impact on employees will likely be lessened.

Virtually every impact has benefit or cost implications for different stakeholders, and the effects ripple through the economy, society and the environment. For example, increased and proactive leak detection enabled by an AMI system might result in more work for plumbers and cash outlays for repairs, but ultimately lower costs to customers. Because OWASA is a public utility, net savings created as a result of an AMI system would eventually be passed back to customers in the form of lower bills, or bills that increase less than would otherwise occur without the project. Social and environmental impacts are difficult to separate, and it is difficult to avoid double-counting impacts.

TBL evaluations help an organization improve and maintain its sustainability. For an organization, sustainability can be defined as meeting the challenges and satisfying the changing demands placed on it to ensure its long term viability (which includes investing in infrastructure and human resources) while maintaining sociological, economic and environmental integrity. This is especially important for an organization such as OWASA, whose mission statement includes "responsible and creative stewardship of the resources we manage" and whose stated values call out environmental responsibility, customer service excellence, employee welfare, and "environmental, social and economic sustainability."

[7] Kenway, S, C. Howe and S. Maheepala. Triple Bottom Line Reporting of Sustainable Water Utility Performance. Water Research Foundation. 2007,

A few soft benefits and costs sometimes raised among water utilities and their associated stakeholders are discussed in the following paragraphs.

Environmental Impacts.

- Leak identification. Proactive identification and reduction of leaks in customers' premises can reduce the amount of water withdrawn from local reservoirs, and treated and pumped for use by OWASA customers. It can also help reduce the volume of unused water that is unnecessarily discharged to the sewer system, which in turn can help reduce wastewater collection and treatment costs and related capacity requirements. Leak reduction programs can also help reduce OWASA's energy and chemical requirements and costs. Reducing the demand for electricity required to treat and pump water that is essentially wasted (even if captured by meters) would reduce the carbon footprint of OWASA and its customers.
- MIU/battery/meter disposal. Most purchased products do not include the full cost of environmental impacts to produce them. In addition to any external environmental costs of producing the MIUs and their lithium batteries, this equipment must be disposed of at the end of its life.

  While other types of batteries include toxic metals such as cadmium, the metals in lithium ion batteries—cobalt, copper, nickel and iron—are considered safe for landfills or incinerators (the batteries contain an ionic form of lithium but no lithium metal). Lithium ion batteries are classified by the US government as non-hazardous waste and are safe for disposal in the normal municipal solid waste stream.

  The water meters that might be scrapped are made of brass (which contains some lead) and plastic components. While the metal would be recycled (which supplants mining and processing of new ores, and therefore is environmentally friendly), the disposal of the plastic could have an environmental impact.

- Greenhouse gas reduction. By reducing the number of vehicles needed for meter reading and field service, OWASA would lower its greenhouse gas emissions (CO2, CO, ozone and hydrocarbons) which have been linked to air pollution and climate change.

Social Impacts

- Privacy. Concerns have been raised in some part of the United States (notably among electric customers) about the vast amount of discrete data that can be collected from AMI meters. AMI systems could log hourly data, allowing someone to discern customer consumption patterns or know when the premises were vacant. While AMI systems encrypt data and impose security to prevent unauthorized persons from accessing such information, these systems can raise sensitivities among OWASA's customers and other stakeholders.
- Reduction in vehicle miles driven reduces air pollution. By reducing the number of vehicle miles driven for meter reading, field investigations and field service, OWASA would reduce vehicle exhaust gases and particulate emissions, which have been linked to illnesses such as cardiovascular disease, asthma, chronic obstructive pulmonary disease, lung and other forms of cancer, and diabetes. All vehicles, especially diesel engines, emit

very fine particles that deeply penetrate lungs and inflame the circulatory system, damaging cells and causing respiratory problems. Children and the elderly are especially vulnerable to these diseases.

By reducing the number of vehicles on the road in its service area, OWASA would also contribute (albeit to a very minor degree) to a reduction in traffic congestion. Congestion contributes to vehicle pollution, costs the economy many dollars in lost productivity, and reduces the quality of life of local residents.

- Electric and magnetic field (EMF) radiation. While few scientific studies have specifically focused on water meter AMI technology, the available studies come to the same conclusions as the many peer-reviewed studies of similar technologies using radio frequencies (low-level wireless): no adverse health impacts. For example, a World Health Organization survey of published research concluded that there is no convincing scientific evidence that the weak RF signals from base stations and wireless networks cause adverse health effects. Although there is anecdotal information that some individuals may be hypersensitive to radio frequencies, there is no definitive evidence linking such symptoms to low-level wireless transmissions like those associated with smart meters; the majority of studies indicate that supposedly hypersensitive individuals cannot detect EMF exposure any more accurately than anyone else can.
- Enhanced customer service. By providing better information to customers about their consumption, including leaks and wise water use, and minimizing problems with billing due to estimated bills, OWASA can alleviate stressful situations for certain customers, reduce the number of collections problems, and increase overall satisfaction among its customers.
- Reduced injuries among OWASA field personnel. Injuries affect not only the quality of life of the injured, but also their families and everyone else that contributed to medical insurance premiums. Reducing activities related to meter reading will reduce the potential for injuries to OWASA field personnel.
- Increased customer goodwill. By providing better and timelier information to customers, and notifying customers of potential leaks and high bills, OWASA might improve customer goodwill, an asset it can draw from when it has to inconvenience customers for events such as line repairs, service outages, or rate increases to cover capital investments and increased operating costs, etc.
- Liability of information. By having information that could enable proactive identification of potential leaks at customers' premises, OWASA might be considered to have an obligation to analyze that information and notify customers of potential leaks in a timely manner. Failure to do so could be a potential risk to OWASA.
- Customer interaction. By reducing the number of field personnel interacting with customers and reading their meters, OWASA might lose some "personable-ness" and opportunities to visually inspect its assets and services status (e.g., noticing that a property appears vacant).

Economic Impacts

- Improved capital and operating efficiency. By having more discrete and real-time consumption data for its hydraulic model, OWASA might be better able to plan distribution component placement and expansion. It might also be able to further optimize its pumping regimes to reduce energy costs and better manage distribution system water quality. It could calculate accounted-for water ratios in real time, providing better tools to monitor anomalies that might indicate significant leaks in the distribution system. It could also use AMI technology to help manage customer demand during times of peak water use or drought (such as monitoring compliance with day of week watering restrictions or daily water use allocations, if applicable).
- System-wide field audit. In conjunction with AMI installation, OWASA will essentially obtain a complete field audit of its service connections and meter assets. Discrepancies between meter numbers and associated accounts would be discovered; however, those are expected to be very minor. Installation contractors often go door to door, and might discover service connections that are not being billed.
- Better rate design. Using more discrete consumption data, OWASA could fine tune its water rates to better reflect the actual cost of service, providing more accurate price signals to customers while managing revenue stability.

Translating soft benefits and costs into dollars is difficult and imprecise. Environmental and social factors are not generally traded in the market, which eliminates a ready and reliable methodology for valuation. In the absence of an actual marketplace that establishes value, valuation is otherwise based on subjective factors. For example, in the absence of an actual market, dollar values ascribed to a ton of CO2, one of the more readily calculable effects, vary significantly.

Quality of life benefits, such as improved health or reductions in vehicle congestion, are also difficult to precisely quantify in terms of accurate economics and generally require regional studies. Consequently, such determinations are outside of the scope of this evaluation. Further, such benefits would also not directly accrue to OWASA. Therefore, while addressed qualitatively herein, this study does not attempt to quantify or include them in the economic models used to evaluate the AMI and AMR scenarios.

However, the social and environmental impacts of alternatives can be considered relatively using value modeling. Impact areas can be identified and weighted according to their relative importance. Alternative projects can be scored on the extent they positively or negatively affect impact areas. The weighted scores can be added to create a total impact score. Different projects can be compared to each other by considering the net present value of each project to its social and environmental impact score.

As part of this study, DS&A conducted a workshop with OWASA managers, during which a number of potential triple-bottom-line criteria were identified. Staff scored each criterion with regards to importance (1 to 9, indicating low to high importance, respectively) and together with the DS&A team assigned an impact score for each of the three major scenarios—AMR everywhere, AMI everywhere, and AMI for only a portion of the service territory, with AMR everywhere else—using a range from -10 to +10 (indicating major drawback to major benefit, respectively). Table 2 shows the tabulated results.

Table 2. Triple Bottom Line Scores for Metering System Alternatives

OWASA AMR/AMI Triple Bottom Line Impacts						
S=Social, E=Economic, N=Environmental			Imptnc	Impact (-10...+10)		
TBL Issue	DIM	Impacts	1 3 5 7 9	AMI	AMR	Mixed
Detailed, timely water use info	S/E/N	Customers	5	10	4	6
First call resolution. Proactive service. Reduce high bills. Support affordability.	S	Customers, OWASA	9	8	0	3
More satisfying work. More data available.	S	Employees	7	2	1	1
More work, stress of managing new system, interfaces	S	Employees	5	-2	-1	-1
Stress of learning new system. Longer phone calls.	S	Call Center employees	5	-2	-1	-1
Fear of job loss; stress of transition	S	Employees (Cus. Serv., MRs)	7	-2	-1	-1
Reduced greenhouse gas emissions	N	Environment	3	2	1	1
Reduced traffic congestion	S	Local Population	1	2	1	1
Loss of "eyes and ears" on system, customers	E/N/S	OWASA	5	-6	-2	-3
Reduced OWASA employee visibility	S	Customers, OWASA	3	-3	-1	-2
Better NRW calcs, audit capability	E	OWASA	3	7	0	0
Better info for planning system and CIP	E	OWASA	3	8	0	0
Better info for demand mgt, drought mgt.	S/E/N	OWASA, Customers	5	9	2	3
Improved safety: reduced accidents, dog bites, snakes, bees, threats, etc.	S	OWASA, employees	9	2	1	1
Full field audit of accounts, connections, meters	E	OWASA	7	2	2	2
Concerns about privacy, EMF health effects	S	Customers	7	-2	-1	-2
Supporting alt. rate structures (tailored rates, individualized budget rates, time of use)	E/N/S	Customers/OWASA	3	9	3	0
Billing in finer resolution	S/E	Customers/OWASA	7	2	1	1
Facilitation of potential OWASA role in submetering	E/N/S	Customers/OWASA	5	5	4	4
Potential to support smart system management		OWASA	5	1	0	0
Potential to enhance community services (e.g., street light control)	S/E	Community	3	1	0	0
Potential to provide additional services to largest customers	E	Customers	5	5	2	4
Innovation, best in class	S	OWASA, Customers	5	2	0	1
Perception of reliabillty, customer confidence	S	OWASA, Customers	9	3	2	2
Customer perception of unnecessary expense	S	OWASA, Customers	9	-4	-4	-4
Equitable service to customers	S	Customers	9	0	0	-6
Potential to reduce distribution system leaks	E	OWASA, environment	5	3	0	0
			Total Score	223	54	4

The total project TBL score is determined by adding up issue scores, which can be considered the product of importance and impact. This methodology results in TBL scores (sum of benefit scores, net of drawback scores) of 223, 54 and 4, respectively, for the AMI, AMR and “hybrid” scenarios.

Were OWASA to assign a weight to the net present value of the projects relative to the TBL scores, an overall total score for each scenario could be determined. However, because both the net present value and TBL score of the AMI alternative are greater than that of the AMR alternatives, DS&A believes there is no need to undertake a more formal weighting and scoring evaluation to help inform a decision as to the preferred alternative.

Section 8. Risk Assessment

An AMI (or AMR) project for OWASA would require significant capital investment. The new metering system must reliably deliver mission-critical information over its 15-20 year service life, during which circumstances (e.g., personnel, economics, technology) can change. An AMI project would impact a large number of stakeholders, including OWASA customers and employees. Even more than AMR, it would rely extensively upon radio communications, computer software and hardware, and interfaces between information systems. OWASA is not experienced in AMI project execution. The project would require the coordination of a number of key players: the technology vendor, the installation contractor, information system integrators, and OWASA's meter reading/ field service, customer service, procurement, community outreach and IT staff. All of these aspects create risks, and risk assessment should be part of any feasibility study.

AMI project risks fall into two broad but interrelated categories:

- Technology risks such as equipment obsolescence, excessive or premature component failures, flaws in AMI project software and control systems, radio interference, incompatibility with future meter registers, inadequate system performance, cybersecurity breaches, and loss or corruption of critical data.
- Business risks such as vendor instability, lack of stakeholder buy-in, business case assumptions that change or fail to materialize, unanticipated increases in certain costs, inadequate system support and maintenance by either OWASA staff or the vendors, poor installation quality, poor integration with existing systems, failure to change business processes to take advantage of the technology, failure to reduce staffing and other costs where the system enables it, and reduced visual inspection by OWASA staff of the meters and services.

Risk is the product of probability and impact. A high probability of failure with a very low impact would carry little risk. A very low probability of failure with a high impact may also carry little risk, but caution is advised in reaching such a conclusion since probability is often much more difficult to estimate than impact.

Careful planning is an essential dimension of AMI project success, and risk assessment and management is an active and very important part of good project management practice. As part of project procurement and planning, the risks of an AMI implementation should be identified, their likelihood and potential impact for OWASA assessed, the potential approaches to prevent or mitigate them evaluated, contingency plans developed where appropriate, and responsibility for risk mitigation implementation assigned.

Where significant risks exist, potential mitigation measures should be identified and those measures that are reasonably cost-effective in comparison to the risk should be implemented. The utility may develop preventive measures (e.g., go/no go decision points), mitigation (e.g., changes in the plan if aspects of it do not have the desired results), or decide to simply accept certain outcomes and their attendant cost or delay. Mitigation may entail putting the burden on another party (e.g., the AMI vendor), but assignment of risk is not always effective, particularly

if the assignee is unable to control the conditions that could lead to the potential failure, or if the risk is too great in comparison to the project benefits for the assignee.

Table 3 lists major AMI and AMR project risk factors identified and rated in a workshop between OWASA and DS&A staff, as well as potential mitigation measures. The table is largely based on DS&A's experience as well as the experiences of utilities that have had problems with AMI deployments. Risks that could more seriously compromise the ability of the system to perform properly over its life or are more likely to prevent the system from being accepted and used are assigned a higher impact rating. Probability and impact for AMR, where significantly different, are noted.

AMI project risk management starts with the feasibility study and should continue throughout the steps leading up to deployment. Risk mitigation measures include: soliciting expertise; involving all stakeholder groups; following a thorough and unbiased selection process; developing robust contracts and performance measures; establishing quality assurance and rigorous testing protocols at each step of project development and deployment, with strict acceptance "gates" for continuance; providing appropriate safeguards to secure sensitive customer and utility information; establishing and maintaining schedules for visual inspections of installations; implementing detailed project control procedures; and adopting comprehensive project management and communications plans.

Other important risk minimization measures for OWASA include providing leadership and vision surrounding the project, ensuring there are adequate resources to support the deployment and maintenance of the system, and ensuring that employees are trained and motivated to use the system.

Risk management is an active part of sound project implementation. During the course of a project, the project team should keep a risk register, adding risk factors and prevention or mitigation measures as they come up, while some risks will fade away as the project progresses.

Table 3. AMI Project Risk Factors and Mitigation Measures

Technology Risks	Probability AMI	Probability AMR	Impact	Comment	Potential Mitigation
Equipment obsolescence	M	M/H	M/H	Market moving toward AMI	Vendor contracts; homogenous deployment
Excessive or early failures of system components	L	L	H	Vendor could have manufacturing batch problems	Strong warranty provisions, regular monitoring, including vendor analysis of returned units
Inadequate system performance (e.g., read success rate)	L	L	M		Specific performance provisions in contract; relocating or adding more collectors
Incompatibility with future meter registers	L	M	L	Firmware can be updated over network	Require standards in RFP and contract; no untested changes allowed
IT interfaces don't work properly	L/M	L	H		Acceptance testing, with specific acceptance threshold requirements, before any installation
Cybersecurity breaches	L	L	L	Water data provides low target value	Encryption; audit trails; role based passwords and access; data firewalls
Loss or corruption of critical data	L	L	M	Several day window for reads for billing	Require network redundancy; maintain backup procedures
Business Risks					
Vendor instability	L	L/M	M		Due diligence in vendor selection; contract provisions
Inadequate utility staffing during project	L	L	H		Dedicated staff; leadership; use consultant or contractor
Inadequate system maintenance by utility staff	L	L	H		Documented protocols; system "ownership;" managerial accountability
Inadequate vendor support	L	L	H		Contract provisions; "ownership" at utility
Loss of key project team members	L/M	L/M	M		Cross train staff; document of processes and procedures; lean on consultant, vendor
Poor installation quality	L	L	L/M		Qualifications-based selection; installation control system; inspections; contract and warranty provisions
Customers do not make needed installation appointments	L/M	L	M		Good public outreach program; manage customer expectations; educate employees; astute policies; effective communications
Employee or customer lack of confidence in system	M	L/M	H		Good public outreach program; educate employees; installation control system; audit procedures
Increased tampering or theft of service	L	M	L	Tampering is not a big issue	Develop system tools and diagnostics; adequate staffing; enforce policies
Reduced visual inspection of meter assets	M/H	M	L		Adequate staffing; enforce procedures
Business case assumptions invalid	L/M	L	M	Could put pressure on rates	Conservative business case; participation by all affected staff
Unanticipated increases in labor rates, other costs	L	L	M		Understand rates before contracting; effective contract terms; hold vendor accountable; contingency budget
Failure to integrate system with other IT systems	M	L	M	Integration important to generate savings, enhancements w/AMI	Integration plan; leadership; adequate staffing (IT support)
Failure to redeploy staffing	M	L	M	Could put pressure on rates	Leadership; managerial accountability; human resources plan
Business processes do not change to take advantage of system	M	L	M	AMR won't require much change, AMI will	Leadership; involvement of managers and employees; change management plan
Customer expectations too high/not met	L/M	L	M		Manage expectations in outreach and "selling" of features
Customer concerns about health, privacy, etc.	L/M	L	L	Issues tend to be leveraged by poor customer relations, mistrust	Education and outreach
Change in Board direction, strategy, support	L	L	M		Broad support among all stakeholders
Lack of buy-in from stakeholders about project	L	L	M		
Lack of cooperation for DCU location	M	L	M	Could raise system costs (not relevant for AMR)	Vendor selection
Inadequate knowledge, skills or ability of individual employees to succeed in available positions	L	L	M		Change management, leadership and training

L=Low, M=Medium, H=High

Section 9. Organizational Readiness

AMI is a major investment, and to be worthwhile both requires and enables OWASA to change the way it interacts with customers. An AMI system installed on all of OWASA's customers' meters would produce almost 200 million hourly meter readings per year, plus tamper flags and other information related to consumption anomalies as well as meter and system performance. Capturing, storing, analyzing and using this information to deliver more cost-effective and enhanced customer service entails changes in related areas. The following paragraphs contain observations and recommendations for OWASA that are important precedents or adjuncts to a successful AMI investment.

Leadership and culture. OWASA counts excellence in customer service as a core value, and goes to great lengths to engage customers. However, as OWASA operates in the information age, and has a relatively sophisticated customer base, it is important to adopt where appropriate the customer service practices of organizations it would in theory have to compete with "were its customers able to choose" among them. In addition to surveying and understanding contributions and barriers to satisfaction, this includes establishing and measuring ***process-oriented*** (as distinguished from task-oriented) KPIs related to the customer experience and efficiency of operations. Process-oriented KPIs often include percentage first call resolution, time to problem resolution, arrears percentages, percentage of bills based on actual reads that are rendered with X days of reading date, dollar amounts of adjustments, etc. (Task oriented KPIs might include call waiting time, number of field work orders performed in a day, percentage meter readings obtained, etc.). OWASA managers need to be responsible for performance against KPI targets. The objectives should be to deliver the most cost-effective service to customers (that is, balancing high levels of service with low operating costs).

There needs to be close collaboration and communication among OWASA's IT, Customer Service and Distribution Operations field staff, including opportunities to observe or experience what employees in other areas do.

Policies. OWASA should adopt and promote customer service policies that leverage AMI to help cost-effectively deliver customer service, provide information to help customers use water wisely, minimize cross-subsidization among customers, and provide a safety net for disadvantaged customers while minimizing abuse. For example, OWASA might adopt policies designed to minimize accounts in Vacant status, or encouraging customers to enroll in leak and high use notification before they are eligible for waste adjustments. It might adopt cost-based charges for field visits demanded by customers that could be more effectively handled by using the AMI system data.

Business processes. In connection with AMI/AMR, OWASA should review and revise its customer service business processes, streamlining them where possible. At present, no one is responsible in most cases for the whole process. Rather, staff in Customer Service and Water Distribution are responsible for discrete tasks and sub processes. It may sometimes be expedient for some employees to forward issues to other sections rather than trying to resolve the problem

themselves. To encourage closer collaboration, managers in different areas might be jointly assigned responsibility for the performance of processes such as billing dispute resolution against KPIs.

Training, empowerment and supervision. For smaller water/wastewater utilities like OWASA, it can be difficult to find opportunities to train customer service staff – both those in the office and those responsible for field services. The Utility Mechanic position that is responsible for meter reading is considered an entry level position, and subject to a relatively high rate of turnover. As a result, at any one time, some meter readers/field service technicians may be under-trained and/or inexperienced. It is important that all staff involved in customer-facing activities using AMI are reasonably computer-literate and well-trained in using the basic functions of the AMI system. They need to be rehearsed and confident in their ability to assist customers with meter related transactions and resolve billing and other service issues using the AMI-based data. For example, CSRs should be able to diagnose some problems (like an intermittent running toilet that would result in a high bill). They need to be empowered and encouraged to try to resolve problems without "rolling a truck." In addition to training, both office and field personnel need to be adequately monitored and supervised to ensure they are being effective. As new features are added, applications rolled out, or because some operations are used infrequently, some or all may need retraining.

Other technologies. While AMI can provide an indication of potential high consumption before a customer gets a high bill, this is only effective if the customer can be notified. This requires maintaining customer contact information (cellphone numbers for text messages, email addresses for emails, or phone numbers for auto-dialer outbound messaging). Efficiently using AMI data requires integration of the AMI and MDMS with OWASA's work order management system, GIS and other systems.

Section 10. Procurement and Implementation Considerations

If OWASA decides to move ahead with AMI, the next steps would consist of additional planning and analysis to ensure that the solicitation, acquisition, and implementation of a system are adequately defined. OWASA would need to ensure that the solicitation focused the vendor proposals on the system features most important to it, while being cognizant of and managing the risks associated with large-scale technology implementation and integration. DS&A recommends that OWASA consider using a best value approach for vendor selection, incorporating a weighted evaluation of the services and features required and desired by OWASA, and the costs proposed by various vendors compared to their systems' features.

OWASA would need to negotiate a strong contract with its AMI provider, project management contractor, and installation contractor. The risks associated with an AMI implementation should be understood and controlled by appropriate contract language. AMI implementation is not a typical capital budget construction project, and some contract language is unique.

10.1 Managed Services

In addition to the option to purchase the AMI system and its software, some AMI vendors today offer software hosting, comprehensive software management, software as a service ("SaaS," in which the utility doesn't purchase the software), network monitoring, and network as a service ("NaaS," in which the utility doesn't purchase the network). The elements incorporated in each of these options vary from vendor to vendor.

Hosted, managed services and SaaS can cover the headend system, the MDMS and customer portal. The vendor can provide both operational and development/testing environments. The software operates on servers at the vendor's network operations center or data center, and the utility's users have web access. The vendor will maintain the servers, install patches and upgrades, back up data, and provide disaster recovery.

With SaaS and NaaS, the vendor owns and operates the software or network, respectively; the utility makes no capital outlay for these components, but will pay setup fees, integration costs, and monthly usage fees based on the number of meters on the system or the number of data collections.

Network management can include monitoring network performance, identifying "missing" or malfunctioning MIUs, and even maintenance of DCUs. NaaS covers the data collectors, site licenses and backhaul communications.

AMI headend systems have comprehensive diagnostic software, and DCU maintenance is relatively straightforward. Interfaces between AMI software and other systems can also be straightforward. However, utilities lacking sufficient technical resources to manage AMI systems, or whose managers are uncomfortable with one or more aspects of AMI system management, may opt for some form of managed services. Managed services options typically offer lower capital costs in return for higher operating costs. OWASA managers need to understand the operating and maintenance requirements of AMI systems, particularly the

software and interfaces, and evaluate the Authority's own resources, to determine the suitability of managed services.

10.2 Implementation Planning

A poorly planned or poorly executed implementation plan (e.g., problems with data conversions that affect bills, or quality assurance problems in the field that affect customer property) could not only fail to yield all of the benefits anticipated, it could also hurt OWASA's reputation with its customers, member governments, bondholders, and other stakeholders. Successful AMI implementation planning consists of several coordinated "sub-plans," which typically include:

1. a comprehensive project schedule and management plan to govern contract management, field inspection, troubleshooting, data audit and acceptance testing;

2. a network (DCUs and possibly repeaters) deployment plan;

3. an installation control system to ensure contractor work is coordinated with OWASA resources and schedules, data is captured correctly and vendor invoices are correct;

4. a human resources plan to manage the changes in job content and staff redeployment during and after the project;

5. a project staffing plan to ensure enough of the right people are supporting each dimension and phase of the deployment, and positions from which people have been "borrowed" are back-filled;

6. a budget and financing plan to fund the project and cover invoices as the project is deployed;

7. a materials handling plan for managing the inventory of new equipment and the scrapping of old equipment;

8. a meter reading transition plan to ensure all meters are read smoothly as routes are converted to AMI, including "blackout windows" to avoid installations on or near reading days;

9. an outreach and communications plan for customers, employees and the general public;

10. an IT integration plan for creating, documenting, and testing interfaces between the AMI system and OWASA's CIS, GIS, and work order management systems;

11. an acceptance test plan for software, components and overall system performance;

12. procedures for identifying and correcting system problems, such as "missing" MIUs;

13. a preventive and corrective maintenance plan;

14. a policy and procedure review plan, to ensure OWASA has the polices needed to support effective AMI deployment, such as reconciling consumption concerns as old meters are

replaced, and to govern the rights and requirements of customers when AMI data is available;

15. a training plan for all utility employees involved in installation, managing contractors, operating and maintaining the system, dealing with customers during installation and using the system data;

16. an application development roadmap, including staffing support; and

17. stakeholder coordination for DCU installations.

Some key AMI planning considerations are discussed briefly in the following paragraphs.

10.2.1 Staffing and Organizational Planning

OWASA's customer service and meter maintenance staff are organized to accommodate the current volume and flow of information and transactions. The flow of work would change to accommodate the process of installing AMI, and again as meters are put on the system and call volumes and field work orders decline with the decrease in meter-related billing and customer service issues. OWASA would need a plan for modifying its organization structures and reassigning staff, as well as identifying training needs related to modified job requirements and assignments.

10.2.2 Policy and Procedure Review

OWASA would need to review and revise its policies and procedures to ensure the success of the implementation and to make the best use of the new AMI system functionality. For example, with AMI, OWASA might require customers to provide up-to-date contact information in order to be eligible for leak adjustments, and those adjustments might be limited by the date of notification by OWASA of a leak or high consumption. Since it can obtain more accurate and timely information from the AMI system, OWASA should discourage no-cost field investigations. To maximize the economies obtainable from an AMI investment, it should discourage anyone from "opting out" of having an AMI meter (some utilities impose a manual read charge reflecting the full cost of a field visit).

DS&A recommends that OWASA review and revise its policies and procedures concerning leak allowances, turn-ons and turn-offs, final reads, limits for billing exceptions, high bill investigations, etc., in connection with AMI. Certain policy revisions may need the Board of Directors' approval. Policies and procedures should be addressed prior to the commencement of an AMI installation.

10.2.3 Project Management and Implementation Planning

A large-scale AMI installation would require dedicated project management resources. OWASA would require staff or contracted resources with the appropriate skills to:

- Manage the technology and implementation contractor(s).

- Oversee acceptance testing of software and network components.

- Track and facilitate the redesign and implementation of processes and systems that are involved in implementation.

- Manage the IT interfaces used to transfer and update meter and AMI system component data.

- Manage inspections to ensure contractor work quality.

- Design and manage communications with all project stakeholders, including customers, staff, and civic leaders.

- Manage and facilitate the redesign and implementation of reengineered business processes that would use the AMI data to provide new levels of service, including policy changes, data analysis, and staff training and assignment.

Many sub-projects need to be planned, integrated, and completed on schedule if the AMI implementation is to be accomplished efficiently and without undue disruption to customers. OWASA needs to evaluate its project management and other resources available to take on a new major initiative, and determine the extent to which it would supplement its staff with contracted resources.

10.2.4 Communications and Community Engagement

Successful AMI projects require carefully planned and executed communications and engagement with customers, employees, community leaders, and others during the implementation phase.

- Employees should understand the project, and be trained in characterizing the project in response to customer inquiries. Employees could have concerns about the implications of the project for their own jobs, and their concerns should be addressed early and often.

- OWASA staff and community leaders could receive questions about the program. Educating them could help develop support for the program, including any policy enhancements OWASA might need to ensure successful implementation and the full benefit of an AMI system.

- OWASA managers not directly involved in the project should understand its importance and help in the executive sponsorship of the project.

- Customers should be adequately informed in order to minimize the volume of inquiries into the call center, and to control the growth of inevitable rumors about the program.

10.2.5 Information Technology Planning

AMI systems entail several interfaces to other OWASA information systems. During installation, "from host" files are passed from the CIS or a work order management system to the contractor's work order system. Completed work orders, with new information about MIUs and meters, constitute a "to host" file. For meter reading, a request file may be passed from the CIS to the MDMS. Typically, access to the web portal by customers is through a landing page on the utility's website, with single sign-on so that customers don't have to log in again.

IT planning for AMI includes identifying the business processes and use cases that will use AMI data, defining the information required, establishing data definitions and standards, determining which systems will store master data for MIUs, meters, etc., and defining the system architecture. Protocols for synchronizing databases, handling and resolving data anomalies, ensuring cybersecurity, backing up and archiving data, installing and testing software patches and upgrades, developing and testing new applications, and maintaining operating systems and servers, are all part of IT planning for AMI.

10.2.6 Installation Control

Ensuring that the data related to meter and AMI equipment installation is accurately recorded in OWASA's information systems is critical to the success of the project. Without rigorous procedures for managing and controlling the accuracy of the information, critical data related to meters, MIUs, premises addresses and account numbers can be miscoded or mismatched, resulting in potential billing and customer service problems. For example, if a MIU is inadvertently associated with the wrong customer's premises, one or more customers may receive erroneous bills, possibly for several years. The discovery of data discrepancies can color customers' and utility employees' faith in the reliability of the system, even if it is otherwise performing flawlessly. CSRs will be less likely to assure customers that the reading is correct and the bill should be paid, and may be more apt to send someone to the field to obtain or verify a meter reading. This can greatly reduce the savings from the system.

An AMI installation control system is used to capture information about installed equipment, record inspections of installations, return improper installations to the contractor, authorize payment for completed work, and update the CIS. The installation control system entails electronic work orders and data capture (using bar code scanners), filters to verify the validity of data, photographs of old meter registers and potential installation problems, and component performance requirements before installations can be accepted and included on contractors' invoices.

10.2.7 Change Management

AMI should precipitate significant changes in organization and processes for OWASA. While many of the elements of change management are incorporated in AMI implementation planning discussed above, OWASA should establish a formal change management plan around AMI.

Change is a constant for most organizations, and the ability to manage and adapt to organizational change is a requirement in today's successful workplaces. A change management

plan embodies a structured approach. It entails securing employee buy-in to ensure that changes are smoothly and successfully implemented and achieve lasting benefits. A change management plan typically encompasses goals and strategies; an analysis of the current situation, leadership styles, culture, stakeholder drivers, and group dynamics; a gap analysis; metrics to assess progress; a communications element to align expectations; orientation and training; personal counseling and attention as needed; and monitoring and feedback.

Section 11. Recommendations

Based on an analysis of OWASA's meter-related operating and customer service processes and performance data, an assessment of OWASA's existing meter reading methods, and an evaluation of key technology alternatives, DS&A recommends the following:

1. OWASA should discontinue its program of installing more AMR meters, and instead acquire a new AMI system to replace its existing AMR and manual read system. The results of the Triple Bottom Line evaluation – including both the economic and non-economic considerations – are more favorable for this strategy than continuing to slowly deploy AMR, rapidly deploying AMR, or deploying a hybrid system (that is, AMI installed to cover only the UNC campus and medical institutions and the Chapel Hill/Carrboro central business districts).

2. Based on OWASA's existing populations of different makes of small meters, their ages, their performance and their compatibility with AMR and AMI systems, were OWASA to move ahead with a new metering system, it should replace its small Rockwell, Sensus, and Master meters (about one-third of OWASA's total number of small meters). It should keep its straight register Badger and Neptune meters, retrofitting them with new AMR/AMI compatible registers. It should keep its Hersey meters equipped with AMR/AMI compatible registers. It should keep all its large meters, retrofitting them with new AMR/AMI compatible registers.

3. To ensure that an investment in AMI is cost effective, OWASA executives and managers should: embrace a culture of customer service improvement based on process-oriented key performance measures; revamp policies to increase the cost-effectiveness of customer service and minimize cross-subsidization among customers for services; ensure that data from the AMI system is used; streamline inefficient customer service business processes across OWASA; enhance the training and empowerment of CSRs; and adopt and enhance related technologies and information systems needed to achieve the benefits of AMI.

4. AMI installation should be completed over a period of approximately one year following approximately six months for implementation planning, installing (or setting up, in the case of managed services) headend hardware, a meter data management system and a customer portal, and developing and testing interfaces and procedures before any endpoint installations.

5. Should OWASA decide to acquire an AMI system, it should develop an AMI IT integration plan, a customer and community outreach and engagement plan, a human resources plan to deal with redeploying staff, an AMI-based application development plan, and an AMI change management plan, among other sub-plans. OWASA should hire a business analyst to support customer service and help manage the AMI system and its data.

6. OWASA should create a comprehensive risk management plan to anticipate and actively manage both technological and business risks associate with this important and complex project.

Appendix A. Meter Summary Tables

Based on an analysis of OWASA's meter populaton by meter size, type, manufacturer, date installed, and whether the meter has a register capable of being read by an AMR or AMI MIU, DS&A developed tables of "action" for each meter size and type depending on the technology strategy. Older meters, as well as meters size and make which were relatively few in number, were identified for replacement. The tables are shown below.

Table A1. Full-scale AMI and AMR deployment impact on meter population

Size	Type	Replace	Retrofit	AMI/AMR Ready	Total
.625"	PD	6717	4869	7881	19467
.75"	PD	0	0	76	76
1"	PD	198	346	61	605
1.5"	PD	158	142	127	427
2"	PD	0	0	134	134
2"	Comp	36	106	0	142
2"	Mag	0	2	0	2
2"	Turbine	12	143	0	155
3"	Comp	0	54	0	54
3"	Turbine	0	39	40	79
4"	Comp	0	46	1	47
4"	Mag	0	2	0	2
4"	Turbine	0	25	22	47
6"	Comp	0	22	2	24
6"	SRM	0	9	2	11
6"	Turbine	0	8	7	15
8"	Comp	0	7	1	8
8"	Turbine	0	16	1	17
	Totals	7121	5836	8355	21312

(Note: PD=positive displacement; Comp=two-register compound; Mag=magnetic; SRM=single register compound)

Table A2. Hybrid AMR/AMI alternative impact on meters in area covered by the AMI network

Size	Type	Replace	Retrofit	AMI/AMR Ready	Total
.625"	PD	868	1323	2453	4644
.75"	PD	0	0	0	0
1"	PD	67	61	87	215
1.5"	PD	57	50	63	170
2"	PD	0	0	58	58
2"	Comp	30	22	0	52
2"	Mag	0	0	0	0
2"	Turbine	6	38	0	44
3"	Comp	0	28	0	28
3"	Turbine	0	21	26	47
4"	Comp	0	34	0	34
4"	Mag	0	2	0	2
4"	Turbine	0	16	17	33
6"	Comp	0	6	2	8
6"	SRM	0	9	2	11
6"	Turbine	0	3	6	9
8"	Comp	0	0	1	1
8"	Turbine	0	12	1	13
	Totals	1028	1625	2716	5369

Table A3. Hybrid AMR/AMI alternative impact on meter in area not covered by the AMI network

Size	Type	Replace	Retrofit	MI/AMR Read	Total
.625"	PD	5849	3546	5428	14823
.75"	PD	0	0	76	76
1"	PD	131	184	75	390
1.5"	PD	100	93	64	257
2"	PD	0	0	76	76
2"	Comp	22	68	0	90
2"	Mag	0	2	0	2
2"	Turbine	6	105	0	111
3"	Comp	0	26	0	26
3"	Turbine	0	18	14	32
4"	Comp	0	12	1	13
4"	Mag	0	0	0	0
4"	Turbine	0	9	5	14
6"	Comp	0	16	0	16
6"	SRM	0	0	0	0
6"	Turbine	0	5	1	6
8"	Comp	0	7	0	7
8"	Turbine	0	4	0	4
	Totals	6108	4095	5740	15943

Appendix B. Economic Analyses of AMI

Table B1. AMI Meter Population

Meter Size	Type*	Ttl in Service	To Be Replaced	To Be Retrofitted	AMR/AMI Ready	Lids Needed	Mtrs Getting New MIUs
.625"	PD	19,467	6717	4869	7881	11586	19,467
.75"	PD	76	0	0	76	0	76
1"	PD	605	198	346	61	544	605
1.5"	PD	427	158	142	127	300	427
2"	PD	134	0	0	134	0	134
2"	Comp	142	36	106	0	142	142
2"	Mag	2	0	2	0	2	2
2"	Turbine	155	12	143	0	155	155
3"	Comp	54	0	54	0	54	54
3"	Turbine	79	0	39	40	39	79
4"	Comp	47	0	46	1	46	47
4"	Mag	2	0	2	0	2	2
4"	Turbine	47	0	25	22	25	47
6"	Comp	24	0	22	2	22	24
6"	SRM	11	0	9	2	9	11
6"	Turbine	15	0	8	7	8	15
8"	Comp	8	0	7	1	7	8
8"	Turbine	17	0	16	1	16	17
TOTAL		21,312	7,121	5,836	8,355	12,957	21,312
Up to 2"		21,008	7,121	5,608	8,279	12,729	21,008
3" and up		304	0	228	76	228	304

*PD=positive displacement; Comp=compound, Mag=magnetic;
SRM=single register compount

Table B2. AMI Endpoint Components

		MIU Unit Cost:			1-port	$75	2-port	$95							
Meter		---------- MIUs ----------			---------- Mtr Registers ----------				---------- Meters ----------			---------- Lids ----------			
Size	Type	Number	Unit Cost	Total Cost	Number	Unit Cost	Total Cost		Number	Unit Cost	Total Cost	Number	Unit Cost	Ttl Cst	Total Cost
.625"	PD	19,467	$75	$1,460,025	4,869	$46	$223,974		6717	$76	$510,492	11586	$22	$254,892	$2,449,383
.75"	PD	76	$75	$5,700	0	$46	$0		0	$76	$0	0	$22	$0	$5,700
1"	PD	605	$75	$45,375	346	$46	$15,916		198	$150	$29,700	544	$22	$11,968	$102,959
1.5"	PD	427	$75	$32,025	142	$46	$6,532		158	$323	$51,034	300	$40	$12,000	$101,591
2"	PD	134	$75	$10,050	0	$46	$0		0	$457	$0	0	$40	$0	$10,050
2"	Comp	142	$95	$13,490	106	$46	$4,876		36	$457	$16,452	142	$40	$5,680	$40,498
2"	Mag	2	$75	$150	2	$46	$92		0	$457	$0	2	$40	$80	$322
2"	Turbine	155	$75	$11,625	143	$46	$6,578		12	$457	$5,484	155	$40	$6,200	$29,887
3"	Comp	54	$95	$5,130	54	$46	$2,484		0	$2,154	$0	54	$40	$2,160	$9,774
3"	Turbine	79	$75	$5,925	39	$46	$1,794		0	$2,154	$0	39	$40	$1,560	$9,279
4"	Comp	47	$95	$4,465	46	$46	$2,116		0	$3,462	$0	46	$40	$1,840	$8,421
4"	Mag	2	$75	$150	2	$46	$92		0	$3,462	$0	2	$40	$80	$322
4"	Turbine	47	$75	$3,525	25	$46	$1,150		0	$3,462	$0	25	$40	$1,000	$5,675
6"	Comp	24	$95	$2,280	22	$46	$1,012		0	$4,795	$0	22	$40	$880	$4,172
6"	SRM	11	$75	$825	9	$46	$414		0	$4,795	$0	9	$40	$360	$1,599
6"	Turbine	15	$75	$1,125	8	$46	$368		0	$4,795	$0	8	$40	$320	$1,813
8"	Comp	8	$95	$760	7	$46	$322		0	$6,685	$0	7	$40	$280	$1,362
8"	Turbine	17	$75	$1,275	16	$46	$736		0	$6,685	$0	16	$40	$640	$2,651
TOTAL		21,312		$1,603,900	5,836		$268,456		7,121		$613,162	12,957		$299,940	$2,785,458
														Materials related to AMI	2,172,296
														Materials related to meters	613,162

Table B3. Installation Costs

		-----MIU Only -----			-----MIU and Register -----			-----MIU and Meter-------			----------Lids----------			Total	Alloc. To	Alloc. To
Meter	Type	No.	Unit Cost	Ttl Cst	No.	Unit Cost	Ttl Cst	No.	Unit Cost	Ttl Cst	No.	Unit Cost	Ttl Cst	Cost	Meters	Electronics
.625"	PD	7,881	$30	$236,430	4,869	$35	$170,415	6,717	$50	$335,850	11586	$1.00	$11,586	$754,281	$201,510	$552,771
.75"	PD	76	$30	$2,280	0	$35	$0	0	$50	$0	0	$1.00	$0	$2,280	$0	$2,280
1"	PD	61	$30	$1,830	346	$35	$12,110	198	$55	$10,890	544	$1.00	$544	$25,374	$7,425	$17,949
1.5"	PD	127	$30	$3,810	142	$50	$7,100	158	$55	$8,690	300	$2.00	$600	$20,200	$5,925	$14,275
2"	PD	134	$50	$6,700	0	$50	$0	0	$150	$0	0	$2.00	$0	$6,700	$0	$6,700
2"	Comp	0	$50	$0	106	$80	$8,480	36	$150	$5,400	142	$2.00	$284	$14,164	$5,400	$8,764
2"	Mag	0	$50	$0	2	$50	$100	0	$150	$0	2	$2.00	$4	$104	$0	$104
2"	Turbine	0	$50	$0	143	$50	$7,150	12	$150	$1,800	155	$2.00	$310	$9,260	$1,800	$7,460
3"	Comp	0	$125	$0	54	$150	$8,100	0	$0	$0	54	$2.00	$108	$8,208	$0	$8,208
3"	Turbine	40	$100	$4,000	39	$125	$4,875	0	$0	$0	39	$2.00	$78	$8,953	$0	$8,953
4"	Comp	1	$125	$125	46	$150	$6,900	0	$0	$0	46	$2.00	$92	$7,117	$0	$7,117
4"	Mag	0	$100	$0	2	$125	$250	0	$0	$0	2	$2.00	$4	$254	$0	$254
4"	Turbine	22	$100	$2,200	25	$125	$3,125	0	$0	$0	25	$2.00	$50	$5,375	$0	$5,375
6"	Comp	2	$200	$400	22	$250	$5,500	0	$0	$0	22	$2.00	$44	$5,944	$0	$5,944
6"	SRM	2	$175	$350	9	$200	$1,800	0	$0	$0	9	$2.00	$18	$2,168	$0	$2,168
6"	Turbine	7	$175	$1,225	8	$200	$1,600	0	$0	$0	8	$2.00	$16	$2,841	$0	$2,841
8"	Comp	1	$200	$200	7	$250	$1,750	0	$0	$0	7	$2.00	$14	$1,964	$0	$1,964
8"	Turbine	1	$200	$200	16	$200	$3,200	0	$0	$0	16	$2.00	$32	$3,432	$0	$3,432
TOTAL		8,355		$259,750	5,836		$242,455	7,121		$362,630	12,957		$13,784	$878,619	$222,060	$656,559

