

**REPORT ON FINANCIAL PLAN, COST OF
SERVICE AND RATES**
WATER AND SEWER OPERATING FUND

Harford County, Maryland

APRIL 2016



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1.0 Executive Summary

Harford County (“County”) provides water and sewer services to retail and wholesale customers. The Water and Sewer fund is an Enterprise Fund, which is primarily funded by the operating and capital revenues from the users of the system. Due to multiple factors including declining consumption, limited customer growth, increasing operating costs, aging infrastructure, and increasing regulatory requirements, the current operating fund revenues are not adequate to meet the annual operating fund revenue requirements. Hence, to build and maintain financial sufficiency and to assure equitable cost recovery the County retained Black & Veatch Management Consulting, LLC (“BVMC”) to perform a Comprehensive Utility Revenue Study (Rate Study).

The primary objectives of the Rate Study were to restore the health of its Enterprise Fund, provide reliable service by effectively replacing and managing its assets, provide enhanced customer service through a transition to electronic bill payment, evaluate the cost/benefit of monthly billing, and foster acceptance and buy-in for a water and sewer financial plan and cost of service analysis, through effective stakeholder engagement.

The following sections provide a brief summary of the key findings and the project team’s set of recommendations. The Rate Study covers the six-year period of fiscal year (FY) 2016 through FY 2021.

1.1 SUMMARY OF FINDINGS

Revenue under Existing Rates

1. The County provides water and sewer services to approximately 41,000 retail customers, and also to a few wholesale water and sewer customers. Based on the recent historical growth trend, a very modest annual growth rate of 0.6% is used to project the increase in accounts during the study period.
2. Sales of treated water are projected to increase from about 3.6 billion gallons in 2014 to about 3.86 billion gallons by 2019.
3. **Water Revenues:** Retail water user fee revenues are derived from three components: Base Charge; Fire Line Charge; and Volume Charge. The total of these revenues under existing rates are projected to increase from \$11.6 million in FY 2016 to \$12.9 million in FY 2021. In addition, non-operating revenues which include miscellaneous revenues, other revenues such as interest and penalty, and purchased water revenues are projected to remain steady at \$1.1 million throughout the study period.
4. **Sewer Revenues:** Retail sewer fee revenues are derived from three components: Base Charge; Volume Charge; and Flat Charge. The total of these revenues under existing rates are projected to increase from \$13.4 million in FY 2016 to \$14.8 million in FY 2021. In addition, non-operating revenues which include miscellaneous revenues, other revenues such as interest and penalty, and intra-county revenues are projected to remain steady at \$1.1 million throughout the study period.

Summary of Revenue Requirements

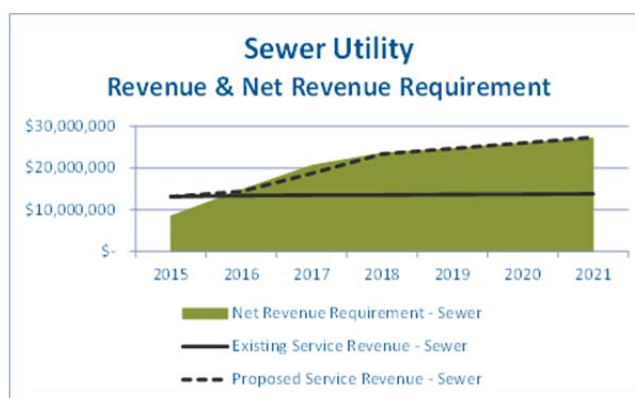
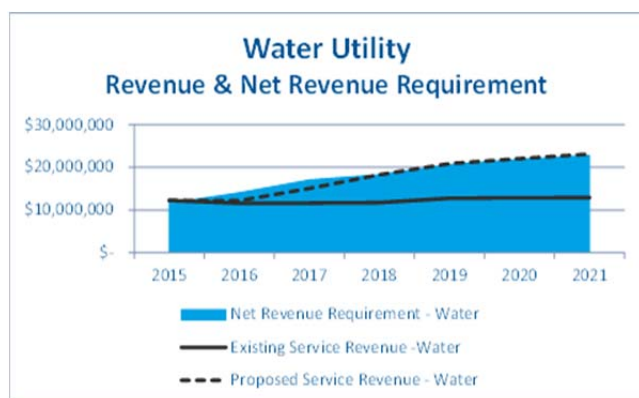
1. **Non-Expansion Capital Improvement Program (CIP) and Financing:** A total CIP of \$15.3 million for the water utility and \$27.2 million for the sewer utility are projected for the study period of FY 2016 through FY 2021. Of these amounts, \$10.2 million of water CIP and \$7.3

million of sewer CIP are projected to be funded through Paygo cash financing during the study period. In addition to cash financing, the water utility's debt service is projected to increase from \$117.0 thousand to \$429.0 thousand in FY 2021; the sewer utility's debt service is projected to increase from \$205.0 thousand in FY 2016 to \$1.56 million in FY 2021. The substantive increase in annual sewer debt service is due to the significant sewer CIP expected to be completed by FY 2021.

2. **Operations and Maintenance (O&M) Expenditures:** Total annual water O&M expenditures are projected to increase from \$14.9 million in FY 2016 to \$18.7 in FY 2021. Concurrently, total annual sewer O&M expenditures are projected to increase from \$19.4 million to \$21.4 million during the same period.
3. **Cash Financing of Expansion Capital:** During the study period, the operating fund is projected to provide some modest level of cash financing for expansion capital program. An annual transfer of \$1.65 million is projected during FY 2019 through FY 2021 for the water utility. For the sewer utility, a transfer of \$300.0 thousand in FY 2020 and \$900.0 thousand in FY 2021 is projected.
4. **Operating Reserve:** Based on the annual O&M expenditures projected for the study period, an annual operating reserve equal to 60-days of O&M expenses is recommended as a minimum financial best practice. Based on this financial policy, the annual water operating reserve requirement is projected to increase from \$2.45 million in FY 2016 to \$3.08 million in FY 2021. During the same time frame the sewer operating reserve requirement is projected to increase from \$3.20 million to \$3.96 million.

Summary of Cash Flow Results

1. The cash flow analysis performed based on the projected revenues under existing rates and the projected revenue requirements indicates a significant funding gap. Both in the water and sewer utilities, the annual revenues under the existing FY 2016 rates are not adequate to cover even 100% of the projected annual O&M expenditures. The funding gap is even more pronounced in the sewer utility.
2. Therefore, as the charts indicate, a series of annual revenue adjustments are needed both in the water and sewer utilities to achieve the goal of the operating fund revenues being self-sufficient and adequate to cover all of the O&M expenses, debt service obligations, cash financing of capital program, required transfers for fleet, and to maintain the minimum operating reserve



requirement. Table W-7, in Appendix 2 presents the cash flow analysis and the proposed series of revenue increases for the water utility, and Table S-7, in Appendix 3 presents the same for the sewer utility.

Summary of Cost of Service Analysis

1. The revenue requirements less any revenues from other sources provides the “net” annual operating fund revenue requirements (also referred to as “cost of service”) that needs to be recovered through user rates and charges.
2. The cost of service analysis for both the water and the sewer utilities indicate that with respect to the *Base Charge*, the ¾” and higher size meters are recovering more than the cost of service, and the 5/8” meters are recovering less than the cost of service. Hence, an adjustment to the meter size based *Base Charge* is necessary in addition to the rate adjustment needed for increased revenue requirements.
3. Transitioning the 5/8” meters to the cost of service rates in the very first test year (FY 2016) would create a significant increase in the residential customer bills, as over 95% of the retail water customer accounts are 5/8” meters.
4. The cost of service based volume rates for both the water and sewer utilities indicate that the rates are in alignment with the existing rates.

1.2 RECOMMENDATIONS

Based on the financial planning and cost of service analysis performed for the study period, the Black & Veatch team proffers the following series of recommendations:

- Implement a series of annual revenue increases beginning in FY 2016 through FY 2021 to eliminate the operating fund deficit by FY 2018 and then build the water and sewer operating fund balances to achieve a minimum of 60 days of operating reserve by FY 2021. Table W-7, in Appendix 2 presents the recommended series of revenue increases for the water utility, and Table S-7, in Appendix 3 presents the same for the sewer utility.
- Implement mid-year revenue increase adjustment in FY 2016 and FY 2017 followed by beginning of fiscal year increase in FY 2018 through FY 2021.
- Phase-in the transition to cost of service rates, for the Base Charge, to mitigate the bill impact on the 5/8” meter size customers. Under the phase-in approach, we recommend that the Base Charge for the 5/8” meter size be gradually increased during the period of FY 2016 through FY 2020 to fully align with their cost of service by FY 2020. During the same period, the rates for the ¾” and larger meter sizes be gradually decreased, from the existing rate levels, to fully align with their cost of service by FY 2020.

The aforementioned plan puts the Enterprise Fund on a path to meet all its financial obligations in so that the water and sewer utility can provide system reliability and expansion as needed to serve its customers.

2.0 Study Overview

Harford County (“County”) provides retail water and sewer services to approximately 41,000 customers outside the three incorporated municipalities (City of Aberdeen, Town of Bel Air, and City of Havre de Grace). In addition, the County provides wholesale water to customers including the City of Aberdeen, Maryland American (for the Town of Bel Air), and the Federal entity of Aberdeen Proving Ground (APG Van Bibber). The County also provides wholesale sewer treatment services to the Town of Bel Air, and serves customers in Whiteford and Spring Meadows service areas.

The Division of Water and Sewer operates as an Enterprise Fund and is primarily funded by the operating and capital revenues from the users of the system. The combined costs of the County’s water and sewer capital improvements, anticipated increases in operation and maintenance expenses, and other financial obligations are anticipated to exceed the enterprise fund’s current financial capabilities. Hence, to build and maintain financial sufficiency and to assure equitable cost recovery the County retained Black & Veatch Management Consulting, LLC (“BVMC”) to perform a Comprehensive Utility Revenue Study (Study).

2.1 SYSTEMS OVERVIEW

The County’s Division of Water and Sewer is responsible for the planning, operations, and management of the County’s Water and Sewer systems. As part of the water system, the County owns and operates three water treatment facilities (Havre de Grace, Perryman, and Abingdon). The water system also includes over 690 miles of distribution and transmission system, a dozen storage tanks and booster stations, and over 4,000 fire hydrants. The County’s wastewater system includes two treatment facilities (Sod Run and Joppatowne), over 780 miles of collection and conveyance system, 53 pumping stations, and over 13,000 manholes.

Many of the assets in the water and wastewater system have been in place for over 40 years and are continuing to age. In addition, the County has been continuously enhancing the treatment systems to comply with Federal and State regulations to meet stringent drinking water quality standards and to meet Enhanced Nutrient Removal (ENR) requirements to enhance Chesapeake Bay Water Quality.

The average daily water produced is 13.1 million gallons (mgd) and the average daily wastewater treated is 13.2 mgd. The Division of Water and Sewer manages all of its water and wastewater operations with a total of 170 employees.

The County serves approximately 45,000 retail customers. Most of the water customers are metered and meter reads are obtained via the use of an Automatic Meter Reading (AMR) system. Retail water and sewer customers are billed on a quarterly billing basis.

2.2 STUDY DRIVERS

The County faced multiple operational and capital program issues that were placing a stress on the fiscal health of the County’s water and wastewater enterprise fund. An overview of the key factors is as follows:

- **Increasing Costs:** water and sewer fund being an enterprise fund, all of its operating and capital revenue requirements must be funded by the operating and capital revenues generated from the users of the system. Over the last two decades, similar to what is occurring in the utility industry

nationwide; the County has encountered significant cost increases due to aging infrastructure, increase in regulatory requirements and service demands, a decline in the rate of customer growth, and increase in operating and capital expenditures. Consequently, revenue requirements have increased at levels higher than that of the Consumer Price Index (“CPI”).

- **Historical CPI Based Rate Increases:** However, during the same period (since 1996), the County’s water and sewer service rates and charges were increased only based on the CPI index without adequate alignment with the actual cost increases. In addition, water and sewer rates and charges were also not adjusted for factors such as usage decline and slow customer growth. The historical practice of increasing service charge rates just based on CPI increase had almost depleted the Operating Fund.
- **Infrastructure Renewal:** Further, given the gradual aging of many of the water and sewer infrastructure, to manage the assets in a cost effective manner and assure reliable service, the County needed an industry standard based water and sewer infrastructure renewal forecast.
- **Monthly Billing Transition:** With the County’s ongoing Advanced Metering Infrastructure deployment nearing completion, the County needed a review of the annual financial impact of transitioning to monthly billing.
- **Electronic Bill Payment:** The County was in the process of changing the vendor for ACH Electronic Payment transactions and had also decided to absorb the transaction fee instead of charging the utility customer that fee. As this change in policy has cost implications, the County needed an assessment of the annual cost impact.
- **Labor Resource:** Since the last cost of service study in 1996, the services and responsibilities of the Division of Water and Sewer had increased including increase in service demands, addition of assets, changes in treatment processes, and addition of customers. As most of these increases were being managed with no significant change in staffing resources, the utility needed a review of staffing resources to be able to effectively deliver the anticipated levels of service.

To holistically meet the funding needs of these diverse initiatives and to address the fiscal vulnerability of the operating fund, a comprehensive multi-year financial plan was necessary. In addition, the County desired a cost of service and rate structure review to assure equitable cost recovery, and to innovatively fund infrastructure renewal while mitigating customer bill impact.

2.3 STUDY OBJECTIVES

The strategic financial goals of the study were to build immediate and long term financial sufficiency and stability, meet stakeholder needs, and meet bond market expectations. The key tactical objectives of the financial plan and cost of service review are as follows:

- The primary objective of the financial plan is to build financial adequacy to fund the following utility obligations:
 - 100% of anticipated Operations & Maintenance (O&M) costs;
 - 100% of existing and anticipated future debt service costs;
 - 10-year capital program including costs based on infrastructure renewal model;
 - Payments to the General Fund for prorated support services;
 - Minimum of sixty (60) days of operating reserve; and
 - Industry best practice level of cash financing (Paygo) of capital expenditures.

- The key objectives of the cost of service and rate structure review are as follows:
 - Establish a reasonable nexus between fees charged for services and costs incurred in providing the services;
 - Utilize industry standard cost of service principles in determining cost of service responsibility;
 - Evaluate alternative water and sewer rate structure to simplify the existing rate structure and to assure revenue stability; and
 - Propose water and sewer rates that balance revenue adequacy, equity of cost recovery, and customer bill impact.

2.4 STUDY SCOPE

To address the diverse tasks that the County desired and meet the financial planning and cost of service objectives, the BVMC team designed an integrated work structure comprising of eight major work items, as illustrated in Figure 2-1.

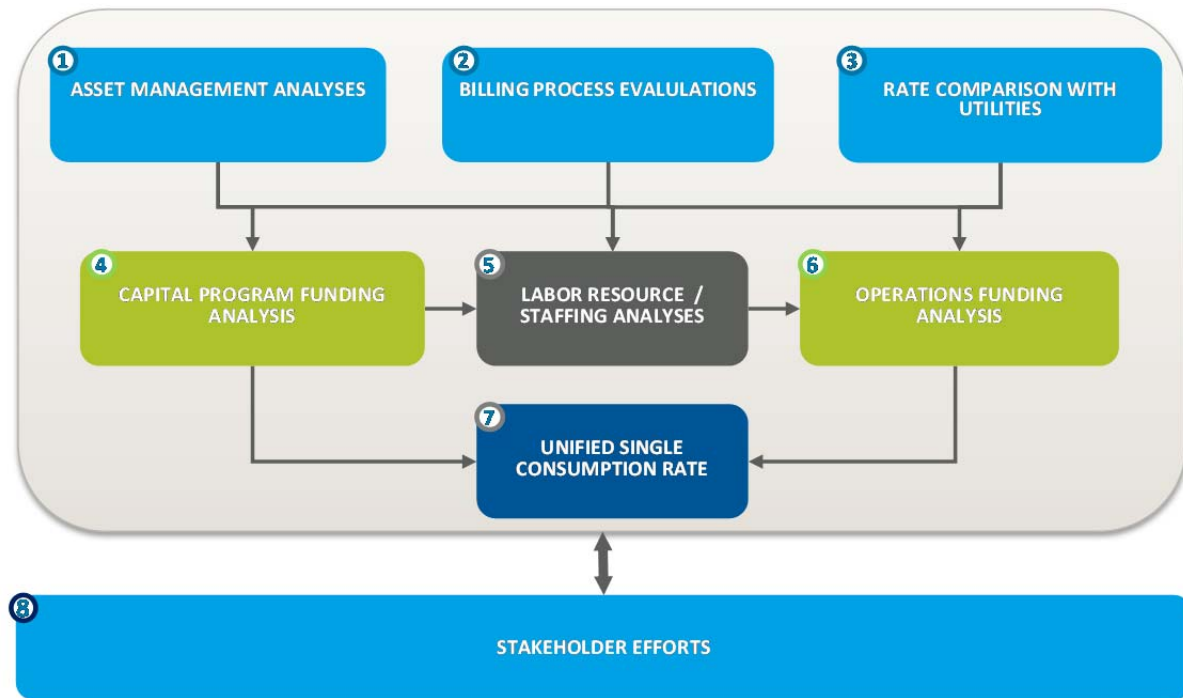


Figure 2-1 Study Scope of Work

A brief overview of each Work Item is as follows:

Work Item 1 – Infrastructure Reinvestment Forecasting. This task involved an evaluation of existing water and wastewater assets, developing asset hierarchies and profiles using size, age and material. Based on the evaluation an Infrastructure Model was developed in Microsoft Excel. The model provides a rehabilitation and replacement (R&R) profile for all assets. In addition, the model forecasts asset replacements costs for all assets over a ten year period, and even a longer schedule for asset classes such as water mains, sewers, and force mains.

An Infrastructure Model and a user guidance manual were provided on completion of this Work Item.

Work Item 2 – Billing Process Evaluations. This Work Item involved two distinct tasks, namely, (i) an evaluation of the financial impact of transitioning from quarterly metering and billing operations to monthly metering and billing operations (Billing Period Modification), and (ii) an evaluation of the financial impact of the County absorbing the transaction costs of electronic bill payments (Electronic Bill Payment).

A technical memorandum was provided for each of the two tasks.

Work Item 3 – Rate Comparison with Peer Utilities. This Work Item involved a rate benchmarking analysis of the monthly water, sewer, and combined bill for average residential water use. The peer utilities included most of the counties in Maryland, and a few neighboring municipal utilities.

A technical memorandum was provided for this Work Item.

Work Item 4 – Capital Program Funding Analysis. This Work Item involved a review of the adequacy of the County's water and sewer utility's capital fund to meet the existing and future capital improvement program expenditures. This work item also included a review of the County's capital connection charges.

The water and sewer computer rate model includes the capital program funding analysis module.

Work Item 5 – Labor Resource Staffing Analysis. This Work Item involved a high level review of the existing major functions of the water and sewer operations, the existing staffing levels for the defined functions, and an estimate of additional staffing resources that may be needed during the FY 2016 through FY 2021 forecast period.

Work Item 6 – Operating Funding Analysis. This Work Item involved a comprehensive review of the existing revenues and anticipated revenue requirements for the six year study period of FY 2016 through FY 2021 for the water and sewer utility's operating fund and a projection of the magnitude of revenue adjustments that would be necessary to assure financial stability of the operating fund.

The water and sewer computer rate model includes the operating program funding analysis module.