Table B4. Existing meter replacement and HotRod installation deferrals

Meter Size	Type	Meters to Replace	Cost per MIU+Mtr	Labor Cost	Total Cost	HotRod Rplcmnts	MIU Cost	Labor Cost	Total Cost	No. Lids Required	Lid Unit Cost	Total Lid Cost	Total Cost
.625"	PD	9,384	$134	$45	$1,679,736	2311	$65	$35	$231,100	9384	$22	$206,448	$2,117,284
.75"	PD	0	$182	$45	$0	0	$65	$35	$0	0	$22	$0	$0
1"	PD	320	$240	$45	$91,200	28	$65	$35	$2,800	320	$22	$7,040	$101,040
1.5"	PD	228	$444	$90	$121,752	31	$65	$35	$3,100	228	$40	$9,120	$133,972
2"	PD	46	$566	$90	$30,176	46	$65	$35	$4,600	46	$40	$1,840	$36,616
2"	Comp	53	$566	$90	$34,768	0	$65	$35	$0	53	$40	$2,120	$36,888
2"	Mag	0	$566	$90	$0	0	$65	$35	$0	0	$40	$0	$0
2"	Turbine	16	$566	$90	$10,496	0	$65	$35	$0	16	$40	$640	$11,136
3"	Comp	0	$2,244	$66	$0	0	$65	$35	$0	0	$40	$0	$0
3"	Turbine	0	$2,219		$0	15	$65	$35	$1,500	0	$40	$0	$1,500
4"	Comp	0	$3,552		$0	0	$65	$35	$0	0	$40	$0	$0
4"	Mag	0	$3,527		$0	0	$65	$35	$0	0	$40	$0	$0
4"	Turbine	0	$3,527		$0	5	$65	$35	$500	0	$40	$0	$500
6"	Comp	0	$4,885		$0	0	$65	$35	$0	0	$40	$0	$0
6"	SRM	0	$4,860		$0	5	$65	$35	$500	0	$40	$0	$500
6"	Turbine	0	$4,860		$0	0	$65	$35	$0	0	$40	$0	$0
8"	Comp	0	$6,775		$0	0	$65	$35	$0	0	$40	$0	$0
8"	Turbine	0	$6,750		$0	1	$65	$35	$100	0	$40	$0	$100
TOTAL		10,047			1,968,128	2,442			244,200			227,208	$2,439,536
All meters <=2" installed 1998 or earlier will be replaced											Total meter repair/replacement savings:		$2,439,536
All Master, Rockwell and Sensus meters will be replaced											Over how many years		10
All others will be retrofitted or are already AMR/AMI capable											Savings per year		$243,954

Table B4a. Meters replaced over 10 years with current program

	size				
Year Installed	0.625"	1"	1.5"	2.0"	Quantity
Pre 1999[1]	6,717	198	158	48	7121
1999	36	2	11	4	53
2000	800	19	30	23	872
2001	729	22	11	23	785
2002	1102	79	18	17	1216
Total	9384	320	228	115	10047
					10,047

[1] All meters <=2" installed 1998 or earlier will be replaced
All Master, Rockwell and Sensus meters will be replaced

Table B4b. Number of HotRod MIUs reaching life expectancy over next 10 years

	Size								
Year to be	.625"	1.0"	1.5"	2.0"	3.0"	4"	6"	8"	Quantity
2016	2	1	0	0	0	0	0	1	4
2020	1			1					2
2021	25		2	2		1			30
2022	1105	5	1	4			1		1116
2023	382	7	7	8	1				405
2024	218	8	10	15	6	3	2		262
2025	578	7	11	16	8	1	2		623
Total	2311	28	31	46	15	5	5	1	2442

Table B5. Salvage on replaced old meters

Meter Size	Type	No. Meters Replaced	Salvage Value	Total Salvage
.625"	PD	6,717	$3.50	$23,510
.75"	PD	0	$5.00	$0
1"	PD	198	$11.00	$2,178
1.5"	PD	158	$31.00	$4,898
2"	PD	0	$75.00	$0
2"	Comp	36	$75.00	$2,700
2"	Mag	0	$75.00	$0
2"	Turbine	12	$75.00	$900
3"	Comp	0	$82.00	$0
3"	Turbine	0	$82.00	$0
4"	Comp	0	$178.00	$0
4"	Mag	0	$178.00	$0
4"	Turbine	0	$178.00	$0
6"	Comp	0	$196.00	$0
6"	SRM	0	$196.00	$0
6"	Turbine	0	$196.00	$0
8"	Comp	0	$212.00	$0
8"	Turbine	0	$212.00	$0
TOTAL		7,121		$34,186

Table B6. AMI data collection hardware, software, and vendor project management fees

Project Duration (Months)		18				
			Own/Operate			
Item		Units	Unit Cost	Total		
Data Collection Units		10	$5,000	$50,000		
DCU Installation		10	5,000	50,000		
Repeaters		50	3,500	175,000		
Repeater Installation		50	3,000	150,000		
	Network			$425,000		
Mobile Collector Hardware		1	$30,000	$30,000		
Handheld programmers for staff		5	5,500	27,500		
	Other Hardware			$57,500		
				Own/Operate	Managed Service	
				Unit Cost	SetUp Fee	Ann/Meter
Control system hardware				$50,000	$0	
Control system software				50,000	25,000	$0.50
Meter Data Mgt. System, Cust. Portal hardware				50,000	0	
Meter Data Mgt. System				100,000	50,000	$2.50
MDMS Integration to billing system				50,000	50,000	
Customer portal software				50,000	25,000	$1.50
Customer E-Portal Integration				50,000	50,000	
	System Software, Hardware, Integration		Subtotal	$400,000	$200,000	
Professional Services Project Management				$560,625	560,625	
Training				30,000	30,000	
	Pjt. Management and Training			590,625	590,625	
			TOTAL	$1,473,125	$1,273,125	

Table B7. OWASA project management costs

Project Management Duration		18	months
		Annual	Total
Project Staff	Number	Salary	Annual Cost
Project Manager	1	$70,000	$70,000
Asst Project Mgr.	0	$65,000	$0
Project Administrator	1	$46,000	$46,000
Field Inspectors	1	$52,000	$52,000
Total Salaries			$168,000
Benefits at		43.9%	$73,769
Annual Salary and Benefits			$241,769
		Unit Cost	Total Cost
Vehicles	2	$5,800	$11,600
Total Annual Expense			$253,369
Total Over Project Mgt Duration			$380,053
One-Time Expenses			
Community Engagement			$75,000
Purchasing, Legal and Consulting Fees			$350,000
		Total	$425,000
TOTAL PROJECT MANAGEMENT			$805,053
		Initial	$300,000
		Ongoing	$505,053

Table B8. Annual operating costs

			Cost
Annual HW,Software Maintenance (O/O)	20%	$400,000	$ 80,000
Annual Hosting Cost (Services)			
Head-end software	$0.50	21,312	10,656
MDMS	$2.50	21,312	53,280
Portal	$1.50	21,312	31,968
		Subtotal	95,904
Annual Application Software Development			$ -
Annual DCU maintenance agreement	$0.00	10	$ -
System monitoring service/yr			$ -
DCU Communications Costs			
No. of DCUs	10		
Avg. mo. communications cost/DCU	$50		
Total Annual Communications cost			$ 6,000
Power costs			
DCU power, reqd, KWH/yr	70	10	
Repeater power reqd, KWH/yr	60	50	
$ per KWH	$0.15		
Total running power costs			$ 555
DCU Site lease costs/mo.	300	5	$18,000
Total Annual Operating Cost			$120,459

Table B9. Annual maintenance costs

Total Number of AMR/AMI in Service			21,312		
Hardware Malfunction			Pct/Year	No. Problems	
MIU Failures			1.50%	320	
Other Problems (wiring, fittings)			0.25%	53	
		Total	1.75%	373	
Hand-held failures	5	units	20%	1.0	
Data Collection Unit and Repeater Failu	60	units	10%	6.0	
Personnel Time Required to Correct Malfunctions			Technical	Clerical	
Average Repair Time, except for DCUs, min.			45	10	
Person-hrs for Hand-helds			2	1	
Person-hrs for Data Collector Problems			8	2	
Person Hours Required per year			330	75	
No. of People Required*			0.20	0.05	
Hourly Labor Rate			$19.50	$19.50	
Labor Cost			$6,430	$1,466	
Labor Plus Benefits at		44%	$9,253	$2,109	
Total Annual Labor Cost:				$11,362	
Transportation Costs for Repairs					
No. of Vehicles (1 per technician)			0.2		
Annual vehicle capital and operating Cost			$5,800		
Total Annual Vehicle Cost:			$1,160		
Annual Equipment Repair Costs		DCU	Repeater	MIU**	Handheld
Percent of capital cost	50%				
Expected Avg. Manuf. Rpr/Rplcmnt Cost		$2,500	$1,750	$37.50	$500
Malfunctions per Year		1	5	320	1
Total Repair/Replacement Cost		$2,500	$8,750	$11,988	$500
Annualized Battery Replacement Costs					
No. of collectors and repeaters		60			
Cost per battery		$200			
Labor cost per change		$200			
Replacement interval, yrs		5			
Total annualized cost		$4,800			

TOTAL LABOR, VEHICLE COSTS	$12,522
TOTAL EQUIPMENT REPAIR COSTS	$28,538
TOTAL MAINTENANCE COSTS	$41,060

Assumes 1645 working hours per person per year

Table B10. Personnel impacts

								Overhead	44%		
Customer Service	Auth.	Vcnt	Act.	w/AMI	Savd	Avg Sal	Total Direct	Overtime	Overhead	Total	Savings
Customer Service Manager	1	0	1	1	0	$62,881	$62,881	$0	$27,611	$90,492	$0
Billing Supervisor	1	0	1	1	0	$55,777	$55,777	$0	$24,492	$80,269	$0
Senior Customer Service Representative	1	0	1	1	0	$50,770	$50,770	$0	$22,293	$73,063	$0
Customer Service Representative	3	0	3	2	1	$40,670	$122,010	$0	$53,575	$175,585	$58,528
Clerk/Cashier	2	1	1	1	0	$33,000	$33,000	$0	$14,490	$47,490	$0
Administrative Assistant	1	0	1	1	0	$40,154	$40,154	$0	$17,632	$57,786	$0
Subtotal	9	1	8	7	1		$364,592	$0	$160,092	$524,684	$58,528
Distribution and Collections	Auth.	Vcnt	Act.	w/AMI	Savd	Avg Sal	Total Direct	Overtime	Overhead	Total	Savings
Warehouse-Cross Connection Coordinator	1	0	1	1	0	$42,288	$42,288	$0	$18,569	$60,857	$0
Utility Mechanic I	23.0	2.0	21.0	16.5	6.5	$33,177	$696,717	$7,000	$305,928	$1,009,645	$317,343
Utility Mechanic II	10	3	7	10	0	$40,650	$284,550	$0	$124,946	$409,496	$0
Utility Mechanic III	3	0	3	3	0	$44,414	$133,242	$0	$58,507	$191,749	$0
Crew Leader	6	0	6	6	1	$51,813	$310,878	$0	$136,507	$447,385	$74,564
Asst.Distr./Collct.System Mgr	1	0	1	1	0	$72,000	$72,000	$0	$31,615	$103,615	$0
Distr./Collct.System Mgr	1	0	1	1	0	$98,680	$98,680	$0	$43,330	$142,010	$0
Subtotal	45	5	40	38.5	7.5		$1,638,355	$7,000	$719,402	$2,364,757	$391,907
Information Systems	Auth.	Vcnt	Act.	w/AMI	Savd	Avg Sal	Total Direct	Overtime	Overhead	Total	Savings
Information Service Technical Specialist	1	0	1	1	0	$56,898	$56,898	$0	$24,984	$81,882	$0
AMI System Manager/Business Analyst	0	0	0	1	-1	$70,000	($70,000)	$0	($30,737)	($100,737)	($100,737)
Network Administrator	1	0	1	1	0	$69,628	$69,628	$0	$30,574	$100,202	$0
Database Administrator	1	0	1	1	0	$79,532	$79,532	$0	$24,821	$81,347	$0
Director of IT	1	0	1	1	0	$111,866	$111,866	$0	$55,394	$181,548	$0
Subtotal	4	0	4	5	-1		$247,924	$0	$105,035	$344,241	($100,737)
Total	58	6	52	51	8		$2,250,871	$7,000	$984,529	$3,233,682	$349,698
										% Pos. Reduction	12.9%

Table B11. Vehicle and other savings

Avg. Ann. cost per Vehicle (incl. depreciation)				$5,800	
Vehicles		Number Before	Number After	Number Saved	Total Savings
Meter readers, crew chief		7	0	7	$40,600
Field service investigators		2	2	0	$0
	Total	9	2	7	$40,600
Other Cost Savings		Before	Reduction	After	Savings
Vacant Account		$170,000	0%	$170,000	$0
Leak Adjustments		$260,000	25%	$195,000	$65,000
Theft		15,000	50%	$7,500	$7,500
Bad Debt Write-off		$120,000	10%	$108,000	$12,000
	Total				$84,500
				Total Vehicle and Other Savings	$125,100

Table B12. Revenue recovery from meter replacement

Total Annual Revenues (FY 14)	Small	Large
Water Commodity Revenues	7,883,570	4,563,418
Sewer commodity revenues	8,734,722	4,804,810
Total	16,618,292	9,368,228
Water consumption, small meters, MGD		
Water consumption, large meters, MGD		
	Total Small	- Large
Ttl Wtr Cons., CCF	-	-
No of meters	21,008	304
No. of meters to be replaced	7,121	0
Revenue through meters to be replaced	$5,633,038	0
Pct rcvry for mtrs to be rplcd	0.00%	0.01%
Revenues recovered through replacement	$0	0
Total Increase in annual revenues	$0	
Annual Loss in Meter Accuracy	0.25%	0.25%

Table B13. Summary of non-discounted costs and benefits

		All Meters:	21,312
Capital Cost		Total Cost	Cst/Unit
Meters & Assoc. Misc. Mat'ls.		$613,162	$28.77
Installation Costs Allocable to Meters		$222,060	$10.42
Endpoints (MIUs) & Assoc. Mat'ls.		$1,603,900	$75.26
Installation Costs Allocable to Endpoints		$656,559	$30.81
Data Collection HW/SW, Vendor Pjt Mgt.		$1,275,000	
OWAWA Project Mgt. Initial Costs		$300,000	$14.08
OWASA Project Mgt. Ongoing Costs		$505,053	
Grand Total System Cost		$5,175,734	$242.86
Salvage on Old Meters		$34,186	$1.60
Savings on normal meter turnover, HotRod		$2,439,536	$114.47
Net Total System Cost		$2,702,013	$126.78
Annual System O&M Costs			
Operating Costs		$120,459	$5.65
Maintenance and Repair		$41,060	$1.93
Total Annual O&M Cost		$161,519	$7.58
Annual Operating Costs/Savings			
Personnel Savings	$	349,698	$16.41
Vehicle and other savings		125,100	
Other Savings		0	
Total Annual Savings	$	474,798	$22.28
Under-Registration Recovery		$0	$0.00
Total Revenue Plus Savings		$474,798	$22.28
Net Annual Savings		$313,279	$14.70
* Unadjusted for inflation or discounting			
Simple Payback Period Calculation		8.6	

Table B14. Factors for multi-period analysis

Input Data		Cost Item	Total Cost	Number of Units	Average Cost	Contin-gency	W/ Cntngy Cost (000s)	Inflation Factor
Default Inflation Factor	2.00%	Meters & Assoc. Misc. Mat'ls.	$613,162	21,312	$28.77	5.0%	$644	2.0%
Discount Rate*	3.50%	Meter Installation	$222,060	21,312	$10.42	5.0%	$233	2.0%
Current Year	2016	Electronics & Assoc. Mat'ls.	$1,603,900	21,312	$75.26	5.0%	$1,684	0.0%
Installation Start	2017	Electronics Installation	$656,559	21,312	$30.81	5.0%	$689	2.0%
Years Until Start	1	Data Collection HW/SW	1,305,000	21,312	$61.23	5.0%	$1,370	2.0%
Years of Installation	2.0	Project Mgt Initial	$300,000	21,312	$14.08	5.0%	$315	2.0%
Meter Service Life	25	Project Mgt Ongoing	$505,053	21,312	$23.70	5.0%	$530	2.0%
Endpoint Service Life	15	Salvage Value	$34,186	21,312	$1.60		$34	2.0%
Savings Delay, yrs	0	Normal meter turnover savings	$2,439,536	21,312	$114.47		$2,440	2.0%
		Annual O&M	$161,519	21,312	$7.58		$162	2.0%
		Annual Operating Cost Savings	$474,798	21,312	$22.28		$475	2.0%
		Under-Registration Recovery	$0	21,312	$0.00		$0	0.0%
*Reflecting cost of capital				Total Capital Cost w/Cont			$5,466	

Table B15. Cumulative installations, cost savings and inflation factors used for multi-period analysis

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Project Time Horizon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Install? Yes=1, No=0	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Installation Curve	0	0.50	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Installed in Year	0.0%	75.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cumulative Installation	0.0%	75.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cost Savings Factor	0.00	0.38	0.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
No. meters chngd	0	5,341	1,780	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. AMI Installations	0	15,984	5,328	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cum.AMI Installs	0	15,984	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312
Inflation Factor	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.32	1.35	1.37	1.40	1.43	1.46
Rate Increase per Year	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Cumulative Rate Increase	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.32	1.35	1.37	1.40	1.43	1.46	1.49

Table B16. Distribution of administrative and start-up costs

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Project Management	$0	$580	$265	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Data Collection HW/SW	0	1,339	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B17. Savings over planning horizon

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual Operating Cost Savings	$0	$178	$415	$475	$475	$475	$475	$475	$475	$475	$475	$475	$475	$475	$475	$475	$475	$475	$475	$475
Normal meter turnover savings	0	244	244	244	244	244	244	244	244	244	244	0	0	0	0	0	0	0	0	0
Under-registration recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Placeholder	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table B18. Costs and savings over planning horizon, including deprecation calculations

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
Planning Horizon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Meters & Misc. Matls.	0	483	164	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	647
Meter Installation	0	175	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	234
Meter Salvage Value	0	(26)	(9)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(34)
Subtotal	$0	$632	$215	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	847
Endpoints	0	1,263	421	0	0	0	0	0	0	0	0	0	0	0	0	0	1,263	421	0	0	3,368
Endpoint Installation	0	517	176	0	0	0	0	0	0	0	0	0	0	0	0	0	696	237	0	0	1,625
Data Collection HW/SW	$0	$1,339	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	1,339
Subtotal	0	3,119	597	0	0	0	0	0	0	0	0	0	0	0	0	0	1,959	658	0	0	6,332
Project Start-up & Admin.	0	580	270	0	0	0	0	0	0	0	0	0	0	0	0	0	781	364	0	0	1,995
Normal meter turnover savin	$0	($244)	($249)	($254)	($259)	($264)	($269)	($275)	($280)	($286)	($292)	$0	$0	$0	$0	$0	$0	$0	$0	$0	(2,671)
Total Capital Costs	$0	$4,331	$1,082	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,740	$1,022	$0	$0	9,175
Operating Cost Savings	$0	$422	$673	$748	$763	$778	$794	$809	$826	$842	$859	$579	$590	$602	$614	$626	$639	$652	$665	$678	13,159
Under-registration Recovery	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0
System O&M Costs	$0	($121)	($165)	($168)	($171)	($175)	($178)	($182)	($186)	($189)	($193)	($197)	($201)	($205)	($209)	($213)	($217)	($222)	($226)	($231)	(3,649)
Net Operating Savings	$0	$301	$508	$580	$591	$603	$615	$628	$640	$653	$666	$382	$390	$397	$405	$413	$422	$430	$439	$447	9,510

Table B19. Discounted cash flow and return on investment calculations

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cash on Cash	Residual value hardware included																			
Capital Investment (20yr)	$0	($4,331)	($1,082)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	($2,740)	($1,022)	$0	$1,312
Capital Investment (15yr)	0	(4,331)	(1,082)	0	0	0	0	0	0	0	0	0	0	0	304					
Net Operating Savings	$0	$301	$508	$580	$591	$603	$615	$628	$640	$653	$666	$382	$390	$397	$405	$413	$422	$430	$439	$447
Net Cash (20yr)	0	(4,030)	(574)	580	591	603	615	628	640	653	666	382	390	397	405	413	(2,318)	(592)	439	1,759
Net cash (15 yr)	0	(4,030)	(574)	580	591	603	615	628	640	653	666	382	390	397	709					

20 Year Horizon				
Discount Rate	2.00%	3.50%	6.00%	5.00%
Net Prsnt Val, 000s	$ 791	292	(340)	(113)
Internal Rate of Return	4.55%			

15 Year Horizon				
Discount Rate	2.00%	3.50%	6.00%	8.00%
Net Prsnt Val, 000s	$ 1,300	733	(2)	(442)
Internal Rate of Return	5.99%			

OWASA AMI Feasibility Study Report Supplement

TABLES FOR OTHER STRATEGIES

DS&A

Table C1 Meter Population

Meter Size	Type	Ttl in Service	To Be Replaced	To Be Retrofitted	AMR/AMI Ready	Lids Needed	Mtrs Getting New MIUs
.625"	PD	19,467	6717	4869	7881	11586	19,467
.75"	PD	76	0	0	76	0	76
1"	PD	605	198	346	61	544	605
1.5"	PD	427	158	142	127	300	427
2"	PD	134	0	0	134	0	134
2"	Comp	142	36	106	0	142	142
2"	Mag	2	0	2	0	2	2
2"	Turbine	155	12	143	0	155	155
3"	Comp	54	0	54	0	54	54
3"	Turbine	79	0	39	40	39	79
4"	Comp	47	0	46	1	46	47
4"	Mag	2	0	2	0	2	2
4"	Turbine	47	0	25	22	25	47
6"	Comp	24	0	22	2	22	24
6"	SRM	11	0	9	2	9	11
6"	Turbine	15	0	8	7	8	15
8"	Comp	8	0	7	1	7	8
8"	Turbine	17	0	16	1	17	17
TOTAL		21,312	7,121	5,836	8,355	12,958	21,312
Up to 2"		21,008	7,121	5,608	8,279	12,729	21,008
3" and up		304	0	228	76	229	304
Pct <3"		98.57%					

Table C2. Endpoints

MIU Unit Cost: 1-port $75 2-port $95

Meter Size	Type	MIUs Number	MIUs Init Cos	MIUs Total Cost	Mtr Registers Number	Mtr Registers nit Co	Mtr Registers Total Cost	Meters Numbe	Meters Unit Cost	Meters Total Cost	Lids Number	Lids Unit	Lids Ttl Cst	Total Cost
.625"	PD	19,467	$75	$1,460,025	4,869	$46	$223,974	6717	$76	$510,492	11586	$22	$254,892	$2,449,383
.75"	PD	76	$75	$5,700	0	$46	$0	0	$76	$0	0	$22	$0	$5,700
1"	PD	605	$75	$45,375	346	$46	$15,916	198	$150	$29,700	544	$22	$11,968	$102,959
1.5"	PD	427	$75	$32,025	142	$46	$6,532	158	$323	$51,034	300	$40	$12,000	$101,591
2"	PD	134	$75	$10,050	0	$46	$0	0	$457	$0	0	$40	$0	$10,050
2"	Comp	142	$95	$13,490	106	$46	$4,876	36	$457	$16,452	142	$40	$5,680	$40,498
2"	Mag	2	$75	$150	2	$46	$92	0	$457	$0	2	$40	$80	$322
2"	Turbine	155	$75	$11,625	143	$46	$6,578	12	$457	$5,484	155	$40	$6,200	$29,887
3"	Comp	54	$95	$5,130	54	$46	$2,484	0	$2,154	$0	54	$40	$2,160	$9,774
3"	Turbine	79	$75	$5,925	39	$46	$1,794	0	$2,154	$0	39	$40	$1,560	$9,279
4"	Comp	47	$95	$4,465	46	$46	$2,116	0	$3,462	$0	46	$40	$1,840	$8,421
4"	Mag	2	$75	$150	2	$46	$92	0	$3,462	$0	2	$40	$80	$322
4"	Turbine	47	$75	$3,525	25	$46	$1,150	0	$3,462	$0	25	$40	$1,000	$5,675
6"	Comp	24	$95	$2,280	22	$46	$1,012	0	$4,795	$0	22	$40	$880	$4,172
6"	SRM	11	$75	$825	9	$46	$414	0	$4,795	$0	9	$40	$360	$1,599
6"	Turbine	15	$75	$1,125	8	$46	$368	0	$4,795	$0	8	$40	$320	$1,813
8"	Comp	8	$95	$760	7	$46	$322	0	$6,685	$0	7	$40	$280	$1,362
8"	Turbine	17	$95	$1,615	16	$46	$736	0	$6,685	$0	16	$40	$640	$2,991
TOTAL		21,312		$1,604,240	5,836		$268,456			$613,162	12,957		$299,940	$2,785,798

Materials related to AMR	2,172,636
Materials related to meters	613,162

Table C3 Installation Costs

		----MIU Only ----			----MIU and Register ----			----MIU and Meter-----			----------Lids----------			Total	Alloc. To	Alloc. To
Meter	Type	No.	Unit	Ttl Cst	No.	Unit	Ttl Cst	No.	Unit	Ttl Cst	No.	Unit	Ttl Cst	Cost	Meters	Electronics
.625"	PD	7,881	$30	$236,430	4,869	$35	$170,415	6,717	$50	$335,850	11586	$1.00	$11,586	$754,281	$201,510	$552,771
.75"	PD	76	$30	$2,280	0	$35	$0	0	$50	$0	0	$1.00	$0	$2,280	$0	$2,280
1"	PD	61	$30	$1,830	346	$35	$12,110	198	$55	$10,890	544	$1.00	$544	$25,374	$7,425	$17,949
1.5"	PD	127	$30	$3,810	142	$50	$7,100	158	$55	$8,690	300	$2.00	$600	$20,200	$5,925	$14,275
2"	PD	134	$50	$6,700	0	$50	$0	0	$150	$0	0	$2.00	$0	$6,700	$0	$6,700
2"	Comp	0	$50	$0	106	$80	$8,480	36	$150	$5,400	142	$2.00	$284	$14,164	$5,400	$8,764
2"	Mag	0	$50	$0	2	$50	$100	0	$150	$0	2	$2.00	$4	$104	$0	$104
2"	Turbine	0	$50	$0	143	$50	$7,150	12	$150	$1,800	155	$2.00	$310	$9,260	$1,800	$7,460
3"	Comp	0	$125	$0	54	$150	$8,100	0	$0	$0	54	$2.00	$108	$8,208	$0	$8,208
3"	Turbine	40	$100	$4,000	39	$125	$4,875	0	$0	$0	39	$2.00	$78	$8,953	$0	$8,953
4"	Comp	1	$125	$125	46	$150	$6,900	0	$0	$0	46	$2.00	$92	$7,117	$0	$7,117
4"	Mag	0	$100	$0	2	$125	$250	0	$0	$0	2	$2.00	$4	$254	$0	$254
4"	Turbine	22	$100	$2,200	25	$125	$3,125	0	$0	$0	25	$2.00	$50	$5,375	$0	$5,375
6"	Comp	2	$200	$400	22	$250	$5,500	0	$0	$0	22	$2.00	$44	$5,944	$0	$5,944
6"	SRM	2	$175	$350	9	$200	$1,800	0	$0	$0	9	$2.00	$18	$2,168	$0	$2,168
6"	Turbine	7	$175	$1,225	8	$200	$1,600	0	$0	$0	8	$2.00	$16	$2,841	$0	$2,841
8"	Comp	1	$200	$200	7	$250	$1,750	0	$0	$0	7	$2.00	$14	$1,964	$0	$1,964
8"	Turbine	1	$200	$200	16	$200	$3,200	0	$0	$0	17	$2.00	$34	$3,434	$0	$3,434
TOTAL		8,355		$259,750	5,836		$242,455	7,121		$362,630	12,958		$13,786	$878,621	$222,060	$656,561

Note: meter install cost equals total less MIU along plus another half of the difference for mobilization

Table C4. Existing Meter Replacement Program

Meter Size	Type	Meters to Replace	Cost per MIU+Mtr	Labor Cost	Total Cost	HotRod Rplcmnts	MIU Cost	Labor Cost	Total Cost	No. Lids Require	Lid Unit Cost	Total Lid Cost	Total Cost
.625"	PD	9,384	$134	$45	$1,679,736	2311	$65	$35	$231,100	9384	$22	$206,448	$2,117,284
.75"	PD	0	$182	$45	$0	0	$65	$35	$0	0	$22	$0	$0
1"	PD	320	$240	$45	$91,200	28	$65	$35	$2,800	320	$22	$7,040	$101,040
1.5"	PD	228	$444	$90	$121,752	31	$65	$35	$3,100	228	$40	$9,120	$133,972
2"	PD	46	$566	$90	$30,176	46	$65	$35	$4,600	46	$40	$1,840	$36,616
2"	Comp	53	$566	$90	$34,768	0	$65	$35	$0	53	$40	$2,120	$36,888
2"	Mag	0	$566	$90	$0	0	$65	$35	$0	0	$40	$0	$0
2"	Turbine	16	$566	$90	$10,496	0	$65	$35	$0	16	$40	$640	$11,136
3"	Comp	0	$2,244	$90	$0	0	$65	$35	$0	0	$40	$0	$0
3"	Turbine	0	$2,219		$0	15	$65	$35	$1,500	0	$40	$0	$1,500
4"	Comp	0	$3,552		$0	0	$65	$35	$0	0	$40	$0	$0
4"	Mag	0	$3,527		$0	0	$65	$35	$0	0	$40	$0	$0
4"	Turbine	0	$3,527		$0	5	$65	$35	$500	0	$40	$0	$500
6"	Comp	0	$4,885		$0	0	$65	$35	$0	0	$40	$0	$0
6"	SRM	0	$4,860		$0	5	$65	$35	$500	0	$40	$0	$500
6"	Turbine	0	$4,860		$0	0	$65	$35	$0	0	$40	$0	$0
8"	Comp	0	$6,775		$0	0	$65	$35	$0	0	$40	$0	$0
8"	Turbine	0	$6,750		$0	1	$65	$35	$100	0	$40	$0	$100
TOTAL		10,047				2,442							$2,439,536

All meters <=2" installed 1998 or earlier will be replaced	Total meter repair/replacement savings:	Yes	
All Master, Rockwell and Sensus meters will be replaced		Over how many years	$2,439,536
All others will be retrofitted or are already AMR/AMI capable		Savings per year	10
	Savings per year		$243,954

Table C4a. Meters replaced over 10 years with current program

Year Installed	size 0.625"	1"	1.5"	2.0"	Quantity
Pre 1999[1]	6,717	198	158	48	7121
1999	36	2	11	4	53
2000	800	19	30	23	872
2001	729	22	11	23	785
2002	1102	79	18	17	1216
Total	9384	320	228	115	10047
					10,047

[1] All meters <=2" installed 1998 or earlier will be replaced
All Master, Rockwell and Sensus meters will be replaced

Table C4b. Number of HotRod MIUs reaching life expectancy over next 10 years

Year to be	Size .625"	1.0"	1.5"	2.0"	3.0"	4"	6"	8"	Quantity
2016	2	1	0	0	0	0	0	1	4
2020	1			1					2
2021	25		2	2		1			30
2022	1105	5	1	4			1		1116
2023	382	7	7	8	1				405
2024	218	8	10	15	6	3	2		262
2025	578	7	11	16	8	1	2		623
Total	2311	28	31	46	15	5	5	1	2442

Table C5. Salvage on Old Meters

Meter Size	Type	No. Meters Replaced	Salvage Value	Total Salvage
.625"	PD	6,717	$3.50	$23,510
.75"	PD	0	$5.00	$0
1"	PD	198	$11.00	$2,178
1.5"	PD	158	$31.00	$4,898
2"	PD	0	$75.00	$0
2"	Comp	36	$75.00	$2,700
2"	Mag	0	$75.00	$0
2"	Turbine	12	$75.00	$900
3"	Comp	0	$82.00	$0
3"	Turbine	0	$82.00	$0
4"	Comp	0	$178.00	$0
4"	Mag	0	$178.00	$0
4"	Turbine	0	$178.00	$0
6"	Comp	0	$196.00	$0
6"	SRM	0	$196.00	$0
6"	Turbine	0	$196.00	$0
8"	Comp	0	$212.00	$0
8"	Turbine	0	$212.00	$0
TOTAL		7,121		$34,186

Table C6. Data Collection Hardware and Software - AMR

Project Duration (Months) 15

Item	Units	Unit Price	Total
Data Collection Units	0	$5,000	$0
DCU Installation	0	5,000	0
Repeaters	0	3,500	0
Repeater Installation	0	3,000	0
Network			$0
Mobile Collector Hardware	2	$30,000	$60,000
Handheld programmers for staff	5	5,500	27,500
Other Hardware			$87,500
Control system hardware	1	$25,000	$25,000
Control system software	1	$25,000	25,000
Meter Data Management System, Cust. Portal	0	150,000	0
Interface to billing system	1	5,000	5,000
Customer E-Portal Interface	0	50,000	0
System Software, Hardware, Integration		Subtotal	$55,000
Professional Services Project Management	1	456250	$456,250
Training	1	15,000	15,000
Professional Services			471,250
		TOTAL	$613,750

Vendor Project Management Cost

Project Duration(Months) 15.0

	% Assigned	Hourly Rate	Total Hours	Total Cost
Project Manager	30%	$125.00	750	$93,750
Implementation Manager	50%	$125.00	1,250	$156,250
Technical Consultant	10%	$125.00	250	$31,250
Field Engineer	20%	$125.00	500	$62,500
3rd Party	10%	$150.00	250	$37,500
Expenses				$75,000
Total				$456,250

Expenses	Total weeks	% Assigned	Wkly Expns	Ttl Expns
Project Manager	63	30%	$ 1,500	$ 28,125
Implementation Manager	63	50%	$ 1,500	$ 46,875
Technical Consultant	0	10%	$ 1,500	$ -
Field Engineer	0	20%	$ 1,500	$ -
3rd Party	0	10%	$ 1,500	$ -
				75,000

Table C7. OWASA Project Management AMR

Project Management Duration		15 months	
		Annual	Total
Project Staff	Number	Salary	Annual Cost
Project Manager	1	$70,000	$70,000
Asst Project Mgr.	0	65,000	$0
Project Administrator	1	46,000	$46,000
Field Inspectors	1	$52,000	$52,000
Total Salaries			$168,000
Benefits at		43.9%	$73,769
Annual Salary and Benefits			$241,769
		Unit Cost	Total Cost
Vehicles	2	$5,800	$11,600
Total Annual Expense			$253,369
Total Over Project Mgt Duration			$316,711
One-Time Expenses			
Community Engagement			$25,000
Purchasing, Legal and Consulting Fees			$250,000
		Total	$275,000
TOTAL PROJECT MANAGEMENT			$591,711
		Initial	$200,000
		Ongoing	$391,711
Procurement			75,000
Oversight			50,000
Setup, testing			50,000
Business process, policy chng			25,000
Legal			50,000
			250,000

Table C8. Annual Operating Costs

AMR

				Cost
Annual HW,Software Maintenance (O/O)	20%	$30,000	$	6,000
Annual Hosting Cost (Services)			$	-
Head-end software	$0.00	0	$	-
MDMS	/yr		$	-
Portal				
	Subtotal		$	6,000
Annual Application Software Development			$	-
Annual DCU maintenance agreement			$	-
System monitoring service/yr			$	-
DCU Communications Costs	0		$	-
No. of DCUs	0		$	-
Avg. mo. communications cost/DCU	$50		$	-
Total Annual Communications cost			$	-
Power costs			$	-
DCU power, reqd, KWH/yr	70	0	$	-
Repeater power reqd, KWH/yr	60	0	$	-
$ per KWH	$0.15		$	-
Total running power costs			$	-
DCU Site lease costs/mo.	300	0		$0
Total Annual Operating Cost			$	6,000

Table C9. Maintenance costs

Type of Install	AMR				
Total Number of AMR/AMI in Service			21,312		
Hardware Malfunction			Pct/Year	No. Problems	
MIU Failures			1.50%	320	
Other Problems (wiring, fittings)			0.25%	53	
		Total	1.75%	373	
Hand-held failures	5 units		20%	1.0	
Data Collection Unit and Repeater Failures	0 units		10%	0.0	
Personnel Time Required to Correct Malfunctions			Technical	Clerical	
Average Repair Time, except for DCUs, min.			45	10	
Person-hrs for Hand-helds			2	1	
Person-hrs for Data Collector Problems			8	2	
Person Hours Required per year			282	63	
No. of People Required*			0.17	0.04	
Hourly Labor Rate			$19.50	$19.50	
Labor Cost			$5,494	$1,232	
Labor Plus Benefits at		44%	$7,906	$1,772	
	Total Annual Labor Cost:			$9,678	
Transportation Costs for Repairs					
No. of Vehicles (1 per technician)			0.2		
Annual vehicle capital and operating Cost			$5,800		
	Total Annual Vehicle Cost:			$1,160	

Annual Equipment Repair Costs		DCU	Repeater	MIU**	Handhelds
Percent of capital cost	50%				
Expected Avg. Manuf. Rpr/Rplcmnt Cost		$2,500	$1,750	$37.50	$500
Malfunctions per Year		0	0	320	1
Total Repair/Replacement Cost		$0	$0	$11,988	$500

Annualized Battery Replacement Costs	
No. of collectors and repeaters	0
Cost per battery	$200
Labor cost per change	$200
Replacement interval, yrs	5
Total annualized cost	$0

TOTAL LABOR, VEHICLE COSTS	$10,838
TOTAL EQUIPMENT REPAIR COSTS	$12,488
TOTAL MAINTENANCE COSTS	$23,326

**Assumes 1645 working hours per person per year*

Table C10. Personnel Impact
AMR

OWASA

Customer Service	Auth.	Vcnt	Act.	w/AMR	Savd	Avg Sal	Total Direct	Overtime	Overhead	Total	Savings
								Overhead	44%		
Customer Service Manager	1	0	1	1	0	$62,881	$ 62,881	$0	$ 27,611	$ 90,492	$ -
Billing Supervisor	1	0	1	1	0	$55,777	$ 55,777	$0	$ 24,492	$ 80,269	$ -
Senior Customer Service Representative	1	0	1	1	0	$50,770	$ 50,770	$0	$ 22,293	$ 73,063	$ -
Customer Service Representative	3	0	3	3	0	$40,670	$ 122,010	$0	$ 53,575	$ 175,585	$ -
Clerk/Cashier	2	1	1	1	0	$33,000	$ 33,000	$0	$ 14,490	$ 47,490	$ -
Administrative Assistant	1	0	1	1	0	$40,154	$ 40,154	$0	$ 17,632	$ 57,786	$ -
Subtotal	9	1	8	8	0		$ 364,592	$0	$ 160,092	$ 524,684	$ -
Distribution and Collections	**Auth.**	**Vcnt**	**Act.**	**w/AMR**	**Savd**	**Avg Sal**	**Total Direct**	**Overtime**	**Overhead**	**Total**	**Savings**
Warehouse-Cross Connection Coordinator	1	0	1	1	0	$42,288	$ 42,288	$0	$ 18,569	$ 60,857	$ -
Utility Mechanic I	23.0	2.0	21.0	20.0	2.0	$33,177	$ 696,717	$7,000	$ 305,928	$ 1,009,645	$ 102,490.04
Utility Mechanic II	10	3	7	10	0	$40,650	$ 284,550	$0	$ 124,946	$ 409,496	$ -
Utility Mechanic III	3	0	3	3	0	$44,414	$ 133,242	$0	$ 58,507	$ 191,749	$ -
Crew Leader	6	0	6	6	0	$51,813	$ 310,878	$0	$ 136,507	$ 447,385	$ -
Asst.Distr./Collct.System Mgr	1	1	0	1	0	$72,000	$ 72,000	$0	$ 31,615	$ 103,615	$ -
Distr./Collct.System Mgr	1	0	1	1	0	$98,680	$ 98,680	$0	$ 43,330	$ 142,010	$ -
Subtotal	45	6	39	42	2		$ 1,638,355	$7,000	$ 719,402	$ 2,364,757	$ 102,490.04
Information Systems	**Auth.**	**Vcnt**	**Act.**	**w/AMR**	**Savd**	**Avg Sal**	**Total Direct**	**Overtime**	**Overhead**	**Total**	**Savings**
Information Service Technical Specialist	1	0	1	1	0	$56,898	$ 56,898	$0	$ 24,984	$ 81,882	$ -
AMI System Manager/Business Analyst	0	0	0	0	0	$70,000	$ -	$0	$ -	$ -	$ -
Network Administrator	1	0	1	1	0	$69,628	$ 69,628	$0	$ 30,574	$ 100,202	$ -
Database Administrator	1	0	1	1	0	$79,532	$ 79,532	$0	$ 55,558	$ 182,084	$ -
Director of IT	1	0	1	1	0	$111,866	$ 111,866	$0	$ 86,131	$ 282,285	$ -
Subtotal	4	0	4	4	0		$ 317,924	$0	$ 197,246	$ 646,452	$ -
Total	58	7	51	54	2		2,320,871	7,000	1,076,740	3,535,893	102,490
										Savings Reduction	3.4%

Table C11. Vehicle and Other Savings
AMR

Avg. Ann. cost per Vehicle (incl. depreciation)				$5,800	
Vehicles		Number Before	Number After	Number Saved	Total Savings
Meter readers, crew chief		7	5	2	$11,600
Field service investigators		2	2	0	$0
	Total	9	7	0	$11,600

Other Cost Savings	Before	Reduction	After	Savings
Vacant Account	$170,000	0%	$170,000	$0
Leak Adjustments	$260,000	10%	$234,000	$26,000
Theft	15,000	25%	$11,250	$3,750
Bad Debt Write-off	$120,000	0%	$120,000	$0
Total				$29,750
		Total Vehicle and Other Savings		$41,350.00

Unauthorized consumption	6.287	MG/yr
	2.63	/000 gallons
	16,535	

Table C12. Non-revenue Water Revenue Recovery from Meter Replacement
AMR

Total Annual Revenues (FY14)	Small	Large
Water Commodity Revenues	7,883,570	4,563,418
Sewer commodity revenues	8,734,722	4,804,810
Total	16,618,292	9,368,228
Water consumption, small meters, MGD		
Water consumption, large meters, MGD		
	Total	-

	Small	Large
Ttl Wtr Cons., CCF	-	-
No of meters	21,008	304
No. of meters to be replaced	7,121	0
Revenue through meters to be replaced	$5,633,038	0
Pct rcvry for mtrs to be rplcd	0.00%	0.01%
revenues recovered through replace	$0	0
Total Increase in annual revenues	$0	
Annual Loss in Meter Accuracy	0.25%	0.25%

Table C13. Non-discounted summary of Benefits and Costs

Capital Cost	All Meters: Total Cost	21,312 Cst/Unit
Meters & Assoc. Misc. Mat'ls.	$613,162	$28.77
Installation Costs Allocable to Meters	$222,060	$10.42
Endpoints (MIUs) & Assoc. Mat'ls.	$1,604,240	$75.27
Installation Costs Allocable to Endpoints	$656,561	$30.81
Data Collection HW/SW, Vendor Pjt Mgt.	$613,750	
OWAWA Project Mgt. Initial Costs	$200,000	$9.38
OWASA Project Mgt. Ongoing Costs	$391,711	
Grand Total System Cost	$4,301,484	$201.83
Salvage on Old Meters	$34,186	$1.60
Savings on normal meter turnover, HotRod	$2,439,536	$114.47
Net Total System Cost	$1,827,763	$85.76
Annual System O&M Costs		
Operating Costs	$6,000	$0.28
Maintenance and Repair	$23,326	$1.09
Total Annual O&M Cost	$29,326	$1.38
Annual Operating Costs/Savings		
Personnel Savings	$ 102,490	$4.81
Vehicle and other savings	41,350	
Other Savings	0	
Total Annual Savings	$ 143,840	$6.75
Under-Registration Recovery	$0	$0.00
Total Revenue Plus Savings	$143,840	$6.75
Net Annual Savings	$114,514	$5.37
* Unadjusted for inflation or discounting		
Simple Payback Period Calculation	16.0	

Table C14. Factors for Multi-Period Analysis

Input Data		Cost Item	Total Cost	Number of Units	Average Cost	Contin-gency	W/ Cntngy Cost (000s)	Inflation Factor
Default Inflation Factor	2.00%	Meters & Assoc. Misc. Mat'ls.	$613,162	21,312	$28.77	5.0%	$644	2.0%
Nominal Interest Rate*	3.50%	Meter Installation	$222,060	21,312	$10.42	5.0%	$233	2.0%
Current Year	2016	Electronics & Assoc. Mat'ls.	$1,604,240	21,312	$75.27	5.0%	$1,684	0.0%
Installation Start	2017	Electronics Installation	$656,561	21,312	$30.81	5.0%	$689	2.0%
Years Until Start	1	Data Collection HW/SW	613,750	21,312	$28.80	5.0%	$644	2.0%
Years of Installation	2	Project Mgt Initial	$200,000	21,312	$9.38	5.0%	$210	2.0%
Meter Service Life	25	Project Mgt Ongoing	$391,711	21,312	$18.38	5.0%	$411	2.0%
Endpoint Service Life	15	Salvage Value	$34,186	21,312	$1.60		$34	2.0%
Savings Delay, yrs	0	Normal meter turnover savings	$2,439,536	21,312	$114.47		$2,440	2.0%
		Annual O&M	$29,326	21,312	$1.38		$29	2.0%
		Annual Operating Cost Savings	$143,840	21,312	$6.75		$144	2.0%
		Under-Registration Recovery	$0	21,312	$0.00		$0	0.0%
					Total Capital Cost w/Cont		$4,517	

No. of Meters to be Changed	7,121
No. of AMI Installations	21,312
Initial Project Mgt. Cost	$200,000
Annual Project Mgt. Cost	$195,856
Total Vehicles Before	0
Total Vehicles Saved	0
Avg Ann. Cst/Vehicle	$5,800
Normal Meter Turnover Savings	$2,439,536
No. years of turnover savings	10
Annual Loss in Meter Accuracy	0.25%
No. Yrs. Under-reg. recovery	3

Table C15 Cumulative Installations, Cost Savings and Inflation Factors Used for Multi-Period Analysis

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Project Time Horizon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Install? Yes=1, No=0	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Installation Curve	0	0.50	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Installed in Year	0.0%	75.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cumulative Installation	0.0%	75.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cost Savings Factor	0.00	0.38	0.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
No. meters chngd	0	5,341	1,780	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. AMI Installations	0	15,984	5,328	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cum.AMI Installs	0	15,984	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312
Inflation Factor	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.32	1.35	1.37	1.40	1.43	1.46
Rate Increase per Year	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Cumulative Rate Increase	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.32	1.35	1.37	1.40	1.43	1.46	1.49

Table C16 Administrative and Start-Up Costs

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Project Management	0	416	206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Data Collection HW/SW	0	644	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table C17. Savings

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual Operating Cost Savings	0	54	126	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144
Normal meter turnover savings	$0	$244	$244	$244	$244	$244	$244	$244	$244	$244	$244	$0	$0	$0	$0	$0	$0	$0	$0	$0
Under-registration recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Placeholder	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table C18. Costs and savings over planning horizon, including deprecation calculations

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total
Planning Horizon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Meters & Misc. Matls.	0	483	164	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	647
Meter Installation	0	175	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	234
Meter Salvage Value	0	(26)	(9)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(34)
Subtotal	$0	$632	$215	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	847
Endpoints	0	1,263	421	0	0	0	0	0	0	0	0	0	0	0	0	0	1,263	421	0	0	3,369
Endpoint Installation	0	517	176	0	0	0	0	0	0	0	0	0	0	0	0	0	696	237	0	0	1,625
Data Collection HW/SW	$0	$644	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	644
Subtotal	0	2,425	597	0	0	0	0	0	0	0	0	0	0	0	0	0	1,959	658	0	0	5,639
Project Start-up & Admin.	0	416	210	0	0	0	0	0	0	0	0	0	0	0	0	0	559	282	0	0	1,467
Normal meter turnover savin	$0	($244)	($249)	($254)	($259)	($264)	($269)	($275)	($280)	($286)	($292)	$0	$0	$0	$0	$0	$0	$0	$0	$0	(2,671)
Total Capital Costs	$0	$3,229	$773	($254)	($259)	($264)	($269)	($275)	($280)	($286)	($292)	$0	$0	$0	$0	$0	$2,519	$940	$0	$0	5,282
Operating Cost Savings	$0	$54	$128	$150	$153	$156	$159	$162	$165	$169	$172	$175	$179	$182	$186	$190	$194	$197	$201	$205	3,177
Under-registration Recovery	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0
System O&M Costs	$0	($22)	($30)	($31)	($31)	($32)	($32)	($33)	($34)	($34)	($35)	($36)	($36)	($37)	($38)	($39)	($39)	($40)	($41)	($42)	(662)
				0	0	0														0	5,638,644
Net Operating Savings	$0	$32	$98	$119	$122	$124	$126	$129	$132	$134	$137	$140	$142	$145	$148	$151	$154	$157	$160	$164	2,515

Table C19. Discounted cash flow and return on investment calculations

	Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cash on Cash		Residual value hardware included																			
Capital Investment (20yr)		$0	($3,229)	($773)	$254	$259	$264	$269	$275	$280	$286	$292	$0	$0	$0	$0	$0	($2,519)	($940)	$0	$1,312
Capital Investment (15yr)		0	(3,229)	(773)	254	259	264	269	275	280	286	292	0	0	0	304					
Operating Cash Flow		$0	$32	$98	$119	$122	$124	$126	$129	$132	$134	$137	$140	$142	$145	$148	$151	$154	$157	$160	$164
Net Cash (20yr)		0	(3,197)	(674)	373	380	388	396	404	412	420	428	140	142	145	148	151	(2,364)	(783)	160	1,475
Net cash (15 yr)		0	(3,197)	(674)	373	380	388	396	404	412	420	428	140	142	145	452					

20 Year Horizon					
Discount Rate		2.00%	3.50%	6.00%	5.00%
Net Present Value	$	(1,535)	(1,586)	(1,655)	(1,630)
Internal Rate of Return		-11.12%			

15 Year Horizon					
Discount Rate		2.00%	3.50%	6.00%	8.00%
Net Present Value	$	(285)	(577)	(948)	(1,165)
Internal Rate of Return		0.78%			

Table D1 Meter Population

Meter Size	Type	Ttl in Service	To Be Replaced	To Be Retrofitted	AMR/AMI Ready	Lids Needed	Mtrs Getting New MIUs
.625"	PD	19,467	6717	4869	7881	11586	11,586
.75"	PD	76	0	0	76	0	0
1"	PD	605	198	346	61	544	544
1.5"	PD	427	158	142	127	300	300
2"	PD	134	0	0	134	0	0
2"	Comp	142	36	106	0	142	142
2"	Mag	2	0	2	0	2	2
2"	Turbine	155	12	143	0	155	155
3"	Comp	54	0	54	0	54	54
3"	Turbine	79	0	39	40	39	39
4"	Comp	47	0	46	1	46	46
4"	Mag	2	0	2	0	2	2
4"	Turbine	47	0	25	22	25	25
6"	Comp	24	0	22	2	22	22
6"	SRM	11	0	9	2	9	9
6"	Turbine	15	0	8	7	8	8
8"	Comp	8	0	7	1	7	7
8"	Turbine	17	0	16	1	16	16
TOTAL		21,312	7,121	5,836	8,355	12,957	12,957
Up to 2"		21,008	7,121	5,608	8,279	12,729	12,729
3" and up		304	0	228	76	228	228
Pct <3"		98.57%					

Table D2. Endpoints

MIU Unit Cost: 1-port $75 2-port $95

Meter Size	Type	MIUs Number	MIUs Unit Cost	MIUs Total Cost	Mtr Registers Number	Mtr Registers Unit Cost	Mtr Registers Total Cost	Meters Number	Meters Unit Cost	Meters Total Cost	Lids Number	Lids Unit Cost	Lids Ttl Cst	Total Cost
.625"	PD	11,586	$75	$868,950	4,869	$46	$223,974	6717	$76	$510,492	11586	$22	$254,892	$1,858,308
.75"	PD	0	$75	$0	0	$46	$0	0	$76	$0	0	$22	$0	$0
1"	PD	544	$75	$40,800	346	$46	$15,916	198	$150	$29,700	544	$22	$11,968	$98,384
1.5"	PD	300	$75	$22,500	142	$46	$6,532	158	$323	$51,034	300	$40	$12,000	$92,066
2"	PD	0	$75	$0	0	$46	$0	0	$457	$0	0	$40	$0	$0
2"	Comp	142	$95	$13,490	106	$46	$4,876	36	$457	$16,452	142	$40	$5,680	$40,498
2"	Mag	2	$75	$150	2	$46	$92	0	$457	$0	2	$40	$80	$322
2"	Turbine	155	$75	$11,625	143	$46	$6,578	12	$457	$5,484	155	$40	$6,200	$29,887
3"	Comp	54	$95	$5,130	54	$46	$2,484	0	$2,154	$0	54	$40	$2,160	$9,774
3"	Turbine	39	$75	$2,925	39	$46	$1,794	0	$2,154	$0	39	$40	$1,560	$6,279
4"	Comp	46	$95	$4,370	46	$46	$2,116	0	$3,462	$0	46	$40	$1,840	$8,326
4"	Mag	2	$75	$150	2	$46	$92	0	$3,462	$0	2	$40	$80	$322
4"	Turbine	25	$75	$1,875	25	$46	$1,150	0	$3,462	$0	25	$40	$1,000	$4,025
6"	Comp	22	$95	$2,090	22	$46	$1,012	0	$4,795	$0	22	$40	$880	$3,982
6"	SRM	9	$75	$675	9	$46	$414	0	$4,795	$0	9	$40	$360	$1,449
6"	Turbine	8	$75	$600	8	$46	$368	0	$4,795	$0	8	$40	$320	$1,288
8"	Comp	7	$95	$665	7	$46	$322	0	$6,685	$0	7	$40	$280	$1,267
8"	Turbine	16	$75	$1,200	16	$46	$736	0	$6,685	$0	16	$40	$640	$2,576
TOTAL		12,957		$977,195	5,836		$268,456			$613,162	12,957		$299,940	$2,158,753

Materials related to AMR 1,545,591

Materials related to meters 613,162

Table D3 Installation Costs

		---MIU Only ---			---MIU and Register ----			----MIU and Meter-----			--------Lids----------			Total	Alloc. To	Alloc. To
Meter Size	Type	No.	Unit Cost	Ttl Cst	No.	Unit Cost	Ttl Cst	No.	Unit Cost	Ttl Cst	No.	Unit Cost	Ttl Cst	Cost	Meters	Electronics
.625"	PD	0	$30	$0	4,869	$35	$170,415	6,717	$50	$335,850	11586	$1.00	$11,586	$517,851	$201,510	$316,341
.75"	PD	0	$30	$0	0	$35	$0	0	$50	$0	0	$1.00	$0	$0	$0	$0
1"	PD	0	$30	$0	346	$35	$12,110	198	$55	$10,890	544	$1.00	$544	$23,544	$7,425	$16,119
1.5"	PD	0	$30	$0	142	$50	$7,100	158	$55	$8,690	300	$2.00	$600	$16,390	$5,925	$10,465
2"	PD	0	$50	$0	0	$50	$0	0	$150	$0	0	$2.00	$0	$0	$0	$0
2"	Comp	0	$50	$0	106	$80	$8,480	36	$150	$5,400	142	$2.00	$284	$14,164	$5,400	$8,764
2"	Mag	0	$50	$0	2	$50	$100	0	$150	$0	2	$2.00	$4	$104	$0	$104
2"	Turbine	0	$50	$0	143	$50	$7,150	12	$150	$1,800	155	$2.00	$310	$9,260	$1,800	$7,460
3"	Comp	0	$125	$0	54	$150	$8,100	0	$0	$0	54	$2.00	$108	$8,208	$0	$8,208
3"	Turbine	0	$100	$0	39	$125	$4,875	0	$0	$0	39	$2.00	$78	$4,953	$0	$4,953
4"	Comp	0	$125	$0	46	$150	$6,900	0	$0	$0	46	$2.00	$92	$6,992	$0	$6,992
4"	Mag	0	$100	$0	2	$125	$250	0	$0	$0	2	$2.00	$4	$254	$0	$254
4"	Turbine	0	$100	$0	25	$125	$3,125	0	$0	$0	25	$2.00	$50	$3,175	$0	$3,175
6"	Comp	0	$200	$0	22	$250	$5,500	0	$0	$0	22	$2.00	$44	$5,544	$0	$5,544
6"	SRM	0	$175	$0	9	$200	$1,800	0	$0	$0	9	$2.00	$18	$1,818	$0	$1,818
6"	Turbine	0	$175	$0	8	$200	$1,600	0	$0	$0	8	$2.00	$16	$1,616	$0	$1,616
8"	Comp	0	$200	$0	7	$250	$1,750	0	$0	$0	7	$2.00	$14	$1,764	$0	$1,764
8"	Turbine	0	$200	$0	16	$200	$3,200	0	$0	$0	16	$2.00	$32	$3,232	$0	$3,232
TOTAL		0		$0	5,836		$242,455	7,121		$362,630	12,957		$13,784	$618,869	$222,060	$396,809

Note: meter install cost equals total less MIU along plus another half of th
difference for mobilization

Table D4. Existing Meter Replacement Program

Meter Size	Type	Meters to Replace	Cost per MIU+Mtr	Labor Cost	Total Cost	HotRod Rplcmnts	MIU Cost	Labor Cost	Total Cost	No. Lids Required	Lid Unit Cost	Total Lid Cost	Total Cost
.625"	PD	9,384	$135	$45	$1,689,120	9384	$22	$206,448	2311	$65	$35	$231,100	$1,664,468
.75"	PD	0	$182	$45	$0	0	$22	$0	0	$65	$35	$0	$0
1"	PD	320	$240	$45	$91,200	320	$22	$7,040	28	$65	$35	$2,800	$95,440
1.5"	PD	228	$444	$90	$121,752	228	$40	$9,120	31	$65	$35	$3,100	$127,772
2"	PD	46	$566	$90	$30,176	46	$40	$1,840	0	$65	$35	$0	$32,016
2"	Comp	53	$566	$90	$34,768	53	$40	$2,120	0	$65	$35	$0	$36,888
2"	Mag	0	$566	$90	$0	0	$40	$0	0	$65	$35	$0	$0
2"	Turbine	16	$566	$90	$10,496	16	$40	$640	46	$65	$35	$4,600	$6,536
3"	Comp	0	$2,244		$0	0	$40	$0	0	$65	$35	$0	$0
3"	Turbine	0	$2,219		$0	0	$40	$0	15	$65	$35	$1,500	($1,500)
4"	Comp	0	$3,552		$0	0	$40	$0	0	$65	$35	$0	$0
4"	Mag	0	$3,527		$0	0	$40	$0	0	$65	$35	$0	$0
4"	Turbine	0	$3,527		$0	0	$40	$0	5	$65	$35	$500	($500)
6"	Comp	0	$4,885		$0	0	$40	$0	0	$65	$35	$0	$0
6"	SRM	0	$4,860		$0	0	$40	$0	0	$65	$35	$0	$0
6"	Turbine	0	$4,860		$0	0	$40	$0	5	$65	$35	$500	($500)
8"	Comp	0	$6,775		$0	0	$40	$0	0	$65	$35	$0	$0
8"	Turbine	0	$6,750		$0	0	$40	$0	1	$65	$35	$100	($100)
TOTAL		10,047			1,977,512				2,442			244,200	$1,960,520

All meters <=2" installed 1998 or earlier will be replaced
All Master, Rockwell and Sensus meters will be replaced
All others will be retrofitted or are already AMR/AMI capable

Total meter repair/replacement savings: Yes
Over how many years $1,960,520
Savings per year 10
Savings per year $196,052

Table D4a. Meters replaced over 10 years with current program

Year Installed	size 0.625"	1"	1.5"	2.0"	Quantity
Pre 1999 [1]	6,717	198	158	48	7121
1999	36	2	11	4	53
2000	800	19	30	23	872
2001	729	22	11	23	785
2002	1102	79	18	17	1216
Total	9384	320	228	115	10047
					10,047

[1] All meters <=2" installed 1998 or earlier will be replaced
All Master, Rockwell and Sensus meters will be replaced

Table D4b. Number of HotRod MIUs reaching life expectancy over next 10 years

Year to be	Size .625"	1.0"	1.5"	2.0"	3.0"	4"	6"	8"	Quantity
2016	2	1	0	0	0	0	0	1	4
2020	1			1					2
2021	25		2	2		1			30
2022	1105	5	1	4			1		1116
2023	382	7	7	8	1				405
2024	218	8	10	15	6	3	2		262
2025	578	7	11	16	8	1	2		623
Total	2311	28	31	46	15	5	5	1	2442

Table D5. Salvage on Old Meters

Meter Size	Type	No. Meters Replaced	Salvage Value	Total Salvage
.625"	PD	6,717	$3.50	$23,510
.75"	PD	0	$5.00	$0
1"	PD	198	$11.00	$2,178
1.5"	PD	158	$31.00	$4,898
2"	PD	0	$75.00	$0
2"	Comp	36	$75.00	$2,700
2"	Mag	0	$75.00	$0
2"	Turbine	12	$75.00	$900
3"	Comp	0	$82.00	$0
3"	Turbine	0	$82.00	$0
4"	Comp	0	$178.00	$0
4"	Mag	0	$178.00	$0
4"	Turbine	0	$178.00	$0
6"	Comp	0	$196.00	$0
6"	SRM	0	$196.00	$0
6"	Turbine	0	$196.00	$0
8"	Comp	0	$212.00	$0
8"	Turbine	0	$212.00	$0
TOTAL		7,121		$34,186

Table D6. Data Collection Hardware and Software - AMR with Hot Rods

Project Duration (Months)		15		15
Item		Units	Unit Price	Total
Data Collection Units		0	$5,000	$0
DCU Installation		0	5,000	0
Repeaters		0	3,500	0
Repeater Installation		0	3,000	0
	Network			$0
Mobile Collector Hardware		1	$30,000	$30,000
Handheld programmers for staff		5	5,500	27,500
	Other Hardware			$57,500
Control system hardware		1	$25,000	$25,000
Control system software		1	$25,000	25,000
Meter Data Management System, Cust. Portal		0	150,000	0
Interface to billing system		1	5,000	5,000
Customer E-Portal Interface		0	50,000	0
	System Software, Hardware, Integration		Subtotal	$55,000
Professional Services Project Management		1	456250	$456,250
Training		1	15,000	15,000
	Professional Services			471,250
			TOTAL	$583,750

	Vendor Project Management Cost			
Project Duration(Months)	15.0			
	% Assigned	Hourly Rate	Total Hours	Total Cost
Project Manager	30%	$125.00	750	$93,750
Implementation Manager	50%	$125.00	1,250	$156,250
Technical Consultant	10%	$125.00	250	$31,250
Field Engineer	20%	$125.00	500	$62,500
3rd Party	10%	$150.00	250	$37,500
Expenses				$75,000
Total				$456,250
Expenses	Total weeks	% Assigned	Wkly Expns	Ttl Expns
Project Manager	63	30%	$ 1,500	$ 28,125
Implementation Manager	63	50%	$ 1,500	$ 46,875
Technical Consultant	0	10%	$ 1,500	$ -
Field Engineer	0	20%	$ 1,500	$ -
3rd Party	0	10%	$ 1,500	$ -
				75,000

Table D7. OWASA Project Management AMR with Hot Rods

Project Management Duration		15	months
		Annual	Total
Project Staff	Number	Salary	Annual Cost
Project Manager	1	$70,000	$70,000
Asst Project Mgr.	0	$65,000	$0
Project Administrator	1	$46,000	$46,000
Field Inspectors	1	$52,000	$52,000
Total Salaries			$168,000
Benefits at		43.9%	$73,769
Annual Salary and Benefits			$241,769
		Unit Cost	Total Cost
Vehicles	2	$5,800	$11,600
Total Annual Expense			$253,369
Total Over Project Mgt Duration			$316,711
One-Time Expenses			
Community Engagement			$25,000
Purchasing, Legal and Consulting Fees			$250,000
		Total	$275,000
TOTAL PROJECT MANAGEMENT			$591,711
		Initial	$200,000
		Ongoing	$391,711
Procurement			75,000
Oversight			50,000
Setup, testing			50,000
Business process, policy chng			25,000
Legal			50,000
			250,000

Table D8. Annual Operating Costs
AMR with Hot Rods

				Cost
Annual HW,Software Maintenance (O/O)	20%	$30,000		$6,000
Annual Hosting Cost (Services)				$ -
Head-end software	$0.00		0	$ -
MDMS	/yr			$ -
Portal				
	Subtotal			$6,000
Annual Application Software Development				$ -
Annual DCU maintenance agreement				$ -
System monitoring service/yr				$ -
DCU Communications Costs	0			$ -
No. of DCUs	0			$ -
Avg. mo. communications cost/DCU	$50			$ -
Total Annual Communications cost				$ -
Power costs				$ -
DCU power, reqd, KWH/yr	70		0	$ -
Repeater power reqd, KWH/yr	60		0	$ -
$ per KWH	$0.15			$ -
Total running power costs				$ -
DCU Site lease costs/mo.	300		0	$0
Total Annual Operating Cost				$6,000

Table D9. Maintenance costs

Type of Install		AMR with Hot Rods			
Total Number of AMR/AMI in Service		21,312			
Hardware Malfunction			Pct/Year	No. Problems	
MIU Failures			1.50%	320	
Other Problems (wiring, fittings)			0.25%	53	
		Total	1.75%	373	
Hand-held failures	5	units	20%	1.0	
Data Collection Unit and Repeater Failures	0	units	10%	0.0	
Personnel Time Required to Correct Malfunctions			Technical	Clerical	
Average Repair Time, except for DCUs, min.			45	10	
Person-hrs for Hand-helds			2	1	
Person-hrs for Data Collector Problems			8	2	
Person Hours Required per year			282	63	
No. of People Required*			0.17	0.04	
Hourly Labor Rate			$19.50	$19.50	
Labor Cost			$5,494	$1,232	
Labor Plus Benefits at		44%	$7,906	$1,772	
		Total Annual Labor Cost:	$9,678		
Transportation Costs for Repairs					
No. of Vehicles (1 per technician)			0.2		
Annual vehicle capital and operating Cost			$5,800		
		Total Annual Vehicle Cost:	$1,160		

Annual Equipment Repair Costs		DCU	Repeater	MIU**	Handhelds
Percent of capital cost	50%				
Expected Avg. Manuf. Rpr/Rplcmnt Cost		$2,500	$1,750	$37.50	$500
Malfunctions per Year		0	0	320	1
Total Repair/Replacement Cost		$0	$0	$11,988	$500

Annualized Battery Replacement Costs	
No. of collectors and repeaters	0
Cost per battery	$200
Labor cost per change	$200
Replacement interval, yrs	5
Total annualized cost	$0

TOTAL LABOR, VEHICLE COSTS	$10,838
TOTAL EQUIPMENT REPAIR COSTS	$12,488
TOTAL MAINTENANCE COSTS	$23,326

**Assumes 1645 working hours per person per year*

Table D10. Personnel Impact

AMR with Hot Rods

OWASA

									Overhead	44%		
Customer Service		Auth.	Vcnt	Act.	w/AMR	Savd	Avg Sal	Total Direct	Overtime	Overhead	Total	Savings
Customer Service Manager		1	0	1	1	0	$ 62,881	$ 62,881	$ -	$ 27,611	$ 90,492	$ -
Billing Supervisor		1	0	1	1	0	$ 55,777	$ 55,777	$ -	$ 24,492	$ 80,269	$ -
Senior Customer Service Representative		1	0	1	1	0	$ 50,770	$ 50,770	$ -	$ 22,293	$ 73,063	$ -
Customer Service Representative		3	0	3	3	0	$ 40,670	$ 122,010	$ -	$ 53,575	$ 175,585	$ -
Clerk/Cashier		2	1	1	1	0	$ 33,000	$ 33,000	$ -	$ 14,490	$ 47,490	$ -
Administrative Assistant		1	0	1	1	0	$ 40,154	$ 40,154	$ -	$ 17,632	$ 57,786	$ -
	Subtotal	9	1	8	8	0		$ 364,592	$ -	$ 160,092	$ 524,684	$ -
Distribution and Collections		Auth.	Vcnt	Act.	w/AMR	Savd	Avg Sal	Total Direct	Overtime	Overhead	Total	Savings
Warehouse-Cross Connection Coordinator		1	0	1	1	0	$ 42,288	$ 42,288	$ -	$ 18,569	$ 60,857	$ -
Utility Mechanic I		23.0	2.0	21.0	20.0	2.0	$ 33,177	$ 696,717	$ 7,000.00	$ 305,928	$ 1,009,645	$ 102,490.04
Utility Mechanic II		10	3	7	10	0	$ 40,650	$ 284,550	$ -	$ 124,946	$ 409,496	$ -
Utility Mechanic III		3	0	3	3	0	$ 44,414	$ 133,242	$ -	$ 58,507	$ 191,749	$ -
Crew Leader		6	0	6	6	0	$ 51,813	$ 310,878	$ -	$ 136,507	$ 447,385	$ -
Asst.Distr./Collct.System Mgr		1	1	0	1	0	$ 72,000	$ 72,000	$ -	$ 31,615	$ 103,615	$ -
Distr./Collct.System Mgr		1	0	1	1	0	$ 98,680	$ 98,680	$ -	$ 43,330	$ 142,010	$ -
	Subtotal	45	6	39	42	2		$ 1,638,355	$ 7,000.00	$ 719,402	$ 2,364,757	$ 102,490.04
Information Systems		Auth.	Vcnt	Act.	w/AMR	Savd	Avg Sal	Total Direct	Overtime	Overhead	Total	Savings
Information Service Technical Specialist		1	0	1	1	0	$ 56,898	$ 56,898	$ -	$ 24,984	$ 81,882	$ -
AMI System Manager/Business Analyst		0	0	0	0	0	$ 70,000	$ -	$ -	$ -	$ -	$ -
Network Administrator		1	0	1	1	0	$ 69,628	$ 69,628	$ -	$ 30,574	$ 100,202	$ -
Database Administrator		1	0	1	1	0	$ 79,532	$ 79,532	$ -	$ 55,558	$ 182,084	$ -
Director of IT		1	0	1	1	0	$111,866	$ 111,866	$ -	$ 86,131	$ 282,285	$ -
	Subtotal	4	0	4	4	0		$ 317,924	$ -	$ 197,246	$ 646,452	$ -
	Total	58	7	51	54	2		2,320,871	7,000	1,076,740	3,535,893	102,490
											Savings Reduction	3.4%

Table D11. Vehicle and Other Savings

AMR with Hot Rods

Avg. Ann. cost per Vehicle (incl. depreciation) $5,800

Vehicles		Number Before	Number After	Number Saved	Total Savings
Meter readers, crew chief		7	5	2	$11,600
Field service investigators		2	2	0	$0
	Total	9	7	0	$11,600

Other Cost Savings	Before	Reduction	After	Savings
Vacant Account	$170,000	0%	$170,000	$0
Leak Adjustments	$260,000	10%	$234,000	$26,000
Theft	15,000	25%	$11,250	$3,750
Bad Debt Write-off	$120,000	0%	$120,000	$0
Total				$29,750
	Total Vehicle and Other Savings			$41,350.00

Unauthorized consumption	6.287	MG/yr
	2.63	/000 gallons
	16,535	

Table D12. Non-revenue Water Revenue Recovery from Meter Replacement

AMR with Hot Rods

Total Annual Revenues (FY14)	Small	Large
Water Commodity Revenues	7,883,570	4,563,418
Sewer commodity revenues	8,734,722	4,804,810
Total	16,618,292	9,368,228
Water consumption, small meters, MGD		
Water consumption, large meters, MGD		
	Total	-

	Small	Large
Ttl Wtr Cons., CCF	-	-
No of meters	21,008	304
No. of meters to be replaced	7,121	0
Revenue through meters to be repl	$5,633,038	0
Pct rcvry for mtrs to be rplcd	0.00%	0.01%
revenues recovered through replace	$0	0
Total Increase in annual revenues	$0	
Annual Loss in Meter Accuracy	0.25%	0.25%

Table D13. Non-discounted summary of Benefits and Costs		
	All Meters:	21,312
Capital Cost	Total Cost	Cst/Unit
Meters & Assoc. Misc. Mat'ls.	$613,162	$28.77
Installation Costs Allocable to Meters	$222,060	$10.42
Endpoints (MIUs) & Assoc. Mat'ls.	$977,195	$45.85
Installation Costs Allocable to Endpoints	$396,809	$18.62
Data Collection HW/SW, Vendor Pjt Mgt.	$583,750	
OWAWA Project Mgt. Initial Costs	$200,000	$9.38
OWASA Project Mgt. Ongoing Costs	$391,711	
Grand Total System Cost	$3,384,687	$158.82
Salvage on Old Meters	$34,186	$1.60
Savings on normal meter turnover, HotRod	$1,960,520	$91.99
Net Total System Cost	$1,389,982	$65.22
Annual System O&M Costs		
Operating Costs	$6,000	$0.28
Maintenance and Repair	$23,326	$1.09
Total Annual O&M Cost	$29,326	$1.38
Annual Operating Costs/Savings		
Personnel Savings	$ 102,490	$4.81
Vehicle and other savings	41,350	
Other Savings	0	
Total Annual Savings	$ 143,840	$6.75
Under-Registration Recovery	$0	$0.00
Total Revenue Plus Savings	$143,840	$6.75
Net Annual Savings	$114,514	$5.37
* Unadjusted for inflation or discounting		
Simple Payback Period Calculation	12.1	

Table D14. Factors for Multi-Period Analysis

Input Data		Cost Item	Total Cost	Number of Units	Average Cost	Contin-gency	W/ Cntngy Cost (000s)	Inflation Factor
Default Inflation Factor	2.00%	Meters & Assoc. Misc. Mat'ls.	$613,162	21,312	$28.77	5.0%	$644	2.0%
Nominal Interest Rate*	3.50%	Meter Installation	$222,060	21,312	$10.42	5.0%	$233	2.0%
Current Year	2016	Electronics & Assoc. Mat'ls.	$977,195	21,312	$45.85	5.0%	$1,026	0.0%
Installation Start	2017	Electronics Installation	$396,809	21,312	$18.62	5.0%	$417	2.0%
Years Until Start	1	Data Collection HW/SW	583,750	21,312	$27.39	5.0%	$613	2.0%
Years of Installation	2	Project Mgt Initial	$200,000	21,312	$9.38	5.0%	$210	2.0%
Meter Service Life	25	Project Mgt Ongoing	$391,711	21,312	$18.38	5.0%	$411	2.0%
Endpoint Service Life	15	Salvage Value	$34,186	21,312	$1.60		$34	2.0%
Savings Delay, yrs	0	Normal meter turnover savings	$1,960,520	21,312	$91.99		$1,961	2.0%
		Annual O&M	$29,326	21,312	$1.38		$29	2.0%
		Annual Operating Cost Savings	$143,840	21,312	$6.75		$144	2.0%
		Under-Registration Recovery	$0	21,312	$0.00		$0	0.0%
					Total Capital Cost w/Cont		$3,554	

No. of Meters to be Changed	7,121
No. of AMI Installations	12,957
Initial Project Mgt. Cost	$200,000
Annual Project Mgt. Cost	$195,856
Total Vehicles Before	0
Total Vehicles Saved	0
Avg Ann. Cst/Vehicle	$5,800
Normal Meter Turnover Savings	$1,960,520
No. years of turnover savings	10
Annual Loss in Meter Accuracy	0.25%
No. Yrs. Under-reg. recovery	3

Table D15. Cumulative Installations, Cost Savings and Inflation Factors Used for Multi-Period Analysis

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Project Time Horizon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Install? Yes=1, No=0	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Installation Curve	0	0.50	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Installed in Year	0.0%	75.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cumulative Installation	0.0%	75.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cost Savings Factor	0.00	0.38	0.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
No. meters chngd	0	5,341	1,780	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. AMI Installations	0	9,718	3,239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cum.AMI Installs	0	9,718	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957	12,957
Inflation Factor	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.32	1.35	1.37	1.40	1.43	1.46
Rate Increase per Year	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Cumulative Rate Increase	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.32	1.35	1.37	1.40	1.43	1.46	1.49

Table D16. Administrative and Start-Up Costs

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Project Management	0	416	206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Data Collection HW/SW	0	613	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table D17. Savings

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual Operating Cost Savings	0	54	126	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144
Normal meter turnover savings	$0	$196	$196	$196	$196	$196	$196	$196	$196	$196	$196	$0	$0	$0	$0	$0	$0	$0	$0	$0
Under-registration recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Placeholder	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table D18. Costs and savings over planning horizon, including deprecation calculations

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total
Planning Horizon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Meters & Misc. Matls.	0	483	164	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	647
Meter Installation	0	175	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	234
Meter Salvage Value	0	(26)	(9)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(34)
Subtotal	$0	$632	$215	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	847
Endpoints	0	770	257	0	0	0	0	0	0	0	0	0	0	0	0	0	770	257	0	0	2,052
Endpoint Installation	0	312	106	0	0	0	0	0	0	0	0	0	0	0	0	0	421	143	0	0	982
Data Collection HW/SW	$0	$613	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	613
Subtotal	0	1,695	363	0	0	0	0	0	0	0	0	0	0	0	0	0	1,190	400	0	0	3,647
Project Start-up & Admin.	0	416	210	0	0	0	0	0	0	0	0	0	0	0	0	0	559	282	0	0	1,467
Normal meter turnover savin	$0	($196)	($200)	($204)	($208)	($212)	($216)	($221)	($225)	($230)	($234)	$0	$0	$0	$0	$0	$0	$0	$0	$0	(2,147)
Total Capital Costs	$0	$2,547	$587	($204)	($208)	($212)	($216)	($221)	($225)	($230)	($234)	$0	$0	$0	$0	$0	$1,750	$682	$0	$0	3,815
Operating Cost Savings	$0	$54	$128	$150	$153	$156	$159	$162	$165	$169	$172	$175	$179	$182	$186	$190	$194	$197	$201	$205	3,177
Under-registration Recovery	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0
System O&M Costs	$0	($22)	($30)	($31)	($31)	($32)	($32)	($33)	($34)	($34)	($35)	($36)	($36)	($37)	($38)	($39)	($39)	($40)	($41)	($42)	(662)
				0	0	0													0	0	3,647,339
Net Operating Savings	$0	$32	$98	$119	$122	$124	$126	$129	$132	$134	$137	$140	$142	$145	$148	$151	$154	$157	$160	$164	2,515

Table D19. Discounted cash flow and return on investment calculations

	Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cash on Cash		Residual value hardware included																			
Capital Investment (20yr)		$0	($2,547)	($587)	$204	$208	$212	$216	$221	$225	$230	$234	$0	$0	$0	$0	$0	($1,750)	($682)	$0	$867
Capital Investment (15yr)		0	(2,547)	(587)	204	208	212	216	221	225	230	234	0	0	0	304					
Operating Cash Flow		$0	$32	$98	$119	$122	$124	$126	$129	$132	$134	$137	$140	$142	$145	$148	$151	$154	$157	$160	$164
Net Cash (20yr)		0	(2,515)	(489)	323	330	336	343	350	357	364	371	140	142	145	148	151	(1,595)	(525)	160	1,031
Net cash (15 yr)		0	(2,515)	(489)	323	330	336	343	350	357	364	371	140	142	145	452					

20 Year Horizon				
Discount Rate	2.00%	3.50%	6.00%	5.00%
Net Present Value	$ (642)	(768)	(932)	(873)
Internal Rate of Return	-2.96%			

15 Year Horizon				
Discount Rate	2.00%	3.50%	6.00%	8.00%
Net Present Value	$ 176	(104)	(463)	(675)
Internal Rate of Return	2.91%			

Table E1 Meter Population

Meter Size	Type	Ttl in Service	To Be Replaced	To Be Retrofitted	AMR/AMI Ready	Lids Needed	Mtrs Getting New MIUs
.625"	PD	19,467	6717	4869	7881	11586	19,467
.75"	PD	76	0	0	76	0	76
1"	PD	605	198	346	61	544	605
1.5"	PD	427	158	142	127	300	427
2"	PD	134	0	0	134	0	134
2"	Comp	142	36	106	0	142	142
2"	Mag	2	0	2	0	2	2
2"	Turbine	155	12	143	0	155	155
3"	Comp	54	0	54	0	54	54
3"	Turbine	79	0	39	40	39	79
4"	Comp	47	0	46	1	46	47
4"	Mag	2	0	2	0	2	2
4"	Turbine	47	0	25	22	25	47
6"	Comp	24	0	22	2	22	24
6"	SRM	11	0	9	2	9	11
6"	Turbine	15	0	8	7	8	15
8"	Comp	8	0	7	1	7	8
8"	Turbine	17	0	16	1	16	17
TOTAL		21,312	7,121	5,836	8,355	12,957	21,312
Up to 2"		21,008	7,121	5,608	8,279	12,729	21,008
3" and up		304	0	228	76	228	304
Pct <3"		98.57%					

Table E2. Endpoints

MIU Unit Cost: 1-port $75 2-port $95

Meter Size	Type	MIUs Number	MIUs Unit Cost	MIUs Total Cost	Mtr Registers Number	Mtr Registers Unit Cost	Mtr Registers Total Cost	Meters Number	Meters Unit Cost	Meters Total Cost	Lids Number	Lids Unit Cost	Lids Ttl Cst	Total Cost
.625"	PD	19,467	$75	$1,460,025	4,869	$46	$223,974	6717	$76	$510,492	11586	$22	$254,892	$2,449,383
.75"	PD	76	$75	$5,700	0	$46	$0	0	$76	$0	0	$22	$0	$5,700
1"	PD	605	$75	$45,375	346	$46	$15,916	198	$150	$29,700	544	$22	$11,968	$102,959
1.5"	PD	427	$75	$32,025	142	$46	$6,532	158	$323	$51,034	300	$40	$12,000	$101,591
2"	PD	134	$75	$10,050	0	$46	$0	0	$457	$0	0	$40	$0	$10,050
2"	Comp	142	$95	$13,490	106	$46	$4,876	36	$457	$16,452	142	$40	$5,680	$40,498
2"	Mag	2	$75	$150	2	$46	$92	0	$457	$0	2	$40	$80	$322
2"	Turbine	155	$75	$11,625	143	$46	$6,578	12	$457	$5,484	155	$40	$6,200	$29,887
3"	Comp	54	$95	$5,130	54	$46	$2,484	0	$2,154	$0	54	$40	$2,160	$9,774
3"	Turbine	79	$75	$5,925	39	$46	$1,794	0	$2,154	$0	39	$40	$1,560	$9,279
4"	Comp	47	$95	$4,465	46	$46	$2,116	0	$3,462	$0	46	$40	$1,840	$8,421
4"	Mag	2	$75	$150	2	$46	$92	0	$3,462	$0	2	$40	$80	$322
4"	Turbine	47	$75	$3,525	25	$46	$1,150	0	$3,462	$0	25	$40	$1,000	$5,675
6"	Comp	24	$95	$2,280	22	$46	$1,012	0	$4,795	$0	22	$40	$880	$4,172
6"	SRM	11	$75	$825	9	$46	$414	0	$4,795	$0	9	$40	$360	$1,599
6"	Turbine	15	$75	$1,125	8	$46	$368	0	$4,795	$0	8	$40	$320	$1,813
8"	Comp	8	$95	$760	7	$46	$322	0	$6,685	$0	7	$40	$280	$1,362
8"	Turbine	17	$75	$1,275	16	$46	$736	0	$6,685	$0	16	$40	$640	$2,651
TOTAL		21,312		$1,603,900	5,836		$268,456	7,121		$613,162	12,957		$299,940	$2,785,458

Materials related to AMI	2,172,296
Materials related to meters	613,162

Table E3 Installation Costs

		---MIU Only ---			---MIU and Register ---			---MIU and Meter---			--------Lids---------			Total	Alloc. To	Alloc. To
Meter Size	Type	No.	Unit Cost	Ttl Cst	No.	Unit Cost	Ttl Cst	No.	Unit Cost	Ttl Cst	No.	Unit Cost	Ttl Cst	Cost	Meters	Electronics
.625"	PD	7,881	$30	$236,430	4,869	$35	$170,415	6,717	$50	$335,850	11586	$1.00	$11,586	$754,281	$201,510	$552,771
.75"	PD	76	$30	$2,280	0	$35	$0	0	$50	$0	0	$1.00	$0	$2,280	$0	$2,280
1"	PD	61	$30	$1,830	346	$35	$12,110	198	$55	$10,890	544	$1.00	$544	$25,374	$7,425	$17,949
1.5"	PD	127	$30	$3,810	142	$50	$7,100	158	$55	$8,690	300	$2.00	$600	$20,200	$5,925	$14,275
2"	PD	134	$50	$6,700	0	$50	$0	0	$150	$0	0	$2.00	$0	$6,700	$0	$6,700
2"	Comp	0	$50	$0	106	$80	$8,480	36	$150	$5,400	142	$2.00	$284	$14,164	$5,400	$8,764
2"	Mag	0	$50	$0	2	$50	$100	0	$150	$0	2	$2.00	$4	$104	$0	$104
2"	Turbine	0	$50	$0	143	$50	$7,150	12	$150	$1,800	155	$2.00	$310	$9,260	$1,800	$7,460
3"	Comp	0	$125	$0	54	$150	$8,100	0	$0	$0	54	$2.00	$108	$8,208	$0	$8,208
3"	Turbine	40	$100	$4,000	39	$125	$4,875	0	$0	$0	39	$2.00	$78	$8,953	$0	$8,953
4"	Comp	1	$125	$125	46	$150	$6,900	0	$0	$0	46	$2.00	$92	$7,117	$0	$7,117
4"	Mag	0	$100	$0	2	$125	$250	0	$0	$0	2	$2.00	$4	$254	$0	$254
4"	Turbine	22	$100	$2,200	25	$125	$3,125	0	$0	$0	25	$2.00	$50	$5,375	$0	$5,375
6"	Comp	2	$200	$400	22	$250	$5,500	0	$0	$0	22	$2.00	$44	$5,944	$0	$5,944
6"	SRM	2	$175	$350	9	$200	$1,800	0	$0	$0	9	$2.00	$18	$2,168	$0	$2,168
6"	Turbine	7	$175	$1,225	8	$200	$1,600	0	$0	$0	8	$2.00	$16	$2,841	$0	$2,841
8"	Comp	1	$200	$200	7	$250	$1,750	0	$0	$0	7	$2.00	$14	$1,964	$0	$1,964
8"	Turbine	1	$200	$200	16	$200	$3,200	0	$0	$0	16	$2.00	$32	$3,432	$0	$3,432
TOTAL		8,355		$259,750	5,836		$242,455	7,121		$362,630	12,957		$13,784	$878,619	$222,060	$656,559

Note: meter install cost equals total less MIU along plus another half of the difference for mobilization

Table E4. Existing Meter Replacement Program

Meter Size	Type	Meters to Replace	Cost per MIU+Mtr	Labor Cost	Total Cost	HotRod Rplcmnts	MIU Cost	Labor Cost	Total Cost	No. Lids Required	Lid Unit Cost	Total Lid Cost	Total Cost
.625"	PD	9,384	$134	$45	$1,679,736	2311	$65	$35	$231,100	9384	$22	$206,448	$2,117,284
.75"	PD	0	$182	$45	$0	0	$65	$35	$0	0	$22	$0	$0
1"	PD	320	$240	$45	$91,200	28	$65	$35	$2,800	320	$22	$7,040	$101,040
1.5"	PD	228	$444	$90	$121,752	31	$65	$35	$3,100	228	$40	$9,120	$133,972
2"	PD	46	$566	$90	$30,176	46	$65	$35	$4,600	46	$40	$1,840	$36,616
2"	Comp	53	$566	$90	$34,768	0	$65	$35	$0	53	$40	$2,120	$36,888
2"	Mag	0	$566	$90	$0	0	$65	$35	$0	0	$40	$0	$0
2"	Turbine	16	$566	$90	$10,496	0	$65	$35	$0	16	$40	$640	$11,136
3"	Comp	0	$2,244	$90	$0	0	$65	$35	$0	0	$40	$0	$0
3"	Turbine	0	$2,219		$0	15	$65	$35	$1,500	0	$40	$0	$1,500
4"	Comp	0	$3,552		$0	0	$65	$35	$0	0	$40	$0	$0
4"	Mag	0	$3,527		$0	0	$65	$35	$0	0	$40	$0	$0
4"	Turbine	0	$3,527		$0	5	$65	$35	$500	0	$40	$0	$500
6"	Comp	0	$4,885		$0	0	$65	$35	$0	0	$40	$0	$0
6"	SRM	0	$4,860		$0	5	$65	$35	$500	0	$40	$0	$500
6"	Turbine	0	$4,860		$0	0	$65	$35	$0	0	$40	$0	$0
8"	Comp	0	$6,775		$0	0	$65	$35	$0	0	$40	$0	$0
8"	Turbine	0	$6,750		$0	1	$65	$35	$100	0	$40	$0	$100
TOTAL		10,047				2,442							$2,439,536

All meters <=2" installed 1998 or earlier will be replaced
All Master, Rockwell and Sensus meters will be replaced
All others will be retrofitted or are already AMR/AMI capable