Work Item 7 – Rate Structure Analysis. This Work Item involved an evaluation of the existing water and sewer rate structure, alternative rate structure, and the design of rate schedules. Cost of service analysis based rate schedules were developed and recommended for each fiscal year, from FY 2016 through FY 2019.

The water and sewer computer rate model includes the rate design module.

Work Item 8 – Stakeholder Engagement Efforts. This Work Item involved a series of rate study presentations to the various stakeholders including the management and staff of the Division of Water and Sewer, and the County's Administration. A series of workshops for the Council members and a public hearing was also conducted as part of this Work Item.

As Figure 2 illustrates, Work Items 1, 2, 4, and 5 were performed first so that the financial projections resulting from infrastructural renewal forecast, billing frequency transition, electronic bill payment, and labor resource analysis could be integrated in to Work Item 6 – Operating

Funding Analysis. Work Items 7 and 8 were initiated and completed as an iterative process along with Work Item 6.

This Operating Fund Analysis and Cost of Service Rates Report (Rate Study Report) provides a detailed discussion on the analysis, findings, and recommendation of Work Items 6 and 7.

2.5 STUDY METHODOLOGY

The development of user rates and charges requires the integration of three critical components: (i) financial plan; (ii) cost of service allocations; and (iii) rate design. Figure 2-2 illustrates the three components and the key tasks within each component.

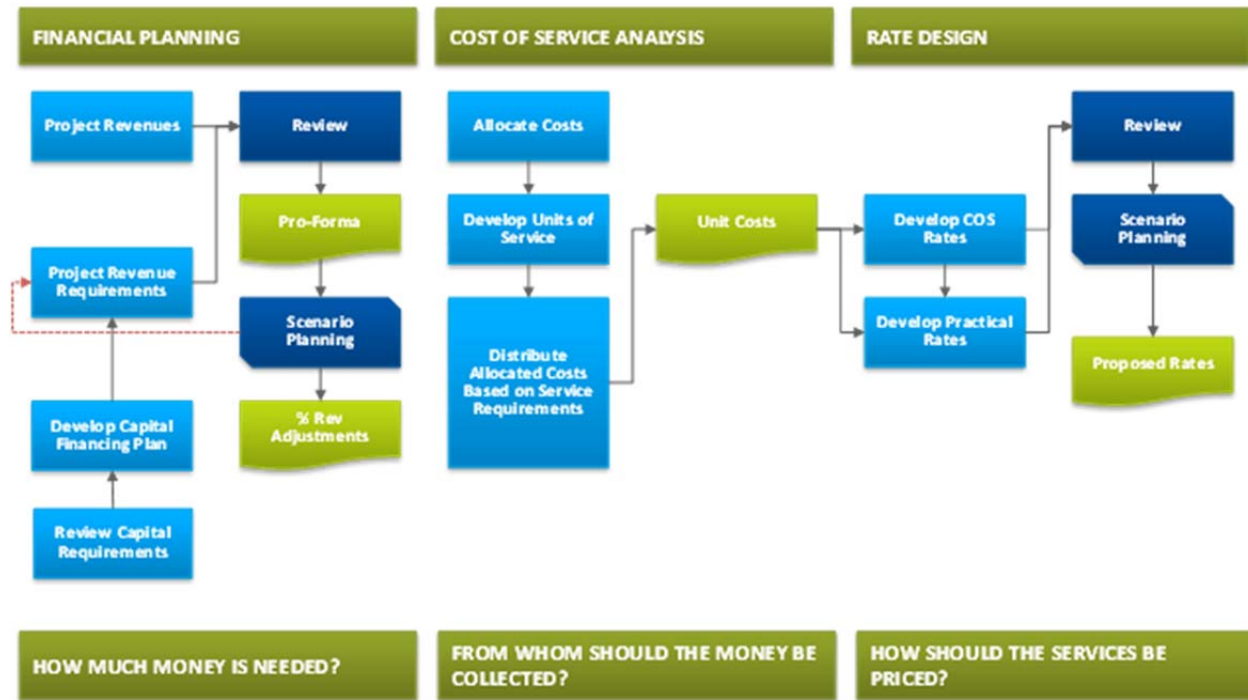


Figure 2-2 Rate Study Methodology

Financial Planning: The first building block in determining the County’s Operating Fund user rates and charges is the development of distinct water and sewer financial plans. The financial planning process helps to establish the annual revenue requirements that are necessary to meet all of the water and sewer utility’s operating fund obligations.

As illustrated in Figure 2-2, the key components of a financial plan are: (i) projection of revenues from user rates and other sources; (ii) development of a capital financing plan to decide the mix of debt and cash funding of capital program; (iii) projection of revenue requirements (O&M and capital costs, and target reserves); and determination of the level and timing of revenue adjustments needed to maintain financial viability.

The Operating Fund annual revenue requirements are typically developed on a *cash basis* for public utility rate setting. The revenue requirements, under the cash basis approach, include the following:

- Operations & Maintenance expenditures;
- Debt service expenses;
- Cash financing of capital program (Paygo);
- Contributions to operating reserves; and
- Other obligations such as payments and transfers for specific purposes

To establish financial stability, a financial plan is typically prepared for a multi-year period. A six-year financial plan was developed for the water and wastewater utility's Operating Fund to achieve the financial objectives and target metrics defined to build and sustain financial integrity. The FY 2015 is the baseline year which reflects the actuals and FY 2016 through FY 2021 is the forecast period for both revenues and revenue requirement projections.

Cost of Service: The second critical component in rate setting is the cost of service analysis. Cost of service can be described as the amount of money that the Operating Fund needs to generate, *net of funding from other miscellaneous sources of revenues*. Therefore, Cost of Service is essentially the "net revenue requirement" that is to be recovered through user rates and charges. Cost of service analysis enables an equitable apportioning of the net annual revenue requirements (also referred to as cost of service) to the various cost components and customer classes. The level and types of allocation performed depend on the existing and anticipated rate structure.

As municipal utilities are *public utilities that cannot make a profit*, the equitable allocation of costs is a critical step that is necessary to establish a *reasonable nexus* between costs incurred in providing service and the fees charged from customers, and to establish defensible user rates and charges.

Rate Design: The third and final critical component is an evaluation of the existing rate structure components and the development of proposed user rates and charges. The user rates and charge schedules typically include fixed charge, volumetric charge, and other special charge rate components. The rates and charges are designed to recover the annual cost of service allocated to these different rate components, and based on local policy and practical considerations.

As the County desired rate recommendations for multiple years, the cost of service allocations and rate schedules were designed for four consecutive years of FY 2016, FY 2017, FY 2018, and FY 2019.

The study methodology described above and used in the operating funding analysis and rate structure Work Items reflect the application of industry accepted rate setting approaches that are provided in the following two guidance manuals:

- American Water Works Association (AWWA) *Manual M-1: Principles of Water Rates, Fees, and Charges* for water rate setting; and
- Water Environment Foundation (WEF) *Financing and Charges for Wastewater Systems* for wastewater.

3.0 Rate Structure Overview

One of the key objectives of the Operating Fund analysis is to evaluate the existing operating fund rate structure for potential simplification and to propose water and sewer utility rates for FY 2016 through FY 2019. In this chapter, a brief overview of industry accepted practices on water and sewer rate structures is first presented followed by a discussion on the County's existing retail and wholesale water and sewer rate structure.

The revenue requirements of a water and sewer utility, net of any miscellaneous sources of revenues, are recovered from user rates and charges. A water rate structure usually consists of two primary components, namely, a fixed charge and a volumetric charge. Similarly, a sewer rate structure more commonly consists of a fixed charge, a volumetric charge, and pollutant charge (for wastewater pollutants such as Bio-chemical Oxygen Demand (BOD) and Total Suspended Solids (TSS)).

Occasionally, a utility's water and sewer rate structures may also include a special surcharge to recover costs associated with certain service situations such as purchased water, pumping to elevations, drought conditions, readiness-to-serve, or extra-strength wastewater discharges.

3.1 FIXED CHARGE

In the utility industry, fixed charges are designed to recover one or more of the following types of costs, namely, (i) metering; (ii) billing; (iii) readiness-to-serve cost; (iv) specific capital investment; and (v) other specific costs. The costs of providing these functions vary among types of customers and/or by factors such as size and capacity of the meters. Therefore, to provide for equitable cost recovery, water and sewer fixed charges are usually assessed based on meter size and also by customer class.

A utility's annual revenue requirements comprise mostly of fixed costs such as salaries and benefits, pension obligations, debt service, cash financing for infrastructure renewal, and costs related to the provision of adequate capacity for service. These types of fixed costs occur on a recurring basis regardless of the amount of water used by the customer.

Therefore, rate structures need to afford the ability to recover at least some of the fixed costs based on billing parameter that is not related to water usage or wastewater flow. The fixed charge, which is assessed regardless of the volume of water used, provides a mechanism to reliably recover some of the fixed annual operating costs of the utility, and provide for some level of revenue stability.

3.2 VOLUMETRIC (USAGE) CHARGE

In the utility industry, usage charges are designed to recover all other costs (except those that are recovered through fixed charge) associated with the treatment and delivery of water service and the collection, treatment, and disposal of wastewater.

The three common types of volumetric charge are: (i) inclining block rate, where the usage in the next higher usage block is priced at a higher rate per unit; (ii) uniform block rate, where all units of usage is priced at the same unit rate; and (iii) declining block rate, where the usage in the next higher usage block is priced at a lower rate per unit. As usage patterns vary among customer classes and consequently different classes place different levels of service demands, different volumetric rates can be established for the various customer classes. In designing the volumetric rate structure, practical considerations including conservation, equity, affordability, and ease of administration are addressed.

3.3 EXISTING OPERATING FUND RATE STRUCTURE

3.3.1 Water Rate Structure

Consistent with industry rate structures, the County’s Operating Fund water rate structure comprises of both Fixed Charge and Volumetric Charge components. The water rate structure includes the following three components:

- Base Charge (Fixed Charge);
- Volume Charge (Volumetric Charge); and
- Fire Line Ready-to-Serve Charge (Fixed Charge).

Some of these components are applicable to only specific customer classes. The revenues derived from the above three charges are collectively referred to as “**Water Service Revenues.**”

In addition, the County also has a *Purchased Water Adjustment Charge*, which is a volumetric charge. This charge is assessed to recover the costs the County incurs in purchasing raw water from the City of Baltimore. The revenues from the Purchased Water Adjustment Charge are included as part of “**Other Revenues.**”

The customer classes to which the specific charge components apply is illustrated in Figure 3-1. The existing water rate schedule for FY 2015 and FY 2016, for these rate components, is presented in Appendix 1.

Figure 3-1 Harford County: Existing Water Service Revenue Rate Structure

RATE COMPONENT	APPLICABLE CUSTOMER CLASSES
<ul style="list-style-type: none"> • Base Charge by Meter Size; and • Volume Rate (Two-tier inclining block rates per 1,000 gallons); 	<ul style="list-style-type: none"> • Harford Water Only; • Harford Water & Sewer; • Maryland (MD) American; • Swan Creek Water Only; • Swan Creek Water & Sewer; and • Swan Creek Commercial Water & Sewer; <i>(Above Customer Classes Billed Quarterly)</i>
<ul style="list-style-type: none"> • Volume Rate (Single rate per 1,000 gallons) for Wholesale customers <i>(Customers Billed Monthly)</i> 	<ul style="list-style-type: none"> • Misc Customers; • City of Aberdeen; • APG at Chapel Hill; and • APG at Van Bibber <i>(Above Customer Classes Billed Monthly)</i>

- Fire Line Ready-to-Serve Charge by Meter Size and Service Line Size
- Any customer with a Fire Line connection *(Customers Billed Quarterly)*

<ul style="list-style-type: none"> • Purchased Water Adjustment Charge (Single rate per 1,000 gallons) 	<ul style="list-style-type: none"> • All customer classes
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3.3.2 Sewer Rate Structure

The County’s Operating Fund sewer rate structure also comprises of both Fixed Charge and Volumetric Charge components. The sewer rate structure includes the following three components:

- Base Charge (Fixed Charge);
- Volume Charge (Volumetric Charge); and
- Sewer Flat Charge (Fixed Charge).

The revenues derived from all these three sources are collectively referred to as “**Sewer Service Revenues.**” Some of these user rate components are applicable to only specific customer classes. The customer classes to which the specific rate components are applicable is illustrated in Figure 3-2. The existing sewer rate schedule for FY 2015 and FY 2016 is presented in Appendix 1.

Figure 3-2 Harford County: Existing Sewer Service Revenue Rate Structure

RATE COMPONENT	APPLICABLE CUSTOMER CLASSES
<ul style="list-style-type: none"> • Base Charge by Meter Size; and • Volume Rate (Two-tier inclining block rates per 1,000 gallons); 	<ul style="list-style-type: none"> • Harford Sewer Only; • Harford Water & Sewer; • Metered Sewer; • Swan Creek Sewer Only; • Swan Creek Water & Sewer; and • Swan Creek Commercial Water & Sewer
<ul style="list-style-type: none"> • Quarterly Flat Rate (per bill) 	<ul style="list-style-type: none"> • Harford Residential Flat; • Harford Commercial Flat; • Swan Creek Residential Flat; • Swan Creek Commercial Flat; • Whiteford; and • Spring Meadows

4.0 Water Utility

The financial plan, cost of service, and rate design were developed to build the minimum level of financial integrity necessary to meet all the funding obligations of the water utility, and to provide a financial path to achieve the financial performance targets discussed in Section 2.3.

Water Utility Financial Plan

The water utility financial plan was developed for the forecast period of FY 2016 through FY 2021, and includes the following key components:

- Revenue projections (user rate revenues and non-rate revenues);
- Capital improvement program;
- Annual revenue requirement projections; and
- Annual proposed revenue increases.

4.1 WATER REVENUE PROJECTIONS UNDER EXISTING RATES

The water utility revenues that are designated to the Operating Fund are derived from the following sources:

- Water Service Revenues (Base, Volume, and Fire Line)
- Non-Rate Revenues (Miscellaneous, Other, Interest Income, and Intra-County)

As a first step in the development of a financial plan, Water Service Revenues were determined under the FY 2016 rates, and then projected for the six-year forecast period.

4.1.1 Water Service Revenues from Existing Rates

As described in Section 3.3.1, the Water Service Revenue consists of four charge components. For each of the four components, revenues are projected based on billing units and applicable existing rate schedules. The billing units necessary to compute the Base Charge and Fire Line Charge revenues are the *number of accounts* based on meter size and customer class. The billing units necessary to compute the Volume and Purchased Water revenues are the *annual water usage* by customer class, and by applicable blocks of usage.

Projection of Customer Accounts

Typically, historical billing units are reviewed and used to project billing units for the forecast period. The project team reviewed historical accounts and usage trends for each customer class referenced in Section 3.3.1.

Based on the review of the historical trends, two annual adjustment factors were applied to project billing units for the forecast period. The two adjustment factors applied at the customer class level are *accounts growth rate* and *usage factor*. The number of accounts in most of the customer classes expected to remain at the FY 2014 level. A moderate decrease is anticipated in the Harford Water only class, and a rather slow growth is anticipated in the Harford Water and Sewer class.

The total number of water accounts is anticipated to increase from 39,777 in FY 2014 to 41,507 in FY 2021, at an overall annual system growth rate of 0.60%. [Table W-1, in Appendix 2](#), presents the projected annual number of accounts for the period of FY 2015 through 2021.

Figure 4-1 presents both the historical and projected number of accounts for the water utility.

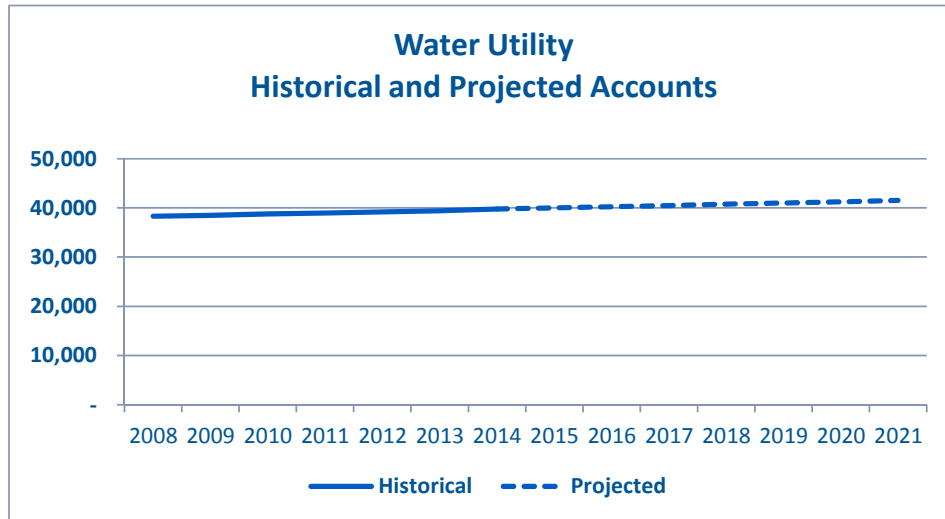


Figure 4-1 Historical and Projected Water Accounts

Projection of Water Sales

Water sales, or billed water volumes, are projected based on estimates of the number of water accounts and the average billed usage per account. Average water use per account is determined based on historical usage. The historical average usage per account appears to be relatively stable in all classes, during the period of FY 2012 through FY 2014. Therefore, with the exception of the wholesale customer – APG Van Bibber, the average usage per account is estimated to remain at the FY 2014 level in all the classes, during the forecast period.

Based on input from the County management, APG Van Bibber is expected to not have any water usage during FY 2016 through FY 2018, and resume its annual water purchase (at the FY 2015 level) beginning FY 2019. Consequently, total system water usage is projected to decrease from 3.66 billion gallons in FY 2014 to 3.44 billion gallons in FY 2016. With the resumption of APG Van Bibber usage in FY 2019 along with a moderate increase in usage due to the growth in accounts, total system water usage is projected to increase to 3.86 billion gallons beginning FY 2019.

[Table W-2, in Appendix 2](#), presents the projected annual water volume for the period of FY 2015 through 2021. Figure 4-2 presents both the historical and projected annual billed volume for the water utility.

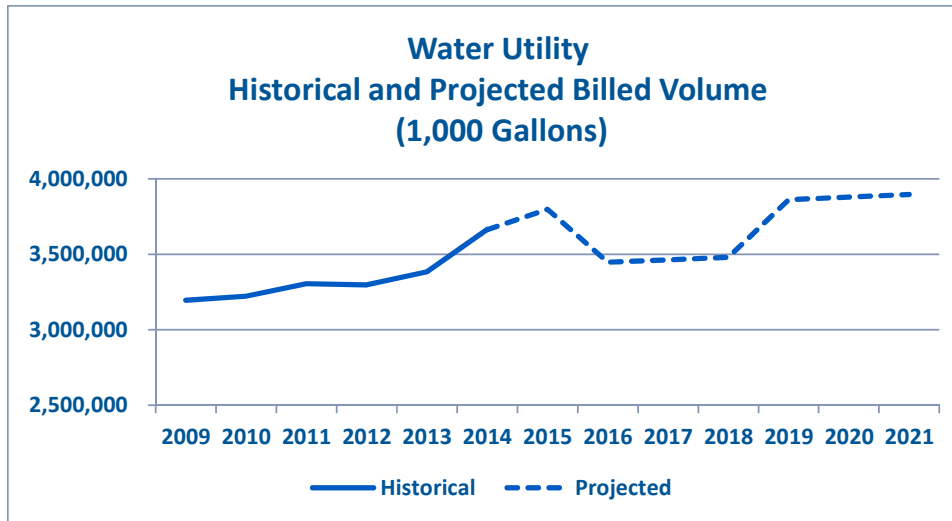


Figure 4-2 Historical and Projected Water Volume

Projection of Service Revenues under Existing Rates

Table W-3a, in Appendix 2, presents the historical service revenues for the period of FY 2009 through FY 2014 (summarized from the County’s billing system). Service revenues for the period of FY 2015 through FY 2021 are projected for each charge component (Base, Volume, Purchased Water, and Fire Line) based on the projections of accounts by meter size, projected water usage for each customer class, and the application of the FY 2016 rate schedule.