Total meter repair/replacement savings: Yes
Over how many years $2,439,536
Savings per year 10
Savings per year $243,954

Table E4a. Meters replaced over 10 years with current program

	size				
Year Installed	0.625"	1"	1.5"	2.0"	Quantity
Pre 1999[1]	6,717	198	158	48	7121
1999	36	2	11	4	53
2000	800	19	30	23	872
2001	729	22	11	23	785
2002	1102	79	18	17	1216
Total	9384	320	228	115	10047
					10,047

[1] All meters <=2" installed 1998 or earlier will be replaced
All Master, Rockwell and Sensus meters will be replaced

Table E4b. Number of HotRod MIUs reaching life expectancy over next 10 years

	Size								
Year to be	.625"	1.0"	1.5"	2.0"	3.0"	4"	6"	8"	Quantity
2016	2	1	0	0	0	0	0	1	4
2020	1			1					2
2021	25		2	2		1			30
2022	1105	5	1	4			1		1116
2023	382	7	7	8	1				405
2024	218	8	10	15	6	3	2		262
2025	578	7	11	16	8	1	2		623
Total	2311	28	31	46	15	5	5	1	2442

Table E5. Salvage on Old Meters

Meter Size	Type	No. Meters Replaced	Salvage Value	Total Salvage
.625"	PD	6,717	$3.50	$23,510
.75"	PD	0	$5.00	$0
1"	PD	198	$11.00	$2,178
1.5"	PD	158	$31.00	$4,898
2"	PD	0	$75.00	$0
2"	Comp	36	$75.00	$2,700
2"	Mag	0	$75.00	$0
2"	Turbine	12	$75.00	$900
3"	Comp	0	$82.00	$0
3"	Turbine	0	$82.00	$0
4"	Comp	0	$178.00	$0
4"	Mag	0	$178.00	$0
4"	Turbine	0	$178.00	$0
6"	Comp	0	$196.00	$0
6"	SRM	0	$196.00	$0
6"	Turbine	0	$196.00	$0
8"	Comp	0	$212.00	$0
8"	Turbine	0	$212.00	$0
TOTAL		7,121		$34,186

Table E6. Data Collection Hardware and Software - AMI

Project Duration (Months)		18		18
Item		Units	Own/Operate Init Prch Pric	Total
Data Collection Units		4	$5,000	$20,000
DCU Installation		4	5,000	20,000
Repeaters		20	3,500	70,000
Repeater Installation		20	3,000	60,000
	Network			$170,000
Mobile Collector Hardware		1	$30,000	$30,000
Handheld programmers for staff		5	5,500	27,500
	Other Hardware			$57,500
Control system hardware				$50,000
Control system software				50,000
Meter Data Mgt. System, Cust. Portal hardware				50,000
Meter Data Mgt. System				100,000
MDMS Integration to billing system				50,000
Customer portal software				50,000
Customer E-Portal Integration				50,000
	System Software, Hardware, Integration		Subtotal	$400,000
Professional Services Project Management				$592,500
Training				30,000
	Pjt. Management and Training			622,500
			TOTAL	$1,250,000

	Vendor Project Management Cost			
Project Duration(Months)	18.0			
	% Assigned	Hourly Rate	Total Hours	Total Cost
Project Manager	30%	$125.00	900	$112,500
Implementation Manager	50%	$125.00	1,500	$187,500
Technical Consultant	10%	$125.00	300	$37,500
Field Engineer	20%	$125.00	600	$75,000
3rd Party	10%	$150.00	300	$45,000
Expenses				$135,000
Total				$592,500

Expenses	Total weeks	% Assigned	Wkly Expns	Ttl Expns
Project Manager	75	30%	$ 1,500	$ 33,750
Implementation Manager	75	50%	$ 1,500	$ 56,250
Technical Consultant	75	10%	$ 1,500	$ 11,250
Field Engineer	75	20%	$ 1,500	$ 22,500
3rd Party	75	10%	$ 1,500	$ 11,250
				135,000

Table E7. OWASA Project Management AMI

Project Management Duration	18	months	
		Annual	Total
Project Staff	Number	Salary	Annual Cost
Project Manager	1	$70,000	$70,000
Asst Project Mgr.	0	$65,000	$0
Project Administrator	1	$46,000	$46,000
Field Inspectors	1	$52,000	$52,000
Total Salaries			$168,000
Benefits at		43.9%	$73,769
Annual Salary and Benefits			$241,769
		Unit Cost	Total Cost
Vehicles	2	$5,800	$11,600
Total Annual Expense			$253,369
Total Over Project Mgt Duration			$380,053
One-Time Expenses			
Community Engagement			$75,000
Purchasing, Legal and Consulting Fees			$350,000
		Total	$425,000
TOTAL PROJECT MANAGEMENT			$805,053
		Initial	$300,000
		Ongoing	$505,053
			100,000
			75,000
			75,000
			50,000
			50,000
			350,000

Table E8. Annual Operating Costs
AMI Hybrid with New AMR

				Cost
Annual HW,Software Maintenance (O/O)	20%	$400,000	$	80,000
Annual Hosting Cost (Services)			$	-
Head-end software	$0.00	0	$	-
MDMS /yr			$	-
Portal				
		Subtotal		80,000
Annual Application Software Development			$	-
Annual DCU maintenance agreement			$	-
System monitoring service/yr			$	-
DCU Communications Costs			$	-
No. of DCUs	4		$	-
Avg. mo. communications cost/DCU	$50		$	-
Total Annual Communications cost			$	2,400
Power costs			$	-
DCU power, reqd, KWH/yr	70	4	$	-
Repeater power reqd, KWH/yr	60	20	$	-
$ per KWH	$0.15		$	-
Total running power costs			$	222
DCU Site lease costs/mo.	300	2		$7,200
Total Annual Operating Cost				$89,822

Table E9. Maintenance costs

Type of Install	AMI Hybrid with New AMR			
Total Number of AMR/AMI in Service	21,312			
Hardware Malfunction			Pct/Year	o. Problems
MIU Failures			1.50%	320
Other Problems (wiring, fittings)			0.25%	53
		Total	1.75%	373
Hand-held failures	5	units	20%	1.0
Data Collection Unit and Repeater Failures	24	units	10%	2.4
Personnel Time Required to Correct Malfunctions			Technical	Clerical
Average Repair Time, except for DCUs, min.			45	10
Person-hrs for Hand-helds			2	1
Person-hrs for Data Collector Problems			8	2
Person Hours Required per year			301	68
No. of People Required*			0.18	0.04
Hourly Labor Rate			$19.50	$19.50
Labor Cost			$5,868	$1,325
Labor Plus Benefits at		44%	$8,445	$1,907
Total Annual Labor Cost:			$10,352	
Transportation Costs for Repairs				
No. of Vehicles (1 per technician)			0.2	
Annual vehicle capital and operating Cost			$5,800	
Total Annual Vehicle Cost:			$1,160	

Annual Equipment Repair Costs	DCU	Repeater	MIU**	Handhelds
Percent of capital cost	50%			
Expected Avg. Manuf. Rpr/Rplcmnt Cost	$2,500	$1,750	$37.50	$500
Malfunctions per Year	0	2	320	1
Total Repair/Replacement Cost	$1,000	$3,500	$11,988	$500

Annualized Battery Replacement Costs	
No. of collectors and repeaters	24
Cost per battery	$200
Labor cost per change	$200
Replacement interval, yrs	5
Total annualized cost	$1,920

TOTAL LABOR, VEHICLE COSTS	$11,512
TOTAL EQUIPMENT REPAIR COSTS	$18,908
TOTAL MAINTENANCE COSTS	$30,420

Assumes 1645 working hours per person per year

Table E10. Personnel Impact
AMI Hybrid with New AMR

OWASA									Overhead	44%			
Customer Service		Auth.	Vcnt	Act.	w/Hybrid	Savd	Avg Sal	Total Direct	Overtime	Overhead		Total	Savings
Customer Service Manager		1	0	1	1	0	$ 62,881	$ 62,881	$ -	$ 27,611	$	90,492	$ -
Billing Supervisor		1	0	1	1	0	$ 55,777	$ 55,777	$ -	$ 24,492	$	80,269	$ -
Senior Customer Service Representative		1	0	1	1	0	$ 50,770	$ 50,770	$ -	$ 22,293	$	73,063	$ -
Customer Service Representative		3	0	3	2	0	$ 40,670	$ 122,010	$ -	$ 53,575	$	175,585	$ -
Clerk/Cashier		2	1	1	1	0	$ 33,000	$ 33,000	$ -	$ 14,490	$	47,490	$ -
Administrative Assistant		1	0	1	1	0	$ 40,154	$ 40,154	$ -	$ 17,632	$	57,786	$ -
	Subtotal	9	1	8	7	0		$ 364,592	$ -	$ 160,092	$	524,684	$ -
Distribution and Collections		Auth.	Vcnt	Act.	w/Hybrid	Savd	Avg Sal	Total Direct	Overtime	Overhead		Total	Savings
Warehouse-Cross Connection Coordinator		1	0	1	1	0	$ 42,288	$ 42,288	$ -	$ 18,569	$	60,857	$ -
Utility Mechanic I		23.0	2.0	21.0	19.0	4	$ 33,177	$ 696,717	$ 7,000.00	$ 305,928	$	1,009,645	$ 197,980.08
Utility Mechanic II		10	3	7	10	0	$ 40,650	$ 284,550	$ -	$ 124,946	$	409,496	$ -
Utility Mechanic III		3	0	3	3	0	$ 44,414	$ 133,242	$ -	$ 58,507	$	191,749	$ -
Crew Leader		6	0	6	6	0	$ 51,813	$ 310,878	$ -	$ 136,507	$	447,385	$ -
Assistant Distribution/Collection System Manager		1	1	0	1	0	$ 72,000	$ 72,000	$ -	$ 31,615	$	103,615	$ -
Distribution/Collection Systems Manager		1	0	1	1	0	$ 98,680	$ 98,680	$ -	$ 43,330	$	142,010	$ -
	Subtotal	45	6	39	41	4		$ 1,638,355	$ 7,000.00	$ 719,402	$	2,364,757	$ 197,980.08
Information Systems		Auth.	Vcnt	Act.	w/Hybrid	Savd	Avg Sal	Total Direct	Overtime	Overhead		Total	Savings
Information Service Technical Specialist		1	0	1	1	0	$ 56,898	$ 56,898	$ -	$ 24,984	$	81,882	$ -
AMI System Manager/Business Analyst		0	0	0	1	-0.5	$ 70,000	$ -	$ -	$ -	$	-	$ (50,368.50)
Network Administrator		1	0	1	1	0	$ 69,628	$ 69,628	$ -	$ 30,574	$	100,202	$ -
Database Administrator		1	0	1	1	0	$ 79,532	$ 79,532	$ -	$ 55,558	$	182,084	$ -
Director of IT		1	0	1	1	0	$111,866	$ 111,866	$ -	$ 86,131	$	282,285	$ -
	Subtotal	4	0	4	4.5	-0.5		$ 317,924	$ -	$ 197,246	$	646,452	$ (50,368.50)
	Total	58	7	51	53	4		2,320,871	7,000	1,076,740		3,535,893	147,612
												Savings Reduction	6.0%

Table E11. Vehicle and Other Savings
AMI Hybrid with New AMR

Avg. Ann. cost per Vehicle (incl. depreciation) $5,800

Vehicles		Number Before	Number After	Number Saved	Total Savings
Meter readers, crew chief		7	3	4	$23,200
Field service investigators		2	2	0	$0
	Total	9	5	0	23,200

Other Cost Savings	Before	Reduction	After	Savings
Vacant Account	$170,000	0%	$170,000	$0
Leak Adjustments	$260,000	15%	$221,000	$39,000
Theft	15,000	35%	$9,750	$5,250
Bad Debt Write-off	$120,000	0%	$120,000	$0
Total				$44,250
		Total Vehicle and Other Savings		$67,450.00

Unauthorized consumption	6.287	MG/yr
	2.63	/000 gallons
	16,535	

Table E12. Non-revenue Water Revenue Recovery from Meter Replacement
AMI Hybrid with New AMR

Total Annual Revenues (FY14)	Small	Large
Water Commodity Revenues	7,883,570	4,563,418
Sewer commodity revenues	8,734,722	4,804,810
Total	16,618,292	9,368,228
Water consumption, small meters, MGD		
Water consumption, large meters, MGD		
	Total	-
	Small	Large
Ttl Wtr Cons., CCF	-	-
No of meters	21,008	304
No. of meters to be replaced	7,121	0
Revenue through meters to be repla	$5,633,038	0
Pct rcvry for mtrs to be rplcd	0.00%	0.01%
revenues recovered through replace	$0	0
Total Increase in annual revenues	$0	
Annual Loss in Meter Accuracy	0.25%	0.25%

Table E13. Non-discounted summary of Benefits and Costs		
	All Meters:	21,312
Capital Cost	Total Cost	Cst/Unit
Meters & Assoc. Misc. Mat'ls.	$613,162	$28.77
Installation Costs Allocable to Meters**	$222,060	$10.42
Endpoints (MIUs) & Assoc. Mat'ls.	$1,603,900	$75.26
Installation Costs Allocable to Endpoints	$656,559	$30.81
Data Collection HW/SW, Vendor Pjt Mgt.	$1,250,000	
OWAWA Project Mgt. Initial Costs	$300,000	$14.08
OWASA Project Mgt. Ongoing Costs	$505,053	
Grand Total System Cost	$5,150,734	$241.68
Salvage on Old Meters	$34,186	$1.60
Savings on normal meter turnover, HotRod	$2,439,536	$114.47
Net Total System Cost	$2,677,013	$125.61
Annual System O&M Costs		
Operating Costs	$0	$0.00
Maintenance and Repair	$30,420	$1.43
Total Annual O&M Cost	$30,420	$1.43
Annual Operating Costs/Savings		
Manpower Savings	$ 147,612	$6.93
Vehicle and other savings	67,450	
Other Savings	0	
Total Annual Savings	$ 215,062	$10.09
Under-Registration Recovery	$0	$0.00
Total Revenue Plus Savings	$215,062	$10.09
Net Annual Savings	$184,642	$8.66
* Unadjusted for inflation or discounting		
Simple Payback Period Calculation	14.5	

Table E14. Factors for Multi-Period Analysis

Input Data		Cost Item	Total Cost	Number of Units	Average Cost	Contin-gency	W/ Cntngy Cost (000s)	Inflation Factor
Default Inflation Factor	2.00%	Meters & Assoc. Misc. Mat'ls.	$613,162	21,312	$28.77	5.0%	$644	2.0%
Nominal Interest Rate*	3.50%	Meter Installation	$222,060	21,312	$10.42	5.0%	$233	2.0%
Current Year	2016	Electronics & Assoc. Mat'ls.	$1,603,900	21,312	$75.26	5.0%	$1,684	0.0%
Installation Start	2017	Electronics Installation	$656,559	21,312	$30.81	5.0%	$689	2.0%
Years Until Start	1	Data Collection HW/SW	1,250,000	21,312	$58.65	5.0%	$1,313	2.0%
Years of Installation	2	Project Mgt Initial	$300,000	21,312	$14.08	5.0%	$315	2.0%
Meter Service Life	25	Project Mgt Ongoing	$505,053	21,312	$23.70	5.0%	$530	2.0%
Endpoint Service Life	15	Salvage Value	$34,186	21,312	$1.60		$34	2.0%
Savings Delay, yrs	0	Normal meter turnover savings	$2,439,536	21,312	$114.47		$2,440	2.0%
		Annual O&M	$30,420	21,312	$1.43		$30	2.0%
		Annual Operating Cost Savings	$215,062	21,312	$10.09		$215	2.0%
		Under-Registration Recovery	$0	21,312	$0.00		$0	0.0%
					Total Capital Cost w/Cont		$5,408	

No. of Meters to be Changed	7,121
No. of AMI Installations	21,312
Initial Project Mgt. Cost	$300,000
Annual Project Mgt. Cost	$252,527
Total Vehicles Before	0
Total Vehicles Saved	0
Avg Ann. Cst/Vehicle	$5,800
Normal Meter Turnover Savings	$2,439,536
No. years of turnover savings	10
Annual Loss in Meter Accuracy	0.25%
No. Yrs. Under-reg. recovery	3

Table E15 Cumulative Installations, Cost Savings and Inflation Factors Used for Multi-Period Analysis

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Project Time Horizon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Install? Yes=1, No=0	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Installation Curve	0	0.75	0.25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Installed in Year	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cumulative Installation	0.0%	50.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Cost Savings Factor	0.00	0.25	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
No. meters chngd	0	3,561	3,561	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. AMI Installations	0	10,656	10,656	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cum.AMI Installs	0	10,656	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312	21,312
Inflation Factor	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.32	1.35	1.37	1.40	1.43	1.46
Rate Increase per Year	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Cumulative Rate Increase	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.32	1.35	1.37	1.40	1.43	1.46	1.49

Table E16. Administrative and Start-Up Costs

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Project Management	0	580	265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Data Collection HW/SW	0	1,313	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table E17. Savings

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual Operating Cost Savings	0	54	161	215	215	215	215	215	215	215	215	215	215	215	215	215	215	215	215	215
Normal meter turnover savings	$0	$244	$244	$244	$244	$244	$244	$244	$244	$244	$244	$0	$0	$0	$0	$0	$0	$0	$0	$0
Under-registration recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Placeholder	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table E18. Costs and savings over planning horizon, including deprecation calculations

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total
Planning Horizon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Meters & Misc. Matls.	0	322	328	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	650
Meter Installation	0	117	119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	235
Meter Salvage Value	0	(17)	(17)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(35)
Subtotal	$0	$421	$430	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	851
Endpoints	0	842	842	0	0	0	0	0	0	0	0	0	0	0	0	0	842	842	0	0	3,368
Endpoint Installation	0	345	352	0	0	0	0	0	0	0	0	0	0	0	0	0	464	473	0	0	1,633
Data Collection HW/SW	$0	$1,313	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	1,313
Subtotal	0	2,499	1,194	0	0	0	0	0	0	0	0	0	0	0	0	0	1,306	1,315	0	0	6,314
Project Start-up & Admin.	0	580	270	0	0	0	0	0	0	0	0	0	0	0	0	0	781	364	0	0	1,995
Normal meter turnover savin	$0	($244)	($249)	($254)	($259)	($264)	($269)	($275)	($280)	($286)	($292)	$0	$0	$0	$0	$0	$0	$0	$0	$0	(2,671)
Total Capital Costs	$0	$3,257	$1,645	($254)	($259)	($264)	($269)	($275)	($280)	($286)	($292)	$0	$0	$0	$0	$0	$2,087	$1,679	$0	$0	6,489
Operating Cost Savings	$0	$54	$165	$224	$228	$233	$237	$242	$247	$252	$257	$262	$267	$273	$278	$284	$289	$295	$301	$307	4,696
Under-registration Recovery	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0
System O&M Costs	$0	($15)	($31)	($32)	($32)	($33)	($34)	($34)	($35)	($36)	($36)	($37)	($38)	($39)	($39)	($40)	($41)	($42)	($43)	($43)	(680)
				0	0	0													0	0	6,314,073
Net Operating Savings	$0	$39	$133	$192	$196	$200	$204	$208	$212	$216	$221	$225	$230	$234	$239	$244	$249	$253	$259	$264	4,016

Table E19. Discounted cash flow and return on investment calculations

	Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cash on Cash		Residual value hardware included																			
Capital Investment (20yr)		$0	($3,257)	($1,645)	$254	$259	$264	$269	$275	$280	$286	$292	$0	$0	$0	$0	$0	($2,087)	($1,679)	$0	$1,361
Capital Investment (15yr)		0	(3,257)	(1,645)	254	259	264	269	275	280	286	292	0	0	0	312					
Operating Cash Flow		$0	$39	$133	$192	$196	$200	$204	$208	$212	$216	$221	$225	$230	$234	$239	$244	$249	$253	$259	$264
Net Cash (20yr)		0	(3,218)	(1,512)	446	455	464	473	483	492	502	512	225	230	234	239	244	(1,838)	(1,426)	259	1,625
Net cash (15 yr)		0	(3,218)	(1,512)	446	455	464	473	483	492	502	512	225	230	234	551					

20 Year Horizon				
Discount Rate	2.00%	3.50%	6.00%	5.00%
Net Present Value	$ (1,375)	(1,530)	(1,726)	(1,655)
Internal Rate of Return	-4.98%			

15 Year Horizon				
Discount Rate	2.00%	3.50%	6.00%	8.00%
Net Present Value	$ (280)	(643)	(1,101)	(1,367)
Internal Rate of Return	1.02%			

Agenda Item 2

Discussion of Cost Allocation Study

Purpose

Discuss results of a Cost Allocation Study (Study) intended to serve as a basis for the Board of Director's consideration of potential water and sewer rate structure modifications.

Overview

On October 8, 2015, the Board authorized staff to proceed with a cost allocation study as the next step in a process to consider changes to OWASA's water and sewer rate structures.

Staff has worked with the consulting firm, Burton & Associates, to examine the costs incurred to provide its services to OWASA's various types of customers and determine the amount of revenue that should be collected for each defined customer class. This information will be utilized in evaluating potential rate structure modifications.

Burton & Associates prepared a technical memorandum and a cost of service model workbook. Both are attached for the Board's review.

At the December 10, 2015 Board Meeting, OWASA and Burton & Associates staff will lead the Board in a discussion of the Study's cost of service analyses and the types of rate structures to be evaluated for each identified rate class with the intent of receiving the Board's guidance.

Action Requested

At the meeting, OWASA and Burton & Associates staff will lead the Board in a discussion of the Study's cost of service analyses including a review of the rate classes and how they were determined. The next step in our rate structure review process will be to evaluate rate structure alternatives for each rate class. Rate structure alternatives are not part of the consultant's Technical Memo, but will be presented at the Board meeting.

We seek the Board's approval on the Study's recommended rate classes and guidance on the types of rate structure alternatives the Board would like to be evaluated.

Information

- Summary of the Results of the Cost Allocation Study
- Technical Memorandum: Cost of Service Analysis Summary
- Cost of Service Allocation Model (a "workbook" of the Study's detailed calculations)

Summary of the Results of the Cost Allocation Study (Study)

The goal of the Study was to examine the costs we incur to provide services to various types of customers and determine the amount of revenue that should be collected for each defined customer class. The process can be considered a "truing-up" of our application of cost-of-service principles. Cost allocation information will be utilized in evaluating potential rate structure modifications.

Highlights of the Study include:

- We analyzed customer use patterns and grouped them into what the attached Technical Memorandum terms "rate classes." Four rate classes are proposed and the groupings are based on similarities in system use patterns and other property characteristics. Four rate classes are proposed:
    - Individually-metered, single-family residences
    - Master-metered, multi-family residences
    - General Service
    - Irrigation
- Based on function (e.g. raw water supply, drinking water treatment, distribution, sewer treatment, etc.), costs were allocated to the four rate classes based on the respective rate class' share of each function's cost. For example, drinking water treatment costs are allocated based on the rate class' maximum day and average day demands.
- Cost per rate class was then compared to "revenue per rate class." (Revenue per rate class was based on our current rate structure.)
- Not surprisingly, results of the Study show that revenues from each rate class do not match the costs of each rate class. However, we are pleased that the discrepancies are not significantly large.

Board Action Requested

At the meeting, OWASA and Burton & Associates staff will lead the Board in a discussion of the Study's cost of service analyses including a review of the rate classes and how they were determined. The next step in our rate structure review process will be to evaluate rate structure alternatives for each rate class. Rate structure alternatives are not part of the consultant's Technical Memo, but will be presented at the Board meeting.

We seek the Board's approval on the Study's recommended rate classes and guidance on the types of rate structure alternatives the Board would like to be evaluated.

Information Attached

- Technical Memorandum: Cost of Service Analysis Summary
- Cost of Service Allocation Model (a "workbook" of the Study's detailed calculations)

BURTON & ASSOCIATES
UTILITY RATES ▪ ASSESSMENTS ▪ FINANCIAL PLANNING

TECHNICAL MEMORANDUM

Burton & Associates
1000 N. Ashley Dr. Suite 513
Tampa, FL 33602
Telephone: (813)-443-5138

DATE: December 3, 2015
TO: Stephen Winters, Director of Finance & Customer Service, OWASA
FROM: Andrew Burnham, Senior Vice President, Burton & Associates
RE: COST OF SERVICE ANALYSIS SUMMARY

The Orange Water and Sewer Authority (OWASA) retained Burton & Associates to perform a comprehensive Cost of Service Rate Study (Study) during Fiscal Year (FY) 2016. This technical memorandum (TM) provides a summary of the first work element, a detailed cost of service analysis. The cost of service analysis examines the costs incurred by OWASA to provide its services to various types of customers. The cost of service analysis informs the determination of the amount of revenue that should be collected for each defined rate class, which in turn is a major consideration during the rate structure evaluation portion of the Study. The cost of service analysis is comprised of four steps:

1. Determination of Rate[1] Classes: Detailed review of historical usage patterns for each type of property use to examine how specific customers impact the water, sewer and reclaimed water systems. Detailed property use/customer classes are grouped into rate classes based on similarities in system usage patterns and other property characteristics.

2. Allocation of Costs to Systems: Operating and capital costs for a defined test-year (currently FY 2016) are separated between the water, sewer and reclaimed water systems.

3. Allocation of System Costs to Functions: Water and sewer system costs[2] are allocated to specific functions, such as supply, treatment, distribution, meters/services, collection, disposal, etc. For each function, a unit of service is defined as the measure by which the costs of that function should be distributed to customers. For example, water supply costs are distributed based upon total demand, water treatment costs based upon maximum day and average day demands, etc.

4. Distribution of Function Costs to Rate Classes: The costs of each function are distributed based on the units of service for each defined rate class. A comparison of the revenue requirements and current revenues by class provides insight into the alignment of costs and rates by class.

The remainder of the TM provides a summary of the results of the cost of service analysis. The cost of service model workbook, which includes the detailed calculations, is being provided as a separate supplemental document.

[1] While often times referred to as "customer classes", the term "rate classes" is used herein to avoid confusion with the 32 detailed categories of customer types referred to as customer classes within the OWASA billing system.
[2] The reclaimed water system operates under a full-cost recovery approach in accord with OWASA-UNC reclaimed water contract terms. As such, once reclaimed water system costs were identified in this analysis, they were not allocated further to system functions or to rate classes.

DETERMINATION OF RATE CLASSES

The first step in the cost of service analysis was to examine historical usage patterns and other attributes of OWASA's various classes of customers. OWASA maintains a detailed customer billing system, and classifies customers into thirty-two separate customer classes for water use tracking, reporting, forecasting, and customer communications purposes.

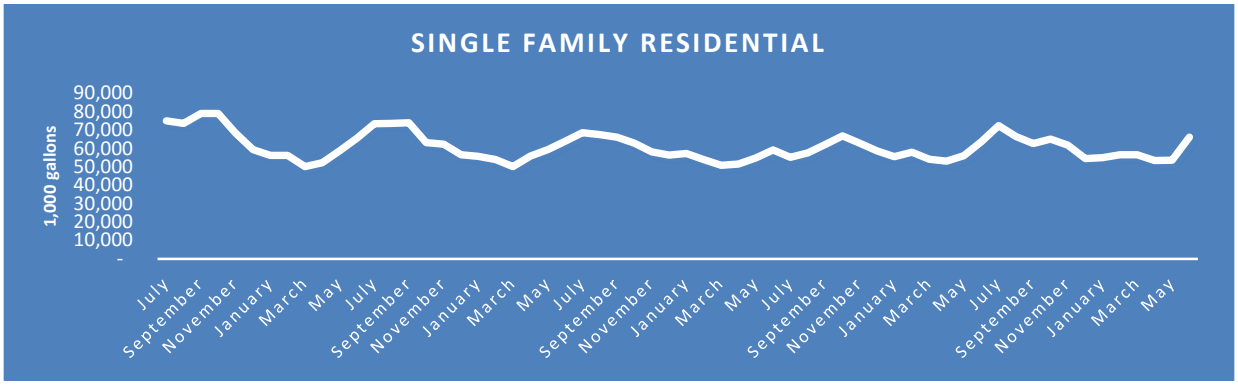
We analyzed detailed monthly metered usage data for each customer class over the past 10 years, as well as the corresponding number of customers and meters by size for each class. Usage patterns are critical to the analysis due to the amount of costs that OWASA incurs to meet peak water demands. The usage patterns analyzed by class included maximum month peaking factor (maximum month usage divided by the annual average monthly usage), a summer maximum month peaking factor (the maximum volume occurring during June, July, August or September divided by the annual average monthly usage) and the annual billed volume for each class. It should be noted that the summer maximum month peaking factor provides insight into the type of peak demand placed on the water system coincident with the period when OWASA experiences its highest total system demands. A comparison of the two peaking factors and the annual volume for each class provided insight into how the customer classes comparatively use water.

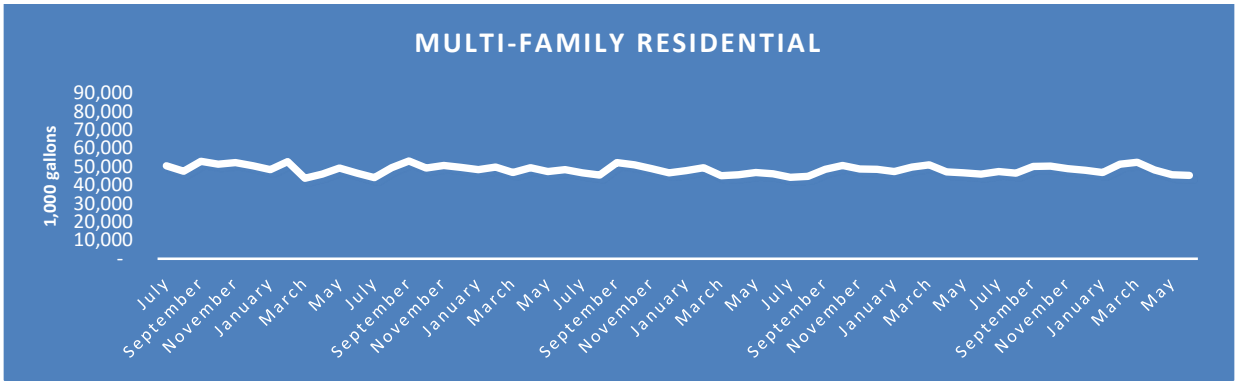
Following the analysis of water use by detailed customer class, we then grouped the various customer classes into four major "rate classes" as shown in the table: General Service; Irrigation; Multi-Family Residential (master-metered residences); and Single-Family Residential (individually-metered residences). The table below provides the peaking factors and annual volumes for each customer class.

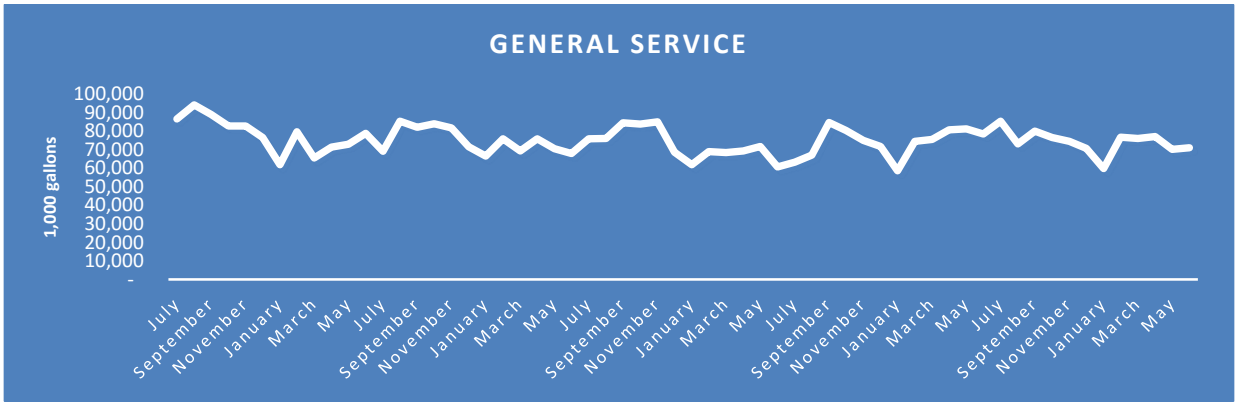
OWASA Water Customer Classes		Five Year Averages		
Customer Class	Potential Class Grouping	Max Month Peaking	Summer Max Month Peaking	Annual Volume (1,000 gallons)
Restaurants	General Service	1.06	1.04	28,167
Laundromats	General Service	1.10	1.06	4,260
UNC Laboratory-Research Facility	General Service	1.20	1.07	85,213
Nursing Homes	General Service	1.12	1.07	11,580
Office-Retail-Commercial-Banks	General Service	1.11	1.10	128,844
Non-UNC Hospital-Medical Research-Health Care	General Service	1.18	1.11	31,748
Gas Service Stations	General Service	1.15	1.12	2,053
UNC Classroom-Faculty Offices	General Service	1.22	1.12	80,392
Utilities	General Service	1.32	1.14	10,767
UNC Other	General Service	1.30	1.14	52,175
Fire Protection-Non-UNC fire lines	General Service	1.28	1.15	466
UNC Hospitals-Patient Care	General Service	1.17	1.16	102,529
Non-UNC Irrigation	General Service	1.30	1.17	3,724
Non-UNC Schools-Churches	General Service	1.28	1.19	37,192
Private non-UNC dormitory or group homes	General Service	1.36	1.21	41,164
Hotel-Motel-Inn-Commercial Guest Quarters	General Service	1.21	1.21	33,995
UNC Office-Administration	General Service	1.28	1.27	7,024
Municipality-Government Operations	General Service	1.40	1.28	6,494
UNC Student Housing	General Service	1.45	1.28	88,899
Other	General Service	1.38	1.39	7,775
Non-UNC Recreation Facilities	General Service	1.61	1.57	17,175
Car Washes	General Service	1.92	1.81	1,171
UNC Heating-Cooling	General Service	2.14	2.03	116,304
Swimming Pools	General Service	2.25	2.25	2,530
Bulk Waste Water Service	General Service	4.99	2.43	65
Irrigation	Irrigation	2.36	2.34	74,143
Multi-family residence-individually metered	Multi-Family Residential	1.07	1.06	114,568
Townhouse-attached SF with yard	Multi-Family Residential	1.09	1.08	12,444
Multi-family residence-individually metered-public housing	Multi-Family Residential	1.12	1.11	4,904
Multi-family residence-master metered	Multi-Family Residential	1.09	1.13	439,660
Multi-family residence-master metered-public housing	Multi-Family Residential	1.17	1.13	9,124
Townhouse-SF with Fire Protection 3/4	Multi-Family Residential	1.24	1.24	909
Single Family Residence	Single Family Residential	1.19	1.17	730,659
Single Family Residence-public housing	Single Family Residential	1.32	1.30	140

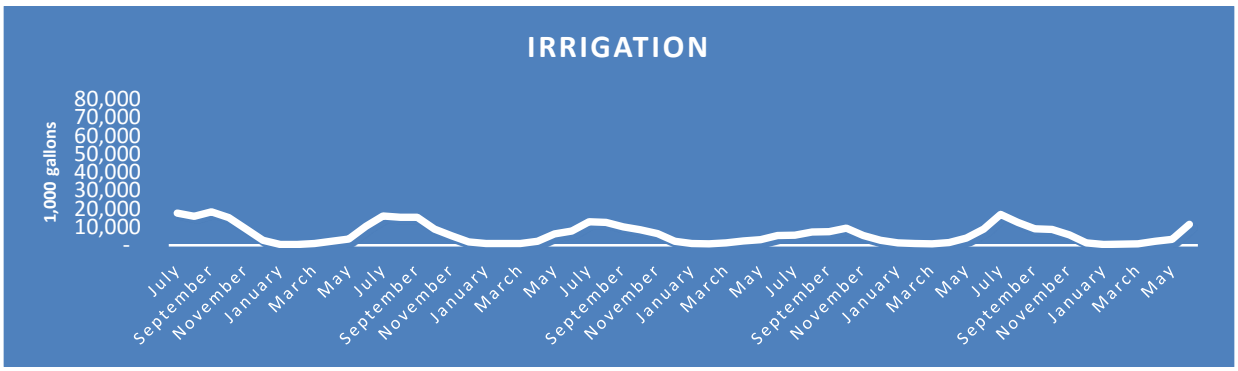
It should be noted that the General Service category includes customer classes with a fairly wide range of peaking factors. OWASA may want to consider further subdividing the General Service category.

The figures below present the monthly water use for each of the four rate classes over the past 5 years.









The same potential recommended rate class groupings for the water system were applied to the sewer system (with the exception of the Irrigation rate class). Typically, the cost drivers for a sewer system include the volume and strength of sewerage generated, with the strength (concentration/level of various pollutants) of volume being the driving consideration for the creation of separate rate classes for certain customers (such as laundromats and restaurants). However, given that OWASA does not currently sample the strength of wastewater generated by any specific customer or customer class, we are not recommending any additional rate classes for the sewer system. Over time, OWASA may want to sample the strength for various customer types to determine if any material differentials in strength exist that would warrant consideration of additional rate classifications for sewer service.

ALLOCATION OF COSTS TO SYSTEMS

The next step in the cost of service analysis was to allocate costs between the water, sewer, and reclaimed water systems/services provided by OWASA. The expenditures within the FY 2016 Budget were allocated between water, sewer and reclaimed water at a budgetary line item level based on each type of expense. The detailed allocation of the FY 2016 Budget is presented on Schedule 5 of the cost of service workbook provided in the Appendix, while the table below provides a summary of the total cost associated with each of the services provided by OWASA. It is important to note that the reclaimed water system is excluded from the remainder of the analysis presented herein as the system operates under a full-cost recovery approach in accord with the OWASA-UNC reclaimed water contract terms.

	Water System	Sewer System	Reclaim System	Total
FY 2016 Budget	$20,646,638	$20,363,334	$593,722	$41,603,694

ALLOCATION OF SYSTEM COSTS TO FUNCTIONS

Once the FY 2016 Budget allocations to the water and sewer systems were determined, the costs of each system were further allocated to the major functional categories. Specifically, water system costs were allocated between water supply, treatment, distribution, customer service/meters and fire protection. In most instances the specific budgetary line item could be directly allocated to a specific function based on the type of expenditure. When costs could not be directly allocated to a function, indirect allocations were used based on the type of expense. The detailed water system allocations to functions are shown on Schedule 6 of the cost of service workbook, while the following table presents a summary of the FY 2016 water system costs by major function.

	Water System Function					
	Supply	Treatment	Distribution	Meters/Services	Fire Protection	Total
FY 16 Water Costs	$3,644,067	$8,580,477	$5,998,778	$1,305,651	$1,117,665	$20,646,638

The preceding table demonstrates that the most significant functional cost category is water treatment, closely followed by costs associated with maintaining the distribution system. Overall, the allocation of costs between each of the functional categories is consistent with our experience with similar systems.

Similarly, the sewer system costs were allocated to defined system functions. Specifically, sewer system costs were allocated to customer, collection, treatment, and disposal functions. The detailed sewer system allocations to functions are shown on Schedule 7 of the cost of service workbook, while the following table presents a summary of the FY 2016 sewer system costs by function.

	Sewer System Function				
	Customer	Collection	Treatment	Disposal	Total
FY 16 Sewer Costs	$571,175	$6,834,816	$11,375,163	$1,582,180	$20,363,334

The preceding table demonstrates that the most significant functional cost category is treatment, accounting for nearly 50% of the total cost of providing sewer service. Costs associated with maintaining the collection system account for just over 35% of the sewer system costs. As with the water system, the allocation of costs between functions is consistent with our experience with other similar systems.

DISTRIBUTION OF FUNCTION COSTS TO RATE CLASSES

Water System Cost Distribution

The final step in the cost of service analysis is to distribute the costs of each system function to each rate class. The Base-Extra Capacity Method as outlined by the American Water Works Association (AWWA) in the M1 Manual was used to distribute the costs of each function of the water system. Under this approach, the costs of each function are allocated to base, extra capacity, customer, and fire protection cost components. Base costs are those that tend to vary with the total quantity of water used and extra capacity costs are those associated with meeting peak demands. Customer costs are associated with serving each customer (such as meter reading, billing, and customer service program costs), irrespective of the quantity of water used, and fire protection costs are associated with providing sufficient capacity to meet fire protection demands. The percentage distribution of the costs of each function of the water system to the identified cost components are shown in the table below.

Percentage to Each Water System Component	Base Capacity - Avg Day	Extra Capacity - Max Day	Extra Capacity - Peak Hour	Fire Protection	Customers
Source of Supply	100.0%				
Treatment	69.6%	30.4%			
Distribution	58.3%	25.5%	16.2%		
Meters/Services					100.0%
Fire Protection				100.0%	

The table shows that source of supply, fire protection and customer costs are directly allocated to the appropriate cost component. Water treatment and distribution costs are allocated based on the ratios of the water system's average day, maximum day, and peak hour demands (distribution only). The ratios in the table are based on the average system demands in the OWASA water system over the past five years. The following table presents the corresponding distribution of costs by system component.

FY 16 Water System Costs	Base Capacity - Avg Day	Extra Capacity - Max Day	Extra Capacity - Peak Hour	Fire Protection	Customer - Meters/Services
Source of Supply	3,644,067	-	-	-	-
Treatment	5,971,139	2,609,338	-	-	-
Distribution	3,499,203	1,529,123	970,453	-	-
Meters/Services	-	-	-	-	1,305,651
Fire Protection	-	-	-	1,117,665	-
Total	**$13,114,408**	**$4,138,461**	**$970,453**	**$1,117,665**	**$1,305,651**

Once the costs were allocated to the water system components, the units of service (i.e. volume of water, number of customer bills, etc.) associated with each of the system components were determined. The units of service were determined based on the actual billed volumes for each of the rate classes, the

number of billed service connections within each class, the demonstrated maximum month peaking factors and calculated maximum day and peak hour demands for each class. OWASA measures and bills customer use on a monthly basis, so it does not have specific maximum day and peak hour usage data for its various customer classes. Therefore, maximum day and peak hour demand factors for each customer class have been calculated by applying water and sewer utility industry methods and ratios. The units of service for each potential rate class are shown in the following table.

Water System Units of Service	Total Annual Use (1,000 gallons)	Max Day Extra Capacity (1,000 gpd)	Peak Hour Extra Capacity (1,000 gpd)	Fire Protection (1,000 gallons)	Number of Bills
Single Family Residential	724,976	968	1,477	1,699,700	169,970
Multi-Family Residential	581,241	390	991	550,820	55,082
General Service	890,738	1,256	1,566	499,380	16,646
Irrigation	72,499	549	374	-	2,953
Total	**2,269,454**	**3,164**	**4,408**	**2,749,900**	**244,651**

The detailed analysis of the units of service are presented in Schedule 10 of the cost of service workbook. The establishment of the units of service enabled the determination of the unit costs for each of the system components. Based on the units of service associated with each rate class and the calculation of unit costs, the cost of service and net revenue requirements for each class were determined. The following table shows the water system revenue requirement for each rate class. For this purpose, anticipated revenues from other miscellaneous fees and charges (such as plan review fees, lake recreation fees, and cellular antenna leases) have been subtracted from the revenue requirements of the system, since the monthly revenues collected from OWASA's water customers do not need to cover the costs related to those miscellaneous fees and charges.