Water service revenue under existing rates is projected to decrease from \$12.6 million in FY 2015 to from \$11.9 million in FY 2016 due to the cessation of water usage by APG Van Bibber during FY 2016 through FY 2018. With the resumption of water use by APG Van Bibber beginning FY 2019, annual service revenues are projected to increase to \$13.1 million beginning in FY 2019.

Tables W-3.1 through W-3.4, in Appendix 2, present the projected annual revenue under existing rates for the Base Charge, Volume Charge, Purchased Water, and Fire Line Charge components, respectively.

Table W-3, in Appendix 2, presents a consolidated summary of the total water utility service revenues projected for the period of FY 2015 through FY 2021.

Figure 4-3 presents both the historical and projected annual service revenues under existing rates for the water utility.

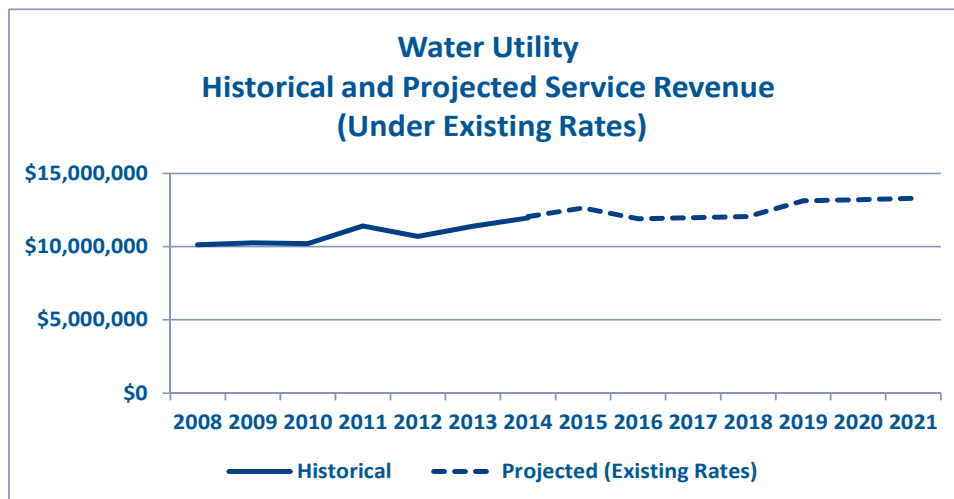


Figure 4-3 Historical and Projected Water Service Revenue

4.1.2 Non-Rate Water Revenues

Non-rate revenues include the following four components:

- Miscellaneous Revenues;
- Other Revenues; and
- Intra-County Revenues.

Miscellaneous Revenues include 50% of the annual revenues from Sale of Property; Rental Income; and Other Miscellaneous Revenues, that are allocated to the water utility. *Other Revenues* include revenues from Purchased Water, Meter Installation, Interest and Penalty charges, and Miss Utility. *Intra-County* revenues reflect a portion of the County revenues allocated to the water utility.

The annual Miscellaneous, Other (excluding Purchased Water), and Intra-County revenues for FY 2014 is \$790,213, and is projected to remain at this level during the forecast period. The Purchased Water revenue is projected to increase consistent with the water usage projection for each year of the forecasting period and the FY 2016 purchased water volume rate of \$0.10 per 1,000 gallons of billed volume. Based on this existing rate, the annual Purchased Water revenue is projected to be just over \$300,000 during the forecast period.

Line 15 of Table W-4, in Appendix 2, presents a consolidated summary projection of the total Non-Rate Water Revenues for the period of FY 2015 through FY 2021. The non-rate revenues including revenues from purchased water are expected to grow only modestly from \$1.10 million in FY 2016 to \$1.14 million in FY 2021.

4.2 WATER CAPITAL IMPROVEMENT PROGRAM

The County's water utility Capital Improvement Plan (CIP) provides for a total of \$36.6 million of investments during the period of FY 2016 through FY 2021. Table W-5, in Appendix 2, presents the CIP list of projects and schedule for the period of FY 2015 through FY 2021.

It is important to note that the \$36.6 million of total CIP includes both *Expansion* and *Non-Expansion* projects. Only the Non-Expansion CIP projected investments of \$15.3 million, planned for the

study period, is included in this Service Revenues financial plan. [Table W-5.1, in Appendix 2](#), presents the water utility’s Expansion and Non-Expansion CIP costs.

The cost of the scheduled Non-Expansion CIP of the water utility is expected to be financed from a funding mix of cash financing from service revenues (Paygo) and Bonded Debt. Figure 4-4 presents the projected mix of Paygo and Bond financing for the water utility Non-Expansion CIP.

Figure 4-4 Water Utility Non-Expansion CIP Financing

FUNDING SOURCE	WATER UTILITY NON-EXPANSION CIP (ESCALATED) (FY 2016 – FY 2021)
Bonds	\$ 5,119,789
Cash Financing (Paygo)	\$10,214,628
Total Non-Expansion CIP	\$15,334,417

4.3 WATER REVENUE REQUIREMENTS

As briefly discussed in Section 2.5, projection of reliable revenue requirements includes: (i) O&M expenses; (ii) debt service requirements; (iii) reserves; (iv) cash financing of capital; and (v) any transfers. In addition, annual revenues need to be adequate to build and sustain the financial performance targets discussed in Section 2.4. The projection of annual revenue requirements for the forecast period is discussed in this section.

4.3.1 O&M Expenses

O&M expenses for the water utility include the annual expenses associated with supply; treatment; storage and distribution; meter and services; billing, collection, and accounting; and administrative and general services. These expenses include personnel costs (salaries and benefits), costs for material and supplies, costs of utilities, and contract services.

The FY 2016 O&M budget provided by the County was used as the baseline. Based on historical O&M costs, industry experience, and discussions with the County management, appropriate escalation factors were applied to various categories of costs to project future annual O&M expenses. Annual escalation factors used for key cost categories include the following:

- Chemicals: 9%; Benefits & Sludge Disposal: 5%; Power & Equipment: 4%
- All other costs: 3%

Total FY 2016 baseline O&M expenses for the water utility are budgeted at \$14.9 million. Annual water system O&M expenses are projected to increase to \$18.7 million in FY 2021. Figure 4-5 presents the projected O&M expenses for the water utility. [Table W-6, in Appendix 2](#), presents the water utility’s projected annual O&M expenses.

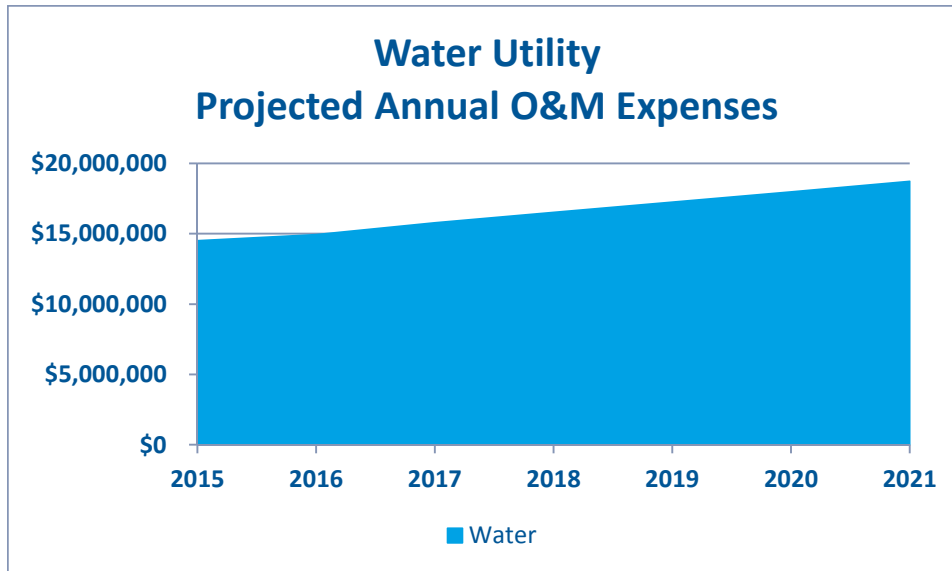


Figure 4-5 Projected Annual Water O&M Expenses

4.3.2 Debt Service

The County does not have any outstanding General Obligation bond related debt service costs related to Non-Expansion CIP. A total of \$4.26 Million of new bond issuance is estimated for the Water Utility to fund Non-Expansion capital investments, during the forecast period. The annual proposed debt service related to this estimated bond issuance is to be paid from service revenues, and is projected to increase from \$116,807 in FY 2015 to \$429,311 in FY 2021. [Line 11 of Table W-7, in Appendix 2](#), presents the projected annual debt service. [Line 1 of Table W-7.1, in Appendix 2](#), reflects the projected new bond issuance amounts.

Figure 4-6 presents the projected debt service expenses for the water utility.

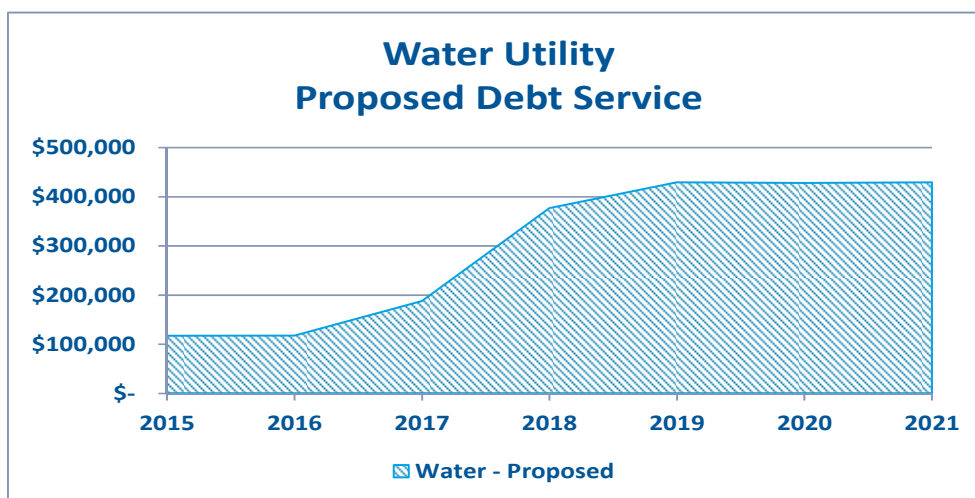


Figure 4-6 Projected Annual Water Debt Service

4.3.3 Transfers to Construction Fund

In addition to the O&M expenses discussed in sub-section 4.3.1 and the debt service discussed in sub-section 4.3.2, there are other revenue requirements such as cash financing of capital program and other transfers that need to be forecasted for the study period. These additional revenue requirements of the water utility are as follows:

- Cash financing for Non-Expansion capital program (Non-Expansion Pay-go)
- Recurring Annual Capital for Fleet
- Cash financing for Expansion capital program (Expansion Pay-go)

Lines 12.1 and 12.2 of Table W-7, in Appendix 2, presents the projected annual Non-Expansion Pay-go and the recurring capital transfer for fleet, respectively. Line 12 of Table W-7, in Appendix 2, presents the sum of the annual transfers needed for the recurring fleet and non-expansion pay-go. To adequately fund non-expansion capital investment needs, it is projected that a total cash financing (Pay-go) of \$10.2 Million will be necessary during FY 2016 through FY 2021.

In addition, the Water Utility also needs to cash finance the Expansion related capital program, and hence is projected to contribute \$1.65 million annually beginning FY 2019. Line 13 of Table W-7, in Appendix 2, reflects the projected annual pay-go transfer for expansion capital program.

In summary, the total annual revenue requirements of the water utility include the sum of the annual O&M, debt service, and transfers. Line 14 of Table W-7, in Appendix 2, presents the projected annual revenue requirements estimated for each year of the study period.

4.4 WATER PROPOSED SERVICE REVENUE INCREASES

4.4.1 Summary of Revenue and Requirements

The annual revenue adjustments that are needed to achieve the defined financial performance objectives are determined by evaluating the funding gap between the projected annual revenue requirements and the projected revenues under existing rates. Table W-7, in Appendix 2, provides a summary of the revenue and revenue requirements (financial plan) for the forecast period of FY 2016 through FY 2021.

Projected Revenue Under Existing Rates: Line 2 indicates that under existing rates (FY 2016 rates) water utility revenues will increase from \$11.6 million in FY 2016 to \$12.9 million in FY 2021.

Projected Non-Rate Revenues Including Interest Income: Lines 5 through 8 present the various sources of non-rate revenues. The sum of those revenue items is expected to increase from \$1.12 million in FY 2016 to \$1.17 million in FY 2021.

Projected Revenue Requirements: Line 14 indicates that total annual revenue requirement for the water utility is expected to increase from \$16.6 million in FY 2016 to \$27.3 million in FY 2021.

Funding Gap: The cash flow analysis indicates that, beginning in FY 2015, the sum of the revenues under existing rates and the non-rate revenues, is not adequate to fund the projected annual revenue requirements, thereby causing an operating deficit.

Proposed Revenue Adjustments: To address the critical annual funding gap in the service revenues of the water utility, the following measures are proposed:

- A complete draw down (in FY 2016) of the \$3.08 million service revenue fund balance that is available at the beginning of FY 2016;
- A series of revenue adjustments at the suggested time:
 - FY 2016: 22.5% (mid-year implementation, effective January 1, 2016)
 - FY 2017: 22.5% (mid-year implementation, effective January 1, 2017)
 - FY 2018: 5% (effective July 1, 2017)
 - FY 2019: 5% (effective July 1, 2018)
 - FY 2020: 5% (effective July 1, 2019)
 - FY 2021: 4% (effective July 1, 2020)

Line 1 presents the percent of annual revenue adjustments needed and Line 3 reflects the amount of revenue increases that can be generated each year with the proposed magnitude and timing of revenue adjustments.

Substantive revenue adjustments are needed in FY 2016 and FY 2017 to transition from an operating deficit to first a break even position. Additional level annual revenue adjustments are needed during FY 2018 through FY 2021 not only to fully fund the O&M, debt service, and cash transfer obligations but also to achieve the *minimum* financial performance targets of 60 days of annual O&M reserve and cash financing of capital program.

With the proposed series of annual revenue adjustments, the water utility is projected to achieve and sustain the minimum 60 day level of O&M reserve beginning FY 2018. Line 17 shows the fiscal year ending projected operating balance from service revenues, and Line 18 presents the required minimum 60 day O&M reserve requirement.

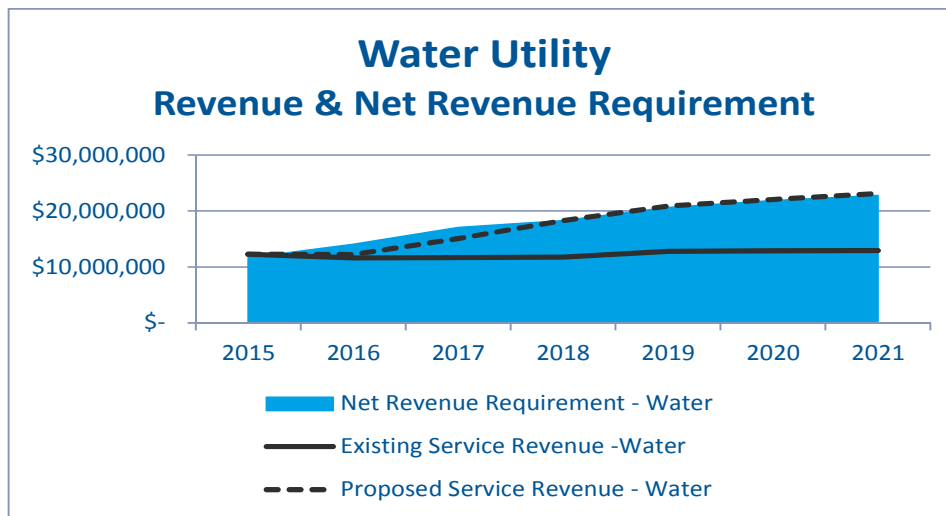


Figure 4-7 Water Revenues and Revenue Requirements

Water Utility Cost of Service

A key step to developing an equitable rate structure involves the cost of service analysis. The financial plan discussed in Sub-sections 4.1 through 4.4 provides an estimate of the total annual revenue requirements for a given fiscal year. The cost of service analysis provides a mechanism to defensibly allocate the total annual revenue requirements to the various customer classes.

The cost of service analysis is typically performed for a single specific year (“Test Year”) for which rates and charges are to be designed. On completion of the financial plan, the County management desired to seek Council approval for multiple years of rate increases. Therefore, the cost of service analysis for the water utility, described herein, was performed for each of the five test years, namely, FY 2016, FY 2017, FY 2018, FY 2019, and FY 2020.

4.5 WATER COST OF SERVICE

As the methodology used in performing a cost of service analysis for each of the five test years is the same, in the following sub-sections, the cost of service approach and the results of the analysis are explained using just the FY 2016 analysis. The key components of the cost of service analysis are:

- Determination of Cost of Service (net revenue requirements);
- Determination of Functional Costs;
- Allocation of Functional Costs to Cost Components; and
- Determination of Unit Cost of Service.

4.5.1 Determination of Cost of Service

The first key step is to determine the cost of service that is to be recovered from user rates and charges. As briefly discussed in Section 2.5, Cost of Service is defined as and synonymous with the “net revenue requirement” that is to be recovered, for the test year, through user rates and charges. In determining costs of service to be met from charges for water service, the following are deducted from total revenue requirements:

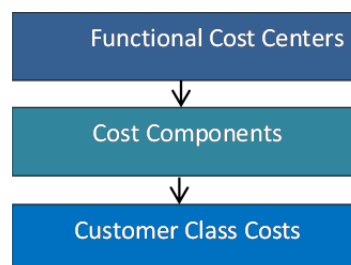
- Income from non-rate revenues (discussed in subsection 4.1.2); and
- Any projected operating deficit.

Table W-8, in Appendix 2, presents the derivation of the cost of service to be recovered through water charges. As Line 12 in Table W-8 indicates, the water cost of service for FY 2016 is projected to be \$12.55 Million. This cost of service consists of \$11.86 Million of O&M expenditures and \$0.69 Million of capital costs.

4.5.2 Determination of Functional Costs

As a basis for developing an equitable rate structure, the test year cost of service should be allocated to the various customer classes according to respective service requirements.

The basic underlying principle in developing cost of service rates is the determination of what elements in a water system are responsible for causing the level of revenue requirements that is needed. To allocate the costs to customer classes, first the



operating and capital costs of service are aggregated into “Functional Cost Centers.” The functional costs are then further allocated to cost components. Each component cost is then apportioned to customer classes.

Functional Cost Centers

Functional cost centers of a water utility represent the activities that contribute to the incurrence of O&M and capital costs. For a water utility, they often include source of raw water *supply, pumping, treatment, storage, distribution, meters, billing, and other administration* costs. Both the O&M and capital costs defined for the Test Year, discussed in 4.5.1, need to be allocated to functional cost centers. [Table W-9 and Table W-11, in Appendix 2](#), present the capital and O&M functional cost centers as defined in the County’s water/sewer fund accounting system.

Functional Costs

The **capital costs** associated with the functional cost centers are determined using detailed fixed assets data, provided by the County, for each class of asset that is currently in service in the water system. The total value of the fixed assets (referred to as “plant investment”) in the system is usually presented as Original Cost Less Depreciation (“OCLD”). The total estimated OCLD of the water system is \$171.5 Million, as presented in [Line 23 in Table W-9, in Appendix 2](#). This plant investment data is subsequently used as a basis for the allocation to cost components, discussed in the following sub-section 4.5.3.

The **O&M costs** for the Test Year are allocated to the various functional cost centers based on the specific nature of the costs. For example, the O&M costs associated with the water treatment plants such as Abingdon and Perryman are allocated 100% to the treatment cost center. Other O&M costs such as Water Engineering and Other O&M costs are allocated to the various functional cost centers based on the proportionate allocation of plant investment costs. The allocation of the projected O&M cost of service (net operating revenue requirement) of \$11.86 Million, to the various functional cost centers, is presented in the second column of [Table W-11, in Appendix 2](#).

4.5.3 Allocation of Functional Costs to Cost Components

The functional costs discussed in sub-section 4.5.2 are typically allocated to specific cost elements based on the customer classes and the type of rate structure the utility has. As discussed in Section 3.3, the retail rate structure has four components – a fixed charge based on meter size; a two-tiered volumetric rate; a fire line charge based on meter size, and a purchased water volumetric rate.

The rate structure does not further delineate rates by residential, commercial, and other types of customer classes. Hence, to equitably allocate the functional O&M and capital costs to the rate structure components, five cost components were defined. The five cost components are:

- Volume (for determining the two tiered volumetric rates);
- Purchased Water (for determining the purchased water volumetric rate);
- Meters and Services, and Customer Billing (for determining the meter size based fixed charge); and
- Fire Protection (for determining the fire-line Ready-to-Serve service charge).

Volume costs include the operating costs of supply, treatment, pumping, storage, transmission and distribution facilities, and a portion of general administration costs, as well as capital costs on water plant investment associated with serving customers to the extent required for a constant, or

average annual rate of use. The total volume of water produced impact the costs of supply and treatment. Hence, these two functions are allocated 100% to the Volume cost component. The costs of pumping, transmission, distribution not only depend on the total volume of water provided, but also are driven by any demand associated with providing fire protection needs. Hence, these functional costs are allocated between Volume and Fire Protection cost components.

Purchased Water costs include the purchased water related operating and capital costs the County incurs annually in purchasing raw water from the City of Baltimore. Hence, these costs are allocated 100% to Purchased Water cost component.

Meters and Services costs are costs that tend to vary in proportion to the number of customers (meters) connected to the system. These costs include meter reading and other meter related services costs, and a portion of administrative and general costs. Hence, these costs are allocated 100% to Meters and Services cost component.

Customer Billing costs include costs associated with billing, collections, and customer service. These costs generally tend to vary in proportion to the number of bills rendered. Hence, these costs are allocated 100% to Customer Billing cost component.

Fire Protection costs includes 30% of the costs of pumping, transmission, and distribution. In addition, a proportion of the general administration costs.

Allocation of Capital Cost of Service to Cost Components

Based on the approach described above, first the plant investment functional costs discussed in sub-section 4.5.2 are allocated to the five cost components. [Line 23 and Line 24 in Table W-9, in Appendix 2](#) present the results of the allocation of the Plant Investment, and the resulting percent distribution to each of the cost components, respectively.

The Test Year capital cost of service is then allocated to the five cost components, with purchased water cost allocated 100% to the purchased water cost component, and other capital costs allocated based on the proportionate distribution of the plant investment for each cost component. [Line 13 in Table W-10, in Appendix 2](#) presents the results of the allocation of the Test Year capital cost of service to each of the cost components.

Allocation of O&M Cost of Service to Cost Components

Based on the approach described above, each of the Test Year O&M Functional Cost is allocated to the five cost components. [Line 15 and Line 16 in Table W-11, in Appendix 2](#) present the results of the allocation of the Test Year O&M cost of service, and the resulting percent distribution to each of the cost components.

4.5.4 Determination of Unit Cost of Service

The unit cost of service for each of the key five cost component provides a defensible basis for designing the rate schedules for the Test Year. To determine the unit cost of service, the units of service for each cost component is first established.

Units of Service

The units of service, for the Test Year, which are applicable to Volume, Purchased Water, Meters and Services, Customer Billing, and Public Fire Protection components, are determined for each

retail and wholesale customer class defined in Figure 3-1 in sub-section 3.3.1. [Line 15 in Table W-12, in Appendix 2](#), presents the projected Test Year units of service for the different components.

Volume: The total billed volume is projected as the sum of the first tier and second tier usage water sales projection discussed earlier in sub-section 4.1.1. In addition, as the second tier is priced at an inclining rate with a 25% rate differential, an adjustment to the second tier billed volume was applied to determine the total units of service for the Volume component. A total of 3.47 Billion gallons is projected for the Volume component.

Purchased Water: As the costs of purchased water are recovered through a volumetric rate, the projected total billed volume, discussed above, is also applicable to the Purchased Water cost component.

Bills: The total number of bills projected for the Test Year is used as the basis for determining the unit cost of service for the billing cost component. A total of 161,017 bills are projected for the Test Year.

Meters and Services: The total number of meters for the Test Year is projected on the basis of the number of equivalent 5/8” meters on a capacity ratio basis to reflect the capacity of the service line size. The service line capacity ratios are used to translate the meters to equivalent 5/8” meters, as shown in Figure 4-8, as this component also reflects the capacity available to a customer for private fire protection.

LINE SIZE	EQUIVALENT CAPACITY RATIOS
5/8”	1.0
3/4”	1.5
1”	2.5
1 1/4”	3.8
1 1/2”	5.0
2”	8.0
3”	16.0
4”	25.0
6”	50.0
8”	80.0
10”	115.0
12”	125.0

Figure 4-8 Equivalent Meters & Services Ratio

A total of 50,123 equivalent meters are projected for the meters and services cost component.

Public Fire Protection: The number of Equivalent Dwelling Units (EDUs), for the Test Year, is projected to allocate the public fire protection cost component. A total of 66,610 EDUs are projected for the Test Year.

Unit Cost of Service

Unit cost of service for each cost component is developed by dividing the total cost allocated to the cost component (discussed in sub-section 4.5.3) by the total applicable units of service. [Line 4 and Line 6 in Table W-13, in Appendix 2](#), presents the projected Test Year units of service and the associated unit cost, respectively, for each of the different cost components.

These unit costs are then used to develop the rate schedules for the Test Year. The rate design is discussed in Section 4.6.

Water Utility Rate Design

The revenue requirement and the proposed revenue adjustments discussed in Section 4.4 provide the level of revenue increases for the water utility at the system level. The cost of service analysis and the resulting unit cost of service, discussed in Section 4.5, provide a basis for the review and update of a schedule of water rates that recovers allocated cost of service.

It should be recognized that these studies involve engineering estimates, consideration of historical data and, to some extent, judgment and experience. Therefore, judgment must enter into the final choice of rates, and factors such as customer bill impact, stakeholder acceptance, contractual agreements, and administrative concerns should be recognized in making rate adjustments.

As discussed in the previous section, as the County management desired to seek Council approval for multiple years of rate increases, the design of rate schedules, described herein, was performed for each of the five test years, namely, FY 2016, FY 2017, FY 2018, FY 2019, and FY 2020.

This section presents the results of the following:

- Proposed rate schedules;
- Residential bill impact; and
- Water residential bill benchmarking.

4.6 WATER RATE DESIGN

The key factors to be addressed during the design of rate schedules were discussed with the Division of Water and Sewer management and County administration. Key guidelines provided were as follows: (1) develop rate modifications so that the total revenues recovered from water and sewer charges will be at least adequate to recover the respective revenue requirements of each utility, without the need for one utility to subsidize the other, (2) recover test year revenue from each class of water customer approximately equal to the allocated costs of providing service, (3) use practical rate setting strategy, as needed, to mitigate significant rate impacts, (4) simplify the

water rate structure by integrating the private fire ready-to-serve charge with the base charge, and (5) provide a rate mechanism for stable infrastructure reinvestment.

4.6.1 Proposed Water Rate Structure

The existing retail and wholesale rate structures were discussed in sub-section 3.3.1. The proposed retail and wholesale water rate structure retains all of the existing rate components. For most of the rate components, the proposed basis of rates and charges is the same as the existing basis.

In addition, in the proposed rate structure, a new rate component, namely, the Water Asset Reinvestment Charge (“Water ARC”) is proposed. It should be noted that the revenues generated from the Water ARC are to be accounted for entirely in the Water/Sewer Capital Fund and not in the Operating Fund, which is the purview of this report.

A brief description of the proposed water rate structure is presented.

- **Retail Base Charge & Volume Rate:** The existing *Base Charge* which is based on meter size, and the two-tiered inclining *Volume Rate* based on the quantity of water used are retained in the proposed rate structure as well. These types of rate components are commonly used among water utilities to recover revenues from customers commensurate with the cost of service.

It is important to note that in the proposed rate structure, the separate retail fire-line charge that the County had is eliminated. The purpose of the separate fire-line ready to serve charge was to recover the costs of capacity that the utility maintains to serve oversized connections and meters required to provide private on-site fire protection, such as fire sprinklers systems and private fire hydrants.

Rather than have a separate charge for private fire line capacity, it is proposed that the costs associated with the availability of fire line capacity be reflected in the Base Charge. To do so, in the proposed rate structure, the line size capacity ratios are used to determine the equivalent meters. The capacity ratios, as presented in Figure 4-8, used to determine the total number of equivalent 5/8” meters was discussed in sub-section 4.5.4.

- **Purchased Water Adjustment Charge:** The County is expected to continue to purchase raw water from the City of Baltimore. Hence, the existing purchased water charge is to be retained in the proposed water rate structure, so as to recover the costs associated with purchased water.
- **Wholesale Volume Rate:** Consistent with the existing rate structure, it is proposed that the County retain the uniform volumetric rate for the wholesale customers who purchase water in bulk, and for which the County does not maintain the distribution system. The uniform volumetric rate for the wholesale customers will be the same as the Harford retail water usage rate of the first block.
- **Water ARC:** To provide a nominal level of cash financing for water infrastructure renewal and replacements, a Water ARC is proposed. The revenues from Water ARC are to be dedicated for financing reinvestments in existing water assets. Reinvestments in the water assets need to occur in a proactive manner in order to maintain system integrity and service reliability. Therefore, these investments in the water system assets are essentially fixed costs that have to be incurred regardless of the volume of water treated, stored, and distributed. Therefore, the Water ARC is designed as a quarterly fixed charge based on meter size. The capacity ratios of the meters were used in designing the meter size based Water ARC.

4.6.2 Proposed Water Rate Schedules for FY 2016 through FY 2020

A comparison of the Test Year cost of service determined for each customer class and the revenues from existing rates reflects the level of rate adjustment that is necessary for each rate component discussed in the preceding proposed rate structure.

The proposed water rate schedules are designed for each of the five fiscal years of FY 2016, FY 2017, FY 2018, FY 2019, and FY 2020.

- **Retail Base Charge Phase-in:** In the case of the retail *Base Charge* based on meter size, the comparison of the cost of service and the revenues under existing rates for each meter size indicated that the ¾" and higher size meters were recovering more than the cost of service, and the 5/8" meters were recovering less than the cost of service. Hence, an adjustment to the meter size based base charge was necessary in addition to the rate adjustment needed for increased revenue requirements.

Transitioning the 5/8" meters to the cost of service rates in the very first test year (FY 2016) would create a significant increase in the residential customer bills, as over 95% of the retail water customer accounts are 5/8" meters.

Hence, to mitigate the bill impact, a gradual *phase-in* to cost of service rates is proposed. The phase-in of the Base Charge is designed such that the rates for the 5/8" meter size will gradually be increased during the period of FY 2016 through FY 2020 to fully align with their cost of service by FY 2020. During the same period, the rates for the ¾" and larger meter sizes will gradually be decreased during the period of FY 2016 through FY 2020, from the existing rate levels, to fully align with their cost of service by FY 2020.

The proposed rate schedules for the Base Charge for FY 2016 through FY 2020 are presented in [Table W-14, in Appendix 2](#).

Retail Volume Rate: The volume rates determined based on cost of service analysis, for each of the two tier blocks, were in alignment with the volume rates under existing rates. However, as the Base Charge had to be phased-in over five years to mitigate bill impact, the cost of service volume rates also had to be adjusted so as to assure 100% recovery of the total water system revenue requirements in each of the five test years. The proposed rate schedules for the retail volume rates for FY 2016 through FY 2020 are presented in [Table W-14, in Appendix 2](#).

- **Purchased Water Adjustment Rate:** The uniform purchased water rate of \$0.10 per 1,000 gallons is to be retained in the proposed rate structure for each of the five fiscal years, FY 2016 through FY 2020. This purchased water adjustment charge is applicable to both retail and wholesale customers.
- **Water ARC:** As indicated in sub-section 4.6.1, the Water ARC is proposed as a fixed charge based on meter size. The proposed rate schedules for the Water ARC for FY 2016 through FY 2020 are presented in [Table W-14, in Appendix 2](#).

4.6.3 Implementation of Proposed Rate Schedules and Proof of Revenue Adequacy

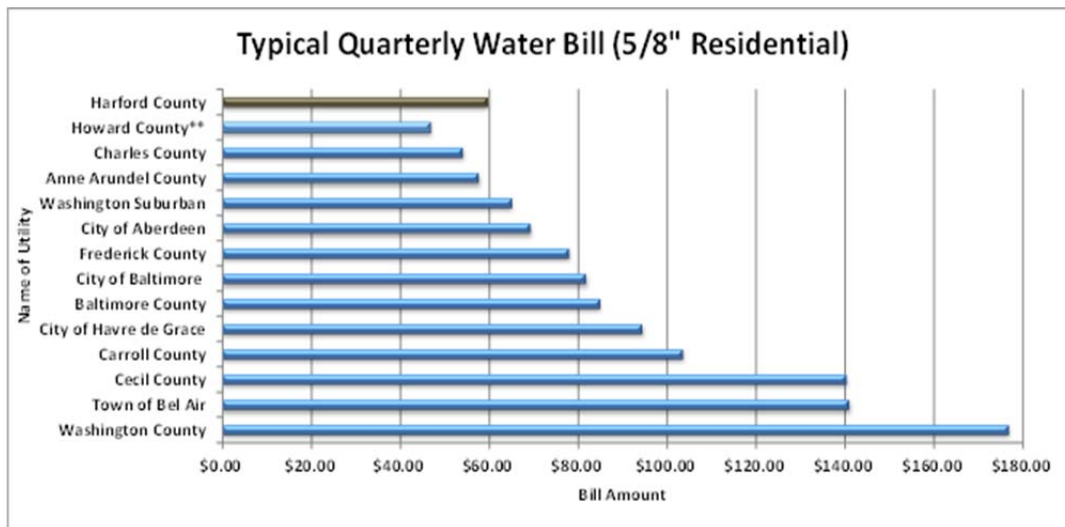
To provide adequate time to educate stakeholders on the comprehensive revenue study findings and the proposed rate increases, the County desired that the first rate increase (FY 2016) be implemented effective January 1, 2016 and the subsequent rate increase be implemented effective January 2017. Hence, the proposed rate schedules are to be implemented as follows:

- **FY 2016:** Effective January 1, 2016
- **FY 2017:** Effective January 1, 2017
- **FY 2018:** Effective July 1, 2017
- **FY 2019:** Effective July 1, 2018
- **FY 2020:** Effective July 1, 2019

Table W-15, in Appendix 2, presents a comparison of the revenues under existing rates and the proposed FY 2016 rates for the *Base Charge, Volume Charge; and Purchased Water*, for each customer class. The proposed FY 2016 revenues are calculated using an effective rate that reflects nine (9) months of billing under the existing FY 2016 rates, and three (3) months of billing under the proposed FY 2016 rates.

4.7 WATER SYSTEM RESIDENTIAL QUARTERLY BILL BENCHMARKING

Figure 4-9 presents a graphical illustration of the comparison of Harford’s residential quarterly water charges under proposed FY 2016 rates with that of a number of peer utilities in Maryland. In any utility typical bill benchmarking it is critical to recognize that the benchmark results only provide a high level overview of the typical bill. The benchmark results do not provide a reliable basis for any inference on performance or cost efficiencies, as there are significant differences among utilities including system characteristics, operations, service levels, compliance requirements, and level of infrastructure investment.



** Howard County receives "Ad Valorem" tax for its water sewer services.

Figure 4-9 Water Utility Residential Quarterly Bill Comparison

The residential quarterly bill benchmarking is discussed in greater detail in the Technical Memorandum titled, “*Water and Sewer Residential Bill Comparison with Other Utilities.*”

4.8 WATER SYSTEM RESIDENTIAL QUARTERLY BILL IMPACT

The project team calculated the quarterly water bill for an average residential customer under the existing FY 2016 rates and the proposed phased-in FY 2016 rates. The quarterly residential bill impact was calculated for a 5/8" meter with a quarterly usage of 14,000 gallons.

Figure 4-10 presents the quarterly water bill impact.

#	Description	Quarterly WATER
1	EXISTING Residential (5/8")	\$46.04
2	PROPOSED Residential (5/8")	\$59.84
3	Increase in Quarterly Charges	\$13.80

Figure 4-10 Residential Quarterly Water Bill Impact

5.0 Sewer Utility

The financial plan, cost of service, and proposed rates were developed to build the minimum level of financial integrity necessary to meet all the funding obligations of the sewer utility, and to provide a financial path to achieve the financial performance targets discussed in Section 2.3.

Sewer Utility Financial Plan

The sewer utility financial plan was developed for the forecast period of FY 2016 through FY 2021, and includes the following key components:

- Revenue projections (user rate revenues and non-rate revenues);
- Capital improvement program;
- Annual revenue requirement projections; and
- Annual proposed revenue increases.

5.1 SEWER REVENUE PROJECTIONS UNDER EXISTING RATES

The sewer utility revenues that are designated to the Operating Fund are derived from the following sources:

- Sewer Service Revenues (Base, Volume, and Flat Charges)
- Non-Rate Revenues (Miscellaneous, Other, Interest Income, and Intra-County)

As a first step in the development of a financial plan, Sewer Service Revenues were determined under the FY 2016 rates, and then projected for the six-year forecast period.

5.1.1 Sewer Service Revenues from Existing Rates

As described in Section 3.3.2, the Sewer Service Revenue consists of three charge components. For each of the three components, revenues are projected based on billing units and applicable existing rate schedules. The billing units necessary to compute the Base Charge and Flat Charge revenues are the *number of accounts* based on meter size and customer class. The billing units necessary to compute the Volume Charge revenue for all customer classes except Metered Sewer customers are the *annual water usage* by customer class, and by applicable blocks of usage. The billing units necessary to compute the Volume Charge revenue for Metered Sewer customers are the metered sewer volume by applicable blocks of usage.

Projection of Customer Accounts

Typically, historical billing units are reviewed and used to project billing units for the forecast period. The project team reviewed historical accounts and usage trends for each customer class referenced in Section 3.3.2.