Water Revenue Requirements	Single Family Residential	Multi-Family Residential	General Service	Irrigation
Operations and Maintenance	4,393,906	2,545,797	3,868,129	621,958
Debt Service	1,664,126	1,167,612	2,006,480	326,001
Rate Funded Capital	1,320,487	891,920	1,552,665	287,558
Less: Other Revenue	$1,079,888	$632,694	$935,974	$150,698
Revenue Requirement from Rates	**$6,298,631**	**$3,972,635**	**$6,491,300**	**$1,084,819**

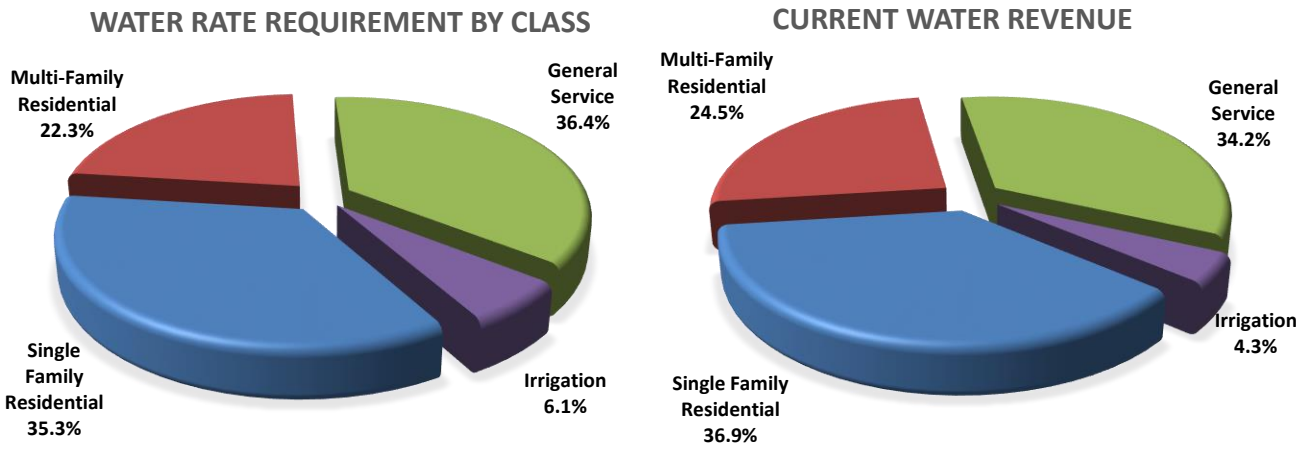
A comparison of the estimated revenue generated by each class with current rates and the revenue requirements provides insight into the alignment of current revenues with the cost to serve each class.

	Total	Single Family Residential	Multi-Family Residential	General Service	Irrigation
Rate Requirement	17,847,384	6,298,631	3,972,635	6,491,300	1,084,819
Estimated Current Rate Revenue*	17,990,169	6,639,864	4,412,973	6,160,557	776,775
Over/(Under) Recovery	**$142,784**	**$341,233**	**$440,338**	**($330,742)**	**($308,044)**
Estimated Total Revenue		36.9%	24.5%	34.2%	4.3%
System Revenue Requirement by Class		35.3%	22.3%	36.4%	6.1%
Over / (Under) Recovery Percentage		**1.6%**	**2.3%**	**-2.1%**	**-1.8%**

**Estimated revenues for FY16 based on current rates*

As expected, there are some variances between current revenues and the cost of service for each rate class, as the distribution of costs and usage patterns will vary somewhat from year to year. Other contributing factors to the variances include the changes in customer demand profiles (notably residential) since the last detailed cost of service analysis, as well as the impacts of the implementation of the reclaimed water system. In that regard, were it not for the reclaimed water system, the peak

demands of the General Service rate class would likely be larger, resulting in a greater cost allocation to this class of user. The following figures provide a graphical comparison of the percentage of water system revenue requirements and estimated revenues by rate class.



Sewer System Cost Distribution

The distribution of costs of each function of the sewer system to the identified rate classes requires a slightly different approach than the water system. Rather than allocate costs based on peak demands (i.e. the base-extra capacity approach), sewer costs are typically allocated to volume, customer, and various pollutant categories. The percentage distribution of the costs of each function of the sewer system to the identified cost components are shown in the following table.

Percentage to Each Sewer System Component	Volume	Biological Oxygen Demand	Suspended Solids	Nitrogen	Phosphorous	Customer
Customer						100.0%
Collection	100.0%					
Treatment	50.0%	21.6%	24.9%	2.9%	0.6%	
Disposal		43.2%	49.9%	5.8%	1.2%	

The table shows that customer and collection costs are directly allocated to the appropriate cost component. Treatment and solids disposal costs are allocated based on the ratios of the volumes and total pounds of each pollutant processed. The ratios in the table are based on the average volumes and pounds of pollutants processed by the OWASA system over the past five years. The following table presents the corresponding distribution of sewer costs by system component.

FY 16 Sewer System Costs	Volume	Biological Oxygen Demand	Total Suspended Solids	Nitrogen	Phosphorous	Customer
Customer	-	-	-	-	-	571,175
Collection	6,834,816	-	-	-	-	-
Treatment	5,687,581	2,455,114	2,835,566	327,512	69,389	-
Disposal	-	682,902	788,726	91,099	19,301	-
Total	**$12,522,398**	**$3,138,016**	**$3,624,293**	**$418,610**	**$88,690**	**$571,175**

Once the costs were allocated to the sewer system components, the units of service (i.e. volume, number of customer bills issued, pounds of pollutants, etc.) associated with each of the system components were determined. The units of service were determined based on the actual billed volumes

for each of the rate classes, the number billed service connections within each class, and assumed wastewater strength concentrations by rate class. It should be noted that the analysis, assumes that all rate classes generate the same strength of wastewater, as OWASA does not currently sample the strength of wastewater generated by its various types of customers[3]. The units of service for the defined rate classes within the OWASA sewer system are shown in the following table.

Sewer System Units of Service	Annual Use 1,000 gallons	Biological Oxygen Demand (lbs)	Total Suspended Solids (lbs)	Nitrogen (lbs)	Phosphorous (lbs)	Number of Bills
Single Family Residential	662,369	1,792,558	2,097,675	236,465	45,767	160,112
Multi-Family Residential	576,554	1,560,319	1,825,905	205,829	39,838	54,853
General Service	840,299	2,274,087	2,661,166	299,986	58,062	15,770
Total	**2,079,222**	**5,626,964**	**6,584,745**	**742,280**	**143,667**	**230,735**

The detailed analysis of the units of service are presented in Schedule 10 of the cost of service workbook. The establishment of the units of service enabled the determination of the unit costs for each system component. Based on the units of service associated with each rate class and the calculation of unit costs, the cost of service and net revenue requirements for each class were determined. As was done for the water cost allocation process, anticipated revenues from miscellaneous fees and charges (such as plan review fees, lake recreation fees, and cellular antenna leases) have been subtracted from the revenue requirements of the sewer system, since the monthly revenues collected from OWASA's sewer customers do not need to cover the costs related to those miscellaneous fees and charges. The following table shows the sewer system revenue requirement for each rate class.

Sewer Revenue Requirement	Single Family Residential	Multi-Family Residential	General Service
Operations and Maintenance	2,935,932	2,472,608	3,540,716
Debt Service	1,038,614	901,513	1,311,981
Rate Funded Capital	2,726,861	2,249,854	3,185,104
Total Revenue Requirements	**$6,701,407**	**$5,623,974**	**$8,037,801**
Less: Other Revenue	$1,251,771	$950,593	$1,273,999
Revenue Requirement from Rates	**$5,449,636**	**$4,673,382**	**$6,763,802**

A comparison of the estimated revenue generated by each class with current rates and the revenue requirements provides insight into the alignment of current revenues with the cost to serve each class.

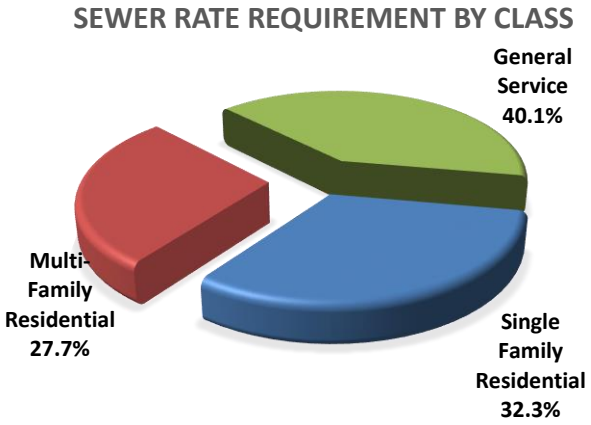
	Total	Single Family Residential	Multi-Family Residential	General Service
Rate Requirement	16,886,820	5,449,636	4,673,382	6,763,802
Estimated Current Rate Revenue*	16,794,115	6,222,123	4,593,641	5,978,351
Over/(Under) Recovery	**($92,705)**	**$772,486**	**($79,740)**	**($785,451)**
Estimated Total Revenue		37.0%	27.4%	35.6%
System Revenue Requirement by Class		32.3%	27.7%	40.1%
Over / (Under) Recovery Percentage		**4.8%**	**-0.3%**	**-4.5%**

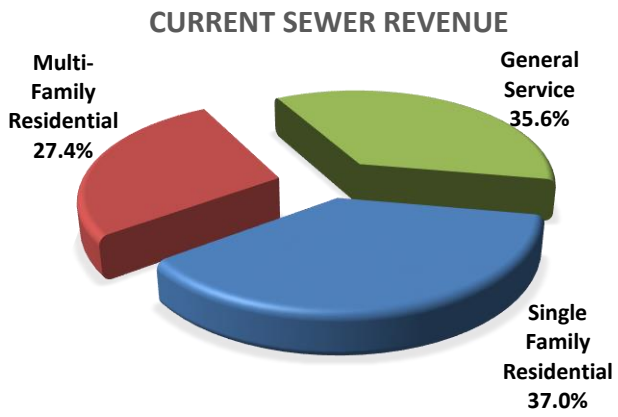
**Estimated revenues for FY16 based on current rates*

As expected, there are some variances between current revenues and the cost of service for each rate class, as the distribution of costs and customer volumes will vary somewhat from year to year. Other

[3] Some communities will sample and differentiate users with higher strengths. However, this is often times only for a limited number of users, such as restaurants and laundromats.

contributing factors to the variances include the changes in billed customer demand profiles (notably residential) since the last detailed cost of service analysis, and OWASA's use of lower, non-standard adjustment factors to establish the monthly service charges for customers with larger meters (predominantly General Service customers). If OWASA decided to use higher, more common industry meter ratio factors as recommended in the FY 2012 Rate Study, it would eliminate some of the variance between the current revenues and cost of service for this class of user. The following figures provide a graphical comparison of the percentage of sewer revenue requirements and revenues by rate class.





TRANSITION TO RATE DESIGN

The resulting allocations of revenue requirements to defined rate classes for each system will inform the evaluation of alternative rate structures by class. The rate structure evaluation phase will identify rates and corresponding revenue generation and customer impacts for each rate class consistent with the direction of the rate structures to be evaluated as identified by the Board at its December 10, 2015 meeting. Each of the rate structure alternatives evaluated will be developed such that the revenue generation by class of customer is consistent with the results of this cost of service analysis.

Therefore, prior to proceeding to the rate structure evaluation, Board direction is requested relative to:

- The recommended rate classes identified as part of the cost of service analysis.
- The types of rate structures to be evaluated for each rate class.

During the Board meeting on December 10, 2015, we will facilitate a discussion of not only the cost of service analysis presented herein, but also explore the types of rate structures to be evaluated for each identified rate class with the goal of receiving the requested direction from the Board of Directors.

It is our understanding that this memorandum and other supporting materials will be provided to the Board as part of the agenda for the December 10, 2015 meeting. If you or others have any questions or would like to discuss the analysis presented herein, please do not hesitate to call me at (813)-443-5138 or Dave Hyder at (240)-544-5425.

Very Sincerely,

Andrew J. Burnham
Senior Vice President

OWASA - FY 16 Water & Sewer Cost Allocation

Cost of Service Allocation Model



BURTON & ASSOCIATES

UTILITY RATES ▪ ASSESSMENTS ▪ FINANCIAL PLANNING

Cost Allocation Framework: Mapping of Functions & Cost Components

Schedule 1

Service	**Water**	**Sewer**
Function		
A	Source of Supply	Meters/Services
B	Treatment	Collection System
C	Transmission/Distribution	Treatment
D	Meters/Services	Disposal
E	Fire Protection	

WATER

Function	Base Capacity - Avg Day	Extra Capacity - Max Day	Extra Capacity - Peak Hour	Potential Fire Demand	Customer
Source of Supply	X				
Treatment	X	X			
Transmission/Distribution	X	X	X		
Meters/Services					X
Fire Protection				X	

SEWER

		Strength				
Function	Volume	CBOD	TSS	TKN	TP	Customer
Meters/Services						X
Collection System	X					
Treatment	X	X	X	X	X	
Disposal		X	X	X	X	

Cost Allocation Criteria Table

Schedule 2

Total System Allocation Factors	Label	Water	Sewer	Reclaim	
Meter Equivalents	Meters	54.6%	45.3%	0.05%	100.0%
Water Only	WAT	100.0%	0.0%	0.0%	100.0%
Sewer Only	SEW	0.0%	100.0%	0.0%	100.0%
Reclaim Only	RW	0.0%	0.0%	100.0%	100.0%
Revenues	REV	50.0%	48.7%	1.3%	100.0%
Fixed Assets	FA	42.6%	55.6%	1.8%	100.0%
Weighted Average (All Divisions)	WTD$	49.6%	48.9%	1.4%	100.0%
Full Time Equivalents	FTE	60.8%	38.4%	0.8%	100.0%
5-Year CIP	Five Year CIP	44.1%	55.9%	0.0%	100.0%
FY 16 Cash Funded CIP	FY16 CIP	21.3%	78.7%	0.0%	100.0%
Reclaim Agreement - Water Operating	Water FAMS	98.80%	0.00%	1.20%	100.0%
Reclaim Agreement - Sewer Operating	Sewer FAMS	0.00%	95.93%	4.07%	100.0%
Not Applicable	N/A	0.0%	0.0%	0.0%	0.0%

Water System Allocation Factors	Single Family Residential	Multi-Family Residential	General Service	Irrigation	
Total Customers	69.5%	22.5%	6.8%	1.2%	100.0%
Meter Equivalents	48.5%	24.9%	24.2%	2.4%	100.0%
Water Sales	31.9%	25.6%	39.2%	3.2%	100.0%
Max Day Demand	30.6%	12.3%	39.7%	17.4%	100.0%
Max Hour Demand	33.5%	22.5%	35.5%	8.5%	100.0%

Sewer System Allocation Factors	Single Family Residential	Multi-Family Residential	General Service	
Total Customers	69.4%	23.8%	6.8%	100.0%
Meter Equivalents	48.5%	26.3%	25.1%	100.0%
Volume	31.9%	27.7%	40.4%	100.0%
Strength	31.9%	27.7%	40.4%	100.0%

		FY 2016 Budget	ADJ.	FY 2016 COSA
Executive Directors Office				
5010	SALARIES & WAGES - REGULAR	549,968		549,968
5070	PER DIEM	15,000		15,000
5110	FICA EXPENSE	39,972		39,972
5120	RETIREMENT CONTRIBUTION	38,024		38,024
5121	DEFERRED COMPENSATION	7,800		7,800
5130	WORKERS' COMPENSATION	12,000		12,000
5140	HEALTH INSURANCE	73,454		73,454
5141	DENTAL INSURANCE	3,748		3,748
5150	DISABILITY SALARY CONTINUATION	1,622		1,622
5160	AUTOMOBILE ALLOWANCE	6,000		6,000
5180	GROUP LIFE & A D & D	1,933		1,933
5210	ELECTRICITY	45,000		45,000
5233	CELL PHONE STIPENDS	5,000		5,000
5240	FUEL	12,000		12,000
5330	SUBSCRIPTIONS	910		910
5360	OFFICE SUPPLIES	10,900		10,900
5380	SAFETY SUPPLIES	450		450
5500	LEGAL	240,000		240,000
5530	INSURANCE	39,109		39,109
5570	CONSULTANTS	38,000		38,000
5590	PROFESSIONAL SERVICES - OTHERS	0		-
5610	POSTAGE AND FREIGHT	11,700		11,700
5620	CUSTOMER INFORMATION	21,635		21,635
5630	ADVERTISING	3,630		3,630
5690	OTHER	5,280		5,280
5700	PRINTING AND REPRODUCTION	1,000		1,000
5810	EDUCATION & DEVELOPMENT	13,080		13,080
5840	BOARD TRAVEL	4,500		4,500
5910	DUES AND MEMBERSHIPS	17,530		17,530
5920	CONSERVATION	25,000		25,000
5970	BOARD EXPENSE	4,500		4,500
5990	OTHER	1,550		1,550
6010	FORCE ACCOUNT - LABOR	(41,658)		(41,658)
Executive Directors Office Subtotal		**1,208,637**	**-**	**1,208,637**

		FY 2016 Budget	ADJ.	FY 2016 COSA
Customer Services				
5010	SALARIES & WAGES - REGULAR	392,920		392,920
5020	SALARIES & WAGES - OVERTIME	3,000		3,000
5110	FICA EXPENSE	31,009		31,009
5120	RETIREMENT CONTRIBUTION	27,036		27,036
5121	DEFERRED COMPENSATION	13,520		13,520
5140	HEALTH INSURANCE	107,933		107,933
5141	DENTAL INSURANCE	5,544		5,544
5150	DISABILITY SALARY CONTINUATION	1,727		1,727
5180	GROUP LIFE & A D & D	2,595		2,595
5233	CELL PHONE STIPENDS	1,500		1,500
5360	OFFICE SUPPLIES	4,000		4,000
5560	COLLECTION SERVICES	45,000		45,000
5570	CONSULTANTS	0		-
5610	POSTAGE AND FREIGHT	75,000		75,000
5700	PRINTING AND REPRODUCTION	1,000		1,000
5810	EDUCATION & DEVELOPMENT	5,000		5,000
5930	OVERAGE AND SHORTAGES	0		-
5940	UNCOLLECTABLE ACCOUNTS	30,000		30,000
5990	OTHER	0		-
Customer Services Subtotal		**746,784**	**-**	**746,784**
Engineering				
5010	SALARIES & WAGES - REGULAR	1,060,949		1,060,949
5020	SALARIES & WAGES - OVERTIME	9,000		9,000
5060	PART TIME SUMMER	65,000		65,000
5110	FICA EXPENSE	82,411		82,411
5120	RETIREMENT CONTRIBUTION	71,854		71,854
5121	DEFERRED COMPENSATION	18,720		18,720
5140	HEALTH INSURANCE	194,251		194,251
5141	DENTAL INSURANCE	8,454		8,454
5150	DISABILITY SALARY CONTINUATION	4,770		4,770
5180	GROUP LIFE & A D & D	4,802		4,802
5233	CELL PHONE STIPENDS	9,200		9,200
5320	SMALL TOOLS	2,060		2,060
5330	SUBSCRIPTIONS	615		615
5350	FUEL - VEHICLES	7,000		7,000
5360	OFFICE SUPPLIES	3,650		3,650
5380	SAFETY SUPPLIES	2,425		2,425
5390	OTHER - MATERIALS AND SUPPLIES	1,450		1,450
5440	MOTOR VEHICLES	2,500		2,500
5520	ENGINEERING	5,000		5,000
5570	CONSULTANTS	122,500		122,500
5610	POSTAGE AND FREIGHT	400		400
5700	PRINTING AND REPRODUCTION	1,600		1,600
5810	EDUCATION & DEVELOPMENT	22,790		22,790
5910	DUES AND MEMBERSHIPS	3,335		3,335
5960	FOREST MANAGEMENT	10,000		10,000
5990	OTHER	0		-
Engineering Subtotal		**1,714,736**	**-**	**1,714,736**

		FY 2016 Budget	ADJ.	FY 2016 COSA
Human Resources				
5010	SALARIES & WAGES - REGULAR	195,167		195,167
5020	SALARIES & WAGES - OVERTIME	1,000		1,000
5110	FICA EXPENSE	15,313		15,313
5120	RETIREMENT CONTRIBUTION	13,351		13,351
5121	DEFERRED COMPENSATION	6,240		6,240
5140	HEALTH INSURANCE	44,939		44,939
5141	DENTAL INSURANCE	2,124		2,124
5142	VISION INSURANCE	50,000		50,000
5143	WELLNESS PROFRA REIMBURSEMENT	2,300		2,300
5144	RETIREES & COBRA INSURANCE	176,744		176,744
5150	DISABILITY SALARY CONTINUATION	894		894
5161	UNEMPLOYMENT TAX	21,000		21,000
5170	UNIFORMS	200		200
5180	GROUP LIFE & A D & D	1,020		1,020
5233	CELL PHONE STIPENDS	1,750		1,750
5330	SUBSCRIPTIONS	200		200
5360	OFFICE SUPPLIES	2,500		2,500
5380	SAFETY SUPPLIES	2,500		2,500
5390	OTHER - MATERIALS AND SUPPLIES	500		500
5570	CONSULTANTS	326,000		326,000
5590	PROFESSIONAL SERVICES - OTHERS	32,000		32,000
5610	POSTAGE AND FREIGHT	3,500		3,500
5630	ADVERTISING	20,000		20,000
5700	PRINTING AND REPRODUCTION	800		800
5810	EDUCATION & DEVELOPMENT	8,800		8,800
5910	DUES AND MEMBERSHIPS	5,000		5,000
5980	RECRUITMENT EXPENSE	4,000		4,000
Human Resources Subtotal		**962,842**	**-**	**962,842**
Finance Department				
5010	SALARIES & WAGES - REGULAR	467,351		467,351
5020	SALARIES & WAGES - OVERTIME	0		-
5110	FICA EXPENSE	35,429		35,429
5120	RETIREMENT CONTRIBUTION	32,021		32,021
5121	DEFERRED COMPENSATION	10,920		10,920
5140	HEALTH INSURANCE	79,355		79,355
5141	DENTAL INSURANCE	3,755		3,755
5150	DISABILITY SALARY CONTINUATION	1,908		1,908
5180	GROUP LIFE & A D & D	2,040		2,040
5233	CELL PHONE STIPENDS	3,250		3,250
5250	WASTE DISPOSAL	2,000		2,000
5360	OFFICE SUPPLIES	4,000		4,000
5390	OTHER - MATERIALS AND SUPPLIES	8,000		8,000
5510	ACCOUNTING	30,000		30,000
5570	CONSULTANTS	50,000		50,000
5580	FINANCIAL SERVICES	241,600		241,600
5581	TRUSTEE SERVICES	29,350		29,350
5590	PROFESSIONAL SERVICES - OTHERS	24,000		24,000
5610	POSTAGE AND FREIGHT	4,000		4,000
5700	PRINTING AND REPRODUCTION	3,000		3,000
5810	EDUCATION & DEVELOPMENT	9,025		9,025
5910	DUES AND MEMBERSHIPS	2,405		2,405
5950	RENTS AND LEASES	3,400		3,400
Finance Department Subtotal		**1,046,809**	**-**	**1,046,809**

		FY 2016 Budget	ADJ.	FY 2016 COSA
IT Department				
5010	SALARIES & WAGES - REGULAR	320,443		320,443
5020	SALARIES & WAGES - OVERTIME	0		-
5110	FICA EXPENSE	25,293		25,293
5120	RETIREMENT CONTRIBUTION	22,053		22,053
5121	DEFERRED COMPENSATION	3,120		3,120
5140	HEALTH INSURANCE	58,314		58,314
5141	DENTAL INSURANCE	3,025		3,025
5150	DISABILITY SALARY CONTINUATION	1,413		1,413
5180	GROUP LIFE & A D & D	1,378		1,378
5231	TELEPHONE - LOCAL	106,960		106,960
5233	CELL PHONE STIPENDS	6,000		6,000
5360	OFFICE SUPPLIES	10,000		10,000
5365	COMPUTER EQUIPMENT & PARTS	72,180		72,180
5410	MAINTENANCE - EQUIPMENT	307,870		307,870
5570	CONSULTANTS	125,000		125,000
5810	EDUCATION & DEVELOPMENT	17,180		17,180
5950	RENTS AND LEASES	40,400		40,400
IT Department Subtotal		**1,120,629**	**-**	**1,120,629**
Water Supply and Treatment				
5010	SALARIES & WAGES - REGULAR	1,252,160		1,252,160
5020	SALARIES & WAGES - OVERTIME	66,119		66,119
5050	STANDBY PAY	4,929		4,929
5060	PART TIME SUMMER	18,800		18,800
5110	FICA EXPENSE	106,174		106,174
5120	RETIREMENT CONTRIBUTION	92,573		92,573
5121	DEFERRED COMPENSATION	28,600		28,600
5130	WORKERS' COMPENSATION	26,000		26,000
5140	HEALTH INSURANCE	299,490		299,490
5141	DENTAL INSURANCE	13,100		13,100
5150	DISABILITY SALARY CONTINUATION	5,639		5,639
5170	UNIFORMS	12,000		12,000
5180	GROUP LIFE & A D & D	7,203		7,203
5210	ELECTRICITY	231,073		231,073
5233	CELL PHONE STIPENDS	9,750		9,750
5240	FUEL	19,500		19,500
5250	WASTE DISPOSAL	80,600		80,600
5310	CHEMICALS	1,036,528		1,036,528
5320	SMALL TOOLS	5,000		5,000
5340	LAKE SUPPLIES	20,200		20,200
5350	FUEL - VEHICLES	27,299		27,299
5360	OFFICE SUPPLIES	3,200		3,200
5370	LABORATORY EXPENSE	71,200		71,200
5380	SAFETY SUPPLIES	8,398		8,398
5390	OTHER - MATERIALS AND SUPPLIES	5,500		5,500
5410	MAINTENANCE - EQUIPMENT	242,801		242,801

		FY 2016 Budget	ADJ.	FY 2016 COSA
5413	MAINTENANCE - PUMPING EQUIPMENT	128,250		128,250
5415	MAINT - RESERVOIR & TANKS	142,200		142,200
5420	FACILITIES	30,300		30,300
5421	BUILDINGS	293,650		293,650
5423	MAINTENANCE - METERS	94,800		94,800
5430	MAINTENANCE - GROUNDS	82,000		82,000
5440	MOTOR VEHICLES	15,661		15,661
5530	INSURANCE	100,206		100,206
5570	CONSULTANTS	70,100		70,100
5590	PROFESSIONAL SERVICES - OTHERS	16,000		16,000
5610	POSTAGE AND FREIGHT	4,000		4,000
5810	EDUCATION & DEVELOPMENT	16,000		16,000
5910	DUES AND MEMBERSHIPS	11,090		11,090
5950	RENTS AND LEASES	2,000		2,000
5990	OTHER	1,500		1,500
Water Supply and Treatment Subtotal		**4,701,593**	**-**	**4,701,593**
Water Distribution				
5010	SALARIES & WAGES - REGULAR	1,322,255		1,322,255
5020	SALARIES & WAGES - OVERTIME	41,000		41,000
5050	STANDBY PAY	20,965		20,965
5110	FICA EXPENSE	108,557		108,557
5120	RETIREMENT CONTRIBUTION	94,650		94,650
5121	DEFERRED COMPENSATION	31,720		31,720
5130	WORKERS' COMPENSATION	22,000		22,000
5140	HEALTH INSURANCE	403,004		403,004
5141	DENTAL INSURANCE	16,871		16,871
5150	DISABILITY SALARY CONTINUATION	7,079		7,079
5170	UNIFORMS	21,000		21,000
5180	GROUP LIFE & A D & D	8,818		8,818
5210	ELECTRICITY	165,000		165,000
5233	CELL PHONE STIPENDS	8,000		8,000
5240	FUEL	5,000		5,000
5250	WASTE DISPOSAL	500		500
5320	SMALL TOOLS	7,000		7,000
5330	SUBSCRIPTIONS	175		175
5350	FUEL - VEHICLES	68,500		68,500
5360	OFFICE SUPPLIES	1,500		1,500
5380	SAFETY SUPPLIES	12,798		12,798
5390	OTHER - MATERIALS AND SUPPLIES	1,200		1,200
5421	BUILDINGS	1,500		1,500
5422	MAINTENANCE - MAINS	297,185		297,185
5423	MAINTENANCE - METERS	70,910		70,910
5424	MAINTENANCE - HYDRANTS	30,000		30,000
5425	MAINTENANCE - SERVICE LINES	37,000		37,000
5440	MOTOR VEHICLES	67,685		67,685
5530	INSURANCE	10,707		10,707
5610	POSTAGE AND FREIGHT	1,500		1,500
5700	PRINTING AND REPRODUCTION	1,000		1,000
5810	EDUCATION & DEVELOPMENT	12,070		12,070
5910	DUES AND MEMBERSHIPS	1,600		1,600
5950	RENTS AND LEASES	2,000		2,000
5990	OTHER	500		500
6010	FORCE ACCOUNT - LABOR	(53,000)		(53,000)
Water Distribution Subtotal		**2,848,249**	**-**	**2,848,249**

		FY 2016 Budget	ADJ.	FY 2016 COSA
Wastewater Treatment				
5010	SALARIES & WAGES - REGULAR	1,169,976		1,169,976
5020	SALARIES & WAGES - OVERTIME	60,080		60,080
5050	STANDBY PAY	6,583		6,583
5110	FICA EXPENSE	99,567		99,567
5120	RETIREMENT CONTRIBUTION	86,812		86,812
5121	DEFERRED COMPENSATION	31,200		31,200
5130	WORKERS' COMPENSATION	24,000		24,000
5140	HEALTH INSURANCE	291,731		291,731
5141	DENTAL INSURANCE	13,301		13,301
5150	DISABILITY SALARY CONTINUATION	5,574		5,574
5170	UNIFORMS	12,000		12,000
5180	GROUP LIFE & A D & D	6,563		6,563
5210	ELECTRICITY	529,500		529,500
5233	CELL PHONE STIPENDS	6,600		6,600
5240	FUEL	65,000		65,000
5250	WASTE DISPOSAL	562,521		562,521
5310	CHEMICALS	695,080		695,080
5315	LAND APPLICATION	60,000		60,000
5320	SMALL TOOLS	5,000		5,000
5350	FUEL - VEHICLES	20,107		20,107
5360	OFFICE SUPPLIES	5,000		5,000
5370	LABORATORY EXPENSE	114,900		114,900
5380	SAFETY SUPPLIES	12,000		12,000
5390	OTHER - MATERIALS AND SUPPLIES	5,000		5,000
5410	MAINTENANCE - EQUIPMENT	349,954		349,954
5413	MAINTENANCE - PUMPING EQUIPMENT	365,000		365,000
5420	FACILITIES	0		-
5421	BUILDINGS	69,000		69,000
5423	MAINTENANCE - METERS	75,000		75,000
5430	MAINTENANCE - GROUNDS	12,000		12,000
5440	MOTOR VEHICLES	15,180		15,180
5530	INSURANCE	127,140		127,140
5570	CONSULTANTS	146,000		146,000
5610	POSTAGE AND FREIGHT	7,655		7,655
5810	EDUCATION & DEVELOPMENT	18,500		18,500
5910	DUES AND MEMBERSHIPS	3,600		3,600
5950	RENTS AND LEASES	10,000		10,000
5990	OTHER	19,000		19,000
Wastewater Treatment Subtotal		**5,106,124**	**-**	**5,106,124**

Water & Sewer System Expenses — Schedule 3

		FY 2016 Budget	ADJ.	FY 2016 COSA
Sewer Collection				
5010	SALARIES & WAGES - REGULAR	453,442		453,442
5020	SALARIES & WAGES - OVERTIME	23,500		23,500
5050	STANDBY PAY	9,747		9,747
5110	FICA EXPENSE	38,124		38,124
5120	RETIREMENT CONTRIBUTION	33,240		33,240
5121	DEFERRED COMPENSATION	14,560		14,560
5130	WORKERS' COMPENSATION	13,000		13,000
5140	HEALTH INSURANCE	139,144		139,144
5141	DENTAL INSURANCE	5,341		5,341
5150	DISABILITY SALARY CONTINUATION	2,209		2,209
5170	UNIFORMS	9,000		9,000
5180	GROUP LIFE & A D & D	3,013		3,013
5210	ELECTRICITY	119,759		119,759
5233	CELL PHONE STIPENDS	1,800		1,800
5240	FUEL	7,000		7,000
5250	WASTE DISPOSAL	750		750
5310	CHEMICALS	200,000		200,000
5320	SMALL TOOLS	3,500		3,500
5350	FUEL - VEHICLES	35,000		35,000
5360	OFFICE SUPPLIES	1,500		1,500
5380	SAFETY SUPPLIES	9,686		9,686
5390	OTHER - MATERIALS AND SUPPLIES	2,000		2,000
5422	MAINTENANCE - MAINS	110,000		110,000
5425	MAINTENANCE - SERVICE LINES	2,500		2,500
5440	MOTOR VEHICLES	65,000		65,000
5530	INSURANCE	8,800		8,800
5610	POSTAGE AND FREIGHT	700		700
5700	PRINTING AND REPRODUCTION	500		500
5810	EDUCATION & DEVELOPMENT	10,240		10,240
5910	DUES AND MEMBERSHIPS	2,000		2,000
5950	RENTS AND LEASES	1,500		1,500
5990	OTHER	500		500
6010	FORCE ACCOUNT - LABOR	0		-
6020	FORCE ACCOUNT - VEHICLE	0		-
Sewer Collection Subtotal		**1,327,055**	**-**	**1,327,055**

Water & Sewer System Expenses — Schedule 3

	FY 2016 Budget	ADJ.	FY 2016 COSA
Debt Service			
Series 2003	1,317,750		1,317,750
Series 2004B	200,000		200,000
Series 2005	2,770,100		2,770,100
Series 2006	785,200		785,200
Series 2010	2,439,600		2,439,600
Series 2014	700,725		700,725
Series 2005 - Forward Purchase	(125,048)		(125,048)
SRF Loan	328,000		328,000
Debt Service Subtotal	8,416,327	-	**8,416,327**
Capital Projects			
Capital Improvements Transfer	400,000		400,000
Cash Funded Capital Projects	4,989,050		4,989,050
CIP Funded from Reserve Fund	5,625,950		5,625,950
Minor Capital Equipment Not In Budget	875,000		875,000
Capital Projects Subtotal	11,890,000	-	**11,890,000**
Contribution to (Use of) Reserves			
Transfer to Rate Stabilization Fund	250,000		250,000
Cont. to R&R & Contingency Funds - RW	263,909		263,909
Contribution to (Use of) Reserves Subtotal	513,909	-	**513,909**
Total Expenditure Requirements	**41,603,694**	-	**41,603,694**

Prepared by Burton & Associates 12/3/2015

Water & Sewer System Revenues

Schedule 4

Class	Description	FY 2016 Budget	Allocation Basis/Factor	Water % Allocation	Sewer % Allocation	Reclaim % Allocation	Total % Allocation	Water $ Allocation	Sewer $ Allocation	Reclaim $ Allocation
Water Usage Revenue	Sales based on usage volume	12,972,573	Direct	100.00%	0.00%	0.00%	100.00%	12,972,573	-	-
Water Fixed Revenue	Customer and base facility charge	5,017,596	Direct	100.00%	0.00%	0.00%	100.00%	5,017,596	-	-
Sewer Usage Revenue	Sales based on usage volume	13,396,251	Direct	0.00%	100.00%	0.00%	100.00%	-	13,396,251	-
Sewer Fixed Revenue	Customer and base facility charge	3,397,864	Direct	0.00%	100.00%	0.00%	100.00%	-	3,397,864	-
Irrigation Usage Revenue	Sales based on usage volume	-	Direct	100.00%	0.00%	0.00%	100.00%	-	-	-
Irrigation Fixed Revenue	Customer and base facility charge	-	Direct	100.00%	0.00%	0.00%	100.00%	-	-	-
Other Revenue	Service Initiation Fee	158,421	Customers	51.46%	48.54%	0.00%	100.00%	81,529	76,892	-
Other Revenue	Refunds/Adjustments	(232,207)	Revenues	49.97%	48.72%	1.31%	100.00%	(116,034)	(113,138)	(3,035)
Other Revenue	Rental/Royalty Income	737,241	Revenues	49.97%	48.72%	1.31%	100.00%	368,400	359,204	9,636
Other Revenue	Fishing & Boating	61,246	Revenues	49.97%	48.72%	1.31%	100.00%	30,605	29,841	801
Other Revenue	Other	250,000	Revenues	49.97%	48.72%	1.31%	100.00%	124,925	121,807	3,268
Water Impact Fees	Water Impact Fees	419,703	Direct	100.00%	0.00%	0.00%	100.00%	419,703	-	-
Sewer Impact Fees	Sewer Impact Fees	539,879	Direct	0.00%	100.00%	0.00%	100.00%	-	539,879	-
Non-Operating Revenue	NA	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-
Non-Operating Revenue	NA	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-
Other Revenue	Reclaimed Revenue From UNC	452,250	Direct	0.00%	0.00%	100.00%	100.00%	-	-	452,250
Other Revenue	NA	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-
Transfers In	Grants / Reimbursements	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-
Irrigation Impact Fees	Irrigation Impact Fees	-	Direct	100.00%	0.00%	0.00%	100.00%	-	-	-
Transfers In	Transfers In	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-
Transfers In	Outside Funding for CIP	479,000	Five Year CIP	42.59%	55.58%	1.83%	100.00%	204,004	266,240	8,756
Rate Stabilization Fund	Rate Stabilization Fund	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-
R&R Transfer	Renewal & Replacement	-	Assets	42.59%	55.58%	1.83%	100.00%	-	-	-
Capital Improvements	Capital Improvements	-	Five Year CIP	44.10%	55.90%	0.00%	100.00%	-	-	-
Transfers In	Use of Reserves	3,924,295	Five Year CIP	42.59%	55.58%	1.83%	100.00%	1,671,339	2,181,223	71,733
Interest	Interest Earned on Unrestricted Funds	29,583	Revenues	49.97%	48.72%	1.31%	100.00%	14,783	14,414	387
Interest	Interest Earned on Restricted Funds	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-
Interest	Interest Earned on Construction Fund	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-
Transfers In	Capitalized Interest From New Borrowing	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-
Total		**41,603,694**						**20,789,422**	**20,270,477**	**543,795**
							Revenue Allocation	50%	49%	1%

Prepared by Burton & Associates

12/3/2015

Test Year Expense Direct Allocation Between Water, Sewer and Reclaim

Schedule 5

	Test Year COS	Allocation Basis/Factor	Water % Allocation	Sewer % Allocation	Reclaim % Allocation	Total % Allocation	Total W & S & RW $ Allocation	Water $ Allocation	Sewer $ Allocation	Reclaim $ Allocation
Executive Directors Office										
SALARIES & WAGES - REGULAR	549,968	Indirect	54.39%	44.09%	1.52%	100.00%	549,968	299,103	242,490	8,375
PER DIEM	15,000	Indirect	54.39%	44.09%	1.52%	100.00%	15,000	8,158	6,614	228
FICA EXPENSE	39,972	Indirect	54.39%	44.09%	1.52%	100.00%	39,972	21,739	17,624	609
RETIREMENT CONTRIBUTION	38,024	Indirect	54.39%	44.09%	1.52%	100.00%	38,024	20,680	16,765	579
DEFERRED COMPENSATION	7,800	Indirect	54.39%	44.09%	1.52%	100.00%	7,800	4,242	3,439	119
WORKERS' COMPENSATION	12,000	Indirect	54.39%	44.09%	1.52%	100.00%	12,000	6,526	5,291	183
HEALTH INSURANCE	73,454	Indirect	54.39%	44.09%	1.52%	100.00%	73,454	39,948	32,387	1,119
DENTAL INSURANCE	3,748	Indirect	54.39%	44.09%	1.52%	100.00%	3,748	2,038	1,653	57
DISABILITY SALARY CONTINUATION	1,622	Indirect	54.39%	44.09%	1.52%	100.00%	1,622	882	715	25
AUTOMOBILE ALLOWANCE	6,000	Indirect	54.39%	44.09%	1.52%	100.00%	6,000	3,263	2,645	91
GROUP LIFE & A D & D	1,933	Indirect	54.39%	44.09%	1.52%	100.00%	1,933	1,051	852	29
ELECTRICITY	45,000	Indirect	54.39%	44.09%	1.52%	100.00%	45,000	24,474	19,841	685
CELL PHONE STIPENDS	5,000	Indirect	54.39%	44.09%	1.52%	100.00%	5,000	2,719	2,205	76
FUEL	12,000	Indirect	54.39%	44.09%	1.52%	100.00%	12,000	6,526	5,291	183
SUBSCRIPTIONS	910	Indirect	54.39%	44.09%	1.52%	100.00%	910	495	401	14
OFFICE SUPPLIES	10,900	Indirect	54.39%	44.09%	1.52%	100.00%	10,900	5,928	4,806	166
SAFETY SUPPLIES	450	Indirect	54.39%	44.09%	1.52%	100.00%	450	245	198	7
LEGAL	240,000	Indirect	54.39%	44.09%	1.52%	100.00%	240,000	130,525	105,820	3,655
INSURANCE	39,109	Indirect	54.39%	44.09%	1.52%	100.00%	39,109	21,270	17,244	596
CONSULTANTS	38,000	Indirect	54.39%	44.09%	1.52%	100.00%	38,000	20,667	16,755	579
PROFESSIONAL SERVICES - OTHERS	-	Indirect	54.39%	44.09%	1.52%	100.00%	-	-	-	-
POSTAGE AND FREIGHT	11,700	Indirect	54.39%	44.09%	1.52%	100.00%	11,700	6,363	5,159	178
CUSTOMER INFORMATION	21,635	Indirect	54.39%	44.09%	1.52%	100.00%	21,635	11,766	9,539	329
ADVERTISING	3,630	Indirect	54.39%	44.09%	1.52%	100.00%	3,630	1,974	1,601	55
OTHER	5,280	Indirect	54.39%	44.09%	1.52%	100.00%	5,280	2,872	2,328	80
PRINTING AND REPRODUCTION	1,000	Indirect	54.39%	44.09%	1.52%	100.00%	1,000	544	441	15
EDUCATION & DEVELOPMENT	13,080	Indirect	54.39%	44.09%	1.52%	100.00%	13,080	7,114	5,767	199
BOARD TRAVEL	4,500	Indirect	54.39%	44.09%	1.52%	100.00%	4,500	2,447	1,984	69
DUES AND MEMBERSHIPS	17,530	Indirect	54.39%	44.09%	1.52%	100.00%	17,530	9,534	7,729	267
CONSERVATION	25,000	Indirect	54.39%	44.09%	1.52%	100.00%	25,000	13,596	11,023	381
BOARD EXPENSE	4,500	Indirect	54.39%	44.09%	1.52%	100.00%	4,500	2,447	1,984	69
OTHER	1,550	Indirect	54.39%	44.09%	1.52%	100.00%	1,550	843	683	24
FORCE ACCOUNT - LABOR	(41,658)	Indirect	54.39%	44.09%	1.52%	100.00%	(41,658)	(22,656)	(18,368)	(634)
Executive Directors Office Subtotal	1,208,637		54.39%	44.09%	1.52%		1,208,637	657,325	532,907	18,405
Customer Services										
SALARIES & WAGES - REGULAR	392,920	Meters	54.63%	45.32%	0.05%	100.00%	392,920	214,653	178,077	190
SALARIES & WAGES - OVERTIME	3,000	Meters	54.63%	45.32%	0.05%	100.00%	3,000	1,639	1,360	1
FICA EXPENSE	31,009	Meters	54.63%	45.32%	0.05%	100.00%	31,009	16,940	14,054	15
RETIREMENT CONTRIBUTION	27,036	Meters	54.63%	45.32%	0.05%	100.00%	27,036	14,770	12,253	13
DEFERRED COMPENSATION	13,520	Meters	54.63%	45.32%	0.05%	100.00%	13,520	7,386	6,127	7
HEALTH INSURANCE	107,933	Meters	54.63%	45.32%	0.05%	100.00%	107,933	58,964	48,917	52
DENTAL INSURANCE	5,544	Meters	54.63%	45.32%	0.05%	100.00%	5,544	3,029	2,513	3
DISABILITY SALARY CONTINUATION	1,727	Meters	54.63%	45.32%	0.05%	100.00%	1,727	943	783	1
GROUP LIFE & A D & D	2,595	Meters	54.63%	45.32%	0.05%	100.00%	2,595	1,418	1,176	1
CELL PHONE STIPENDS	1,500	Meters	54.63%	45.32%	0.05%	100.00%	1,500	819	680	1
OFFICE SUPPLIES	4,000	Meters	54.63%	45.32%	0.05%	100.00%	4,000	2,185	1,813	2
COLLECTION SERVICES	45,000	Meters	54.63%	45.32%	0.05%	100.00%	45,000	24,584	20,395	22
POSTAGE AND FREIGHT	75,000	Meters	54.63%	45.32%	0.05%	100.00%	75,000	40,973	33,991	36
PRINTING AND REPRODUCTION	1,000	Meters	54.63%	45.32%	0.05%	100.00%	1,000	546	453	0
EDUCATION & DEVELOPMENT	5,000	Meters	54.63%	45.32%	0.05%	100.00%	5,000	2,732	2,266	2
OVERAGE AND SHORTAGES	-	Meters	54.63%	45.32%	0.05%	100.00%	-	-	-	-
UNCOLLECTABLE ACCOUNTS	30,000	Meters	54.63%	45.32%	0.05%	100.00%	30,000	16,389	13,596	14
Customer Services Subtotal	746,784		54.63%	45.32%	0.05%		746,784	407,971	338,453	361