Based on the review of the historical trends, two annual adjustment factors were applied to project billing units for the forecast period. The two adjustment factors applied at the customer class level are *accounts growth rate* and *usage factor*. The number of accounts in most of the customer classes is expected to remain at the FY 2014 level. Growth is anticipated in the Harford Sewer Only customers who are provided water service from Utilities Inc, and a rather slow growth is

anticipated in the Harford Water and Sewer class. A slow decrease is anticipated in the Harford Sewer Only customers who are served by Maryland American.

The total number of sewer accounts is anticipated to increase from 41,494 in FY 2014 to 43,617 in FY 2021, at an overall annual system growth rate of 0.72%. [Table S-1, in Appendix 3](#), presents the projected annual number of accounts for the period of FY 2015 through 2021.

Figure 5-1 presents both the historical and projected number of accounts for the sewer utility.

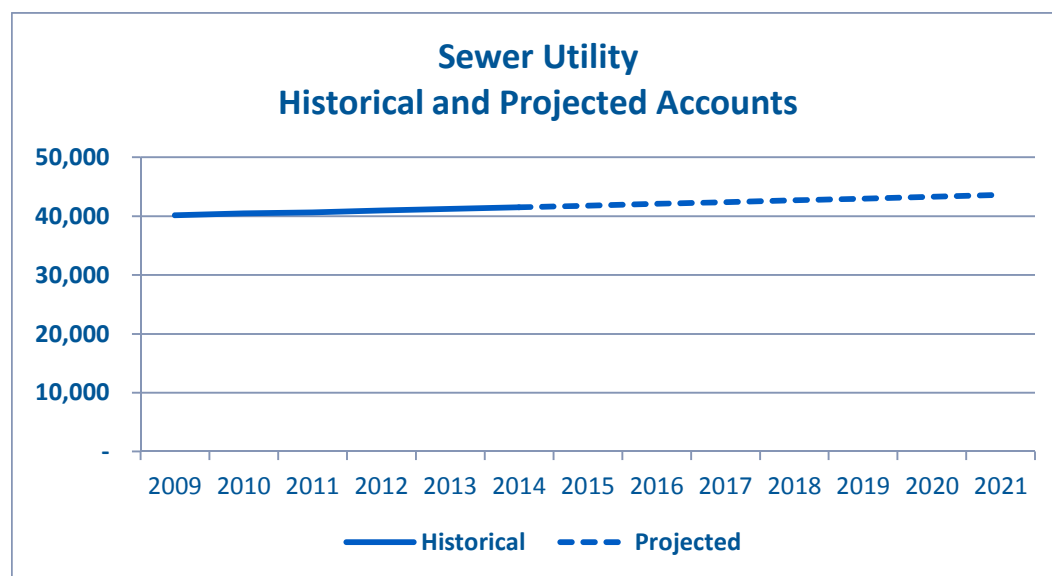


Figure 5-1 Historical and Projected Sewer Accounts

Projection of Sewer Billed Volume

Billed sewer volumes are projected based on estimates of the number of sewer accounts and the average billed volume per account. Average billed volume per account is determined based on historical billed volume data. The historical average billed volume per account appears to be relatively stable in all classes, during the period of FY 2013 and FY 2014. Therefore the average usage per account is estimated to remain at the FY 2014 level in all the classes, during the forecast period.

The total system sewer billed volume is projected to increase from 3.43 billion gallons in FY 2014 to 3.58 billion gallons in FY 2021, due to the growth in accounts.

[Table S-2, in Appendix 3](#), presents the projected annual sewer volume for the period of FY 2015 through 2021. Figure 5-2 presents both the historical and projected annual billed volume for the sewer utility.

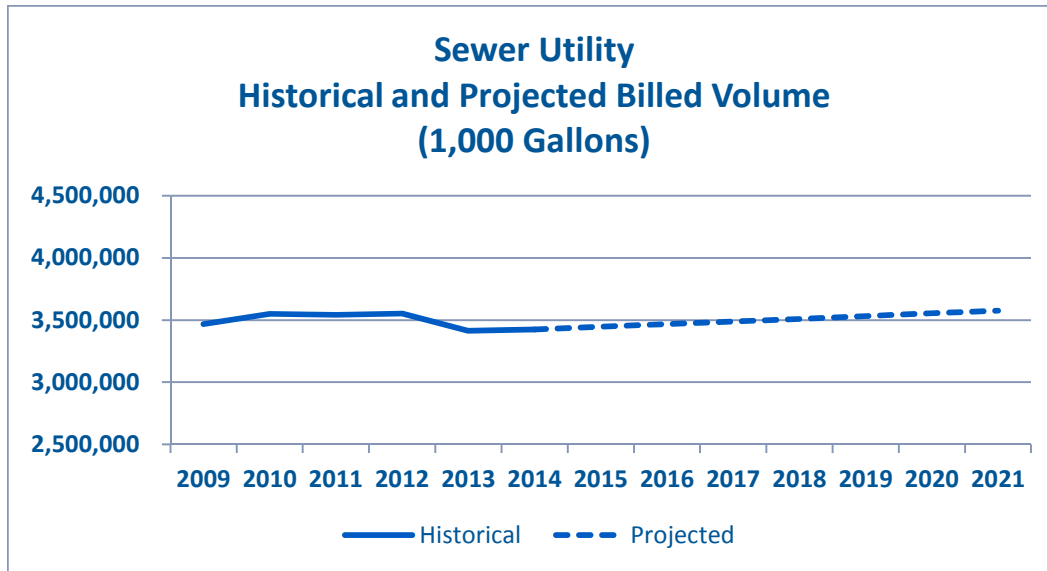


Figure 5-2 Sewer Billed Volume

Projection of Service Revenues under Existing Rates

Table S-3a, in Appendix 3, presents the historical service revenues for the period of FY 2008 through FY 2014 (summarized from the County’s billing system). Service revenues for the period of FY 2015 through FY 2021 are projected for each charge component (Base, Volume, and Flat Charge) based on the projections of accounts by meter size, projected billed sewer volume for each customer class, and the application of the FY 2016 rate schedule.

Sewer service revenue under existing rates is projected to increase from \$13.1 million in FY 2015 to from \$13.8 million in FY 2021 due to the projected growth in accounts.

Tables S-3.1 through S-3.4, in Appendix 3, present the projected annual revenue under existing rates for the Base Charge, Volume Charge, and Flat Charge components, respectively.

Table S-3, in Appendix 3, presents a consolidated summary of the total sewer utility service revenues projected for the period of FY 2015 through FY 2021.

Figure 5-3 presents both the historical and projected annual service revenues under existing rates for the sewer utility.

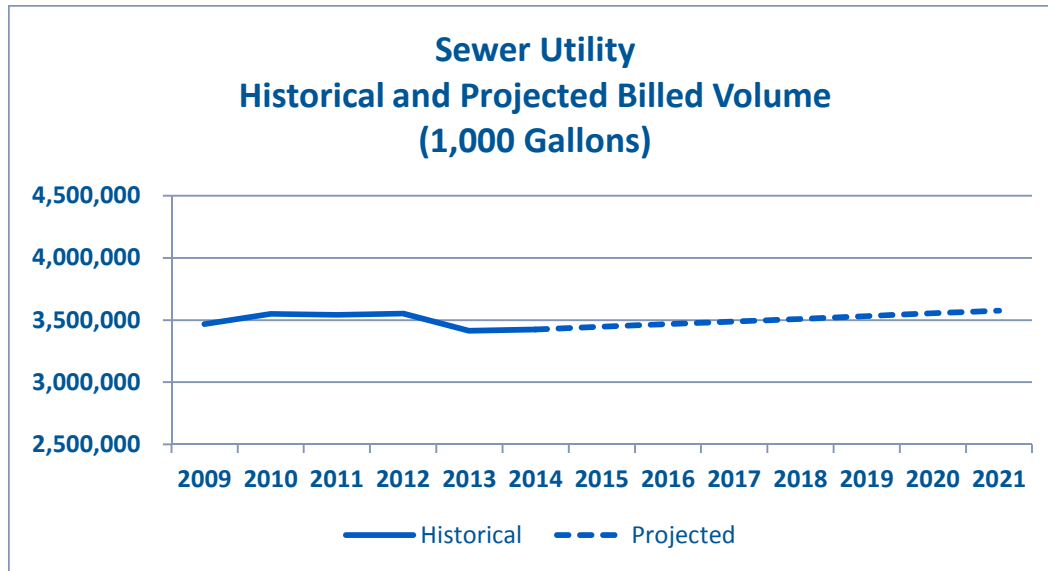


Figure 5-3 Sewer Service Revenue

5.1.2 Non-Rate Sewer Revenues

Non-rate revenues include the following three components:

- Miscellaneous Revenues;
- Other Revenues; and
- Intra-County Revenues.

Miscellaneous Revenues include 50% of the annual revenues from Sale of Property; Rental Income; and Other Miscellaneous Revenues, that are allocated to the sewer utility. *Other Revenues* include revenues from Meter Installation, Interest and Penalty charges, Septic Usage Charges, and Miss Utility. *Intra-County* revenues reflect a portion of the County revenues allocated to the sewer utility.

The annual Miscellaneous, Other, and Intra-County revenues for FY 2014 is \$1,018,213, and is projected to remain at this level during the forecast period.

Line 15 of Table S-4, in Appendix 3, presents a consolidated summary projection of the total Non-Rate Sewer Revenues for the period of FY 2015 through FY 2021.

5.2 SEWER CAPITAL PROGRAM

The County's sewer utility Capital Improvement Plan (CIP) provides for a total of \$72.8 million of investments during the period of FY 2016 through FY 2021. Table S-5, in Appendix 3, presents the CIP list of projects and schedule for the period of FY 2016 through FY 2021.

It is important to note that the \$72.8 million of total CIP includes both *Expansion* and *Non-Expansion* projects. Only the Non-Expansion CIP projected investments of \$27.2 million, planned for the study period, is included in this Service Revenues financial plan. Table S-5a, in Appendix 3, presents the sewer utility's Expansion and Non-Expansion CIP costs.

The cost of the scheduled Non-Expansion CIP of the sewer utility is expected to be financed from a funding mix of cash financing from service revenues (Paygo) and Bonded Debt. Figure 5-4 presents the projected mix of Paygo and Bond financing for the sewer utility Non-Expansion CIP.

Figure 5-4 Sewer Utility Non-Expansion CIP Financing

FUNDING SOURCE	SEWER UTILITY NON-EXPANSION CIP (ESCALATED) (FY 2016 – FY 2021)
Bonds	\$19,890,048
Cash Financing (Paygo)	\$7,275,107
Total Non-Expansion CIP	\$27,165,155

5.3 SEWER REVENUE REQUIREMENTS

As briefly discussed in Section 2.5, projection of reliable revenue requirements includes: (i) O&M expenses; (ii) debt service requirements; (iii) reserves; (iv) cash financing of capital; and (v) any transfers. In addition, annual revenues need to be adequate to build and sustain the financial performance targets discussed in Section 2.4. The projection of annual revenue requirements for the forecast period is discussed in this section.

5.3.1 O&M Expenses

O&M expenses for the sewer utility include the annual expenses associated with wastewater treatment services, wastewater pumping, wastewater collection and transmission, billing, collection and accounting, and administrative and general services. These expenses include personnel costs (salaries and benefits), costs for material and supplies, costs of utilities, and contract services.

The FY 2016 O&M budget provided by the County was used as the baseline. Based on historical O&M costs, industry experience, and discussions with the County management, appropriate escalation factors were applied to various categories of costs to project future annual O&M expenses. Annual escalation factors used for key cost categories include the following:

- Chemicals: 9%; Benefits & Sludge Disposal: 5%; Power & Equipment: 4%
- All other costs: 3%

Total FY 2016 baseline O&M expenses for the sewer utility are budgeted at \$19.4 million. Annual water system O&M expenses are projected to increase to \$24.1 million in FY 2021. Figure 5-5 presents the projected O&M expenses for the sewer utility. [Table S-6, in Appendix 3](#), presents the water utility's projected annual O&M expenses.

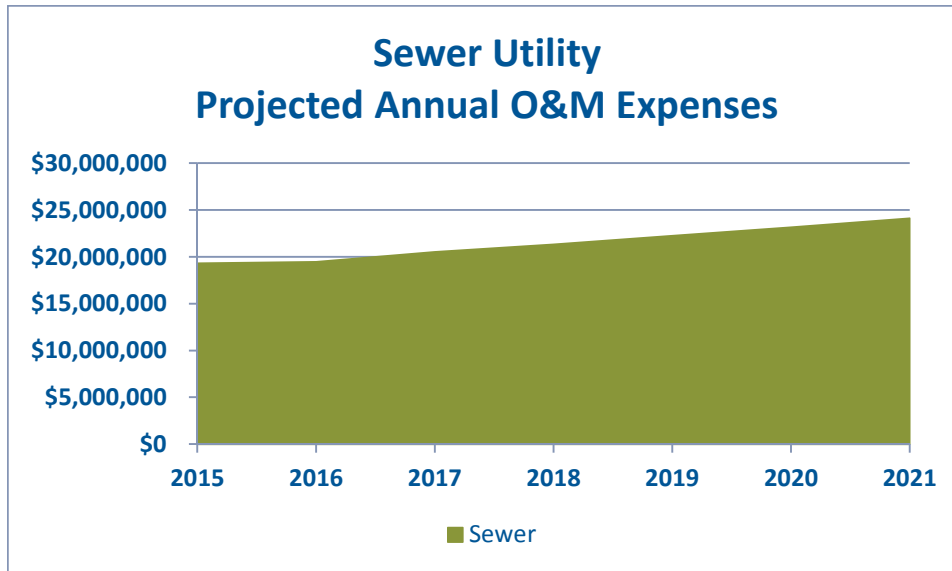


Figure 5-5 Sewer O&M Expenses

5.3.2 Debt Service

The County does not have any outstanding General Obligation bond related debt service costs related to Non-Expansion CIP. A total of \$25.38 Million of new bond issuance is estimated for the Sewer Utility to fund Non-Expansion capital investments, during the forecast period. The annual proposed debt service related to this estimated bond issuance is to be paid from service revenues, and is projected to increase from \$205,006 in FY 2016 to \$1,563,874 in FY 2021. [Line 11 of Table S-7, in Appendix 3](#), presents the projected annual debt service.

[Line 1 of Table S-7.1, in Appendix 3](#), reflects the projected new bond issuance amounts.

Figure 5-6 presents the projected debt service expenses for the sewer utility.

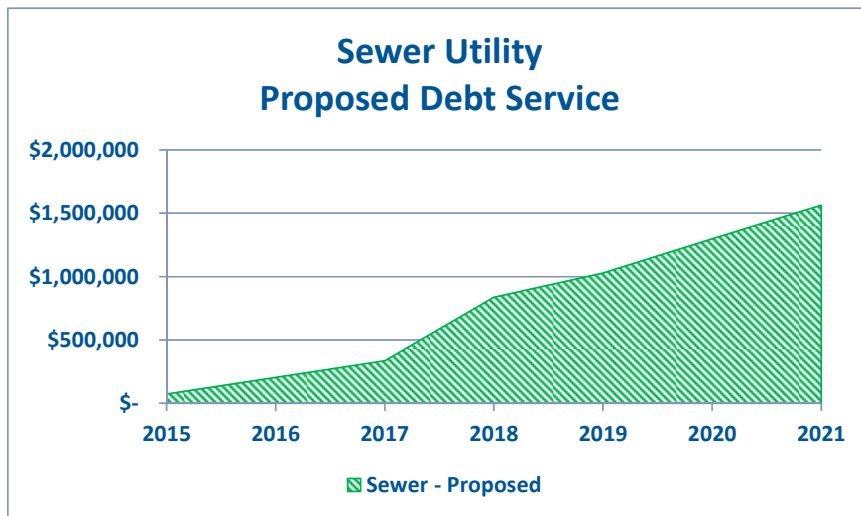


Figure 5-6 Sewer Debt Service

5.3.3 Transfers to Construction Fund

In addition to the O&M expenses discussed in sub-section 5.3.1 and the debt service discussed in sub-section 5.3.2, there are other revenue requirements for the sewer utility such as cash financing of capital program and other transfers that need to be forecasted for the study period. These additional revenue requirements of the sewer utility are as follows:

- Cash financing for Non-Expansion capital program (Non-Expansion Pay-go)
- Recurring Annual Capital for Fleet
- Cash financing for Expansion capital program (Expansion Pay-go)

Lines 12.1 and 12.2 of Table S-7, in Appendix 3, presents the projected annual Non-Expansion Pay-go and the recurring capital transfer for fleet, respectively. Line 12 of Table S-7, in Appendix 3, presents the sum of the annual transfers needed for the recurring fleet and non-expansion pay-go. To adequately fund non-expansion capital investment needs, it is projected that a total cash financing (Pay-go) of \$7.28 Million will be necessary during FY 2016 through FY 2021.

In addition, the Sewer Utility also needs to cash finance Expansion related capital program, and hence is projected to contribute a modest amount of \$300,000 in FY 2020 and \$900,000 in FY 2021. Line 13 of Table S-7, in Appendix 2, reflects the projected annual pay-go transfer for sewer expansion capital program.

In summary, the total annual revenue requirements of the sewer utility include the sum of the annual O&M, debt service, and transfers. Line 14 of Table S-7, in Appendix 3, presents the projected annual revenue requirements estimated for each year of the study period.

5.4 SEWER PROPOSED SERVICE REVENUE INCREASES

5.4.1 Summary of Revenue and Requirements

The annual revenue adjustments that are needed to achieve the defined financial performance objectives are determined by evaluating the funding gap between the projected annual revenue requirements and the projected revenues under existing rates. Table S-7, in Appendix 3, provides a summary of the revenue and revenue requirements (financial plan) for the forecast period of FY 2016 through FY 2021.

Projected Revenue Under Existing Rates: Line 2 indicates that under existing rates (FY 2016 rates) sewer utility revenues will increase from \$13.4 million in FY 2016 to \$13.8 million in FY 2021.

Projected Non-Rate Revenues Including Interest Income: Lines 5 through 8 present the various sources of non-rate revenues. The sum of those revenue items is expected to decrease from \$1.07 million in FY 2016 to \$1.06 million in FY 2021.

Projected Revenue Requirements: Line 14 indicates that total annual revenue requirement for the sewer utility is expected to increase from \$20.4 million in FY 2016 to \$28.1 million in FY 2021.

Funding Gap: The cash flow analysis indicates that, beginning in FY 2015, the sum of the revenues under existing rates and the non-rate revenues, is not adequate to fund the projected annual revenue requirements, thereby causing an operating deficit.

Proposed Revenue Adjustments: To address the critical annual funding gap in the service revenues of the sewer utility, the following measures are proposed:

- A significant draw down (in FY 2016) of the \$7.80 million service revenue fund balance that is available at the beginning of FY 2016;
- A series of revenue adjustments at the following levels and at the suggested time:
 - FY 2016: 29.75% (mid-year implementation, effective January 1, 2016)
 - FY 2017: 28% (mid-year implementation, effective January 1, 2017)
 - FY 2018: 5% (effective July 1, 2017)
 - FY 2019: 5% (effective July 1, 2018)
 - FY 2020: 4.5% (effective July 1, 2019)
 - FY 2021: 4.5% (effective July 1, 2020)

Line 1 presents the percent of annual revenue adjustments needed and Line 3 reflects the amount of revenue increases that can be generated each year with the proposed magnitude and timing of revenue adjustments.

Substantive revenue adjustments are needed in FY 2016 and FY 2017 to transition from an operating deficit to first a break even position. Additional level annual revenue adjustments are needed during FY 2018 through FY 2021 not only to fully fund the O&M, debt service, and cash transfer obligations but also to achieve the *minimum* financial performance targets of 60 days of annual O&M reserve and cash financing of capital program.

With the proposed series of annual revenue adjustments, the sewer utility is projected to achieve and sustain the minimum 60 day level of O&M reserve beginning FY 2018. Line 17 shows the fiscal year ending projected operating balance from service revenues, and Line 18 presents the required minimum 60 day O&M reserve requirement.

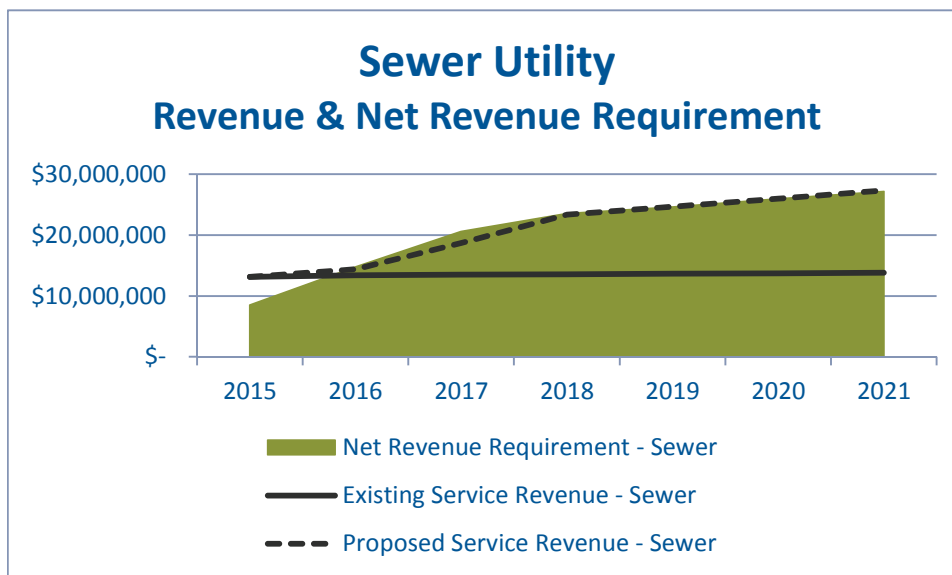


Figure 5-7 Sewer Revenues and Revenue Requirements

Sewer Utility Cost of Service

A key step to developing an equitable rate structure involves the cost of service analysis. The financial plan discussed in Sub-sections 5.1 through 5.4 provides an estimate of the total annual revenue requirements for a given fiscal year. The cost of service analysis provides a mechanism to defensibly allocate the total annual revenue requirements to the various customer classes.

As discussed in the Water cost of service, in Section 4.5, the cost of service analysis is typically performed for a single specific year (“Test Year”) for which rates and charges are to be designed. Per the County’s request, the cost of service analysis for the sewer utility, described herein, was performed for each of the five test years, namely, FY 2016, FY 2017, FY 2018, FY 2019, and FY 2020.

5.5 SEWER COST OF SERVICE

As the methodology used in performing a cost of service analysis for each of the five test years is the same, in the following sub-sections, the cost of service approach and the results of the analysis are explained using just the FY 2016 analysis. The key components of the cost of service analysis are:

- Determination of Cost of Service (net revenue requirements);
- Determination of Functional Costs;
- Allocation of Functional Costs to Cost Components; and
- Determination of Unit Cost of Service.

5.5.1 Determination of Cost of Service

The first key step is to determine the cost of service that is to be recovered from user rates and charges. As briefly discussed in Section 2.5, Cost of Service is synonymous with the “net revenue requirement” that is to be recovered, for the test year, through user rates and charges. In determining costs of service to be met from charges for sewer service, the following are deducted from total revenue requirements:

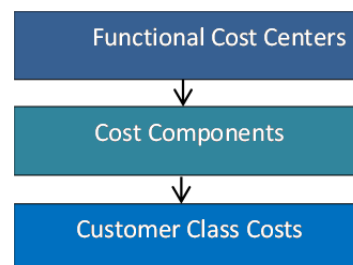
- Income from non-rate revenues (discussed in subsection 5.1.2); and
- Any projected operating deficit.

Table S-8, in Appendix 3, presents the derivation of the cost of service to be recovered through sewer charges. As Line 12 in Table S-8 indicates, the sewer cost of service for FY 2016 is projected to be \$14.39 Million. This cost of service consists of \$13.72 Million of O&M expenditures and \$0.68 Million of capital costs.

5.5.2 Determination of Functional Costs

As a basis for developing an equitable rate structure, the test year cost of service should be allocated to the various customer classes according to respective service requirements.

The basic underlying principle in developing cost of service rates is the determination of what elements in a sewer system are responsible for causing the level of revenue requirements that is needed. To allocate the costs to customer classes, first the



operating and capital costs of service are aggregated into “Functional Cost Centers.” The functional costs are then further allocated to cost components. Each component cost is then apportioned to customer classes.

Functional Cost Centers

Functional cost centers of a sewer utility represent the activities that contribute to the incurrence of O&M and capital costs. For a sewer utility, they often include *collection, pumping, conveyance, treatment, meters, billing, and other administration* costs. Both the O&M and capital costs defined for the Test Year, discussed in 5.5.1, need to be allocated to functional cost centers. [Table S-9 and Table S-11, in Appendix 3](#), present the capital and O&M functional cost centers as defined in the County’s water/sewer fund accounting system.

Functional Costs

The **capital costs** associated with the functional cost centers are determined using detailed fixed assets data, provided by the County, for each class of asset that is currently in service in the sewer system. The total value of the fixed assets (referred to as “plant investment”) in the system is usually presented as Original Cost Less Depreciation (“OCLD”). The total estimated OCLD of the sewer system is \$164.8 Million, as presented in [Line 27 in Table S-9, in Appendix 3](#). This plant investment data is subsequently used as a basis for the allocation to cost components, discussed in the following sub-section 5.5.3.

The **O&M costs** for the Test Year are allocated to the various functional cost centers based on the specific nature of the costs. For example, the O&M costs associated with the sewer treatment plants such as Joppatowne and Sod Run are allocated 100% to the treatment cost center. Other O&M costs such as Sewer Engineering, General Inventory, and Sewer O&M Abingdon costs are allocated to the various functional cost centers based on the proportionate allocation of plant investment costs. Administrative and general related costs are allocated based on the distribution of O&M expenses allocated to the functional cost centers. The allocation of the projected O&M cost of service (net operating revenue requirement) of \$13.71 Million, to the various functional cost centers, is presented in the second column of [Table S-11, in Appendix 3](#).

5.5.3 Allocation of Functional Costs to Cost Components

The functional costs discussed in sub-section 5.5.2 are typically allocated to specific cost elements based on the customer classes and the type of rate structure the utility has. As discussed in Section 3.3, the sewer retail rate structure has three components – a fixed charge based on meter size; a two-tiered volumetric rate; and a flat sewer rate.

The rate structure does not further delineate rates by residential, commercial, and other types of customer classes. Hence, to equitably allocate the functional O&M and capital costs to the rate structure components, eight cost components were defined. The eight cost components are:

- Volume (for determining the-two tiered volumetric rates);
 - Treatment;
 - Pumping & Conveyance; and
 - Local Collection;
- Spring Meadows & Whiteford (for determining the flat charges for these communities)

- Meters and Services, and Customer Billing (for determining the meter size based fixed charge); and
- Industrial Strength (to reflect the level of net revenue requirement recovered from industrial strength surcharge).

Volume costs include the operating costs of treatment, pumping, conveyance and collection facilities, and a portion of general administration costs, as well as capital costs on water plant investment associated with serving customers to the extent required for a constant, or average annual rate of use. The total volume of sewage produced impacts the costs of collection, pumping and treatment. Hence, these three functions are allocated 100% to the Volume cost component.

Meters and Services costs are costs that tend to vary in proportion to the number of customers (meters) connected to the system. These costs include meter reading and other meter related services costs, and a portion of administrative and general costs. Hence, these costs are allocated 100% to Meters and Services cost component.

Customer Billing costs includes costs associated with billing, collections, and customer service. These costs generally tend to vary in proportion to the number of bills rendered. Hence, these costs are allocated 100% to Customer Billing cost component.

Industrial Strength costs include the operating costs the County incurs annually in treating excess strength loadings from industrial waste customers. These costs include treatment related and general administrative costs. Hence, these costs are allocated 100% to the Industrial Strength cost component.

Spring Meadows and Whiteford costs includes costs directly attributable to these communities for collection and treatment of wastewater as well as a proportionate share of the sewer utility general administration costs.

Allocation of Capital Cost of Service to Cost Components

Based on the approach described above, first the plant investment functional costs discussed in sub-section 5.5.2 are allocated to the eight cost components. [Line 27 and Line 28 in Table S-9, in Appendix 3](#) present the results of the allocation of the Plant Investment, and the resulting percent distribution to each of the cost components, respectively.

The Test Year capital cost of service is then allocated to the eight cost components based on the proportionate distribution of the plant investment for each cost component. [Line 12 in Table S-10, in Appendix 3](#) presents the results of the allocation of the Test Year capital cost of service to each of the cost components.

Allocation of O&M Cost of Service to Cost Components

Based on the approach described above, each of the Test Year O&M Functional Cost is allocated to the eight cost components. [Line 28 in Table S-11 and Line 8 in Table S-12, in Appendix 3](#) present the results of the allocation of the Test Year O&M cost of service, and the resulting percent distribution to each of the cost components.

5.5.4 Determination of Unit Cost of Service

The unit cost of service for each of the key eight cost components provides a defensible basis for designing the rate schedules for the Test Year. To determine the unit cost of service, the wastewater units of service for each cost component is first established.

Units of Service

The wastewater units of service, for the Test Year, which are applicable to Volume, Meters and Services, Customer Billing are determined for each retail and wholesale customer class defined in Figure 3-2 in sub-section 3.3.2. [Table S-13, in Appendix 3](#), presents the projected Test Year units of service for the different components.

Volume: The total billed volume is projected as the sum of the first tier and second tier billed volume projection discussed earlier in sub-section 5.1.1. In addition, as the second tier is priced at an inclining rate with a 20% rate differential, an adjustment to the second tier billed volume was applied to determine the total units of service for the Volume component. A total of 3.51 Billion gallons is projected for the Volume component.

Flat Rate: As Flat Rate costs are recovered through a volumetric rate, a portion of the projected total billed volume discussed above, is applicable to the Flat Rate cost component.

Bills: The total number of bills projected for the Test Year is used as the basis for determining the unit cost of service for the billing cost component. A total of 168,309 bills are projected for the Test Year.

Meters and Services: The total number of meters for the Test Year is projected on the basis of the number of equivalent 5/8" meters. The meter cost ratios used to translate the meters to equivalent 5/8" meters is shown in Figure 4-8.

Unit Cost of Service

Unit costs of service are developed by dividing the total cost allocated to each functional costs component by the total applicable units of service. [Table S-14, in Appendix 3](#) presents the estimated Test Year units cost of service for various functional costs components. The unit costs determined in this table are used to develop the volume charge, base charge, flat charge for various retail customers and wholesale charges.

These unit costs are then used to develop the rate schedules for the Test Year. The rate design is discussed in Section 5.6.

Sewer Utility Rate Design

The revenue requirement and the proposed revenue adjustments discussed in Section 5.4 provide the level of revenue increases for the sewer utility at the system level. The cost of service analysis and the resulting unit cost of service, discussed in Section 5.5, provide a basis for the review and update of a schedule of sewer rates that recovers allocated cost of service.

Similar to the discussions, in the Water cost of service, in Section 4.6, it should be recognized that the cost of service studies involve engineering estimates, consideration of historical data and, to some extent, judgment and experience. Therefore, judgment must enter into the final choice of rates, and factors such as customer bill impact, stakeholder acceptance, contractual agreements, and administrative concerns should be recognized in making rate adjustments.

As discussed in the previous section, as the County management desired to seek Council approval for multiple years of rate increases, the design of rate schedules, described herein, was performed for each of the five test years, namely, FY 2016, FY 2017, FY 2018, FY 2019, and FY 2020.

This section presents the results of the following:

- Proposed rate schedules;
- Residential bill impact; and
- Sewer residential bill benchmarking.

5.6 SEWER RATE DESIGN

The key factors that had to be addressed during the design of sewer rate schedules were the same as those discussed in Section 4.6 under the water rate design.

5.6.1 Proposed Sewer Rate Structure

The existing sewer rate structures were discussed in sub-section 3.3.2. The proposed sewer rate structure retains all of the existing rate components. For most of the rate components, the proposed basis of rates and charges is the same as the existing basis.

In addition, in the proposed rate structure, a new rate component, namely, the Sewer Asset Reinvestment Charge (“Sewer ARC”) is proposed. It should be noted that the revenues generated from the Sewer ARC are to be accounted for entirely in the Water/Sewer Capital Fund and not in the Operating Fund, which is the purview of this report.

A brief description of the proposed sewer rate structure is presented.

- **Retail Base Charge & Volume Rate:** The existing *Base Charge* which is based on meter size, and the two-tiered inclining *Volume Rate* based on the billed volume are retained in the proposed rate structure as well. These types of rate components are commonly used among sewer utilities to recover revenues from customers commensurate with the cost of service.
- **Flat Rate Charge (Harford, Harford Commercial, and Swan Creek):** The existing flat rate sewer charge is assessed per bill based on the following criteria:
 - Base charge for the specific community based on an assumed meter size;
 - Volume charge for the specific community, based on an allowance of wastewater volume for the assumed meter size
- **Flat Rate Charge (Spring Meadows and Whiteford):** The existing flat rate sewer charge is assessed per bill based on the following criteria:
 - Sewer cost of service allocated to each of these two communities as discussed in sub-section 5.5.3; and
 - The number of equivalent meters determined for each community.
- **Sewer ARC:** To provide for a nominal level of cash financing for sewer infrastructure renewal and replacements, a Sewer ARC is proposed. This approach is consistent with the Water ARC described in sub-section 4.6.1. The revenues from Sewer ARC are to be dedicated for financing reinvestments in existing sewer assets. Similar to the water system, reinvestments in the sewer assets are critical to maintain system integrity and service

reliability. Therefore, these investments in the sewer system assets are essentially fixed costs that have to be incurred regardless of the volume and strength of sewage flows collected, conveyed, treated, and disposed. Therefore, similar to the Water ARC, the Sewer ARC is also designed as a quarterly fixed charge based on meter size. The capacity ratios of the meters were used in designing the meter size based Sewer ARC.

5.6.2 Proposed Sewer Rate Schedules for FY 2016 through FY 2020

A comparison of the Test Year cost of service determined for each customer class and the revenues from existing rates reflects the level of rate adjustment that is necessary for each rate component discussed in the preceding proposed rate structure.

The proposed sewer rate schedules are designed for each of the five fiscal years of FY 2016, FY 2017, FY 2018, FY 2019, and FY 2020.

- **Retail Base Charge Phase-in:** In the case of the retail *Base Charge*, which is based on meter size, the comparison of the cost of service and the revenues under existing rates for each meter size indicated that the ¾" and higher size meters were recovering more than the cost of service, and the 5/8" meters were recovering less than the cost of service. Hence, an adjustment to the meter size based Base Charge was necessary in addition to the rate adjustment needed for increased revenue requirements.

Transitioning the 5/8" meters to the cost of service rates in the very first test year (FY 2016) would create a significant increase in the residential customer bills, as over 95% of the retail sewer customer accounts are 5/8" meters.

Hence, to mitigate the bill impact, similar to the proposed retail water Base Charge, a gradual *phase-in* to cost of service rates is proposed for sewer Base Charge as well. The phase-in of the Base Charge is designed such that the rates for the 5/8" meter size will gradually be increased during the period of FY 2016 through FY 2020 to fully align with their cost of service by FY 2020. During the same period, the rates for the ¾" and larger meter sizes will gradually be decreased during the period of FY 2016 through FY 2020, from the existing rate levels, to fully align with their cost of service by FY 2020.

The proposed rate schedules for the Base Charge for FY 2016 through FY 2020 are presented in [Table S-15, in Appendix 3](#).

Retail Volume Rate: The sewer volume rates determined based on cost of service analysis, for each of the two tier blocks, were in alignment with the volume rates under existing rates. However, as the sewer Base Charge had to be phased-in over five years to mitigate bill impact, the cost of service based sewer volume rates also had to be adjusted so as to assure 100% recovery of the total sewer system revenue requirements in each of the five test years. The proposed rate schedules for the retail sewer volume rates for FY 2016 through FY 2020 are presented in [Table S-15, in Appendix 3](#).

- **Flat Sewer Charges:** In sub-section 5.6.1, the criteria based on which the flat sewer charges are designed was discussed. For Harford and Swan Creek, where the flat sewer charges are based on a defined meter size and an allowance of volume, the proposed flat charges are calculated based on the phased-in Retail *Base Charge* and the *Retail Volume Rate*.

For Whiteford and Spring Meadows communities, the comparison of the cost of service based flat sewer charge and the revenues under existing rates indicated that the existing

Flat Sewer Rates for these communities were significantly under recovering costs. However, as the cost of service rates would create a significant bill impact, based on discussions with the County management, a phased increase of the flat sewer charges is proposed. The phased increase of the Flat Sewer Charges for Whiteford and Spring Meadows are proposed to reflect the exact same level of year-to-year dollar increase defined for FY 2017 through FY 2020 for the Harford Flat Sewer charges.

The proposed rate schedules for the retail Flat Sewer Charges for FY 2016 through FY 2020 are presented in [Table S-15, in Appendix 3](#). It is important to note that under the proposed flat sewer charges, even in FY 2020, the flat charges for Whiteford and Spring Meadows will result in revenues being lower than their respective costs of service.

- **Sewer ARC:** As indicated in sub-section 5.6.1, the Sewer ARC is proposed as a fixed charge based on meter size. The proposed rate schedules for the Sewer ARC for FY 2016 through FY 2020 are presented in [Table S-15, in Appendix 3](#).