Test Year Expense Direct Allocation Between Water, Sewer and Reclaim

Schedule 5

	Test Year COS	Allocation Basis/Factor	Water % Allocation	Sewer % Allocation	Reclaim % Allocation	Total % Allocation	Total W & S & RW $ Allocation	Water $ Allocation	Sewer $ Allocation	Reclaim $ Allocation
Engineering										
SALARIES & WAGES - REGULAR	1,060,949	Indirect	54.39%	44.09%	1.52%	100.00%	1,060,949	577,004	467,789	16,156
SALARIES & WAGES - OVERTIME	9,000	Indirect	54.39%	44.09%	1.52%	100.00%	9,000	4,895	3,968	137
PART TIME SUMMER	65,000	Indirect	54.39%	44.09%	1.52%	100.00%	65,000	35,351	28,660	990
FICA EXPENSE	82,411	Indirect	54.39%	44.09%	1.52%	100.00%	82,411	44,820	36,336	1,255
RETIREMENT CONTRIBUTION	71,854	Indirect	54.39%	44.09%	1.52%	100.00%	71,854	39,078	31,682	1,094
DEFERRED COMPENSATION	18,720	Indirect	54.39%	44.09%	1.52%	100.00%	18,720	10,181	8,254	285
HEALTH INSURANCE	194,251	Indirect	54.39%	44.09%	1.52%	100.00%	194,251	105,645	85,648	2,958
DENTAL INSURANCE	8,454	Indirect	54.39%	44.09%	1.52%	100.00%	8,454	4,598	3,728	129
DISABILITY SALARY CONTINUATION	4,770	Indirect	54.39%	44.09%	1.52%	100.00%	4,770	2,594	2,103	73
GROUP LIFE & A D & D	4,802	Indirect	54.39%	44.09%	1.52%	100.00%	4,802	2,612	2,117	73
CELL PHONE STIPENDS	9,200	Indirect	54.39%	44.09%	1.52%	100.00%	9,200	5,003	4,056	140
SMALL TOOLS	2,060	Indirect	54.39%	44.09%	1.52%	100.00%	2,060	1,120	908	31
SUBSCRIPTIONS	615	Indirect	54.39%	44.09%	1.52%	100.00%	615	334	271	9
FUEL - VEHICLES	7,000	Indirect	54.39%	44.09%	1.52%	100.00%	7,000	3,807	3,086	107
OFFICE SUPPLIES	3,650	Indirect	54.39%	44.09%	1.52%	100.00%	3,650	1,985	1,609	56
SAFETY SUPPLIES	2,425	Indirect	54.39%	44.09%	1.52%	100.00%	2,425	1,319	1,069	37
OTHER - MATERIALS AND SUPPLIES	1,450	Indirect	54.39%	44.09%	1.52%	100.00%	1,450	789	639	22
MOTOR VEHICLES	2,500	Indirect	54.39%	44.09%	1.52%	100.00%	2,500	1,360	1,102	38
ENGINEERING	5,000	Indirect	54.39%	44.09%	1.52%	100.00%	5,000	2,719	2,205	76
CONSULTANTS	122,500	Indirect	54.39%	44.09%	1.52%	100.00%	122,500	66,622	54,012	1,865
POSTAGE AND FREIGHT	400	Indirect	54.39%	44.09%	1.52%	100.00%	400	218	176	6
PRINTING AND REPRODUCTION	1,600	Indirect	54.39%	44.09%	1.52%	100.00%	1,600	870	705	24
EDUCATION & DEVELOPMENT	22,790	Indirect	54.39%	44.09%	1.52%	100.00%	22,790	12,394	10,048	347
DUES AND MEMBERSHIPS	3,335	Indirect	54.39%	44.09%	1.52%	100.00%	3,335	1,814	1,470	51
FOREST MANAGEMENT	10,000	Indirect	54.39%	44.09%	1.52%	100.00%	10,000	5,439	4,409	152
Engineering Subtotal	1,714,736		54.39%	44.09%	1.52%		1,714,736	932,570	756,055	26,112
Human Resources										
SALARIES & WAGES - REGULAR	195,167	FTE	60.79%	38.45%	0.77%	100.00%	195,167	118,636	75,035	1,496
SALARIES & WAGES - OVERTIME	1,000	FTE	60.79%	38.45%	0.77%	100.00%	1,000	608	384	8
FICA EXPENSE	15,313	FTE	60.79%	38.45%	0.77%	100.00%	15,313	9,308	5,887	117
RETIREMENT CONTRIBUTION	13,351	FTE	60.79%	38.45%	0.77%	100.00%	13,351	8,116	5,133	102
DEFERRED COMPENSATION	6,240	FTE	60.79%	38.45%	0.77%	100.00%	6,240	3,793	2,399	48
HEALTH INSURANCE	44,939	FTE	60.79%	38.45%	0.77%	100.00%	44,939	27,317	17,278	344
DENTAL INSURANCE	2,124	FTE	60.79%	38.45%	0.77%	100.00%	2,124	1,291	817	16
VISION INSURANCE	50,000	FTE	60.79%	38.45%	0.77%	100.00%	50,000	30,394	19,223	383
WELLNESS PROFRA REIMBURSEMENT	2,300	FTE	60.79%	38.45%	0.77%	100.00%	2,300	1,398	884	18
RETIREES & COBRA INSURANCE	176,744	FTE	60.79%	38.45%	0.77%	100.00%	176,744	107,438	67,952	1,354
DISABILITY SALARY CONTINUATION	894	FTE	60.79%	38.45%	0.77%	100.00%	894	543	344	7
UNEMPLOYMENT TAX	21,000	FTE	60.79%	38.45%	0.77%	100.00%	21,000	12,765	8,074	161
UNIFORMS	200	FTE	60.79%	38.45%	0.77%	100.00%	200	122	77	2
GROUP LIFE & A D & D	1,020	FTE	60.79%	38.45%	0.77%	100.00%	1,020	620	392	8
CELL PHONE STIPENDS	1,750	FTE	60.79%	38.45%	0.77%	100.00%	1,750	1,064	673	13
SUBSCRIPTIONS	200	FTE	60.79%	38.45%	0.77%	100.00%	200	122	77	2
OFFICE SUPPLIES	2,500	FTE	60.79%	38.45%	0.77%	100.00%	2,500	1,520	961	19
SAFETY SUPPLIES	2,500	FTE	60.79%	38.45%	0.77%	100.00%	2,500	1,520	961	19
OTHER - MATERIALS AND SUPPLIES	500	FTE	60.79%	38.45%	0.77%	100.00%	500	304	192	4
CONSULTANTS	326,000	FTE	60.79%	38.45%	0.77%	100.00%	326,000	198,166	125,336	2,498
PROFESSIONAL SERVICES - OTHERS	32,000	FTE	60.79%	38.45%	0.77%	100.00%	32,000	19,452	12,303	245
POSTAGE AND FREIGHT	3,500	FTE	60.79%	38.45%	0.77%	100.00%	3,500	2,128	1,346	27
ADVERTISING	20,000	FTE	60.79%	38.45%	0.77%	100.00%	20,000	12,157	7,689	153
PRINTING AND REPRODUCTION	800	FTE	60.79%	38.45%	0.77%	100.00%	800	486	308	6
EDUCATION & DEVELOPMENT	8,800	FTE	60.79%	38.45%	0.77%	100.00%	8,800	5,349	3,383	67
DUES AND MEMBERSHIPS	5,000	FTE	60.79%	38.45%	0.77%	100.00%	5,000	3,039	1,922	38
RECRUITMENT EXPENSE	4,000	FTE	60.79%	38.45%	0.77%	100.00%	4,000	2,431	1,538	31
OTHER	25,000	FTE	60.79%	38.45%	0.77%	100.00%	25,000	15,197	9,612	192
Human Resources Subtotal	962,842		60.79%	38.45%	0.77%		962,842	585,283	370,180	7,378

Test Year Expense Direct Allocation Between Water, Sewer and Reclaim

Schedule 5

	Test Year COS	Allocation Basis/Factor	Water % Allocation	Sewer % Allocation	Reclaim % Allocation	Total % Allocation	Total W & S & RW $ Allocation	Water $ Allocation	Sewer $ Allocation	Reclaim $ Allocation
Finance Department										
SALARIES & WAGES - REGULAR	467,351	Revenues	49.97%	48.72%	1.31%	100.00%	467,351	233,536	227,706	6,109
SALARIES & WAGES - OVERTIME	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-	-
FICA EXPENSE	35,429	Revenues	49.97%	48.72%	1.31%	100.00%	35,429	17,704	17,262	463
RETIREMENT CONTRIBUTION	32,021	Revenues	49.97%	48.72%	1.31%	100.00%	32,021	16,001	15,602	419
DEFERRED COMPENSATION	10,920	Revenues	49.97%	48.72%	1.31%	100.00%	10,920	5,457	5,321	143
HEALTH INSURANCE	79,355	Revenues	49.97%	48.72%	1.31%	100.00%	79,355	39,654	38,664	1,037
DENTAL INSURANCE	3,755	Revenues	49.97%	48.72%	1.31%	100.00%	3,755	1,876	1,830	49
DISABILITY SALARY CONTINUATION	1,908	Revenues	49.97%	48.72%	1.31%	100.00%	1,908	953	930	25
GROUP LIFE & A D & D	2,040	Revenues	49.97%	48.72%	1.31%	100.00%	2,040	1,019	994	27
CELL PHONE STIPENDS	3,250	Revenues	49.97%	48.72%	1.31%	100.00%	3,250	1,624	1,583	42
WASTE DISPOSAL	2,000	Revenues	49.97%	48.72%	1.31%	100.00%	2,000	999	974	26
OFFICE SUPPLIES	4,000	Revenues	49.97%	48.72%	1.31%	100.00%	4,000	1,999	1,949	52
OTHER - MATERIALS AND SUPPLIES	8,000	Revenues	49.97%	48.72%	1.31%	100.00%	8,000	3,998	3,898	105
ACCOUNTING	30,000	Revenues	49.97%	48.72%	1.31%	100.00%	30,000	14,991	14,617	392
CONSULTANTS	50,000	Revenues	49.97%	48.72%	1.31%	100.00%	50,000	24,985	24,361	654
FINANCIAL SERVICES	241,600	Revenues	49.97%	48.72%	1.31%	100.00%	241,600	120,728	117,714	3,158
TRUSTEE SERVICES	29,350	Revenues	49.97%	48.72%	1.31%	100.00%	29,350	14,666	14,300	384
PROFESSIONAL SERVICES - OTHERS	24,000	Revenues	49.97%	48.72%	1.31%	100.00%	24,000	11,993	11,693	314
POSTAGE AND FREIGHT	4,000	Revenues	49.97%	48.72%	1.31%	100.00%	4,000	1,999	1,949	52
PRINTING AND REPRODUCTION	3,000	Revenues	49.97%	48.72%	1.31%	100.00%	3,000	1,499	1,462	39
EDUCATION & DEVELOPMENT	9,025	Revenues	49.97%	48.72%	1.31%	100.00%	9,025	4,510	4,397	118
DUES AND MEMBERSHIPS	2,405	Revenues	49.97%	48.72%	1.31%	100.00%	2,405	1,202	1,172	31
RENTS AND LEASES	3,400	Revenues	49.97%	48.72%	1.31%	100.00%	3,400	1,699	1,657	44
OTHER	-	Revenues	49.97%	48.72%	1.31%	100.00%	-	-	-	-
Finance Department Subtotal	1,046,809		49.97%	48.72%	1.31%		1,046,809	523,092	510,034	13,683
IT Department										
SALARIES & WAGES - REGULAR	320,443	FTE	60.79%	38.45%	0.77%	100.00%	320,443	194,788	123,200	2,456
SALARIES & WAGES - OVERTIME	-	FTE	60.79%	38.45%	0.77%	100.00%	-	-	-	-
FICA EXPENSE	25,293	FTE	60.79%	38.45%	0.77%	100.00%	25,293	15,375	9,724	194
RETIREMENT CONTRIBUTION	22,053	FTE	60.79%	38.45%	0.77%	100.00%	22,053	13,405	8,479	169
DEFERRED COMPENSATION	3,120	FTE	60.79%	38.45%	0.77%	100.00%	3,120	1,897	1,200	24
HEALTH INSURANCE	58,314	FTE	60.79%	38.45%	0.77%	100.00%	58,314	35,447	22,420	447
DENTAL INSURANCE	3,025	FTE	60.79%	38.45%	0.77%	100.00%	3,025	1,839	1,163	23
DISABILITY SALARY CONTINUATION	1,413	FTE	60.79%	38.45%	0.77%	100.00%	1,413	859	543	11
GROUP LIFE & A D & D	1,378	FTE	60.79%	38.45%	0.77%	100.00%	1,378	838	530	11
TELEPHONE - LOCAL	106,960	FTE	60.79%	38.45%	0.77%	100.00%	106,960	65,018	41,123	820
CELL PHONE STIPENDS	6,000	FTE	60.79%	38.45%	0.77%	100.00%	6,000	3,647	2,307	46
OFFICE SUPPLIES	10,000	FTE	60.79%	38.45%	0.77%	100.00%	10,000	6,079	3,845	77
COMPUTER EQUIPMENT & PARTS	72,180	FTE	60.79%	38.45%	0.77%	100.00%	72,180	43,876	27,751	553
MAINTENANCE - EQUIPMENT	307,870	FTE	60.79%	38.45%	0.77%	100.00%	307,870	187,145	118,366	2,359
CONSULTANTS	125,000	FTE	60.79%	38.45%	0.77%	100.00%	125,000	75,984	48,058	958
EDUCATION & DEVELOPMENT	17,180	FTE	60.79%	38.45%	0.77%	100.00%	17,180	10,443	6,605	132
RENTS AND LEASES	40,400	FTE	60.79%	38.45%	0.77%	100.00%	40,400	24,558	15,532	310
IT Department Subtotal	1,120,629		60.79%	38.45%	0.77%		1,120,629	681,198	430,844	8,587

Test Year Expense Direct Allocation Between Water, Sewer and Reclaim

Schedule 5

	Test Year COS	Allocation Basis/Factor	Water % Allocation	Sewer % Allocation	Reclaim % Allocation	Total % Allocation	Total W & S & RW $ Allocation	Water $ Allocation	Sewer $ Allocation	Reclaim $ Allocation
Water Supply and Treatment										
SALARIES & WAGES - REGULAR	1,252,160	Water	100.00%	0.00%	0.00%	100.00%	1,252,160	1,252,160	-	-
SALARIES & WAGES - OVERTIME	66,119	Water	100.00%	0.00%	0.00%	100.00%	66,119	66,119	-	-
STANDBY PAY	4,929	Water	100.00%	0.00%	0.00%	100.00%	4,929	4,929	-	-
PART TIME SUMMER	18,800	Water	100.00%	0.00%	0.00%	100.00%	18,800	18,800	-	-
FICA EXPENSE	106,174	Water	100.00%	0.00%	0.00%	100.00%	106,174	106,174	-	-
RETIREMENT CONTRIBUTION	92,573	Water	100.00%	0.00%	0.00%	100.00%	92,573	92,573	-	-
DEFERRED COMPENSATION	28,600	Water	100.00%	0.00%	0.00%	100.00%	28,600	28,600	-	-
WORKERS' COMPENSATION	26,000	Water	100.00%	0.00%	0.00%	100.00%	26,000	26,000	-	-
HEALTH INSURANCE	299,490	Water	100.00%	0.00%	0.00%	100.00%	299,490	299,490	-	-
DENTAL INSURANCE	13,100	Water	100.00%	0.00%	0.00%	100.00%	13,100	13,100	-	-
DISABILITY SALARY CONTINUATION	5,639	Water	100.00%	0.00%	0.00%	100.00%	5,639	5,639	-	-
UNIFORMS	12,000	Water	100.00%	0.00%	0.00%	100.00%	12,000	12,000	-	-
GROUP LIFE & A D & D	7,203	Water	100.00%	0.00%	0.00%	100.00%	7,203	7,203	-	-
ELECTRICITY	231,073	Water	100.00%	0.00%	0.00%	100.00%	231,073	231,073	-	-
CELL PHONE STIPENDS	9,750	Water	100.00%	0.00%	0.00%	100.00%	9,750	9,750	-	-
FUEL	19,500	Water	100.00%	0.00%	0.00%	100.00%	19,500	19,500	-	-
WASTE DISPOSAL	80,600	Water	100.00%	0.00%	0.00%	100.00%	80,600	80,600	-	-
CHEMICALS	1,036,528	Water	100.00%	0.00%	0.00%	100.00%	1,036,528	1,036,528	-	-
SMALL TOOLS	5,000	Water	100.00%	0.00%	0.00%	100.00%	5,000	5,000	-	-
LAKE SUPPLIES	20,200	Water	100.00%	0.00%	0.00%	100.00%	20,200	20,200	-	-
FUEL - VEHICLES	27,299	Water	100.00%	0.00%	0.00%	100.00%	27,299	27,299	-	-
OFFICE SUPPLIES	3,200	Water	100.00%	0.00%	0.00%	100.00%	3,200	3,200	-	-
LABORATORY EXPENSE	71,200	Water	100.00%	0.00%	0.00%	100.00%	71,200	71,200	-	-
SAFETY SUPPLIES	8,398	Water	100.00%	0.00%	0.00%	100.00%	8,398	8,398	-	-
OTHER - MATERIALS AND SUPPLIES	5,500	Water	100.00%	0.00%	0.00%	100.00%	5,500	5,500	-	-
MAINTENANCE - EQUIPMENT	242,801	Water	100.00%	0.00%	0.00%	100.00%	242,801	242,801	-	-
MAINTENANCE - PUMPING EQUIPMENT	128,250	Water	100.00%	0.00%	0.00%	100.00%	128,250	128,250	-	-
MAINT - RESERVOIR & TANKS	142,200	Water	100.00%	0.00%	0.00%	100.00%	142,200	142,200	-	-
FACILITIES	30,300	Water	100.00%	0.00%	0.00%	100.00%	30,300	30,300	-	-
BUILDINGS	293,650	Water	100.00%	0.00%	0.00%	100.00%	293,650	293,650	-	-
MAINTENANCE - METERS	94,800	Water	100.00%	0.00%	0.00%	100.00%	94,800	94,800	-	-
MAINTENANCE - GROUNDS	82,000	Water	100.00%	0.00%	0.00%	100.00%	82,000	82,000	-	-
MOTOR VEHICLES	15,661	Water	100.00%	0.00%	0.00%	100.00%	15,661	15,661	-	-
INSURANCE	100,206	Water	100.00%	0.00%	0.00%	100.00%	100,206	100,206	-	-
CONSULTANTS	70,100	Water	100.00%	0.00%	0.00%	100.00%	70,100	70,100	-	-
PROFESSIONAL SERVICES - OTHERS	16,000	Water	100.00%	0.00%	0.00%	100.00%	16,000	16,000	-	-
POSTAGE AND FREIGHT	4,000	Water	100.00%	0.00%	0.00%	100.00%	4,000	4,000	-	-
EDUCATION & DEVELOPMENT	16,000	Water	100.00%	0.00%	0.00%	100.00%	16,000	16,000	-	-
DUES AND MEMBERSHIPS	11,090	Water	100.00%	0.00%	0.00%	100.00%	11,090	11,090	-	-
RENTS AND LEASES	2,000	Water	100.00%	0.00%	0.00%	100.00%	2,000	2,000	-	-
OTHER	1,500	Water	100.00%	0.00%	0.00%	100.00%	1,500	1,500	-	-
Water Supply and Treatment Subtotal	4,701,593		100.00%	0.00%	0.00%		4,701,593	4,701,593	-	-

Test Year Expense Direct Allocation Between Water, Sewer and Reclaim

Schedule 5

	Test Year COS	Allocation Basis/Factor	Water % Allocation	Sewer % Allocation	Reclaim % Allocation	Total % Allocation	Total W & S & RW $ Allocation	Water $ Allocation	Sewer $ Allocation	Reclaim $ Allocation
Water Distribution										
SALARIES & WAGES - REGULAR	1,322,255	Water - FAMS	98.80%	0.00%	1.20%	100.00%	1,322,255	1,306,439	-	15,816
SALARIES & WAGES - OVERTIME	41,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	41,000	40,510	-	490
STANDBY PAY	20,965	Water - FAMS	98.80%	0.00%	1.20%	100.00%	20,965	20,714	-	251
FICA EXPENSE	108,557	Water - FAMS	98.80%	0.00%	1.20%	100.00%	108,557	107,258	-	1,299
RETIREMENT CONTRIBUTION	94,650	Water - FAMS	98.80%	0.00%	1.20%	100.00%	94,650	93,518	-	1,132
DEFERRED COMPENSATION	31,720	Water - FAMS	98.80%	0.00%	1.20%	100.00%	31,720	31,341	-	379
WORKERS' COMPENSATION	22,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	22,000	21,737	-	263
HEALTH INSURANCE	403,004	Water - FAMS	98.80%	0.00%	1.20%	100.00%	403,004	398,183	-	4,821
DENTAL INSURANCE	16,871	Water - FAMS	98.80%	0.00%	1.20%	100.00%	16,871	16,669	-	202
DISABILITY SALARY CONTINUATION	7,079	Water - FAMS	98.80%	0.00%	1.20%	100.00%	7,079	6,994	-	85
UNIFORMS	21,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	21,000	20,749	-	251
GROUP LIFE & A D & D	8,818	Water - FAMS	98.80%	0.00%	1.20%	100.00%	8,818	8,713	-	105
ELECTRICITY	165,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	165,000	163,026	-	1,974
CELL PHONE STIPENDS	8,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	8,000	7,904	-	96
FUEL	5,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	5,000	4,940	-	60
WASTE DISPOSAL	500	Water - FAMS	98.80%	0.00%	1.20%	100.00%	500	494	-	6
SMALL TOOLS	7,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	7,000	6,916	-	84
SUBSCRIPTIONS	175	Water - FAMS	98.80%	0.00%	1.20%	100.00%	175	173	-	2
FUEL - VEHICLES	68,500	Water - FAMS	98.80%	0.00%	1.20%	100.00%	68,500	67,681	-	819
OFFICE SUPPLIES	1,500	Water - FAMS	98.80%	0.00%	1.20%	100.00%	1,500	1,482	-	18
SAFETY SUPPLIES	12,798	Water - FAMS	98.80%	0.00%	1.20%	100.00%	12,798	12,645	-	153
OTHER - MATERIALS AND SUPPLIES	1,200	Water - FAMS	98.80%	0.00%	1.20%	100.00%	1,200	1,186	-	14
BUILDINGS	1,500	Water - FAMS	98.80%	0.00%	1.20%	100.00%	1,500	1,482	-	18
MAINTENANCE - MAINS	297,185	Water - FAMS	98.80%	0.00%	1.20%	100.00%	297,185	293,630	-	3,555
MAINTENANCE - METERS	70,910	Water - FAMS	98.80%	0.00%	1.20%	100.00%	70,910	70,062	-	848
MAINTENANCE - HYDRANTS	30,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	30,000	29,641	-	359
MAINTENANCE - SERVICE LINES	37,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	37,000	36,557	-	443
MOTOR VEHICLES	67,685	Water - FAMS	98.80%	0.00%	1.20%	100.00%	67,685	66,875	-	810
INSURANCE	10,707	Water - FAMS	98.80%	0.00%	1.20%	100.00%	10,707	10,579	-	128
POSTAGE AND FREIGHT	1,500	Water - FAMS	98.80%	0.00%	1.20%	100.00%	1,500	1,482	-	18
PRINTING AND REPRODUCTION	1,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	1,000	988	-	12
EDUCATION & DEVELOPMENT	12,070	Water - FAMS	98.80%	0.00%	1.20%	100.00%	12,070	11,926	-	144
DUES AND MEMBERSHIPS	1,600	Water - FAMS	98.80%	0.00%	1.20%	100.00%	1,600	1,581	-	19
RENTS AND LEASES	2,000	Water - FAMS	98.80%	0.00%	1.20%	100.00%	2,000	1,976	-	24
OTHER	500	Water - FAMS	98.80%	0.00%	1.20%	100.00%	500	494	-	6
FORCE ACCOUNT - LABOR	(53,000)	Water - FAMS	98.80%	0.00%	1.20%	100.00%	(53,000)	(52,366)	-	(634)
FORCE ACCOUNT - VEHICLE	-	Water - FAMS	98.80%	0.00%	1.20%	100.00%	-	-	-	-
Water Distribution Subtotal	2,848,249		98.80%	0.00%	1.20%		2,848,249	2,814,179	-	34,070

Test Year Expense Direct Allocation Between Water, Sewer and Reclaim

Schedule 5

	Test Year COS	Allocation Basis/Factor	Water % Allocation	Sewer % Allocation	Reclaim % Allocation	Total % Allocation	Total W & S & RW $ Allocation	Water $ Allocation	Sewer $ Allocation	Reclaim $ Allocation
Wastewater Treatment										
SALARIES & WAGES - REGULAR	1,169,976	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	1,169,976	-	1,122,341	47,635
SALARIES & WAGES - OVERTIME	60,080	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	60,080	-	57,634	2,446
STANDBY PAY	6,583	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	6,583	-	6,315	268
FICA EXPENSE	99,567	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	99,567	-	95,513	4,054
RETIREMENT CONTRIBUTION	86,812	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	86,812	-	83,277	3,535
DEFERRED COMPENSATION	31,200	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	31,200	-	29,930	1,270
WORKERS' COMPENSATION	24,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	24,000	-	23,023	977
HEALTH INSURANCE	291,731	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	291,731	-	279,853	11,878
DENTAL INSURANCE	13,301	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	13,301	-	12,759	542
DISABILITY SALARY CONTINUATION	5,574	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	5,574	-	5,347	227
UNIFORMS	12,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	12,000	-	11,511	489
GROUP LIFE & A D & D	6,563	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	6,563	-	6,296	267
ELECTRICITY	529,500	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	529,500	-	507,942	21,558
CELL PHONE STIPENDS	6,600	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	6,600	-	6,331	269
FUEL	65,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	65,000	-	62,354	2,646
WASTE DISPOSAL	562,521	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	562,521	-	539,618	22,903
CHEMICALS	695,080	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	695,080	-	666,780	28,300
LAND APPLICATION	60,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	60,000	-	57,557	2,443
SMALL TOOLS	5,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	5,000	-	4,796	204
FUEL - VEHICLES	20,107	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	20,107	-	19,288	819
OFFICE SUPPLIES	5,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	5,000	-	4,796	204
LABORATORY EXPENSE	114,900	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	114,900	-	110,222	4,678
SAFETY SUPPLIES	12,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	12,000	-	11,511	489
OTHER - MATERIALS AND SUPPLIES	5,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	5,000	-	4,796	204
MAINTENANCE - EQUIPMENT	349,954	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	349,954	-	335,706	14,248
MAINTENANCE - PUMPING EQUIPMENT	365,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	365,000	-	350,139	14,861
FACILITIES	-	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	-	-	-	-
BUILDINGS	69,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	69,000	-	66,191	2,809
MAINTENANCE - METERS	75,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	75,000	-	71,946	3,054
MAINTENANCE - GROUNDS	12,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	12,000	-	11,511	489
MOTOR VEHICLES	15,180	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	15,180	-	14,562	618
INSURANCE	127,140	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	127,140	-	121,964	5,176
CONSULTANTS	146,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	146,000	-	140,056	5,944
POSTAGE AND FREIGHT	7,655	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	7,655	-	7,343	312
EDUCATION & DEVELOPMENT	18,500	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	18,500	-	17,747	753
DUES AND MEMBERSHIPS	3,600	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	3,600	-	3,453	147
RENTS AND LEASES	10,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	10,000	-	9,593	407
OTHER	19,000	Sewer - FAMS	0.00%	95.93%	4.07%	100.00%	19,000	-	18,226	774
Wastewater Treatment Subtotal	5,106,124		0.00%	95.93%	4.07%		5,106,124	-	4,898,231	207,893

Test Year Expense Direct Allocation Between Water, Sewer and Reclaim

Schedule 5

	Test Year COS	Allocation Basis/Factor	Water % Allocation	Sewer % Allocation	Reclaim % Allocation	Total % Allocation	Total W & S & RW $ Allocation	Water $ Allocation	Sewer $ Allocation	Reclaim $ Allocation
Sewer Collection										
SALARIES & WAGES - REGULAR	453,442	Sewer	0.00%	100.00%	0.00%	100.00%	453,442	-	453,442	-
SALARIES & WAGES - OVERTIME	23,500	Sewer	0.00%	100.00%	0.00%	100.00%	23,500	-	23,500	-
STANDBY PAY	9,747	Sewer	0.00%	100.00%	0.00%	100.00%	9,747	-	9,747	-
FICA EXPENSE	38,124	Sewer	0.00%	100.00%	0.00%	100.00%	38,124	-	38,124	-
RETIREMENT CONTRIBUTION	33,240	Sewer	0.00%	100.00%	0.00%	100.00%	33,240	-	33,240	-
DEFERRED COMPENSATION	14,560	Sewer	0.00%	100.00%	0.00%	100.00%	14,560	-	14,560	-
WORKERS' COMPENSATION	13,000	Sewer	0.00%	100.00%	0.00%	100.00%	13,000	-	13,000	-
HEALTH INSURANCE	139,144	Sewer	0.00%	100.00%	0.00%	100.00%	139,144	-	139,144	-
DENTAL INSURANCE	5,341	Sewer	0.00%	100.00%	0.00%	100.00%	5,341	-	5,341	-
DISABILITY SALARY CONTINUATION	2,209	Sewer	0.00%	100.00%	0.00%	100.00%	2,209	-	2,209	-
UNIFORMS	9,000	Sewer	0.00%	100.00%	0.00%	100.00%	9,000	-	9,000	-
GROUP LIFE & A D & D	3,013	Sewer	0.00%	100.00%	0.00%	100.00%	3,013	-	3,013	-
ELECTRICITY	119,759	Sewer	0.00%	100.00%	0.00%	100.00%	119,759	-	119,759	-
CELL PHONE STIPENDS	1,800	Sewer	0.00%	100.00%	0.00%	100.00%	1,800	-	1,800	-
FUEL	7,000	Sewer	0.00%	100.00%	0.00%	100.00%	7,000	-	7,000	-
WASTE DISPOSAL	750	Sewer	0.00%	100.00%	0.00%	100.00%	750	-	750	-
CHEMICALS	200,000	Sewer	0.00%	100.00%	0.00%	100.00%	200,000	-	200,000	-
SMALL TOOLS	3,500	Sewer	0.00%	100.00%	0.00%	100.00%	3,500	-	3,500	-
FUEL - VEHICLES	35,000	Sewer	0.00%	100.00%	0.00%	100.00%	35,000	-	35,000	-
OFFICE SUPPLIES	1,500	Sewer	0.00%	100.00%	0.00%	100.00%	1,500	-	1,500	-
SAFETY SUPPLIES	9,686	Sewer	0.00%	100.00%	0.00%	100.00%	9,686	-	9,686	-
OTHER - MATERIALS AND SUPPLIES	2,000	Sewer	0.00%	100.00%	0.00%	100.00%	2,000	-	2,000	-
MAINTENANCE - MAINS	110,000	Sewer	0.00%	100.00%	0.00%	100.00%	110,000	-	110,000	-
MAINTENANCE - SERVICE LINES	2,500	Sewer	0.00%	100.00%	0.00%	100.00%	2,500	-	2,500	-
MOTOR VEHICLES	65,000	Sewer	0.00%	100.00%	0.00%	100.00%	65,000	-	65,000	-
INSURANCE	8,800	Sewer	0.00%	100.00%	0.00%	100.00%	8,800	-	8,800	-
POSTAGE AND FREIGHT	700	Sewer	0.00%	100.00%	0.00%	100.00%	700	-	700	-
PRINTING AND REPRODUCTION	500	Sewer	0.00%	100.00%	0.00%	100.00%	500	-	500	-
EDUCATION & DEVELOPMENT	10,240	Sewer	0.00%	100.00%	0.00%	100.00%	10,240	-	10,240	-
DUES AND MEMBERSHIPS	2,000	Sewer	0.00%	100.00%	0.00%	100.00%	2,000	-	2,000	-
RENTS AND LEASES	1,500	Sewer	0.00%	100.00%	0.00%	100.00%	1,500	-	1,500	-
OTHER	500	Sewer	0.00%	100.00%	0.00%	100.00%	500	-	500	-
FORCE ACCOUNT - LABOR	-	N/A	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FORCE ACCOUNT - VEHICLE	-	N/A	0.00%	0.00%	0.00%	0.00%	-	-	-	-
Sewer Collection Subtotal	1,327,055		0.00%	100.00%	0.00%		1,327,055	-	1,327,055	-

Test Year Expense Direct Allocation Between Water, Sewer and Reclaim

Schedule 5

	Test Year COS	Allocation Basis/Factor	Water % Allocation	Sewer % Allocation	Reclaim % Allocation	Total % Allocation	Total W & S & RW $ Allocation	Water $ Allocation	Sewer $ Allocation	Reclaim $ Allocation
Debt Service										
Series 2003	1,317,750	Assets Funded	79.00%	21.00%	0.00%	100.00%	1,317,750	1,041,023	276,728	-
Series 2004B	200,000	Assets Funded	7.00%	93.00%	0.00%	100.00%	200,000	14,000	186,000	-
Series 2005	2,770,100	Assets Funded	31.00%	69.00%	0.00%	100.00%	2,770,100	858,731	1,911,369	-
Series 2006	785,200	Assets Funded	80.31%	19.69%	0.00%	100.00%	785,200	630,594	154,606	-
Series 2010	2,439,600	Assets Funded	86.00%	14.00%	0.00%	100.00%	2,439,600	2,098,056	341,544	-
Series 2014	700,725	Assets Funded	80.00%	20.00%	0.00%	100.00%	700,725	560,580	140,145	-
Series 2005 - Forward Purchase	(125,048)	Assets Funded	31.00%	69.00%	0.00%	100.00%	(125,048)	(38,765)	(86,283)	-
SRF Loan	328,000	Sewer	0.00%	100.00%	0.00%	100.00%	328,000	-	328,000	-
Debt Service Subtotal	8,416,327		61.36%	38.64%	0.00%		8,416,327	5,164,219	3,252,108	-
Capital Projects										
Capital Improvements Transfer	400,000	Five Year CIP	44.10%	55.90%	0.00%	100.00%	400,000	176,391	223,609	-
Cash Funded Capital Projects	4,989,050	Five Year CIP	44.10%	55.90%	0.00%	100.00%	4,989,050	2,200,055	2,788,995	-
CIP Funded from Reserve Fund	5,625,950	FY16 CIP	21.34%	78.66%	0.00%	100.00%	5,625,950	1,200,310	4,425,640	-
Minor Capital Equipment Not In Budget	875,000	Indirect	54.39%	44.09%	1.52%	100.00%	875,000	475,874	385,802	13,324
Capital Projects Subtotal	11,890,000		34.08%	65.80%	0.11%		11,890,000	4,052,630	7,824,046	13,324
Contribution to (Use of) Reserves										
Transfer to Rate Stabilization Fund	250,000	Revenues	50.63%	49.37%	0.00%	100.00%	250,000	126,580	123,420	-
Cont. to R&R & Contingency Funds - RW	263,909	Direct	0.00%	0.00%	100.00%	100.00%	263,909	-	-	263,909
Contribution to (Use of) Reserves Subtotal	513,909		24.63%	24.02%	51.35%		513,909	126,580	123,420	263,909
Total Expenditures	**$ 41,603,694**		**49.63%**	**48.95%**	**1.43%**		**$ 41,603,694**	**$ 20,646,638**	**$ 20,363,334**	**$ 593,722**
Expenses Excluded From Indirect Allocation								49.6%	48.9%	1.4%
Debt Service and Capital								9,343,428	11,199,574	277,234
Net Expenses for Indirect Allocation	**$ 20,783,458**						**$**	**11,303,210**	**$ 9,163,760**	**$ 316,489**
% of Expenditures								54.4%	44.1%	1.5%

Prepared by Burton & Associates

12/3/2015

Water System Operating & Debt Service Expense Allocation to Functions

Schedule 6

	Test Year COS	Allocation Basis/Factor	Supply % Allocation	Treatment % Allocation	Distribution % Allocation	Meters/Services % Allocation	Fire Protection % Allocation	Total % Allocation	Supply $ Allocation	Treatment $ Allocation	Distribution $ Allocation	Meters/Services $ Allocation	Fire Protection $ Allocation
Executive Directors Office													
SALARIES & WAGES - REGULAR	299,103	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	52,206	117,366	70,749	31,671	27,111
PER DIEM	8,158	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	1,424	3,201	1,930	864	739
FICA EXPENSE	21,739	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	3,794	8,530	5,142	2,302	1,970
RETIREMENT CONTRIBUTION	20,680	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	3,609	8,115	4,891	2,190	1,874
DEFERRED COMPENSATION	4,242	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	740	1,665	1,003	449	385
WORKERS' COMPENSATION	6,526	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	1,139	2,561	1,544	691	592
HEALTH INSURANCE	39,948	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	6,973	15,676	9,449	4,230	3,621
DENTAL INSURANCE	2,038	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	356	800	482	216	185
DISABILITY SALARY CONTINUATION	882	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	154	346	209	93	80
AUTOMOBILE ALLOWANCE	3,263	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	570	1,280	772	346	296
GROUP LIFE & A D & D	1,051	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	183	413	249	111	95
ELECTRICITY	24,474	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	4,272	9,603	5,789	2,591	2,218
CELL PHONE STIPENDS	2,719	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	475	1,067	643	288	246
FUEL	6,526	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	1,139	2,561	1,544	691	592
SUBSCRIPTIONS	495	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	86	194	117	52	45
OFFICE SUPPLIES	5,928	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	1,035	2,326	1,402	628	537
SAFETY SUPPLIES	245	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	43	96	58	26	22
LEGAL	130,525	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	22,782	51,217	30,874	13,821	11,831
INSURANCE	21,270	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	3,712	8,346	5,031	2,252	1,928
CONSULTANTS	20,667	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	3,607	8,109	4,888	2,188	1,873
PROFESSIONAL SERVICES - OTHERS	-	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	-	-	-	-	-
POSTAGE AND FREIGHT	6,363	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	1,111	2,497	1,505	674	577
CUSTOMER INFORMATION	11,766	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	2,054	4,617	2,783	1,246	1,067
ADVERTISING	1,974	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	345	775	467	209	179
OTHER	2,872	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	501	1,127	679	304	260
PRINTING AND REPRODUCTION	544	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	95	213	129	58	49
EDUCATION & DEVELOPMENT	7,114	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	1,242	2,791	1,683	753	645
BOARD TRAVEL	2,447	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	427	960	579	259	222
DUES AND MEMBERSHIPS	9,534	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	1,664	3,741	2,255	1,010	864
CONSERVATION	13,596	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	2,373	5,335	3,216	1,440	1,232
BOARD EXPENSE	2,447	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	427	960	579	259	222
OTHER	843	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	147	331	199	89	76
FORCE ACCOUNT - LABOR	(22,656)	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	(3,954)	(8,890)	(5,359)	(2,399)	(2,054)
Executive Directors Office Subtotal	**657,325**								**114,730**	**257,930**	**155,481**	**69,602**	**59,581**
Customer Services													
SALARIES & WAGES - REGULAR	214,653	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	214,653	-
SALARIES & WAGES - OVERTIME	1,639	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	1,639	-
FICA EXPENSE	16,940	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	16,940	-
RETIREMENT CONTRIBUTION	14,770	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	14,770	-
DEFERRED COMPENSATION	7,386	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	7,386	-
HEALTH INSURANCE	58,964	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	58,964	-
DENTAL INSURANCE	3,029	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	3,029	-
DISABILITY SALARY CONTINUATION	943	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	943	-
GROUP LIFE & A D & D	1,418	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	1,418	-
CELL PHONE STIPENDS	819	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	819	-
OFFICE SUPPLIES	2,185	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	2,185	-
COLLECTION SERVICES	24,584	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	24,584	-
CONSULTANTS	-	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	-	-
POSTAGE AND FREIGHT	40,973	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	40,973	-
PRINTING AND REPRODUCTION	546	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	546	-
EDUCATION & DEVELOPMENT	2,732	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	2,732	-
OVERAGE AND SHORTAGES	-	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	-	-
UNCOLLECTABLE ACCOUNTS	16,389	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	16,389	-
OTHER	-	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	-	-
Customer Services Subtotal	**407,971**								**-**	**-**	**-**	**407,971**	**-**

Water System Operating & Debt Service Expense Allocation to Functions

Schedule 6

	Test Year COS	Allocation Basis/Factor	Supply % Allocation	Treatment % Allocation	Distribution % Allocation	Meters/Services % Allocation	Fire Protection % Allocation	Total % Allocation	Supply $ Allocation	Treatment $ Allocation	Distribution $ Allocation	Meters/Services $ Allocation	Fire Protection $ Allocation
Engineering													
SALARIES & WAGES - REGULAR	577,004	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	100,711	226,413	136,482	61,097	52,301
SALARIES & WAGES - OVERTIME	4,895	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	854	1,921	1,158	518	444
PART TIME SUMMER	35,351	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	6,170	13,871	8,362	3,743	3,204
FICA EXPENSE	44,820	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	7,823	17,587	10,601	4,746	4,063
RETIREMENT CONTRIBUTION	39,078	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	6,821	15,334	9,243	4,138	3,542
DEFERRED COMPENSATION	10,181	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	1,777	3,995	2,408	1,078	923
HEALTH INSURANCE	105,645	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	18,439	41,454	24,989	11,186	9,576
DENTAL INSURANCE	4,598	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	802	1,804	1,088	487	417
DISABILITY SALARY CONTINUATION	2,594	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	453	1,018	614	275	235
GROUP LIFE & A D & D	2,612	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	456	1,025	618	277	237
CELL PHONE STIPENDS	5,003	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	873	1,963	1,184	530	454
SMALL TOOLS	1,120	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	196	440	265	119	102
SUBSCRIPTIONS	334	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	58	131	79	35	30
FUEL - VEHICLES	3,807	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	664	1,494	900	403	345
OFFICE SUPPLIES	1,985	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	346	779	470	210	180
SAFETY SUPPLIES	1,319	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	230	518	312	140	120
OTHER - MATERIALS AND SUPPLIES	789	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	138	309	187	84	71
MOTOR VEHICLES	1,360	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	237	534	322	144	123
ENGINEERING	2,719	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	475	1,067	643	288	246
CONSULTANTS	66,622	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	11,628	26,142	15,759	7,054	6,039
POSTAGE AND FREIGHT	218	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	38	85	51	23	20
PRINTING AND REPRODUCTION	870	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	152	341	206	92	79
EDUCATION & DEVELOPMENT	12,394	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	2,163	4,864	2,932	1,312	1,123
DUES AND MEMBERSHIPS	1,814	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	317	712	429	192	164
FOREST MANAGEMENT	5,439	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	949	2,134	1,286	576	493
OTHER	-	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	-	-	-	-	-
Engineering Subtotal	**932,570**								**162,772**	**365,935**	**220,586**	**98,747**	**84,530**
Human Resources													
SALARIES & WAGES - REGULAR	118,636	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	7,779	39,870	62,235	8,752	-
SALARIES & WAGES - OVERTIME	608	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	40	204	319	45	-
FICA EXPENSE	9,308	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	610	3,128	4,883	687	-
RETIREMENT CONTRIBUTION	8,116	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	532	2,727	4,257	599	-
DEFERRED COMPENSATION	3,793	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	249	1,275	1,990	280	-
HEALTH INSURANCE	27,317	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	1,791	9,180	14,330	2,015	-
DENTAL INSURANCE	1,291	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	85	434	677	95	-
VISION INSURANCE	30,394	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	1,993	10,214	15,944	2,242	-
WELLNESS PROFRA REIMBURSEMENT	1,398	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	92	470	733	103	-
RETIREES & COBRA INSURANCE	107,438	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	7,045	36,106	56,361	7,926	-
DISABILITY SALARY CONTINUATION	543	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	36	183	285	40	-
UNEMPLOYMENT TAX	12,765	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	837	4,290	6,697	942	-
UNIFORMS	122	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	8	41	64	9	-
GROUP LIFE & A D & D	620	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	41	208	325	46	-
CELL PHONE STIPENDS	1,064	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	70	357	558	78	-
SUBSCRIPTIONS	122	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	8	41	64	9	-
OFFICE SUPPLIES	1,520	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	100	511	797	112	-
SAFETY SUPPLIES	1,520	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	100	511	797	112	-
OTHER - MATERIALS AND SUPPLIES	304	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	20	102	159	22	-
CONSULTANTS	198,166	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	12,994	66,597	103,956	14,619	-
PROFESSIONAL SERVICES - OTHERS	19,452	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	1,276	6,537	10,204	1,435	-
POSTAGE AND FREIGHT	2,128	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	140	715	1,116	157	-
ADVERTISING	12,157	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	797	4,086	6,378	897	-
PRINTING AND REPRODUCTION	486	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	32	163	255	36	-
EDUCATION & DEVELOPMENT	5,349	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	351	1,798	2,806	395	-
DUES AND MEMBERSHIPS	3,039	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	199	1,021	1,594	224	-
RECRUITMENT EXPENSE	2,431	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	159	817	1,276	179	-
OTHER	15,197	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	997	5,107	7,972	1,121	-
Human Resources Subtotal	**585,283**								**38,379**	**196,694**	**307,034**	**43,177**	**-**