5.6.3 Implementation of Proposed Rate Schedules and Proof of Revenue Adequacy

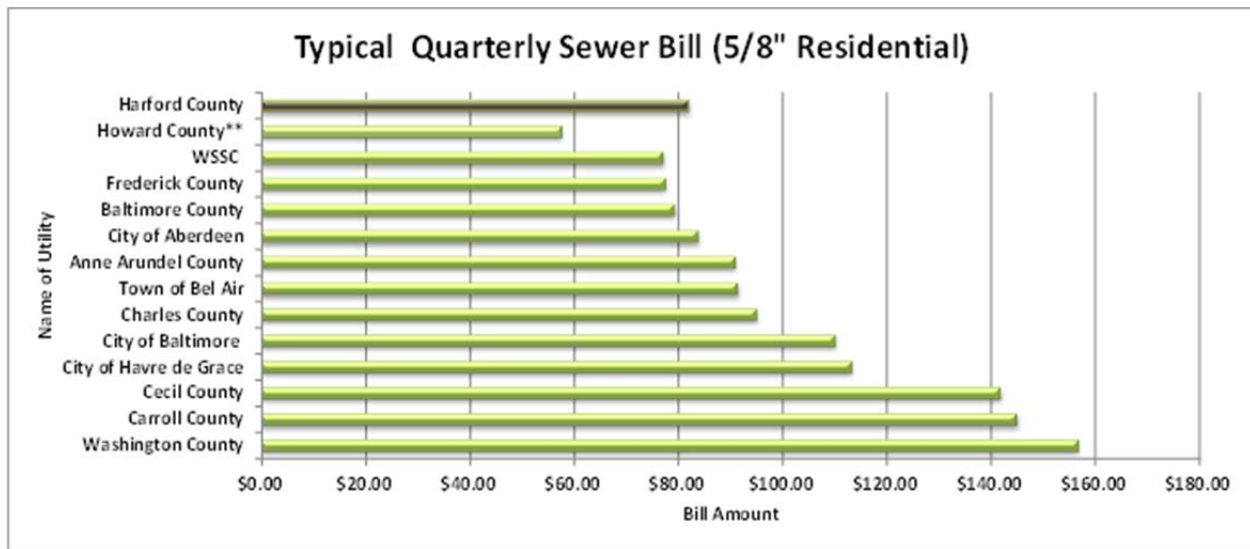
To provide adequate time to educate stakeholders on the comprehensive revenue study findings and the proposed rate increases, the County desired that the first rate increase (FY 2016) be implemented effective January 1, 2016 and the subsequent rate increase be implemented effective January 2017. Hence, the proposed rate schedules are to be implemented as follows:

- **FY 2016:** Effective January 1, 2016
- **FY 2017:** Effective January 1, 2017
- **FY 2018:** Effective July 1, 2017
- **FY 2019:** Effective July 1, 2018
- **FY 2020:** Effective July 1, 2019

[Table S-20, in Appendix 3](#), presents a comparison of the revenues under existing rates and the proposed FY 2016 rates for the *Base Rate*, *Volume Rate*, and *Flat Rate*, for each customer class. The proposed FY 2016 revenues are calculated using an effective rate that reflects nine (9) months of billing under the existing FY 2016 rates, and three (3) months of billing under the proposed FY 2016 rates.

5.7 SEWER SYSTEM RESIDENTIAL QUARTERLY BILL BENCHMARKING

Figure 5-8 presents a graphical illustration of the comparison of Harford’s residential quarterly sewer charges under proposed FY 2016 rates with that of a number of peer utilities in Maryland. In any utility typical bill benchmarking it is critical to recognize that the benchmark results only provide a high level overview of the typical bill. The benchmark results do not provide a reliable basis for any inference on performance or cost efficiencies, as there are significant differences among utilities including system characteristics, operations, service levels, compliance requirements, and level of infrastructure investment.



** Howard County receives "Ad Valorem" tax for its water sewer services.

Figure 5-8 Sewer Utility Residential Quarterly Bill Comparison

5.8 SEWER SYSTEM RESIDENTIAL QUARTERLY BILL IMPACT

The project team calculated the quarterly sewer bill for an average residential customer under the existing FY 2016 rates and the proposed phased-in FY 2016 rates. The quarterly residential bill impact was calculated for a 5/8” meter with a quarterly usage of 14,000 gallons.

Figure 5-9 presents the quarterly sewer bill impact.

#	Description	Quarterly SEWER
1	EXISTING Residential (5/8")	\$57.62
2	PROPOSED Residential (5/8")	\$81.94
3	Increase in Quarterly Charges	\$24.32

Figure 5-9 Residential Quarterly Sewer Bill Impact

6.0 APPENDIX

**Table WR-1
Existing Rates
Water Utility**

Line #	Description	FY 2015	FY 2016
1	Effective Date	7/1/2014	7/1/2015
Base Charge			
2	5/8" Meter Size	\$ 6.46	\$ 6.56
3	3/4" Meter Size	28.14	28.59
4	1" Meter Size	46.79	47.54
5	1 1/4" Meter Size	67.71	68.79
6	1 1/2" Meter Size	95.14	96.66
7	2" Meter Size	150.64	153.05
8	3" Meter Size	316.87	321.94
9	4" Meter Size	467.85	475.34
10	6" Meter Size	951.43	966.65
11	8" Meter Size	2,220.54	2,256.07
12	10" Meter Size	3,568.25	3,625.34
13	12" Meter Size	4,678.51	4,753.37
Volume Charge (per thousand gallons)			
14	First Block	\$ 2.60	\$ 2.64
15	Second Block	3.26	3.31
Wholesale Capital Recovery Rate			
16	Rate per 1,000 gallons	\$ 3.70	\$ 4.58
READY TO SERVE			
	Cost Per Quarter	\$3.95 to \$1,887.14	\$4.01 to \$1,917.33
Asset Reinvestment Charge			
16	5/8" Meter Size	\$ -	\$ -
17	3/4" Meter Size	-	-
18	1" Meter Size	-	-
19	1 1/4" Meter Size	-	-
20	1 1/2" Meter Size	-	-
21	2" Meter Size	-	-
22	3" Meter Size	-	-
23	4" Meter Size	-	-
24	6" Meter Size	-	-
25	8" Meter Size	-	-
26	10" Meter Size	-	-
27	12" Meter Size	-	-

Table SR-1
Existing Rates
Sewer Utility

Line #	Description	FY 2015	FY 2016
1	Effective Date	7/1/2014	7/1/2015
Base Charge (per Bill)			
2	5/8" Meter Size	\$ 6.00	\$ 6.10
3	3/4" Meter Size	33.70	34.24
4	1" Meter Size	56.15	57.05
5	1 1/4" Meter Size	81.07	82.37
6	1 1/2" Meter Size	112.31	114.11
7	2" Meter Size	179.68	182.55
8	3" Meter Size	382.12	388.23
9	4" Meter Size	561.42	570.40
10	6" Meter Size	1,122.82	1,140.79
11	8" Meter Size	2,693.88	2,736.98
12	10" Meter Size	4,255.47	4,323.56
13	12" Meter Size	5,582.75	5,672.07
Volume Charge (per thousand gallons)			
14	First Block	\$ 3.31	\$ 3.36
15	Second Block	3.95	4.01
Swan Creek Base Charge (per Bill)			
16	5/8" Meter Size	\$ 6.90	\$ 7.01
17	3/4" Meter Size	10.31	10.47
18	1" Meter Size	17.26	17.54
19	1 1/4" Meter Size	25.18	25.56
20	1 1/2" Meter Size	34.42	34.97
21	2" Meter Size	55.42	56.31
22	3" Meter Size	103.33	104.98
23	4" Meter Size	561.42	570.40
24	6" Meter Size	-	-
25	8" Meter Size	-	-
26	10" Meter Size	-	-
27	12" Meter Size	-	-

**Table SR-1
Existing Rates
Sewer Utility**

Line #	Description	FY 2015	FY 2016
1	Effective Date	7/1/2014	7/1/2015
Swan Creek Volume Charge (per thousand gallons)			
23	First Block	\$ 1.37	\$ 1.39
24	Second Block	1.96	1.99
Metered Sewer Base Charge (per Bill)			
25	6" Meter Size	\$ 180.01	\$ 182.89
26	8" Meter Size	370.78	376.71
27	10" Meter Size	562.52	571.52
28	12" Meter Size	1,125.04	1,143.04
Flat Sewer Charges (per Bill)			
29	Harford	\$ 64.48	\$ 65.51
30	Harford Commercial	105.69	107.38
31	Swan Creek	24.64	25.03
32	Swan Creek Commercial	35.88	36.45
33	Spring Meadows	86.50	87.88
34	Whiteford	80.00	80.00
Asset Reinvestment Charge (per Bill)			
35	5/8" Meter Size	\$ -	\$ -
36	3/4" Meter Size	-	-
37	1" Meter Size	-	-
38	1 1/4" Meter Size	-	-
39	1 1/2" Meter Size	-	-
40	2" Meter Size	-	-
41	3" Meter Size	-	-
42	4" Meter Size	-	-
43	6" Meter Size	-	-
44	8" Meter Size	-	-
45	10" Meter Size	-	-
46	12" Meter Size	-	-

Table W-1
Annual Average Accounts
Water Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
1	1102 Harford Water	1,257	1,228	1,200	1,173	1,146	1,119	1,094
2	1110 Harford Water & Sewer	38,698	38,969	39,242	39,516	39,793	40,072	40,352
3	4302 MD American	1	1	1	1	1	1	1
4	6610 Swan Creek Comm Both	10	10	10	10	10	10	10
5	7102 Swan Creek Water	5	5	5	5	5	5	5
6	7110 Swan Creek Water & Sewer	41	41	41	41	41	41	41
7	Hand Billed - Misc	1	1	1	1	1	1	1
8	Hand Billed - Aberdeen	1	1	1	1	1	1	1
9	Hand Billed - APG Chapel Hill	1	1	1	1	1	1	1
10	Hand Billed - APG Van Bibber	1	0	0	0	1	1	1
11	Total	40,016	40,257	40,502	40,749	41,000	41,252	41,507

Table W-2
Annual Billed Volume
Water Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
		(1,000 gallons)	(1,000 gallons)	(1,000 gallons)	(1,000 gallons)	(1,000 gallons)	(1,000 gallons)	(1,000 gallons)
1	1102 Harford Water	187,366	183,057	178,846	174,733	170,714	166,788	162,952
2	1110 Harford Water & Sewer	2,881,144	2,901,312	2,921,621	2,942,072	2,962,667	2,983,406	3,004,289
3	4302 MD American	6,041	6,041	6,041	6,041	6,041	6,041	6,041
4	6610 Swan Creek Comm Both	2,968	2,968	2,968	2,968	2,968	2,968	2,968
5	7102 Swan Creek Water	337	337	337	337	337	337	337
6	7110 Swan Creek Water & Sewer	11,953	11,953	11,953	11,953	11,953	11,953	11,953
7	Hand Billed - Misc	26,750	26,750	26,750	26,750	26,750	26,750	26,750
8	Hand Billed - Aberdeen	240,778	240,778	240,778	240,778	240,778	240,778	240,778
9	Hand Billed - APG Chapel Hill	74,274	74,274	74,274	74,274	74,274	74,274	74,274
10	Hand Billed - APG Van Bibber	365,000	0	0	0	365,000	365,000	365,000
11	Total	3,796,611	3,447,470	3,463,568	3,479,906	3,861,482	3,878,294	3,895,342

Table 3a
Service Revenue Under Existing Rates
Water Utility

Line #	Customer Class	2009	2010	2011	2012	2013	2014
		\$	\$	\$	\$	\$	\$
1	Base Charge	1,357,562	1,436,672	1,428,761	1,471,531	1,547,095	1,587,311
2	Volume Charge	8,169,895	7,862,439	9,124,533	8,428,732	8,905,723	9,442,838
3	Fire Meter Charge	601,546	650,897	656,943	684,947	716,727	745,350
4	Total	10,129,003	9,950,008	11,210,236	10,585,209	11,169,546	11,775,499

Table W-3.1
Base Charge Revenue
Water Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$	\$
1	1102 Harford Water	63,931	63,439	61,979	60,554	59,161	57,800	56,471
2	1110 Harford Water & Sewer	1,547,736	1,582,920	1,594,000	1,605,158	1,616,394	1,627,709	1,639,103
3	4302 MD American	1,864	1,894	1,894	1,894	1,894	1,894	1,894
4	6610 SW CR BOTH	4,173	4,239	4,239	4,239	4,239	4,239	4,239
5	7102 Swan Creek Water	129	131	131	131	131	131	131
6	7110 Swan Creek Water & Sewer	3,529	3,585	3,585	3,585	3,585	3,585	3,585
7	Hand Billed - Misc	0	0	0	0	0	0	0
8	Hand Billed - Aberdeen	0	0	0	0	0	0	0
9	Hand Billed - Chapel Hill	0	0	0	0	0	0	0
10	Hand Billed - APG Van Bibber	0	0	0	0	0	0	0
11	Total	1,621,363	1,656,207	1,665,828	1,675,560	1,685,404	1,695,358	1,705,422

Table W-3.2
Volume Charge Revenue
Water Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$	\$
1	1102 Harford Water	490,055	486,177	474,995	464,070	453,397	442,969	432,780
2	1110 Harford Water & Sewer	7,505,905	7,675,169	7,728,895	7,782,998	7,837,479	7,892,341	7,947,587
3	4302 MD American	15,646	15,888	15,888	15,888	15,888	15,888	15,888
4	6610 SW CR BOTH	7,687	7,806	7,806	7,806	7,806	7,806	7,806
5	7102 Swan Creek Water	873	886	886	886	886	886	886
6	7110 Swan Creek Water & Sewer	30,958	31,437	31,437	31,437	31,437	31,437	31,437
7	Hand Billed - Misc	69,550	70,620	70,620	70,620	70,620	70,620	70,620
8	Hand Billed - Aberdeen	626,023	635,654	635,654	635,654	635,654	635,654	635,654
9	Hand Billed - Chapel Hill	193,112	196,083	196,083	196,083	196,083	196,083	196,083
10	Hand Billed - APG Van Bibber	949,000	0	0	0	963,600	963,600	963,600
11	Total	9,888,810	9,119,720	9,162,264	9,205,442	10,212,849	10,257,283	10,302,341

Table W-3.3
Purchased Water Revenue
Water Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$	\$
1	1102 Harford Water	16,863	16,475	16,096	15,726	15,364	15,011	14,666
2	1110 Harford Water & Sewer	259,303	261,118	262,946	264,787	266,640	268,506	270,386
3	4302 MD American	544	544	544	544	544	544	544
4	6610 SW CR BOTH	267	267	267	267	267	267	267
5	7102 Swan Creek Water	30	30	30	30	30	30	30
6	7110 Swan Creek Water & Sewer	1,076	1,076	1,076	1,076	1,076	1,076	1,076
7	Hand Billed - Misc	2,408	2,408	2,408	2,408	2,408	2,408	2,408
8	Hand Billed - Aberdeen	21,670	21,670	21,670	21,670	21,670	21,670	21,670
9	Hand Billed - Chapel Hill	6,685	6,685	6,685	6,685	6,685	6,685	6,685
10	Hand Billed - APG Van Bibber	32,850	0	0	0	32,850	32,850	32,850
11	Total	341,695	310,272	311,721	313,192	347,533	349,046	350,581

Table W-3.4
Fire Line Revenue
Water Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$	\$
1	5/8" Meter Size	123,963	129,005	132,230	135,536	138,924	142,397	145,957
2	3/4" Meter Size	21,622	21,962	21,962	21,962	21,962	21,962	21,962
3	1" Meter Size	34,603	35,394	35,783	36,033	36,286	36,540	36,795
4	1 1/4" Meter Size	0	0	0	0	0	0	0
5	1 1/2" Meter Size	70,983	73,903	76,050	77,952	79,901	81,898	83,945
6	2" Meter Size	266,249	272,336	275,326	277,254	279,194	281,149	283,117
7	3" Meter Size	123,805	132,044	139,194	146,154	153,461	161,135	169,191
8	4" Meter Size	120,949	128,997	135,982	142,781	149,920	157,416	165,287
9	6" Meter Size	20,038	21,371	22,528	23,655	24,837	26,079	27,383
10	8" Meter Size	0	0	0	0	0	0	0
11	10" Meter Size	0	0	0	0	0	0	0
12	Total	782,212	815,013	839,056	861,326	884,486	908,576	933,639

Table W-3
Service Revenue Under Existing Rates
Water Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$	\$
1	Base Charge	1,621,363	1,656,207	1,665,828	1,675,560	1,685,404	1,695,358	1,705,422
2	Volume Charge	9,888,810	9,119,720	9,162,264	9,205,442	10,212,849	10,257,283	10,302,341
3	Fire Meter Charge	782,212	815,013	839,056	861,326	884,486	908,576	933,639
4	Total	12,292,385	11,590,940	11,667,149	11,742,328	12,782,739	12,861,217	12,941,402

Table W-4
Non-Rate Revenues
Water Utility

		Fiscal Year						
Line #	Revenue Category	2015	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$	\$
Miscellaneous Revenues								
1	Rental Income	80,000	80,000	80,000	80,000	80,000	80,000	80,000
2	Sale of Property	15,000	15,000	15,000	15,000	15,000	15,000	15,000
3	Miscellaneous Revenues	112,500	112,500	112,500	112,500	112,500	112,500	112,500
4	Subtotal Miscellaneous Revenues	207,500	207,500	207,500	207,500	207,500	207,500	207,500
Other Revenues								
5	FEMA	0	0	0	0	0	0	0
6	Tax Lien Certificates	86,900	86,900	86,900	86,900	86,900	86,900	86,900
7	Septic User Charge	0	0	0	0	0	0	0
8	Interest & Penalty	140,450	140,450	140,450	140,450	140,450	140,450	140,450
9	Meter Installation	46,550	46,550	46,550	46,550	46,550	46,550	46,550
10	Miss Utility	100,000	100,000	100,000	100,000	100,000	100,000	100,000
11	Other	119,913	119,913	119,913	119,913	119,913	119,913	119,913
12	Subtotal Other Revenues	493,813	493,813	493,813	493,813	493,813	493,813	493,813
13	Intra County Revenues	88,900	88,900	88,900	88,900	88,900	88,900	88,900
14	Purchased Water	341,695	310,272	311,721	313,192	347,533	349,046	350,581
15	Total Non Rate Revenues	1,131,907	1,100,485	1,101,934	1,103,404	1,137,746	1,139,259	1,140,793

Table W-5.1
Capital Improvement Program
Water Utility

Line #	Project Category	2016	2017	2018	2019	2020	2021	Total (2016 - 2021)
		\$	\$	\$	\$	\$	\$	\$
1	Expansion CIP	3,242,227	4,804,988	958,747	0	4,848,285	7,393,347	21,247,593
2	Non Expansion CIP	1,623,250	1,497,645	3,442,384	2,380,971	3,126,999	3,263,169	15,334,417
3	Total	4,865,477	6,302,633	4,401,130	2,380,971	7,975,284	10,656,516	36,582,010

Notes Expansion CIP includes Admin and Customer CIP costs

Table W-5
Capital Improvement Program
Water Utility

Line #	Functional Category	2016	2017	2018	2019	2020	2021	Total (2016 - 2021)
		\$	\$	\$	\$	\$	\$	\$
1	Water Supply	0	0	0	0	0	0	0
2	Water Treatment	0	103,500	107,123	110,872	114,752	831,381	1,267,628
3	Treated Water Pumping	1,250,000	1,583,550	214,245	0	229,505	0	3,277,300
4	Treated Water Storage	700,000	905,625	883,761	914,692	946,706	2,286,296	6,637,080
5	Transmission	2,159,227	1,000,845	1,034,804	55,436	4,963,037	5,493,049	14,706,398
6	Distribution	0	258,750	214,245	332,615	459,009	593,843	1,858,462
7	Transmission & Distribution	0	1,242,000	214,245	388,051	459,009	593,843	2,897,148
8	Meters	0	0	321,368	332,615	344,257	356,306	1,354,546
9	Water General	0	0	0	0	0	0	0
10	Water Admin	756,250	1,208,363	1,411,339	246,690	459,009	501,798	4,583,448
11	Water Customer	0	0	0	0	0	0	0
12	Total	4,865,477	6,302,633	4,401,130	2,380,971	7,975,284	10,656,516	36,582,010