Water System Operating & Debt Service Expense Allocation to Functions

Schedule 6

	Test Year COS	Allocation Basis/Factor	Supply % Allocation	Treatment % Allocation	Distribution % Allocation	Meters/Services % Allocation	Fire Protection % Allocation	Total % Allocation	Supply $ Allocation	Treatment $ Allocation	Distribution $ Allocation	Meters/Services $ Allocation	Fire Protection $ Allocation
Finance Department													
SALARIES & WAGES - REGULAR	233,536	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	40,762	91,638	55,240	24,728	21,168
SALARIES & WAGES - OVERTIME	-	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	-	-	-	-	-
FICA EXPENSE	17,704	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	3,090	6,947	4,188	1,875	1,605
RETIREMENT CONTRIBUTION	16,001	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	2,793	6,279	3,785	1,694	1,450
DEFERRED COMPENSATION	5,457	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	952	2,141	1,291	578	495
HEALTH INSURANCE	39,654	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	6,921	15,560	9,380	4,199	3,594
DENTAL INSURANCE	1,876	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	328	736	444	199	170
DISABILITY SALARY CONTINUATION	953	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	166	374	226	101	86
GROUP LIFE & A D & D	1,019	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	178	400	241	108	92
CELL PHONE STIPENDS	1,624	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	283	637	384	172	147
WASTE DISPOSAL	999	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	174	392	236	106	91
OFFICE SUPPLIES	1,999	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	349	784	473	212	181
OTHER - MATERIALS AND SUPPLIES	3,998	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	698	1,569	946	423	362
ACCOUNTING	14,991	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	2,617	5,882	3,546	1,587	1,359
CONSULTANTS	24,985	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	4,361	9,804	5,910	2,646	2,265
FINANCIAL SERVICES	120,728	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	21,072	47,373	28,556	12,784	10,943
TRUSTEE SERVICES	14,666	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	2,560	5,755	3,469	1,553	1,329
PROFESSIONAL SERVICES - OTHERS	11,993	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	2,093	4,706	2,837	1,270	1,087
POSTAGE AND FREIGHT	1,999	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	349	784	473	212	181
PRINTING AND REPRODUCTION	1,499	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	262	588	355	159	136
EDUCATION & DEVELOPMENT	4,510	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	787	1,770	1,067	478	409
DUES AND MEMBERSHIPS	1,202	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	210	472	284	127	109
RENTS AND LEASES	1,699	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	297	667	402	180	154
OTHER	-	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	-	-	-	-	-
Finance Department Subtotal	**523,092**								**91,301**	**205,258**	**123,730**	**55,389**	**47,414**
IT Department													
SALARIES & WAGES - REGULAR	194,788	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	12,773	65,462	102,184	14,370	-
SALARIES & WAGES - OVERTIME	-	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	-	-	-	-	-
FICA EXPENSE	15,375	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	1,008	5,167	8,066	1,134	-
RETIREMENT CONTRIBUTION	13,405	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	879	4,505	7,032	989	-
DEFERRED COMPENSATION	1,897	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	124	637	995	140	-
HEALTH INSURANCE	35,447	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	2,324	11,913	18,595	2,615	-
DENTAL INSURANCE	1,839	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	121	618	965	136	-
DISABILITY SALARY CONTINUATION	859	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	56	289	451	63	-
GROUP LIFE & A D & D	838	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	55	282	439	62	-
TELEPHONE - LOCAL	65,018	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	4,263	21,850	34,108	4,796	-
CELL PHONE STIPENDS	3,647	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	239	1,226	1,913	269	-
OFFICE SUPPLIES	6,079	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	399	2,043	3,189	448	-
COMPUTER EQUIPMENT & PARTS	43,876	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	2,877	14,745	23,017	3,237	-
MAINTENANCE - EQUIPMENT	187,145	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	12,272	62,893	98,175	13,806	-
CONSULTANTS	75,984	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	4,983	25,536	39,860	5,605	-
EDUCATION & DEVELOPMENT	10,443	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	685	3,510	5,478	770	-
RENTS AND LEASES	24,558	FTE	6.56%	33.61%	52.46%	7.38%	0.00%	100.00%	1,610	8,253	12,883	1,812	-
IT Department Subtotal	**681,198**								**44,669**	**228,927**	**357,350**	**50,252**	**-**

Water System Operating & Debt Service Expense Allocation to Functions

Schedule 6

	Test Year COS	Allocation Basis/Factor	Supply % Allocation	Treatment % Allocation	Distribution % Allocation	Meters/Services % Allocation	Fire Protection % Allocation	Total % Allocation	Supply $ Allocation	Treatment $ Allocation	Distribution $ Allocation	Meters/Services $ Allocation	Fire Protection $ Allocation
Water Supply and Treatment													
SALARIES & WAGES - REGULAR	1,252,160	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	204,434	1,047,726	-	-	-
SALARIES & WAGES - OVERTIME	66,119	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	10,795	55,324	-	-	-
STANDBY PAY	4,929	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	805	4,124	-	-	-
PART TIME SUMMER	18,800	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	3,069	15,731	-	-	-
FICA EXPENSE	106,174	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	17,335	88,839	-	-	-
RETIREMENT CONTRIBUTION	92,573	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	15,114	77,459	-	-	-
DEFERRED COMPENSATION	28,600	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	4,669	23,931	-	-	-
WORKERS' COMPENSATION	26,000	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	4,245	21,755	-	-	-
HEALTH INSURANCE	299,490	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	48,896	250,594	-	-	-
DENTAL INSURANCE	13,100	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	2,139	10,961	-	-	-
DISABILITY SALARY CONTINUATION	5,639	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	921	4,718	-	-	-
UNIFORMS	12,000	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	1,959	10,041	-	-	-
GROUP LIFE & A D & D	7,203	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	1,176	6,027	-	-	-
ELECTRICITY	231,073	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	231,073	-	-	-
CELL PHONE STIPENDS	9,750	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	1,592	8,158	-	-	-
FUEL	19,500	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	19,500	-	-	-
WASTE DISPOSAL	80,600	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	80,600	-	-	-
CHEMICALS	1,036,528	Supply	100.00%	0.00%	0.00%	0.00%	0.00%	100.00%	1,036,528	-	-	-	-
SMALL TOOLS	5,000	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	5,000	-	-	-
LAKE SUPPLIES	20,200	Supply	100.00%	0.00%	0.00%	0.00%	0.00%	100.00%	20,200	-	-	-	-
FUEL - VEHICLES	27,299	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	27,299	-	-	-
OFFICE SUPPLIES	3,200	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	522	2,678	-	-	-
LABORATORY EXPENSE	71,200	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	71,200	-	-	-
SAFETY SUPPLIES	8,398	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	8,398	-	-	-
OTHER - MATERIALS AND SUPPLIES	5,500	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	5,500	-	-	-
MAINTENANCE - EQUIPMENT	242,801	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	242,801	-	-	-
MAINTENANCE - PUMPING EQUIPMENT	128,250	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	128,250	-	-	-
MAINT - RESERVOIR & TANKS	142,200	Supply	100.00%	0.00%	0.00%	0.00%	0.00%	100.00%	142,200	-	-	-	-
FACILITIES	30,300	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	30,300	-	-	-
BUILDINGS	293,650	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	293,650	-	-	-
MAINTENANCE - METERS	94,800	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	94,800	-	-	-
MAINTENANCE - GROUNDS	82,000	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	82,000	-	-	-
MOTOR VEHICLES	15,661	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	15,661	-	-	-
INSURANCE	100,206	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	100,206	-	-	-
CONSULTANTS	70,100	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	70,100	-	-	-
PROFESSIONAL SERVICES - OTHERS	16,000	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	16,000	-	-	-
POSTAGE AND FREIGHT	4,000	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	4,000	-	-	-
EDUCATION & DEVELOPMENT	16,000	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	2,612	13,388	-	-	-
DUES AND MEMBERSHIPS	11,090	FTE	16.33%	83.67%	0.00%	0.00%	0.00%	100.00%	1,811	9,279	-	-	-
RENTS AND LEASES	2,000	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	2,000	-	-	-
OTHER	1,500	Treatment	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	-	1,500	-	-	-
Water Supply and Treatment Subtotal	**4,701,593**								**1,521,022**	**3,180,571**	**-**	**-**	**-**

Water System Operating & Debt Service Expense Allocation to Functions

Schedule 6

	Test Year COS	Allocation Basis/Factor	Supply % Allocation	Treatment % Allocation	Distribution % Allocation	Meters/Services % Allocation	Fire Protection % Allocation	Total % Allocation	Supply $ Allocation	Treatment $ Allocation	Distribution $ Allocation	Meters/Services $ Allocation	Fire Protection $ Allocation
Water Distribution													
SALARIES & WAGES - REGULAR	1,306,439	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	685,880	228,627	391,932
SALARIES & WAGES - OVERTIME	40,510	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	21,268	7,089	12,153
STANDBY PAY	20,714	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	10,875	3,625	6,214
FICA EXPENSE	107,258	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	56,311	18,770	32,178
RETIREMENT CONTRIBUTION	93,518	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	49,097	16,366	28,055
DEFERRED COMPENSATION	31,341	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	16,454	5,485	9,402
WORKERS' COMPENSATION	21,737	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	11,412	3,804	6,521
HEALTH INSURANCE	398,183	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	209,046	69,682	119,455
DENTAL INSURANCE	16,669	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	8,751	2,917	5,001
DISABILITY SALARY CONTINUATION	6,994	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	3,672	1,224	2,098
UNIFORMS	20,749	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	10,893	3,631	6,225
GROUP LIFE & A D & D	8,713	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	4,574	1,525	2,614
ELECTRICITY	163,026	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	114,118	-	48,908
CELL PHONE STIPENDS	7,904	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	5,533	-	2,371
FUEL	4,940	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	3,458	-	1,482
WASTE DISPOSAL	494	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	346	-	148
SMALL TOOLS	6,916	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	4,841	-	2,075
SUBSCRIPTIONS	173	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	121	-	52
FUEL - VEHICLES	67,681	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	47,376	-	20,304
OFFICE SUPPLIES	1,482	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	1,037	-	445
SAFETY SUPPLIES	12,645	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	8,851	-	3,793
OTHER - MATERIALS AND SUPPLIES	1,186	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	830	-	356
BUILDINGS	1,482	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	1,037	-	445
MAINTENANCE - MAINS	293,630	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	205,541	-	88,089
MAINTENANCE - METERS	70,062	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	70,062	-
MAINTENANCE - HYDRANTS	29,641	Fire Protection	0.00%	0.00%	0.00%	0.00%	100.00%	100.00%	-	-	-	-	29,641
MAINTENANCE - SERVICE LINES	36,557	Meter / Services	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	36,557	-
MOTOR VEHICLES	66,875	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	46,813	-	20,063
INSURANCE	10,579	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	7,405	-	3,174
POSTAGE AND FREIGHT	1,482	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	1,037	-	445
PRINTING AND REPRODUCTION	988	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	692	-	296
EDUCATION & DEVELOPMENT	11,926	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	6,261	2,087	3,578
DUES AND MEMBERSHIPS	1,581	FTE	0.00%	0.00%	52.50%	17.50%	30.00%	100.00%	-	-	830	277	474
RENTS AND LEASES	1,976	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	1,383	-	593
OTHER	494	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	346	-	148
FORCE ACCOUNT - LABOR	(52,366)	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	(36,656)	-	(15,710)
FORCE ACCOUNT - VEHICLE	-	Distribution	0.00%	0.00%	70.00%	0.00%	30.00%	100.00%	-	-	-	-	-
Water Distribution Subtotal	**2,814,179**								**-**	**-**	**1,509,435**	**471,727**	**833,017**
Wastewater Treatment													
SALARIES & WAGES - REGULAR	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
SALARIES & WAGES - OVERTIME	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
STANDBY PAY	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
FICA EXPENSE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
RETIREMENT CONTRIBUTION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
DEFERRED COMPENSATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
WORKERS' COMPENSATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
HEALTH INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
DENTAL INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
DISABILITY SALARY CONTINUATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
UNIFORMS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
GROUP LIFE & A D & D	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
ELECTRICITY	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
CELL PHONE STIPENDS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
FUEL	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
WASTE DISPOSAL	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
CHEMICALS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
LAND APPLICATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
SMALL TOOLS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
FUEL - VEHICLES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-

Water System Operating & Debt Service Expense Allocation to Functions

Schedule 6

	Test Year COS	Allocation Basis/Factor	Supply % Allocation	Treatment % Allocation	Distribution % Allocation	Meters/Services % Allocation	Fire Protection % Allocation	Total % Allocation	Supply $ Allocation	Treatment $ Allocation	Distribution $ Allocation	Meters/Services $ Allocation	Fire Protection $ Allocation
OFFICE SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
LABORATORY EXPENSE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
SAFETY SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
OTHER - MATERIALS AND SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
MAINTENANCE - EQUIPMENT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
MAINTENANCE - PUMPING EQUIPMENT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
FACILITIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
BUILDINGS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
MAINTENANCE - METERS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
MAINTENANCE - GROUNDS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
MOTOR VEHICLES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
CONSULTANTS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
POSTAGE AND FREIGHT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
EDUCATION & DEVELOPMENT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
DUES AND MEMBERSHIPS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
RENTS AND LEASES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
OTHER	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
Wastewater Treatment Subtotal	-								-	-	-	-	-
Sewer Collection													
SALARIES & WAGES - REGULAR	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
SALARIES & WAGES - OVERTIME	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
STANDBY PAY	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
FICA EXPENSE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
RETIREMENT CONTRIBUTION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
DEFERRED COMPENSATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
WORKERS' COMPENSATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
HEALTH INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
DENTAL INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
DISABILITY SALARY CONTINUATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
UNIFORMS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
GROUP LIFE & A D & D	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
ELECTRICITY	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
CELL PHONE STIPENDS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
FUEL	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
WASTE DISPOSAL	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
CHEMICALS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
SMALL TOOLS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
FUEL - VEHICLES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
OFFICE SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
SAFETY SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
OTHER - MATERIALS AND SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
MAINTENANCE - MAINS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
MAINTENANCE - SERVICE LINES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
MOTOR VEHICLES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
POSTAGE AND FREIGHT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
PRINTING AND REPRODUCTION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
EDUCATION & DEVELOPMENT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
DUES AND MEMBERSHIPS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
RENTS AND LEASES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
OTHER	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
FORCE ACCOUNT - LABOR	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
FORCE ACCOUNT - VEHICLE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-	-
Sewer Collection Subtotal	-								-	-	-	-	-

Water System Operating & Debt Service Expense Allocation to Functions

Schedule 6

	Test Year COS	Allocation Basis/Factor	Supply % Allocation	Treatment % Allocation	Distribution % Allocation	Meters/Services % Allocation	Fire Protection % Allocation	Total % Allocation	Supply $ Allocation	Treatment $ Allocation	Distribution $ Allocation	Meters/Services $ Allocation	Fire Protection $ Allocation
Debt Service													
Series 2003	1,041,023	Assets Funded	25.39%	63.66%	9.33%	0.87%	0.75%	100.00%	264,342	662,761	97,085	9,070	7,764
Series 2004B	14,000	Assets Funded	25.39%	63.66%	9.33%	0.87%	0.75%	100.00%	3,555	8,913	1,306	122	104
Series 2005	858,731	Assets Funded	25.39%	63.66%	9.33%	0.87%	0.75%	100.00%	218,054	546,706	80,085	7,482	6,405
Series 2006	630,594	Assets Funded	25.39%	63.66%	9.33%	0.87%	0.75%	100.00%	160,124	401,464	58,809	5,494	4,703
Series 2010	2,098,056	Assets Funded	25.39%	63.66%	9.33%	0.87%	0.75%	100.00%	532,750	1,335,714	195,664	18,280	15,648
Series 2014	560,580	Assets Funded	25.39%	63.66%	9.33%	0.87%	0.75%	100.00%	142,346	356,890	52,279	4,884	4,181
Series 2005 - Forward Purchase	(38,765)	Assets Funded	25.39%	63.66%	9.33%	0.87%	0.75%	100.00%	(9,843)	(24,679)	(3,615)	(338)	(289)
SRF Loan	-	Assets Funded	25.39%	63.66%	9.33%	0.87%	0.75%	100.00%	-	-	-	-	-
Debt Service Subtotal	**5,164,219**								**1,311,328**	**3,287,768**	**481,612**	**44,994**	**38,516**
Capital Projects													
Capital Improvements Transfer	176,391	Five Year CIP	7.12%	17.36%	75.52%	0.00%	0.00%	100.00%	12,561	30,625	133,204	-	-
Cash Funded Capital Projects	2,200,055	Five Year CIP	7.12%	17.36%	75.52%	0.00%	0.00%	100.00%	156,674	381,972	1,661,409	-	-
CIP Funded from Reserve Fund	1,200,310	Five Year CIP	7.12%	17.36%	75.52%	0.00%	0.00%	100.00%	85,478	208,397	906,435	-	-
Minor Capital Equipment Not In Budget	475,874	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	83,059	186,730	112,561	50,389	43,134
Capital Projects Subtotal	**4,052,630**								**337,773**	**807,725**	**2,813,609**	**50,389**	**43,134**
Contribution to (Use of) Reserves													
Transfer to Rate Stabilization Fund	126,580	Indirect	17.45%	39.24%	23.65%	10.59%	9.06%	100.00%	22,093	49,669	29,941	13,403	11,473
Cont. to R&R & Contingency Funds - RW	-	Assets	0.00%	42.43%	55.56%	2.01%	0.00%	100.00%	-	-	-	-	-
Contribution to (Use of) Reserves Subtotal	**126,580**								**22,093**	**49,669**	**29,941**	**13,403**	**11,473**
TOTAL EXPENDITURES	**20,646,638**								**3,644,067**	**8,580,477**	**5,998,778**	**1,305,651**	**1,117,665**
% Allocation									17.65%	41.56%	29.06%	6.32%	5.41%
Expenses Excluded From Indirect Allocation													
Debt Service	9,343,428								1,671,194	4,145,162	3,325,162	108,786	93,123
Net Expenses for Indirect Allocation	11,303,210								1,972,873	4,435,315	2,673,616	1,196,865	1,024,541
% of Expenditures							(Basis of Indirect Allocations ->)		17.45%	39.24%	23.65%	10.59%	9.06%

Prepared by Burton & Associates

12/3/2015

Sewer System Operating & Debt Service Expense Allocation to Functions

Schedule 7

	Test Year COS	Allocation Basis/Factor	Customer % Allocation	Collection % Allocation	Treatment % Allocation	Disposal % Allocation	Total % Allocation	Customer $ Allocation	Collection $ Allocation	Treatment $ Allocation	Disposal $ Allocation
Executive Directors Office											
SALARIES & WAGES - REGULAR	242,490	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	14,792	52,135	151,071	24,491
PER DIEM	6,614	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	403	1,422	4,120	668
FICA EXPENSE	17,624	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,075	3,789	10,980	1,780
RETIREMENT CONTRIBUTION	16,765	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,023	3,605	10,445	1,693
DEFERRED COMPENSATION	3,439	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	210	739	2,143	347
WORKERS' COMPENSATION	5,291	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	323	1,138	3,296	534
HEALTH INSURANCE	32,387	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,976	6,963	20,177	3,271
DENTAL INSURANCE	1,653	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	101	355	1,030	167
DISABILITY SALARY CONTINUATION	715	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	44	154	446	72
AUTOMOBILE ALLOWANCE	2,645	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	161	569	1,648	267
GROUP LIFE & A D & D	852	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	52	183	531	86
ELECTRICITY	19,841	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,210	4,266	12,361	2,004
CELL PHONE STIPENDS	2,205	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	134	474	1,373	223
FUEL	5,291	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	323	1,138	3,296	534
SUBSCRIPTIONS	401	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	24	86	250	41
OFFICE SUPPLIES	4,806	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	293	1,033	2,994	485
SAFETY SUPPLIES	198	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	12	43	124	20
LEGAL	105,820	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	6,455	22,751	65,926	10,688
INSURANCE	17,244	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,052	3,707	10,743	1,742
CONSULTANTS	16,755	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,022	3,602	10,438	1,692
PROFESSIONAL SERVICES - OTHERS	-	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	-	-	-	-
POSTAGE AND FREIGHT	5,159	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	315	1,109	3,214	521
CUSTOMER INFORMATION	9,539	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	582	2,051	5,943	963
ADVERTISING	1,601	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	98	344	997	162
OTHER	2,328	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	142	501	1,450	235
PRINTING AND REPRODUCTION	441	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	27	95	275	45
EDUCATION & DEVELOPMENT	5,767	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	352	1,240	3,593	582
BOARD TRAVEL	1,984	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	121	427	1,236	200
DUES AND MEMBERSHIPS	7,729	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	471	1,662	4,815	781
CONSERVATION	11,023	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	672	2,370	6,867	1,113
BOARD EXPENSE	1,984	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	121	427	1,236	200
OTHER	683	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	42	147	426	69
FORCE ACCOUNT - LABOR	(18,368)	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	(1,120)	(3,949)	(11,443)	(1,855)
Executive Directors Office Subtotal	**532,907**							**32,507**	**114,575**	**332,001**	**53,824**
Customer Services											
SALARIES & WAGES - REGULAR	178,077	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	178,077	-	-	-
SALARIES & WAGES - OVERTIME	1,360	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	1,360	-	-	-
FICA EXPENSE	14,054	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	14,054	-	-	-
RETIREMENT CONTRIBUTION	12,253	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	12,253	-	-	-
DEFERRED COMPENSATION	6,127	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	6,127	-	-	-
HEALTH INSURANCE	48,917	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	48,917	-	-	-
DENTAL INSURANCE	2,513	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	2,513	-	-	-
DISABILITY SALARY CONTINUATION	783	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	783	-	-	-
GROUP LIFE & A D & D	1,176	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	1,176	-	-	-
CELL PHONE STIPENDS	680	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	680	-	-	-
OFFICE SUPPLIES	1,813	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	1,813	-	-	-
COLLECTION SERVICES	20,395	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	20,395	-	-	-
POSTAGE AND FREIGHT	33,991	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	33,991	-	-	-
PRINTING AND REPRODUCTION	453	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	453	-	-	-
EDUCATION & DEVELOPMENT	2,266	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	2,266	-	-	-
UNCOLLECTABLE ACCOUNTS	13,596	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	13,596	-	-	-
Customer Services Subtotal	**338,453**							**338,453**	**-**	**-**	**-**

Sewer System Operating & Debt Service Expense Allocation to Functions

Schedule 7

	Test Year COS	Allocation Basis/Factor	Customer % Allocation	Collection % Allocation	Treatment % Allocation	Disposal % Allocation	Total % Allocation	Customer $ Allocation	Collection $ Allocation	Treatment $ Allocation	Disposal $ Allocation
Engineering											
SALARIES & WAGES - REGULAR	467,789	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	28,535	100,575	291,433	47,247
SALARIES & WAGES - OVERTIME	3,968	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	242	853	2,472	401
PART TIME SUMMER	28,660	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,748	6,162	17,855	2,895
FICA EXPENSE	36,336	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	2,217	7,812	22,638	3,670
RETIREMENT CONTRIBUTION	31,682	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,933	6,812	19,738	3,200
DEFERRED COMPENSATION	8,254	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	503	1,775	5,142	834
HEALTH INSURANCE	85,648	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	5,225	18,414	53,359	8,650
DENTAL INSURANCE	3,728	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	227	801	2,322	376
DISABILITY SALARY CONTINUATION	2,103	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	128	452	1,310	212
GROUP LIFE & A D & D	2,117	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	129	455	1,319	214
CELL PHONE STIPENDS	4,056	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	247	872	2,527	410
SMALL TOOLS	908	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	55	195	566	92
SUBSCRIPTIONS	271	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	17	58	169	27
FUEL - VEHICLES	3,086	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	188	664	1,923	312
OFFICE SUPPLIES	1,609	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	98	346	1,003	163
SAFETY SUPPLIES	1,069	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	65	230	666	108
OTHER - MATERIALS AND SUPPLIES	639	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	39	137	398	65
MOTOR VEHICLES	1,102	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	67	237	687	111
ENGINEERING	2,205	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	134	474	1,373	223
CONSULTANTS	54,012	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	3,295	11,613	33,650	5,455
POSTAGE AND FREIGHT	176	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	11	38	110	18
PRINTING AND REPRODUCTION	705	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	43		440	71
EDUCATION & DEVELOPMENT	10,048	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	613	2,160	6,260	1,015
DUES AND MEMBERSHIPS	1,470	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	90	316	916	149
FOREST MANAGEMENT	4,409	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	269	948	2,747	445
Engineering Subtotal	**756,055**							**46,119**	**162,400**	**471,022**	**76,362**
Human Resources											
SALARIES & WAGES - REGULAR	75,035	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	9,931	24,276	38,621	2,207
SALARIES & WAGES - OVERTIME	384	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	51	124	198	11
FICA EXPENSE	5,887	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	779	1,905	3,030	173
RETIREMENT CONTRIBUTION	5,133	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	679	1,661	2,642	151
DEFERRED COMPENSATION	2,399	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	318	776	1,235	71
HEALTH INSURANCE	17,278	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	2,287	5,590	8,893	508
DENTAL INSURANCE	817	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	108	264	420	24
VISION INSURANCE	19,223	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	2,544	6,219	9,894	565
WELLNESS PROFRA REIMBURSEMENT	884	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	117	286	455	26
RETIREES & COBRA INSURANCE	67,952	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	8,994	21,985	34,975	1,999
DISABILITY SALARY CONTINUATION	344	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	45	111	177	10
UNEMPLOYMENT TAX	8,074	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	1,069	2,612	4,156	237
UNIFORMS	77	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	10	25	40	2
GROUP LIFE & A D & D	392	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	52	127	202	12
CELL PHONE STIPENDS	673	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	89	218	346	20
SUBSCRIPTIONS	77	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	10	25	40	2
OFFICE SUPPLIES	961	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	127	311	495	28
SAFETY SUPPLIES	961	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	127	311	495	28
OTHER - MATERIALS AND SUPPLIES	192	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	25	62	99	6
CONSULTANTS	125,336	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	16,589	40,550	64,511	3,686
PROFESSIONAL SERVICES - OTHERS	12,303	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	1,628	3,980	6,332	362
POSTAGE AND FREIGHT	1,346	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	178	435	693	40
ADVERTISING	7,689	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	1,018	2,488	3,958	226
PRINTING AND REPRODUCTION	308	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	41	100	158	9
EDUCATION & DEVELOPMENT	3,383	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	448	1,095	1,741	100
DUES AND MEMBERSHIPS	1,922	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	254	622	989	57
RECRUITMENT EXPENSE	1,538	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	204	498	792	45
OTHER	9,612	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	1,272	3,110	4,947	283
Human Resources Subtotal	**370,180**							**48,994**	**119,764**	**190,534**	**10,888**

Sewer System Operating & Debt Service Expense Allocation to Functions

Schedule 7

	Test Year COS	Allocation Basis/Factor	Customer % Allocation	Collection % Allocation	Treatment % Allocation	Disposal % Allocation	Total % Allocation	Customer $ Allocation	Collection $ Allocation	Treatment $ Allocation	Disposal $ Allocation
Finance Department											
SALARIES & WAGES - REGULAR	227,706	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	13,890	48,957	141,861	22,998
SALARIES & WAGES - OVERTIME	-	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	-	-	-	-
FICA EXPENSE	17,262	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,053	3,711	10,754	1,743
RETIREMENT CONTRIBUTION	15,602	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	952	3,354	9,720	1,576
DEFERRED COMPENSATION	5,321	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	325	1,144	3,315	537
HEALTH INSURANCE	38,664	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	2,359	8,313	24,088	3,905
DENTAL INSURANCE	1,830	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	112	393	1,140	185
DISABILITY SALARY CONTINUATION	930	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	57	200	579	94
GROUP LIFE & A D & D	994	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	61	214	619	100
CELL PHONE STIPENDS	1,583	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	97	340	987	160
WASTE DISPOSAL	974	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	59	210	607	98
OFFICE SUPPLIES	1,949	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	119	419	1,214	197
OTHER - MATERIALS AND SUPPLIES	3,898	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	238	838	2,428	394
ACCOUNTING	14,617	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	892	3,143	9,106	1,476
CONSULTANTS	24,361	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	1,486	5,238	15,177	2,461
FINANCIAL SERVICES	117,714	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	7,181	25,309	73,336	11,889
TRUSTEE SERVICES	14,300	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	872	3,075	8,909	1,444
PROFESSIONAL SERVICES - OTHERS	11,693	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	713	2,514	7,285	1,181
POSTAGE AND FREIGHT	1,949	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	119	419	1,214	197
PRINTING AND REPRODUCTION	1,462	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	89	314	911	148
EDUCATION & DEVELOPMENT	4,397	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	268	945	2,739	444
DUES AND MEMBERSHIPS	1,172	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	71	252	730	118
RENTS AND LEASES	1,657	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	101	356	1,032	167
OTHER	-	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	-	-	-	-
Finance Department Subtotal	**510,034**							**31,112**	**109,657**	**317,751**	**51,513**
IT Department											
SALARIES & WAGES - REGULAR	123,200	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	16,306	39,859	63,412	3,624
SALARIES & WAGES - OVERTIME	-	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	-	-	-	-
FICA EXPENSE	9,724	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	1,287	3,146	5,005	286
RETIREMENT CONTRIBUTION	8,479	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	1,122	2,743	4,364	249
DEFERRED COMPENSATION	1,200	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	159	388	617	35
HEALTH INSURANCE	22,420	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	2,967	7,253	11,540	659
DENTAL INSURANCE	1,163	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	154	376	599	34
DISABILITY SALARY CONTINUATION	543	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	72	176	280	16
GROUP LIFE & A D & D	530	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	70	171	273	16
TELEPHONE - LOCAL	41,123	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	5,443	13,304	21,166	1,209
CELL PHONE STIPENDS	2,307	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	305	746	1,187	68
OFFICE SUPPLIES	3,845	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	509	1,244	1,979	113
COMPUTER EQUIPMENT & PARTS	27,751	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	3,673	8,978	14,283	816
MAINTENANCE - EQUIPMENT	118,366	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	15,666	38,295	60,924	3,481
CONSULTANTS	48,058	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	6,361	15,548	24,736	1,413
EDUCATION & DEVELOPMENT	6,605	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	874	2,137	3,400	194
RENTS AND LEASES	15,532	FTE	13.24%	32.35%	51.47%	2.94%	100.00%	2,056	5,025	7,995	457
IT Department Subtotal	**430,844**							**57,024**	**139,391**	**221,758**	**12,672**

Sewer System Operating & Debt Service Expense Allocation to Functions

Schedule 7

	Test Year COS	Allocation Basis/Factor	Customer % Allocation	Collection % Allocation	Treatment % Allocation	Disposal % Allocation	Total % Allocation	Customer $ Allocation	Collection $ Allocation	Treatment $ Allocation	Disposal $ Allocation
Water Supply and Treatment											
SALARIES & WAGES - REGULAR	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
SALARIES & WAGES - OVERTIME	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
STANDBY PAY	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
PART TIME SUMMER	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FICA EXPENSE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
RETIREMENT CONTRIBUTION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
DEFERRED COMPENSATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
WORKERS' COMPENSATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
HEALTH INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
DENTAL INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
DISABILITY SALARY CONTINUATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
UNIFORMS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
GROUP LIFE & A D & D	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
ELECTRICITY	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
CELL PHONE STIPENDS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FUEL	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
WASTE DISPOSAL	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
CHEMICALS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
SMALL TOOLS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
LAKE SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FUEL - VEHICLES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
OFFICE SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
LABORATORY EXPENSE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
SAFETY SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
OTHER - MATERIALS AND SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MAINTENANCE - EQUIPMENT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MAINTENANCE - PUMPING EQUIPMENT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MAINT - RESERVOIR & TANKS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FACILITIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
BUILDINGS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MAINTENANCE - METERS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MAINTENANCE - GROUNDS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MOTOR VEHICLES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
CONSULTANTS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
PROFESSIONAL SERVICES - OTHERS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
POSTAGE AND FREIGHT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
EDUCATION & DEVELOPMENT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
DUES AND MEMBERSHIPS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
RENTS AND LEASES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
OTHER	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
Water Supply and Treatment Subtotal	**-**							**-**	**-**	**-**	**-**

Sewer System Operating & Debt Service Expense Allocation to Functions

Schedule 7

	Test Year COS	Allocation Basis/Factor	Customer % Allocation	Collection % Allocation	Treatment % Allocation	Disposal % Allocation	Total % Allocation	Customer $ Allocation	Collection $ Allocation	Treatment $ Allocation	Disposal $ Allocation
Water Distribution											
SALARIES & WAGES - REGULAR	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
SALARIES & WAGES - OVERTIME	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
STANDBY PAY	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FICA EXPENSE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
RETIREMENT CONTRIBUTION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
DEFERRED COMPENSATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
WORKERS' COMPENSATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
HEALTH INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
DENTAL INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
DISABILITY SALARY CONTINUATION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
UNIFORMS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
GROUP LIFE & A D & D	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
ELECTRICITY	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
CELL PHONE STIPENDS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FUEL	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
WASTE DISPOSAL	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
SMALL TOOLS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
SUBSCRIPTIONS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FUEL - VEHICLES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
OFFICE SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
SAFETY SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
OTHER - MATERIALS AND SUPPLIES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
BUILDINGS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MAINTENANCE - MAINS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MAINTENANCE - METERS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MAINTENANCE - HYDRANTS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MAINTENANCE - SERVICE LINES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
MOTOR VEHICLES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
INSURANCE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
POSTAGE AND FREIGHT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
PRINTING AND REPRODUCTION	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
EDUCATION & DEVELOPMENT	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
DUES AND MEMBERSHIPS	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
RENTS AND LEASES	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
OTHER	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FORCE ACCOUNT - LABOR	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
FORCE ACCOUNT - VEHICLE	-	N/A	0.00%	0.00%	0.00%	0.00%	0.00%	-	-	-	-
Water Distribution Subtotal	-							-	-	-	-
Wastewater Treatment											
SALARIES & WAGES - REGULAR	1,122,341	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	1,061,674	60,667
SALARIES & WAGES - OVERTIME	57,634	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	54,519	3,115
STANDBY PAY	6,315	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	5,974	341
FICA EXPENSE	95,513	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	90,350	5,163
RETIREMENT CONTRIBUTION	83,277	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	78,776	4,501
DEFERRED COMPENSATION	29,930	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	28,312	1,618
WORKERS' COMPENSATION	23,023	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	21,778	1,244
HEALTH INSURANCE	279,853	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	264,726	15,127
DENTAL INSURANCE	12,759	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	12,070	690
DISABILITY SALARY CONTINUATION	5,347	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	5,058	289
UNIFORMS	11,511	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	10,889	622
GROUP LIFE & A D & D	6,296	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	5,955	340
ELECTRICITY	507,942	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	507,942	-
CELL PHONE STIPENDS	6,331	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	5,989	342
FUEL	62,354	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	62,354	-
WASTE DISPOSAL	539,618	Disposal	0.00%	0.00%	0.00%	100.00%	100.00%	-	-	-	539,618
CHEMICALS	666,780	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	666,780	-
LAND APPLICATION	57,557	Disposal	0.00%	0.00%	0.00%	100.00%	100.00%	-	-	-	57,557

Sewer System Operating & Debt Service Expense Allocation to Functions

Schedule 7

	Test Year COS	Allocation Basis/Factor	Customer % Allocation	Collection % Allocation	Treatment % Allocation	Disposal % Allocation	Total % Allocation	Customer $ Allocation	Collection $ Allocation	Treatment $ Allocation	Disposal $ Allocation
SMALL TOOLS	4,796	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	4,796	-
FUEL - VEHICLES	19,288	Disposal	0.00%	0.00%	0.00%	100.00%	100.00%	-	-	-	19,288
OFFICE SUPPLIES	4,796	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	4,796	-
LABORATORY EXPENSE	110,222	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	110,222	-
SAFETY SUPPLIES	11,511	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	11,511	-
OTHER - MATERIALS AND SUPPLIES	4,796	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	4,796	-
MAINTENANCE - EQUIPMENT	335,706	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	335,706	-
MAINTENANCE - PUMPING EQUIPMENT	350,139	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	350,139	-
FACILITIES	-	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	-	-
BUILDINGS	66,191	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	66,191	-
MAINTENANCE - METERS	71,946	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	71,946	-
MAINTENANCE - GROUNDS	11,511	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	11,511	-
MOTOR VEHICLES	14,562	Management Est.	0.00%	0.00%	30.00%	70.00%	100.00%	-	-	4,369	10,193
INSURANCE	121,964	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	121,964	-
CONSULTANTS	140,056	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	140,056	-
POSTAGE AND FREIGHT	7,343	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	7,343	-
EDUCATION & DEVELOPMENT	17,747	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	16,787	959
DUES AND MEMBERSHIPS	3,453	FTE	0.00%	0.00%	94.59%	5.41%	100.00%	-	-	3,267	187
RENTS AND LEASES	9,593	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	9,593	-
OTHER	18,226	Treatment	0.00%	0.00%	100.00%	0.00%	100.00%	-	-	18,226	-
Wastewater Treatment Subtotal	**4,898,231**							**-**	**-**	**4,176,367**	**721,864**
Sewer Collection											
SALARIES & WAGES - REGULAR	453,442	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	453,442	-	-
SALARIES & WAGES - OVERTIME	23,500	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	23,500	-	-
STANDBY PAY	9,747	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	9,747	-	-
FICA EXPENSE	38,124	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	38,124	-	-
RETIREMENT CONTRIBUTION	33,240	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	33,240	-	-
DEFERRED COMPENSATION	14,560	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	14,560	-	-
WORKERS' COMPENSATION	13,000	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	13,000	-	-
HEALTH INSURANCE	139,144	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	139,144	-	-
DENTAL INSURANCE	5,341	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	5,341	-	-
DISABILITY SALARY CONTINUATION	2,209	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	2,209	-	-
UNIFORMS	9,000	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	9,000	-	-
GROUP LIFE & A D & D	3,013	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	3,013	-	-
ELECTRICITY	119,759	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	119,759	-	-
CELL PHONE STIPENDS	1,800	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	1,800	-	-
FUEL	7,000	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	7,000	-	-
WASTE DISPOSAL	750	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	750	-	-
CHEMICALS	200,000	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	200,000	-	-
SMALL TOOLS	3,500	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	3,500	-	-
FUEL - VEHICLES	35,000	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	35,000	-	-
OFFICE SUPPLIES	1,500	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	1,500	-	-
SAFETY SUPPLIES	9,686	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	9,686	-	-
OTHER - MATERIALS AND SUPPLIES	2,000	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	2,000	-	-
MAINTENANCE - MAINS	110,000	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	110,000	-	-
MAINTENANCE - SERVICE LINES	2,500	Customer	100.00%	0.00%	0.00%	0.00%	100.00%	2,500	-	-	-
MOTOR VEHICLES	65,000	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	65,000	-	-
INSURANCE	8,800	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	8,800	-	-
POSTAGE AND FREIGHT	700	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	700	-	-
PRINTING AND REPRODUCTION	500	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	500	-	-
EDUCATION & DEVELOPMENT	10,240	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	10,240	-	-
DUES AND MEMBERSHIPS	2,000	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	2,000	-	-
RENTS AND LEASES	1,500	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	1,500	-	-
OTHER	500	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	500	-	-
FORCE ACCOUNT - LABOR	-	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	-	-	-
FORCE ACCOUNT - VEHICLE	-	Collection	0.00%	100.00%	0.00%	0.00%	100.00%	-	-	-	-
Sewer Collection Subtotal	**1,327,055**							**2,500**	**1,324,555**	**-**	**-**

Sewer System Operating & Debt Service Expense Allocation to Functions

Schedule 7

	Test Year COS	Allocation Basis/Factor	Customer % Allocation	Collection % Allocation	Treatment % Allocation	Disposal % Allocation	Total % Allocation	Customer $ Allocation	Collection $ Allocation	Treatment $ Allocation	Disposal $ Allocation
Debt Service											
Series 2003	276,728	Assets Funded	0.21%	9.43%	76.83%	13.53%	100.00%	590	26,084	212,619	37,434
Series 2004B	186,000	Assets Funded	0.21%	9.43%	76.83%	13.53%	100.00%	397	17,532	142,910	25,161
Series 2005	1,911,369	Assets Funded	0.21%	9.43%	76.83%	13.53%	100.00%	4,077	180,165	1,468,566	258,561
Series 2006	154,606	Assets Funded	0.21%	9.43%	76.83%	13.53%	100.00%	330	14,573	118,789	20,914
Series 2010	341,544	Assets Funded	0.21%	9.43%	76.83%	13.53%	100.00%	729	32,194	262,419	46,202
Series 2014	140,145	Assets Funded	0.21%	9.43%	76.83%	13.53%	100.00%	299	13,210	107,678	18,958
Series 2005 - Forward Purchase	(86,283)	Assets Funded	0.21%	9.43%	76.83%	13.53%	100.00%	(184)	(8,133)	(66,294)	(11,672)
SRF Loan	328,000	Assets Funded	0.21%	9.43%	76.83%	13.53%	100.00%	700	30,917	252,013	44,370
Debt Service Subtotal	3,252,108							6,937	306,542	2,498,699	439,930
Capital Projects											
Capital Improvements Transfer	223,609	Five Year CIP	0.00%	58.48%	39.21%	2.31%	100.00%	-	130,765	87,677	5,167
Cash Funded Capital Projects	2,788,995	Five Year CIP	0.00%	58.48%	39.21%	2.31%	100.00%	-	1,630,987	1,093,564	64,445
CIP Funded from Reserve Fund	4,425,640	Five Year CIP	0.00%	58.48%	39.21%	2.31%	100.00%	-	2,588,087	1,735,291	102,262
Minor Capital Equipment Not In Budget	385,802	Assets	0.00%	47.06%	45.00%	7.94%	100.00%	-	181,557	173,608	30,637
Capital Projects Subtotal	7,824,046							-	4,531,396	3,090,139	202,510
Contribution to (Use of) Reserves											
Transfer to Rate Stabilization Fund	123,420	Indirect	6.10%	21.50%	62.30%	10.10%	100.00%	7,529	26,535	76,891	12,465
Cont. to R&R & Contingency Funds - RW	-	Assets	0.00%	47.06%	45.00%	7.94%	100.00%	-	-	-	-
Contribution to (Use of) Reserves Subtotal	123,420							7,529	26,535	76,891	12,465
TOTAL EXPENDITURES	**20,363,334**							**571,175**	**6,834,816**	**11,375,163**	**1,582,028**
% Allocation								2.81%	33.56%	55.86%	7.77%
Expenses Excluded From Indirect Allocation											
Debt Service	11,199,574							14,466	4,864,474	5,665,729	654,906
Net Expenses for Indirect Allocation	9,163,760							556,710	1,970,343	5,709,433	927,122
% of Expenditures						(Basis of Indirect Allocations ->)		6.10%	21.50%	62.30%	10.10%

Prepared by Burton & Associates

12/3/2015

Water Cost Allocation Functions & Flow Data

Schedule 8

Function	Base Capacity - Avg Day	Extra Capacity - Max Day	Extra Capacity - Peak Hour	Fire Protection	Customers
Source of Supply	X				
Treatment	X	X			
Distribution	X	X	X		
Meters/Services					X
Fire Protection				X	

% to Each Component					
Source of Supply	100%				
Treatment	70%	30%			
Distribution	58%	25%	16%		
Meters/Services					100%
Fire Protection				100%	

	AVERAGE DAY	**MAX MONTH[1]**	**MAX DAY[2]**	**PEAK HOUR[3]**
Water System Demands	6.9	8.0	10.0	11.9

Fiscal Year	**Average Day (MGD)**	**Max Month (MGD)**	**Max Day (MGD)**	**Max Hour (MGD)**	**MM Factor**	**MD Factor**	**MH Factor**
2011	7.51	9.67	11.91	15.10	1.29	1.59	2.01
2012	6.89	7.67	9.25	10.56	1.11	1.34	1.53
2013	6.61	7.50	10.19	12.28	1.14	1.54	1.86
2014	6.78	7.62	8.87	10.89	1.12	1.31	1.61
2015	6.91	7.69	9.63	10.64	1.11	1.39	1.54

(1) Average max month factor 2011 to 2015

(2) Average max day factor 2011 to 2015

(3) Average peak hour factor 2011 to 2015

Extra Capacity Factors by Customer Class

Schedule 9

	Single Family Residential	Multi-Family Residential	General Service	Irrigation	Total
Average Daily Consumption (MGD)	1.99	1.59	2.44	0.20	6.22
Max Month (MGD)	2.38	1.72	2.80	0.56	
Max Month/Ratio of Avg. Day	1.20	1.08	1.15	2.80	
System Max Day/Max Month Ratio	1.15	1.15	1.15	1.15	
Daily Usage Adjustment	1.08	1.00	1.14	1.17	
Calculated Max Day Peaking Factor	1.49	1.25	1.51	3.77	
Noncoincident Demand (MGD)	2.95	1.98	3.70	0.75	9.38
Noncoincident Max Day Peaking Factor	1.51				
Coincident Max Day Peaking Factor	1.44				
System MD Diversity*	**1.05**				

**AWWA M1: Range for System MD Diversity For Many Utility Systems is 1.10 - 1.40*

Peak Hour Usage Adjustment	1.50	1.50	1.42	1.50	
Calculated Peak Hour Peaking Factor	2.23	1.87	2.16	5.65	
Noncoincident Demand (MGD)	4.43	2.97	5.26	1.12	13.79
Noncoincident Max Hour Peaking Factor	2.22				
Coincident Max Hour Peaking Factor	1.71				
System MH Diversity*	**1.29**				

**AWWA M1: Range for System MH Diversity For Many Utility Systems is 1.10 - 1.40*

Summary of Water and Sewer Units of Service

Schedule 10

Water Units of Service	Base Units: Annual Use 1,000 gallons	Base Units: Average Rate 1,000 gpd	Max Day Units: Peaking Factor %	Max Day Units: Total Capacity 1,000 gpd	Max Day Units: Extra Capacity 1,000 gpd	Max Hour Units: Peaking Factor %	Max Hour Units: Total Capacity 1,000 gpd	Max Hour Units: Extra Capacity 1,000 gpd	Fire Protection: Maximum Needed Fire Flow (gpm)	Fire Protection: Duration (min)	Fire Protection: Equivalent Fire Flow 1,000 gallon	Customer Units: Equivalent Meters & Services	Customer Units: Number of Customers	Customer Units: Number of Bills
Single Family Residential	724,976	1,986	149	2,954	968	223	4,431	1,477	1,000	120	1,699,700	14,335	14,164	169,970
Multi-Family Residential	581,241	1,592	125	1,983	390	187	2,974	991	1,000	120	550,820	7,355	4,590	55,082
General Service	890,738	2,440	151	3,697	1,256	216	5,263	1,566	2,000	180	499,380	7,172	1,387	16,646
Irrigation	72,499	199	377	748	549	565	1,122	374	-	-	-	724	246	2,953
Total	**2,269,454**	**6,218**		**9,382**	**3,164**		**13,790**	**4,408**			**2,749,900**	**29,585**	**20,388**	**244,651**

Sewer Unit of Service	Annual Use 1,000 gallons	Ratio of WTTP Flow to Billings	Contributed Volume 1,000 gallons	Strength (Concentration): CBOD (mg/L)	TSS (mg/L)	TKN(mg/L)	TP(mg/L)	Strength (Loadings): CBOD (lbs)	TSS (lbs)	TKN(lbs)	TP(lbs)	Customer Units: Equivalent Meters &	Number of Customers	Number of Bills
Single Family Residential	662,369	38%	914,069	235	275	31	6	1,792,558	2,097,675	236,465	45,767	13,487	13,343	160,112
Multi-Family Residential	576,554	38%	795,645	235	275	31	6	1,560,319	1,825,905	205,829	39,838	7,322	4,571	54,853
General Service	840,299	38%	1,159,613	235	275	31	6	2,274,087	2,661,166	299,986	58,062	6,981	1,314	15,770
Total	**2,079,222**		**2,869,326**					**5,626,964**	**6,584,745**	**742,280**	**143,667**	**27,789**	**19,228**	**230,735**
WWTP Actuals			*2,874,266*					*5,940,635*	*6,954,264*	*744,401*	*147,922*			
			Limits per Rate Ordinance	*205*	*235*	*25*	*6.5*							

Water Functional Cost Allocations

Schedule 11

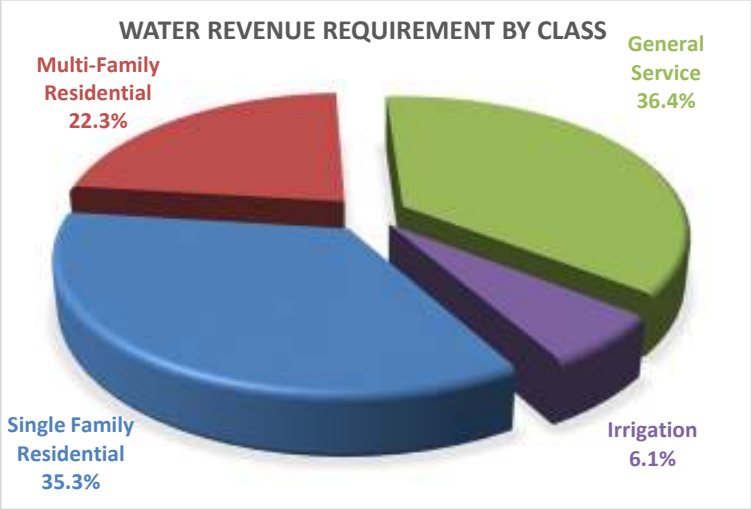
	TY Costs	Base Capacity - Avg Day	Extra Capacity - Max Day	Extra Capacity - Peak Hour	Fire Protection	Customer - Meters/Services
Water System Costs By Function						
Source of Supply	$ 3,644,067	$ 3,644,067	$ -	$ -	$ -	$ -
Treatment	$ 8,580,477	$ 5,971,139	$ 2,609,338	$ -	$ -	$ -
Distribution	$ 5,998,778	$ 3,499,203	$ 1,529,123	$ 970,453	$ -	$ -
Meters/Services	$ 1,305,651	$ -	$ -	$ -	$ -	$ 1,305,651
Fire Protection	$ 1,117,665	$ -	$ -	$ -	$ 1,117,665	$ -
Total Costs	**$ 20,646,638**	**$ 13,114,408**	**$ 4,138,461**	**$ 970,453**	**$ 1,117,665**	**$ 1,305,651**

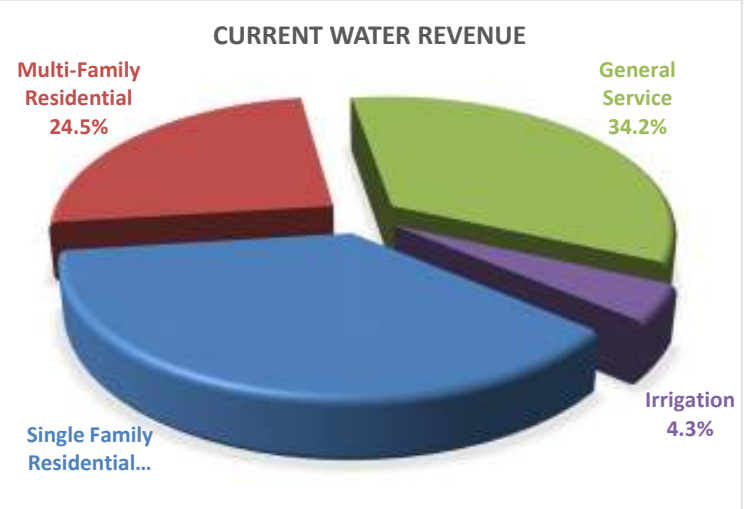
	TY Costs	Base Capacity - Avg Day (per TGAL)	Extra Capacity - Max Day (per TGPD)	Extra Capacity - Peak Hour (per TGPD)	Fire Protection (per TGAL)	Customer - Meters/Services (per Bill)
Water System Unit Costs						
Operating	$ 11,429,789	$ 2.95	$ 648.89	$ 99.22	$ 0.38	$ 4.95
Debt Service	$ 5,164,219	$ 1.71	$ 354.81	$ 17.67	$ 0.01	$ 0.18
Rate Funded Capital	$ 4,052,630	$ 1.12	$ 304.32	$ 103.25	$ 0.02	$ 0.21
Total	**$ 20,646,638**	**$ 5.78**	**$ 1,308.02**	**$ 220.15**	**$ 0.41**	**$ 5.34**

Summary of Water Revenue Requirement Allocations

Schedule 12

	Total	Single Family Residential	Multi-Family Residential	General Service	Irrigation
Operations and Maintenance	$ 11,429,789	$ 4,393,906	$ 2,545,797	$ 3,868,129	$ 621,958
Plus: Debt Service	$ 5,164,219	$ 1,664,126	$ 1,167,612	$ 2,006,480	$ 326,001
Plus: Rate Funded Capital	$ 4,052,630	$ 1,320,487	$ 891,920	$ 1,552,665	$ 287,558
Total Revenue Requirements	$ 20,646,638	$ 7,378,518	$ 4,605,329	$ 7,427,273	$ 1,235,517
Less: Other Revenue	$ 2,799,253	$ 1,079,888	$ 632,694	$ 935,974	$ 150,698
Revenue Requirement from Rates	**$ 17,847,384**	**$ 6,298,631**	**$ 3,972,635**	**$ 6,491,300**	**$ 1,084,819**
Current Rate Revenue	$ 17,990,169	$ 6,639,864	$ 4,412,973	$ 6,160,557	$ 776,775
Total Rate Revenue Req.	$ 17,847,384	$ 6,298,631	$ 3,972,635	$ 6,491,300	$ 1,084,819
Over/(Under) Recovery	$ 142,784	$ 341,233	$ 440,338	$ (330,742)	$ (308,044)
Estimated Total Revenue		36.9%	24.5%	34.2%	4.3%
System Revenue Requirement by Class		35.3%	22.3%	36.4%	6.1%
Over / (Under) Recovery Percentage		**1.6%**	**2.3%**	**-2.1%**	**-1.8%**





Prepared by Burton & Associates

12/3/2015

Sewer Cost Allocation Functions & Flow Data

Schedule 13

Function	Volume	CBOD	TSS	TKN	TP	Customer
Customer						X
Collection	X					
Treatment	X	X	X	X	X	
Disposal		X	X	X	X	
% to Each Component						
Customer						100%
Collection	100%					
Treatment	50%	22%	25%	3%	1%	
Disposal		43%	50%	6%	1%	

Sewer System Flow Data

	Volume					Loadings							
Year	Plant Influent (MG)	Average Day Billings (MGD)	Average Day WWTP Flow (MGD)	Max Month WWTP Flow (MGD)	Max Day WWTP Flow (MGD)	CBOD (lbs)	TSS (lbs)	TKN (lbs)	TP (lbs)	CBOD (mg/L)	TSS (mg/L)	TKN (mg/L)	TP (mg/L)
FY11	2,662	5.79	7.25	8.10	16.53	5,743,489	6,268,285	730,951	161,803	258.67	282.31	32.92	7.29
FY12	2,784	5.69	7.61	8.35	12.06	5,369,311	6,362,758	722,661	165,127	231.21	273.99	31.12	7.11
FY13	2,942	5.55	8.07	9.19	22.31	5,523,201	6,666,003	755,720	158,619	225.08	271.65	30.80	6.46
FY14	3,028	5.67	8.30	9.45	20.11	5,189,671	5,843,139	755,209	150,618	205.51	231.39	29.91	5.96
FY15	2,954	5.70	8.10	9.29	14.96	5,940,635	6,954,264	744,401	147,922	241.10	282.24	30.21	6.00
Average	2,874	5.68	7.86	8.87	17.20	5,553,261	6,418,890	741,788	156,818	232.32	268.32	30.99	6.57

Sewer Functional Cost Allocations

Schedule 14

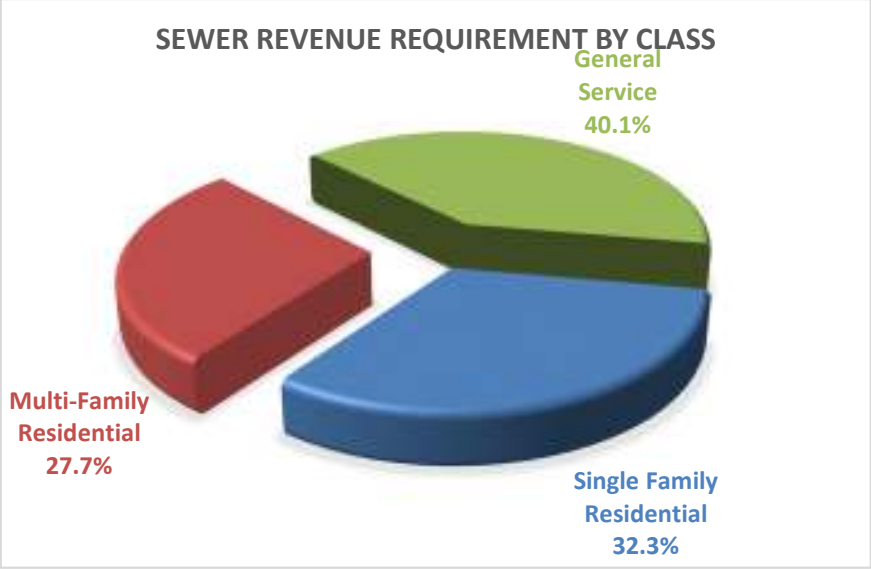
	TY Costs	Volume	CBOD	TSS	TKN	TP	Customer
Sewer System Costs by Function							
Customer	$ 571,175	$ -	$ -	$ -	$ -	$ -	$ 571,175
Collection	$ 6,834,816	$ 6,834,816	$ -	$ -	$ -	$ -	$ -
Treatment	$ 11,375,163	$ 5,687,581	$ 2,455,114	$ 2,835,566	$ 327,512	$ 69,389	$ -
Disposal	$ 1,582,028	$ -	$ 682,902	$ 788,726	$ 91,099	$ 19,301	$ -
Total	**$ 20,363,183**	**$ 12,522,398**	**$ 3,138,016**	**$ 3,624,293**	**$ 418,610**	**$ 88,690**	**$ 571,175**

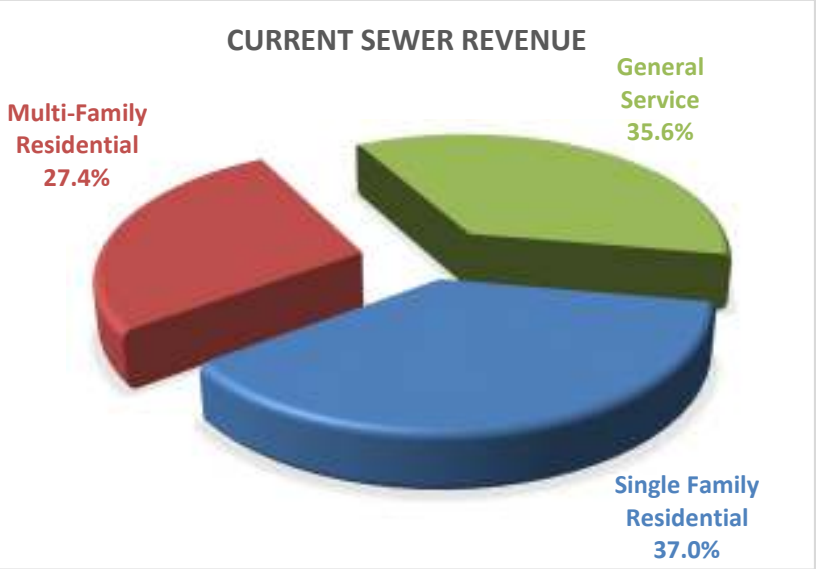
	TY Costs	Volume (per TGAL)	CBOD (lbs)	TSS (lbs)	TKN (lbs)	TP (lbs)	Customer (per bill)
Sewer System Unit Costs							
Operating	$ 8,949,256	$ 2.35	$ 0.29	$ 0.29	$ 0.30	$ 0.33	$ 0.98
Debt Service	$ 3,252,108	$ 0.75	$ 0.13	$ 0.13	$ 0.13	$ 0.14	$ 0.03
Rate Funded Capital	$ 8,161,819	$ 2.92	$ 0.13	$ 0.13	$ 0.14	$ 0.15	$ 1.46
Total	**$ 20,363,183**	**$ 6.02**	**$ 0.56**	**$ 0.55**	**$ 0.56**	**$ 0.62**	**$ 2.48**

Summary of Sewer Revenue Requirement Allocations

Schedule 15

	Total	Single Family Residential	Multi-Family Residential	General Service
Operations and Maintenance	$ 8,949,256	$ 2,935,932	$ 2,472,608	$ 3,540,716
Plus: Debt Service	$ 3,252,108	$ 1,038,614	$ 901,513	$ 1,311,981
Plus: Rate Funded Capital	$ 8,161,819	$ 2,726,861	$ 2,249,854	$ 3,185,104
Total Revenue Requirements	$ 20,363,183	$ 6,701,407	$ 5,623,974	$ 8,037,801
Less: Other Revenue	$ 3,476,362	$ 1,251,771	$ 950,593	$ 1,273,999
Revenue Requirement from Rates	**$ 16,886,820**	**$ 5,449,636**	**$ 4,673,382**	**$ 6,763,802**
Current Rate Revenue	$ 16,794,115	$ 6,222,123	$ 4,593,641	$ 5,978,351
Total Rate Revenue Req.	$ 16,886,820	$ 5,449,636	$ 4,673,382	$ 6,763,802
Over/(Under) Recovery	$ (92,705)	$ 772,486	$ (79,740)	$ (785,451)
Estimated Total Revenue		37.0%	27.4%	35.6%
System Revenue Requirement by Class		32.3%	27.7%	40.1%
Over / (Under) Recovery Percentage		**4.8%**	**-0.3%**	**-4.5%**





Allocation of Water Revenue Requirements to Rate Components

Schedule 16

Conceptual Allocation to Fixed Charge	Base Capacity - Avg Day	Extra Capacity - Max Day	Extra Capacity - Peak Hour	Fire Protection	Customer - Meters/Services
Operations and Maintenance	0%	0%	0%	0%	100%
Debt Service	100%	100%	100%	100%	100%
Rate Funded Capital	0%	0%	0%	0%	100%

Fixed	Total	Single Family Residential	Multi-Family Residential	General Service	Irrigation	Rate Component Cost Recovered	Current Rate Compment Cost Recovered
Operations and Maintenance	$ 1,210,268	$ 840,827	$ 272,486	$ 82,346	$ 14,608		
Plus: Debt Service	$ 5,164,219	$ 1,664,126	$ 1,167,612	$ 2,006,480	$ 326,001		
Plus: Rate Funded Capital	$ 50,389	$ 35,007	$ 11,345	$ 3,428	$ 608		
Total Revenue Requirements	$ 6,424,876	$ 2,539,960	$ 1,451,443	$ 2,092,255	$ 341,218		
Less: Other Revenue	$ -	$ -	$ -	$ -	$ -		
Fixed Charge Requirement	$ 6,424,876	$ 2,539,960	$ 1,451,443	$ 2,092,255	$ 341,218	**36%**	**28%**

Consumption	Total	Single Family Residential	Multi-Family Residential	General Service	Irrigation
Operations and Maintenance	$ 10,219,521	$ 3,553,079	$ 2,273,311	$ 3,785,782	$ 607,350
Plus: Debt Service	$ -	$ -	$ -	$ -	$ -
Plus: Rate Funded Capital	$ 4,002,241	$ 1,285,479	$ 880,575	$ 1,549,236	$ 286,949
Total Revenue Requirements	$ 14,221,762	$ 4,838,558	$ 3,153,886	$ 5,335,019	$ 894,299
Less: Other Revenue	$ 2,799,253	$ 1,079,888	$ 632,694	$ 935,974	$ 150,698
Consumption Rate Requirement	$ 11,422,509	$ 3,758,670	$ 2,521,192	$ 4,399,045	$ 743,601
					64%	**72%**

Allocation of Sewer Revenue Requirements to Rate Components

Schedule 17

Conceptual Allocation to Fixed Charge	Volume	CBOD	TSS	TKN	TP	Customer
Operations and Maintenance	0%	0%	0%	0%	0%	100%
Debt Service	100%	100%	100%	100%	100%	100%
Rate Funded Capital	0%	0%	0%	0%	0%	100%

Fixed	Total	Single Family Residential	Multi-Family Residential	General Service	Rate Component Cost Recovered	Current Rate Compment Cost Recovered
Operations and Maintenance	$ 226,466	$ 157,149	$ 53,838	$ 15,478		
Plus: Debt Service	$ 3,252,108	$ 1,038,614	$ 901,513	$ 1,311,981		
Plus: Rate Funded Capital	$ 337,773	$ 234,388	$ 80,299	$ 23,086		
Total Revenue Requirements	$ 3,816,347	$ 1,430,151	$ 1,035,650	$ 1,350,545		
Less: Other Revenue	$ -	$ -	$ -	$ -		
Fixed Charge Requirement	**$ 3,816,347**	**$ 1,430,151**	**$ 1,035,650**	**$ 1,350,545**	**23%**	**20%**

Consumption	Total	Single Family Residential	Multi-Family Residential	General Service		
Operations and Maintenance	$ 8,722,790	$ 2,778,783	$ 2,418,770	$ 3,525,238		
Plus: Debt Service	$ -	$ -	$ -	$ -		
Plus: Rate Funded Capital	$ 7,824,046	$ 2,492,473	$ 2,169,554	$ 3,162,018		
Total Revenue Requirements	$ 16,546,836	$ 5,271,256	$ 4,588,324	$ 6,687,256		
Less: Other Revenue	$ 3,476,362	$ 1,251,771	$ 950,593	$ 1,273,999		
Consumption Rate Requirement	**$ 13,070,474**	**$ 4,019,485**	**$ 3,637,732**	**$ 5,413,257**	**77%**	**80%**

Prepared by Burton & Associates

12/3/2015

Water System FY 2016 Allocation of Other Revenues

Schedule 18

Type	Budget	Allocation Factor	Single Family Residential % Allocation	Multi-Family Residential % Allocation	General Service % Allocation	Irrigation % Allocation	Total % Allocation	Single Family Residential $ Allocation	Multi-Family Residential $ Allocation	General Service $ Allocation	Irrigation $ Allocation
Operating Income											
Service Initiation Fee	81,529	Customers	69.47%	22.51%	6.80%	1.21%	100.00%	56,642	18,356	5,547	984
Refunds/Adjustments	(116,034)	Revenues	36.91%	24.53%	34.24%	4.32%	100.00%	(42,826)	(28,463)	(39,735)	(5,010)
Rental/Royalty Income	368,400	Weighted	35.74%	22.31%	35.97%	5.98%	100.00%	131,656	82,173	132,526	22,045
Fishing & Boating	30,605	Weighted	35.74%	22.31%	35.97%	5.98%	100.00%	10,937	6,826	11,009	1,831
Other	124,925	Weighted	35.74%	22.31%	35.97%	5.98%	100.00%	44,645	27,865	44,940	7,476
Water Impact Fees	419,703	Meter Equivalents	48.45%	24.86%	24.24%	2.45%	100.00%	203,357	104,335	101,746	10,264
Outside Funding for CIP	204,004	Weighted	35.74%	22.31%	35.97%	5.98%	100.00%	72,905	45,504	73,387	12,208
Use of Reserves	1,671,339	Weighted	35.74%	22.31%	35.97%	5.98%	100.00%	597,289	372,800	601,236	100,015
Rate Stabilization Fund	-	Weighted	35.74%	22.31%	35.97%	5.98%	100.00%	-	-	-	-
Renewal & Replacement	-	Weighted	35.74%	22.31%	35.97%	5.98%	100.00%	-	-	-	-
Capital Improvements	-	Weighted	35.74%	22.31%	35.97%	5.98%	100.00%	-	-	-	-
Interest Earned on Unrestricted Funds	14,783	Weighted	35.74%	22.31%	35.97%	5.98%	100.00%	5,283	3,297	5,318	885
Total Other Revenues	**2,799,253**							**1,079,888**	**632,694**	**935,974**	**150,698**

Prepared by Burton & Associates

12/3/2015

Sewer System FY 2016 Allocation of Other Revenues (Per 2015 Actual to Budget and February Financials.xls)

Schedule 19

Type	Budget	Allocation Factor	Single Family Residential % Allocation	Multi-Family Residential % Allocation	General Service % Allocation	Total % Allocation	Single Family Residential $ Allocation	Multi-Family Residential $ Allocation	General Service $ Allocation
Service Initiation Fee	76,892	Customers	69.39%	23.77%	6.83%	100.00%	53,357	18,280	5,255
Refunds/Adjustments	(113,138)	Revenues	37.05%	27.35%	35.60%	100.00%	(41,917)	(30,946)	(40,275)
Rental/Royalty Income	359,204	Weighted	32.91%	27.62%	39.47%	100.00%	118,212	99,206	141,786
Fishing & Boating	29,841	Weighted	32.91%	27.62%	39.47%	100.00%	9,820	8,241	11,779
Other	121,807	Weighted	32.91%	27.62%	39.47%	100.00%	40,086	33,641	48,080
Sewer Impact Fees	539,879	Meter Equivalents	48.53%	26.35%	25.12%	100.00%	262,023	142,241	135,616
Outside Funding for CIP	266,240	Weighted	32.91%	27.62%	39.47%	100.00%	87,618	73,531	105,091
Use of Reserves	2,181,223	Weighted	32.91%	27.62%	39.47%	100.00%	717,828	602,418	860,977
Rate Stabilization Fund	-	Weighted	32.91%	27.62%	39.47%	100.00%	-	-	-
Renewal & Replacement	-	Weighted	32.91%	27.62%	39.47%	100.00%	-	-	-
Capital Improvements	-	Weighted	32.91%	27.62%	39.47%	100.00%	-	-	-
Interest Earned on Unrestricted Funds	14,414	Weighted	32.91%	27.62%	39.47%	100.00%	4,743	3,981	5,689
Total Other Revenues	**3,476,362**						**1,251,771**	**950,593**	**1,273,999**

Prepared by Burton & Associates

12/3/2015

Water System

Asset Category	Original Cost	Depreciated Value	Water	Supply	Treatment	Distribution	Customer
Distribution	76,867,789	59,532,659				x	
Transmission	9,149,966	1,442,164				x	
General & Admin	7,033,265	4,408,116		x	x	x	x
Hydrants	1,790,884	622,856				x	
Meters	3,184,217	1,007,582					x
Treatment	67,052,209	32,598,660			x		
Total	165,078,329	99,612,037	43%	-	42%	56%	2%

Sewer System

Asset Category	Original Cost	Depreciated Value	Sewer	Customer	Collection	Treatment	Disposal
Collection	90,270,186	70,401,499			x		
General & Admin	7,033,265	4,408,116		x	x	x	x
Transmission	7,805,090	235,942			x		
Treatment	110,331,037	70,373,643				x	
Total	215,439,577	145,419,200	56%	-	47%	45%	8%

Reclaim System

Asset Category	Original Cost	Depreciated Value	Reclaim
Reclaimed Water	7,085,052	6,499,340	
Total	7,085,052	6,499,340	2%

Outstanding Debt

Schedule 21

Water System

Asset Category	Outstanding Debt	Water	Supply	Treatment	Distribution	Customer	Fire Protection
Raw water supply	$3,528,196		x				
Raw water transmission	3,390,547		x				
Water treatment	17,454,156			x			
Water Transmission	2,131,288				x		
Central office and operations	2,376,372		x	x	x	x	x
Total	28,880,559	35.0%	25.4%	63.7%	9.3%	0.9%	0.7%

Sewer System

Asset Category	Outstanding Debt	Sewer	Customer	Collection	Treatment	Disposal
Wastewater collection	3,687,778			x		
Wastewater pumping	960,979			x		
Wastewater treatment	47,070,583				x	
Central office and operations	1,874,102		x	x	x	x
Total	53,593,442	65.0%	0.2%	9.4%	76.8%	13.5%

Agenda Item 3:

Discuss Draft Executive Director's Performance Goals

Purpose:

Discussion and guidance by the Board of Directors on the Draft Executive Director Performance Goals.

Information:

- Draft Executive Director Performance Goals

OWASA Executive Director Performance Goals
For the period of September 2015 – August 2016
December 2015

Goals	Objectives	Measures of Success	Results
Provide effective leadership and management of OWASA's day-to-day operations, business, and customer service activities	Excellence in drinking water quality	1. Zero violations of primary drinking water standards.	
		2. Maintain certification by the Partnership for Safe Water for Phase IV Excellence in Water Treatment.	
		3. Staff recommended improvements to Cross Connection Control Ordinance by August 2016.	
	Excellence in wastewater management	4. Zero violations of NPDES permit for WWTP.	
		5. Zero violations of reclaimed water standards.	
		6. Zero violations of biosolids recycling standards.	
		7. Successfully transition to a 75% liquid/25% dewatered biosolids program as agreed to by the Board on October 8, 2015.	
		8. All wastewater spills/overflows reported and noticed on time in accordance with regulatory requirements.	
	Excellence in customer service	9. Promote a culture whereby staff consistently delivers excellent customer service in all aspects of our business. (Subjective)	
	Excellence in human resources	10. Zero preventable loss time accidents.	
		11. Update required safety training by position for all employees.	
		12. 95+% of employees complete 100% of their annual required safety training.	
		13. Identify top utility safety performers for possible peer review and/or benchmarking purposes.	
		14. Establish an ongoing training program for all supervisors regarding best practices to promote diversity.	

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OWASA Executive Director Performance Goals
For the period of September 2015 – August 2016
December 2015

Goals	Objectives	Measures of Success	Results
	Excellence in financial, engineering, business and information management services	15. Meet all Fiscal Performance Objectives.	
		16. Distinguished Budget and CAFR awards from GFOA.	
		17. Unqualified audit opinion on FY 2016 Financial Report.	
		18. Implement a Business Continuity solution for critical business applications by August 2016.	
	Rate Design Study	19. Complete Cost Allocation Study by December 2015.	
		20. Assist the Board to make a decision on rate design by spring 2016.	
Effectively plan, implement and/or complete Strategic Plan and other Key Initiatives	Provide reliable and high quality supply of water for next 50 years	21. Develop goals and objectives for LRWSP update (currently scheduled for May 2016).	
		22. Develop updated demand projections for LRWSP update based on growth projections provided by Towns, County, and UNC (timing dependent on receipt of information from local governments and UNC).	
		23. Respond to any information requests and proposed allocation decisions by the Environmental Management Commission relating to our Jordan Lake Round 4 Allocation request.	
	Adopt financial management policies and budget decision processes to ensure affordable services and fiscal sustainability	24. Comprehensive Asset Management document prepared and reviewed by the Board by spring 2016.	
		25. Board review of reserve policies completed by spring 2016.	
	Implement Energy Management Plan	26. Board acceptance of Energy Management Plan by summer 2016.	
		27. Explore potential partnership with the University (and others) for a biogas to energy project.	

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OWASA Executive Director Performance Goals
For the period of September 2015 – August 2016
December 2015

Goals	Objectives	Measures of Success	Results
	Implement Advanced Metering Infrastructure (AMI)	28. Complete AMI Feasibility Study and assist the Board to make a go, no-go decision.	
		29. Assist the Board to establish a Community Engagement Plan for AMI (if applicable).	
		30. Initiate the process to procure an AMI system (if applicable).	
	Employee Total Compensation Study	31. Assist the Board to establish an Employee Total Compensation Philosophy by early 2016.	
		32. Seek Board approval of the consultant's scope of work for remaining tasks for the Total Compensation Study by spring 2016.	
	Engage the Community	33. Through a collaborative process with the Board, establish a Community Engagement Plan by July 2016.	
		34. Develop and implement an action plan to address the opportunities to improve that were identified in the 2015 Customer Survey by February 2016.	
		35. Implement Affordability Outreach program as approved by the Board on October 22, 2015.	
		36. Work closely with the IFC to evaluate opportunities to increase funding for the Care to Share program.	
Provide the Board the information needed to enable them to successfully fulfill their fiduciary responsibility	Staff reports and presentations are timely, accurate and complete and include objective review on options and clearly documented staff recommendations as may be appropriate	37. Evaluation by Board (Subjective)	

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OWASA Executive Director Performance Goals
For the period of September 2015 – August 2016
December 2015

Goals	Objectives	Measures of Success	Results
Executive Director Specific	TBD	38. TBD	

Note: Completion/target dates shown above may be revised as needed to reflect organizational priorities and/or timetable for receipt of information/actions by other applicable parties (such as the EMC for Jordan Lake allocation decisions; Towns and County for population and employment projections; etc.)

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Agenda Item 4:

Review Board Work Schedule

Purpose:

a) Request(s) by Board Committees, Board Members and Staff
b) Review and update the 12 Month Board Meeting Schedule
c) Review the draft agenda and discuss expectations for the January 14, 2016 work session
d) Review the draft agenda and discuss expectations for the January 28, 2016 meeting

Information:

- Draft 12 Month Board Meeting Schedule
- Draft agenda for the January 14, 2016 work session
- Draft agenda for the January 28, 2016 meeting

OWASA Board of Directors – 12 Month Board Meeting Schedule (December 10, 2015)

Month	Board Meetings		Committee & Other Meetings
	Work Session	Business Meeting	
January 2016	***Approve AMI Feasibility Study*** ***Discuss Draft Employee Compensation Philosophy*** Approve Solids Handling Supervisor Position Discuss Strategies for Employee Health Insurance Discuss Financial Reserves Policy Discuss FY 17 budget calendar and assumptions () *1/14/2016*	***Discuss potential rate structure modifications*** *(if needed)* Discuss 2015 Customer Survey Results Community Engagement Approach/ Process Discuss CIP Investment Practices Annual Lakes Recreation Report () Q2 Financial Report () CIP Semiannual Report () *1/28/2016*	
February 2016	***Determine AMI Next Steps*** *(if needed)* ***Approve Employee Total Compensation Philosophy*** ***Approve Preliminary Selection of Preferred Rate Structure(s)*** CS - General Counsel Interim Review () *2/11/2016*	Discuss Review & Update of Strategic Plan CS - General Counsel Interim Review () *2/25/2016*	***NRTS - Energy Plan – Strategy Evaluation (TBD)***
March 2016	***Review Energy Plan – Strategy Evaluation*** Review findings of Easement Pilot FY 17 Draft Budget and Rates () Set date for public hearings () CS – ED Interim Review () *3/10/2016*	Discuss Potential Process to Update Strategic Plan FY 17 Draft Budget and Rates () CS – ED Interim Review () *3/24/2016*	***CEC – Draft CE Plan (TBD)***
April 2016	Review Employee Health and Dental Insurance Renewal () FY 17 Draft Budget and Rates () Authorize staff to publish proposed rates () *4/14/2016*	Q3 Financial Report () Audit Firm Selection () Award the Rosemary, Henderson, and Hillsborough St Water Main Project Contract *4/28/2016*	***NRTS – Draft Energy Plan (TBD)***
May 2016	***Discuss LRWSP – Goals and Metrics*** Award the Cane Creek Permanganate Facility Project Contract Review Employee Health and Dental Insurance Renewal (if needed) () Review Employee Merit Pay for FY 17 () Appointment of Nominating Committee () *5/12/2016*	Public Hearings - FY 17 Budget and Rates () Approve Employee Health and Dental Insurance () Approve LRWSP – Goals and Metrics *5/26/2016*	
June 2016	***Review Draft Energy Plan*** Approve Employee Merit Pay for FY 17 () Approve FY 17 Budget and Rates () Election of Officer () *6/9/2016*	To Be Determined *6/23/2016*	
July 2016	***Public Comment on Draft Energy Plan*** ***Discuss LRWSP - Demands and Yield*** *7/14/2016*	To Be Determined *7/28/2016*	
August 2016	***Discuss & Approve/Disapprove AMI Phase 2 with DS&A*** (if needed) CS – General Counsel Review () *8/11/2016*	12 Month Financial Report () CIP Semiannual Report () CS – General Counsel Review () 8*/25/2016*	
September 2016	CS - General Counsel Review () CS – ED Review () *9/8/2016*	***Approve Contract for AMI Procurement Phase*** (if needed) ***Approve Energy Plan*** Annual Report and Financial Audit () Approve General Counsel Engagement () CS – ED Review () *9/22/2016*	
October 2016	TBD *10/13/2016*	Q1 Financial Report () Strategic Trends Report () *10/27/2016*	

Current and Pending Key Projects and Stages – in ***bold italics***

OWASA Board of Directors – 12 Month Board Meeting Schedule (December 10, 2015)

Month	Board Meetings		Committee & Other Meetings
	Work Session	Business Meeting	
November 2016	TBD *11/10/2016*	*Holiday - no meeting*	
December 2016	TBD *12/8/2016*	*Holiday - no meeting*	

The 12 Month Board Meeting Schedule shows Strategic Plan initiatives and other priority efforts that the Board and staff plan to give greatest consideration to during the next twelve months. The schedule also shows major recurring agenda items that require Board action, or items that have been scheduled in response to the Board's prior standing request. This schedule does not show all the items the Board may consider in a work session or business meeting.

The 12 Month Board Meeting Schedule will be reviewed and updated at each monthly work session and may also be discussed and updated at the Board's business meetings.

In addition to the initiatives shown in this schedule, staff will be working on other Strategic Plan and organizational priorities that are not expected to require major additional discussion with the Board except as part of budget deliberations (e.g., continuing our comprehensive asset management work).

The schedule implies that the following Strategic Plan initiatives would be addressed beyond the 12 month period. The Board may conclude that one or more of the following initiatives are higher priority. The schedule will be revised as needed to reflect the Board's priorities, and any additional initiatives that the Board may decide to address.

- Development of a plan and policy framework for OWASA lands is considered a longer-term priority.
- Improve effectiveness as a learning organization is considered a longer-term priority.
- Water Conservation Plan will be prepared concurrent with update of the Long-Range Water Supply Plan.

The OWASA Board determines which topics it wants to explore as a full Board (potentially in a work session format) and which topics it wants to assign to Board committees or committee chairs for further analysis and development of recommendations. Board also determines priorities and desired timeframes for addressing topics. Committee meetings will be updated on the schedule routinely.

Abbreviations Used in Draft Schedule:

( )	Recurring agenda item (generally these are "required" items)
AMI	Advanced Metering Infrastructure
CE	Community Engagement
CIP	Capital Improvements Program
COLA	Cost of Labor Adjustment
CS	Closed Session of the Board
CY	Calendar Year
ED	Executive Director
FY	Fiscal Year
JLP	Jordan Lake Partnership
LRWSP	Long-Range Water Supply Plan
NRTS	Natural Resources/Technical Systems
Q	Quarter
TBD	To Be Determined
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plan

Current and Pending Key Projects and Stages

Project	Strategic Initiative	Project Lead	Jan-16	Feb-16	Mar-16	Apr-16	May-16	June-16	July-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
AMI	6	Przybyl	Determine Next Steps	Community Engagement (TBD)						Action (if needed)	Procurement (if needed)			
Total Compensation Study		Glasgow	Review	Action	*Schedule To Be Determined*									
Rate Structure Study	4	Winters	Review	Action		Community Engagement		Action						
LRWSP	1	Rouse					Goals & Metrics	Goals & Metrics	Demands & Yields					
Energy Plan	5	Tiger/Davis		NRTS	Strategy Evaluation	NRTS		Review Draft Plan	Comm. Eng.		Action			

Stages	Committee Discussion	Feasibility Study	Board Review	Community Engagement	Action	Procurement

AGENDA
WORK SESSION OF THE OWASA BOARD OF DIRECTORS
THURSDAY, JANUARY 14, 2016, 6:00 P.M.
OWASA COMMUNITY ROOM

The Board of Directors appreciates and invites the public to attend and observe its meetings. For the Board's Work Session, public comments are invited on only items appearing on this agenda. Speakers are invited to submit more detailed comments via written materials, ideally submitted at least three days in advance of the meeting to the Clerk to the Board via email or US Postal Service (aorbich@owasa.org/400 Jones Ferry Road, Carrboro, NC 27510).

Public speakers are encouraged to organize their remarks for delivery within a four minute time frame allowed each speaker. Additional time may be allowed at the discretion of the Board of Directors.

The Board may take action on any item on the agenda.

Announcements

a. Announcements by the Chair
   - Any Board Member who knows of a conflict of interest or potential conflict of interest with respect to any item on the agenda tonight is asked to disclose the same at this time.

b. Announcements by Board Members

c. Announcements by Staff

CONSENT AGENDA

Action

1. Resolution Creating a Solids Handling Supervisor Position for the Biosolids Management Program (Todd Taylor)
2. Approval of the Minutes of the October 22, 2015 Meeting of the Board of Directors (Andrea Orbich)
3. Approval of the Minutes of the November 4, 2015 Special Closed Session of the Board of Directors for the Purpose of Discussing a Personnel Matter (Robert Morgan)
4. Approval of the Minutes of the November 12, 2015 Work Session of the Board of Directors (Andrea Orbich)
5. Approval of the Minutes of the November 12, 2015 Closed Session of the Board of Directors for the Purpose of Discussing a Personnel Matter (Heather Payne)

REGULAR AGENDA

Discussion

6. Consider Approval of the Advanced Metering Infrastructure Feasibility Study (Dan Przybyl/Todd Taylor)
7. Discuss Strategies for Employee Health Insurance for Fiscal Year 2017 (Stephanie Glasgow/Ellen Tucker, Hill Chesson & Woody)
8. Discuss Draft Employee Compensation Philosophy (Stephanie Glasgow/John Anzivino, Senior Vice President at Springsted Incorporated)
9. Discuss Financial Reserves Policy (Stephen Winters)
10. Discuss Fiscal Year 2017 Budget Calendar and Assumptions (Stephen Winters)
11. Review Board Work Schedule (John Young/Ed Kerwin)

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a. Request(s) by Board Committees, Board Members and Staff
b. 12 Month Board Meeting Schedule
c. January 28, 2016 Board Meeting
d. February 11, 2016 Work Session

Summary of Work Session Items

12. Executive Director will summarize the key staff action items from the Work Session

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AGENDA
MEETING OF THE OWASA BOARD OF DIRECTORS
THURSDAY, JANUARY 28, 2016, 7:00 P.M.
CHAPEL HILL TOWN HALL

In compliance with the "Americans with Disabilities Act," interpreter services are available with five days prior notice. If you need this assistance, please contact the Clerk to the Board at 919-537-4217 or aorbich@owasa.org.

The Board of Directors appreciates and invites the public to attend and observe its meetings. Public comment is invited either by petition upon topics not on the Board's agenda, or by comments upon items appearing on the Board's agenda. Speakers are invited to submit more detailed comments via written materials, ideally submitted at least three days in advance of the meeting to the Clerk to the Board via email or US Postal Service (aorbich@owasa.org/400 Jones Ferry Road, Carrboro, NC 27510).

Public speakers are encouraged to organize their remarks for delivery within the three-to-five minute time frame allowed each speaker. Additional time may be allowed at the discretion of the Board of Directors.

Announcements

1. Announcements by the Chair
   A. Any Board Member who knows of a conflict of interest or potential conflict of interest with respect to any item on the agenda tonight is asked to disclose the same at this time.
2. Announcements by Board Members
3. Announcements by Staff

Petitions and Requests

1. Public
2. Board
3. Staff

CONSENT AGENDA

Information and Reports

1. Quarterly Report on Attendance at Board and Committee Meetings (Andrea Orbich)
2. Semiannual Status Report for Various Capital Improvement Projects including the Semiannual Report on Communication Plans for Capital Projects (Vishnu Gangadharan)
3. 2015 Lake Recreation Report (Kenneth Loflin)

Action

4. Approval of the Minutes of the December 10, 2015 Work Session of the Board of Directors (Andrea Orbich)
5. Approval of the Minutes of the January 14, 2016 Work Session of the Board of Directors (Andrea Orbich)

REGULAR AGENDA

Discussion

6. Discuss 2015 Customer Survey Results (Greg Feller)
7. Community Engagement Approach and Process (Ruchir Vora/Ed Kerwin)
8. Discuss Potential Rate Structure Modifications (Stephen Winters)

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9. Review of OWASA's Capital Improvement Program Investment Practices (Stephen Winters/Vishnu Gangadharan)

Information and Reports

10. Financial Report for the Six-Month Period Ended December 31, 2015 (Stephen Winters)

Summary of Board Meeting Action Items

11. Executive Director will summarize the key action items from the Board meeting and note significant items for discussion and/or action expected at the next meeting

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