Table W-6
Operations and Maintenance Expenses
Water Utility

Line #	Expense Category	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$
1	Administration	1,739,262	1,794,470	1,851,484	1,910,366	2,016,076	2,080,505
2	Benefits	354,646	366,096	377,929	390,161	402,804	415,873
3	General Inventory	25,000	25,750	26,523	27,318	28,138	28,982
4	Personnel Matters	87,018	89,983	93,056	96,239	99,538	102,956
5	Water Accounting	600,219	624,897	650,560	677,244	704,993	733,847
6	Water Engineering	675,433	846,518	876,740	908,097	940,633	974,396
7	Water O&M-Abingdon	3,496,029	3,731,815	3,863,925	4,066,645	4,211,242	4,396,521
8	Water O&M-Abingdon Water Plant	4,927,872	5,135,933	5,479,031	5,713,201	5,959,355	6,218,239
9	Water O&M-Havre de Grace	1,118,834	1,157,747	1,198,170	1,240,175	1,283,835	1,329,229
10	Water O&M-Havre de Grace Solids	52,350	54,918	57,642	60,536	63,610	66,880
11	Water O&M Long Booster Stations	785,128	814,361	844,733	876,293	909,090	943,176
12	Water O&M Perryman	1,044,637	1,106,899	1,173,505	1,244,794	1,321,134	1,402,924
13	Water O&M Carbon Treatment Plant	16,400	17,048	17,722	18,422	19,150	19,907
14	Total Water O&M Expenses	14,922,827	15,766,434	16,511,019	17,229,491	17,959,597	18,713,434

Table W-7.1
 Construction Fund (Non Expansion): Service Revenue Cash Flow
 Water Utility

Line #	Description	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$
New Capital Funding Sources							
1	GO Bond Issuance	960,000	2,600,000	700,000	0	0	0
2	GO Bond Issuance Costs	(9,600)	(26,000)	(7,000)	0	0	0
3	Net GO Bond Proceeds	950,400	2,574,000	693,000	0	0	0
4	Federal Grants	0	0	0	0	0	0
5	Other Sources	0	0	0	0	0	0
6	Total New Funding Sources	1,900,800	5,148,000	1,386,000	0	0	0
Existing Source of Funds							
7	Beginning Balance	1,864,552	1,965,670	3,316,741	1,015,101	1,023,295	1,030,941
8	Transfer from Operations	756,250	258,750	428,490	2,380,971	3,126,999	3,263,169
9	Interest Income	17,718	15,966	19,254	8,193	7,646	7,608
10	Total Existing Sources of Funds	4,539,320	7,388,386	5,150,485	3,404,265	4,157,940	4,301,718
Application of Funds							
11	Major Capital Improvement	1,623,250	1,497,645	3,442,384	2,380,971	3,126,999	3,263,169
12	Total Uses of Funds	1,623,250	1,497,645	3,442,384	2,380,971	3,126,999	3,263,169
13	Ending Fund Balance	1,965,670	3,316,741	1,015,101	1,023,295	1,030,941	1,038,549
14	Required Balance	1,929,171	3,260,420	1,000,000	1,000,000	1,000,000	1,000,000

Table W-7
Operating Fund: Service Revenue Cash Flow
Water Utility

Line #	Description	2016	2017	2018	2019	2020	2021
Revenues							
1	Proposed Revenue Increases	22.50%	22.50%	5.00%	5.00%	5.00%	4.00%
		\$	\$	\$	\$	\$	\$
2	Revenues from Existing Rates	11,590,940	11,667,149	11,742,328	12,782,739	12,861,217	12,941,402
3	Revenue Increases	651,990	3,429,048	6,539,284	8,113,759	9,214,812	10,214,336
4	Total Revenues from Rates	12,242,930	15,096,197	18,281,613	20,896,497	22,076,029	23,155,739
5	Interest Income	18,652	6,440	16,825	29,121	31,399	33,177
6	Other Revenues	804,085	805,534	807,004	841,346	842,859	844,393
7	Miscellaneous Revenues	207,500	207,500	207,500	207,500	207,500	207,500
8	Intra County Revenues	88,900	88,900	88,900	88,900	88,900	88,900
9	Total Revenues	13,362,067	16,204,570	19,401,842	22,063,364	23,246,686	24,329,709
Revenue Requirements							
10	O&M Expenses	14,922,827	15,766,434	16,511,019	17,229,491	17,959,597	18,713,434
11	Debt Service	117,345	187,514	377,064	429,100	428,277	429,311
12	Transfer to Construction	756,250	258,750	428,490	2,380,971	3,126,999	3,263,169
12.1	Cash Funded Capital (Non-Expansion Pay-go)	556,250	0	0	2,159,227	2,667,990	2,788,094
12.2	Recurring Capital (Fleet)	200,000	258,750	428,490	221,744	459,009	475,075
13	Transfer to Capital Expansion (Expansion Pay-go)	0	0	0	1,650,000	1,650,000	1,650,000
14	Total Revenue Requirements	15,796,422	16,212,697	17,316,573	21,689,562	23,164,874	24,055,914
15	Annual Net Balance	-2,434,355	-8,128	2,085,269	373,802	81,812	273,795
16	Beginning Balance	3,082,379	648,023	639,896	2,725,165	3,098,967	3,180,779
17	Ending Fund Balance	648,023	639,896	2,725,165	3,098,967	3,180,779	3,454,574
18	Required O&M Balance (60 days)	2,453,067	2,591,743	2,714,140	2,832,245	2,952,263	3,076,181
19	Fund Balance Available (days)	16	15	60	66	65	67

Table W-8
Service Charge Cost of Service
Water Utility
Test Year - FY 2016

Line #	Component	Service Charges Cost of Service		
		Operating	Capital	Total
		\$	\$	\$
	REVENUE REQUIREMENTS			
1	Operation and Maintenance Expense	14,922,827	0	14,922,827
	Debt Service			
2	Proposed GO Bonds	0	117,345	117,345
3	Cash Funded Capital	0	756,250	756,250
4	Transfer to Capital (Expansion)	0	0	0
5	Fund Balance Increase	0	0	0
6	Total Revenue Requirement	14,922,827	873,595	15,796,422
	Less: Other Sources of Revenue			
7	Interest Income	(17,620)	(1,032)	(18,652)
8	Other Revenues (a)	(466,503)	(27,310)	(493,813)
9	Miscellaneous Revenues (b)	(196,025)	(11,475)	(207,500)
10	Intra-County Revenues	(83,984)	(4,916)	(88,900)
11	Fund Balance Decrease	(2,299,727)	(134,628)	(2,434,355)
12	Net Revenue Requirement	11,858,968	694,234	12,553,202

- Notes:
- (a) Other revenues include 50% of Tax Lien Certificates, Interest & Penalties, Meter Installations, Miss Utility, and Other Revenues.
 - (b) Miscellaneous Revenues include Rental Income, sale of property and other miscellaneous revenue.

Table W-9
Allocation of Plant Investment Value
Water Utility
Test Year 2016

Line #	Functional Components	Total Plant Investment	Volume	Purchased Water	Meters & Services	Customer Billing	Fire Protection	Allocation Basis
		\$	\$	\$	\$	\$	\$	
	Original Cost							
1	Water Supply - Wells	632,164	632,164					Volume
2	Water Treatment	110,923,173	110,923,173					Volume
3	Treated Water Pumping	2,214,511	1,550,158				664,353	30% Fire Protection, 70% Volume
4	Treated Water Storage	9,859,360	6,901,552				2,957,808	30% Fire Protection, 70% Volume
	Water Distribution System							
5	Transmission	43,998,114	30,798,680				13,199,434	30% Fire Protection, 70% Volume
6	Distribution	47,803,391	28,682,035				19,121,356	40% Fire Protection, 60% Volume
7	Water Meters	2,402,493			2,402,493			Meters & Services
	General							
8	Admin	20,653,276	17,017,655		227,786		3,407,835	Distribution of Plant Investment (OC) excluding Admin
9	Admin - Customer	500,000				500,000		Customer
10	Admin - Abingdon Maintenance Shop	3,564,062	2,126,793		809,305	202,068	425,896	Distribution of Abingdon Maint Shop O&M
11	Total: Original Cost	242,550,543	198,632,209	0	3,439,584	702,068	39,776,682	
12	Distribution of Total Original Cost Excluding General	100.0%	82.4%	0.0%	1.1%	0.0%	16.5%	
	Original Cost Less Depreciation (OCLD)							
13	Water Supply - Wells	2	2					Volume
14	Water Treatment	90,726,161	90,726,161					Volume
15	Treated Water Pumping	1,020,589	714,412				306,177	30% Fire Protection, 70% Volume
16	Treated Water Storage	6,320,350	4,424,245				1,896,105	30% Fire Protection, 70% Volume
	Water Distribution System							
17	Transmission	27,580,689	19,306,482				8,274,207	30% Fire Protection, 70% Volume
18	Distribution	29,966,067	17,979,640				11,986,427	40% Fire Protection, 60% Volume
19	Water Meters	1,098,572			1,098,572			Meters & Services
	General							
20	Admin	13,111,779	10,803,697		144,610		2,163,472	Distribution of Plant Investment (OC) excluding Admin
21	Admin - Customer	317,426				317,426		Customer
22	Admin - Abingdon Maintenance Shop	1,336,670	1,101,375		14,742		220,553	Distribution of Abingdon Maint Shop O&M
23	Total: OCLD	171,478,305	145,056,014	0	1,257,924	317,426	24,846,941	
24	Distribution of Total OCLD Cost Excluding General	100.0%	85.0%	0.0%	0.7%	0.0%	14.3%	

Table W-10
Allocation of Capital Net Revenue Requirement
Water Utility
Test Year 2016

Line #	Cost Components	Annual Cost of Service	Volume	Purchased Water	Meters & Services	Customer Billing	Fire Protection	Notes
	Existing GO Bonds							
1	Purchased Water Related	113,868		113,868				Direct Allocation to Purchased Water
2	Other	3,477	2,941	0	26	6	504	Distribution of Table W-9, Line 24
3	Subtotal	117,345	2,941	113,868	26	6	504	
4	Cash Funded Capital	756,250	619,317	0	10,724	2,189	124,020	Distribution of Table W-9, Line 12
5	Transfer to Capital (Expansion)	0	0	0	0	0	0	Distribution of Table W-9, Line 12
6	Fund Balance Increase	0	0	0	0	0	0	Distribution of Table W-9, Line 12
7	Total Revenue Requirements	873,595	622,258	113,868	10,750	2,195	124,524	
8	Interest Income	(1,032)	(845)	0	(15)	(3)	(169)	
9	Other Revenues	(27,310)	(22,369)	0	(386)	(79)	(4,476)	Excludes Purchased Water Costs
10	Miscellaneous Revenues	(11,475)	(9,399)	0	(162)	(33)	(1,881)	
11	Intra-County Revenues	(4,916)	(4,026)	0	(70)	(14)	(806)	
12	Fund Balance Decrease	(134,628)	(110,268)	0	(1,905)	(389)	(22,066)	
13	Total Net Revenue Requirement	694,234	475,351	113,868	8,212	1,677	95,126	

Table W-11
Allocation of Operating Net Revenue Requirement
Water Utility
Test Year 2016

Line #	Functional Components	Total Annual Cost	Volume	Purchased Water	Meters & Services	Customer Billing	Fire Protection	Notes
		\$	\$	\$	\$	\$	\$	
1	Water Supply	9,314	9,314					Volume
2	Water Treatment	8,544,183	8,544,183					Volume
3	Purchased Water	250,000		250,000				Purchased Water
4	Treated Water Pumping	817,751	572,426				245,325	70% Volume / 30% Fire Protection
5	Treated Water Storage	145,245	101,671				43,574	70% Volume / 30% Fire Protection
6	Transmission	648,168	453,718				194,450	70% Volume / 30% Fire Protection
7	Distribution	704,226	422,535				281,691	60% Volume / 40% Fire Protection
8	Fire Protection	39,000					39,000	Fire Protection
9	Meters	785,248			785,248			Meters & Services
10	Customer	736,219				736,219		Customer
11	General	2,243,474	1,823,724		141,736	132,886	145,128	Distribution of Total Excluding General
12	Allocation of O&M Costs	14,922,827	11,927,570	250,000	926,984	869,105	949,168	
13	Increase in Fund Balance							Distribution of Total Revenue Requirement
14	Less Other Revenues	(3,063,859)	(2,490,618)		(193,565)	(181,479)	(198,197)	Distribution of Total Revenue Requirement
15	Allocation of Operating Net Revenue Requirement	11,858,968	9,436,952	250,000	733,419	687,626	750,971	Distribution of Total Revenue Requirement
16	Distribution of Operating Net Revenue Requirement	100.0%	79.6%	2.1%	6.2%	5.8%	6.3%	

Table W-12
Units of Service
Water Utility
Test Year 2016

Line #	Customer Class	First Block Billed Volume	Second Block Billed Volume	Total Billed Volume	Bills	Equivalent Meters & Services	EDUs
		1,000 gallons	1,000 gallons	1,000 gallons			
1	1102 Harford Water	175,958	7,098	183,057	4,914	1,348	1,575
2	1110 Harford Water & Sewer	2,834,317	66,995	2,901,312	155,876	41,329	45,345
3	4302 MD American	6,041	0	6,041	4	14	25
4	6610 Swan Creek Comm Both	2,968	0	2,968	40	30	59
5	7102 Swan Creek Water	337	0	337	20	5	5
6	7110 Swan Creek Water & Sewer	11,953	0	11,953	164	61	71
7	Hand Billed - Misc	26,750	0	26,750	0	0	0
8	Hand Billed - Aberdeen	240,778	0	240,778	0	0	0
9	Hand Billed - APG Chapel Hill	74,274	0	74,274	0	0	0
10	Hand Billed - APG Van Bibber	0	0	0	0	0	0
11	Total	3,373,376	74,093	3,447,470	161,017	42,787	47,079
12	Adjustment for Second Block Volume Rate Pricing Factor (1.25)		18,523	18,523			
	Adjustment for Fire Service Lines						
13	Units of Service based on Meter Size					(9,835)	(12,564)
14	Units of Service based on Service Line					17,171	32,094
15	Total Adjusted Units of Service	3,373,376	92,617	3,465,993	161,017	50,123	66,610

Notes: (a) Equivalent Dwelling Units (EDUs) is used as an allocation basis for Fire Protection and Infrastructure Renewal Charge.

Table W-13
Unit Costs of Service
Water Utility
Test Year 2016

Line #	Cost Components	Total Annual Cost	Volume	Purchased Water	Meters & Services	Customer Billing	Fire Protection
1	Allocation of O&M Net Revenue Requirement	\$ 11,858,968	\$ 9,436,952	\$ 250,000	\$ 733,419	\$ 687,626	\$ 750,971
2	Allocation of Capital Net Revenue Requirement	694,234	475,351	113,868	8,212	1,677	95,126
3	Total Net Revenue Requirement	\$ 12,553,202	\$ 9,912,304	\$ 363,868	\$ 741,631	\$ 689,303	\$ 846,097
4	Units of Service		3,465,993	3,465,993	50,123	161,017	66,610
5	Units		1,000 gallons	1,000 gallons	Eq M & S	Bills	EDUs
6	Unit Cost		\$ 2.86	\$ 0.10	\$ 14.80	\$ 4.28	\$ 12.70

Notes: Eq M & S = Equivalent Meters and Services

Table W-14
Proposed Rates
Water Utility

Line #	Description	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
1	Effective Date	1/1/2016	1/1/2017	7/1/2017	7/1/2018	7/1/2019
Base Charge						
2	5/8" Meter Size	\$ 9.02	\$ 11.48	\$ 13.94	\$ 16.40	\$ 18.86
3	3/4" Meter Size	13.16	15.74	18.33	20.91	23.50
4	1" Meter Size	33.62	33.13	32.63	32.14	31.64
5	1 1/4" Meter Size	48.00	46.48	44.95	43.43	41.90
6	1 1/2" Meter Size	61.60	59.06	56.52	53.98	51.44
7	2" Meter Size	96.42	91.99	87.56	83.13	78.70
8	3" Meter Size	200.57	195.54	190.52	185.49	180.46
9	4" Meter Size	266.06	264.68	263.29	261.91	260.53
10	6" Meter Size	483.45	481.44	479.44	477.44	475.44
11	8" Meter Size	888.18	848.90	809.63	770.35	731.08
12	10" Meter Size	1,282.63	1,218.84	1,155.04	1,091.25	1,027.45
13	12" Meter Size	1,513.22	1,419.18	1,325.14	1,231.10	1,137.06
Volume Charge (per thousand gallons)						
14	First Block	\$ 3.45	\$ 3.82	\$ 4.44	\$ 4.45	\$ 4.73
15	Second Block	4.31	4.77	5.55	5.56	5.91
Wholesale Capital Recovery Rate						
16	Rate per 1,000 gallons	\$ 3.86	\$ 3.98	\$ 4.11	\$ 4.25	\$ 4.40
REMOVAL OF READY TO SERVE						
	Cost Per Quarter	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Asset Reinvestment Charge						
16	5/8" Meter Size	\$ -	\$ -	\$ 3.89	\$ 3.89	\$ 3.89
17	3/4" Meter Size	-	-	5.84	5.84	5.84
18	1" Meter Size	-	-	9.73	9.73	9.73
19	1 1/4" Meter Size	-	-	14.78	14.78	14.78
20	1 1/2" Meter Size	-	-	19.45	19.45	19.45
21	2" Meter Size	-	-	31.12	31.12	31.12
22	3" Meter Size	-	-	62.24	62.24	62.24
23	4" Meter Size	-	-	97.25	97.25	97.25
24	6" Meter Size	-	-	194.50	194.50	194.50
25	8" Meter Size	-	-	311.20	311.20	311.20
26	10" Meter Size	-	-	447.35	447.35	447.35
27	12" Meter Size	-	-	486.25	486.25	486.25

Table S-1
Annual Average Accounts
Sewer Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
1	1107 Harford Sewer Cubic Ft (Utilities Inc)	704	739	776	814	855	898	943
2	1110 Harford Water & Sewer	38,698	38,969	39,242	39,516	39,793	40,072	40,352
3	2100 Harford Flat	573	573	573	573	573	573	573
4	4307 Bel Air	4	4	4	4	4	4	4
5	4600 Spring Meadows	53	53	53	53	53	53	53
6	5107 Metered Sewer	4	4	4	4	4	4	4
7	6500 Harford Flat (Commercial)	9	9	9	9	9	9	9
8	6601 SW CR Com Flat	2	2	2	2	2	2	2
9	6610 SW CR Com Both	10	10	10	10	10	10	10
10	7107 Swan Creek Sewer	0	0	0	0	0	0	0
11	7110 Swan Creek Water & Sewer	41	41	41	41	41	41	41
12	8100 Whiteford	178	178	178	178	178	178	178
13	9107 Harford Cubic Ft (American Water)	1,508	1,498	1,487	1,477	1,467	1,456	1,446
14	Hand Billed - Bel Air Unmetered	1	1	1	1	1	1	1
15	Hand Billed - Misc (Delta Sludge)	1	1	1	1	1	1	1
16	Total	41,786	42,081	42,381	42,684	42,991	43,302	43,617

Table S-2
Annual Billed Volume
Sewer Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
1	1107 Harford Sewer Cubic Ft (Utilities Inc)	32,897	34,541	36,268	38,082	39,986	41,985	44,084
2	1110 Harford Water & Sewer	2,881,144	2,901,312	2,921,621	2,942,072	2,962,667	2,983,406	3,004,289
3	2100 Harford Flat	0	0	0	0	0	0	0
4	4307 Bel Air	365,154	365,154	365,154	365,154	365,154	365,154	365,154
5	4600 Spring Meadows	0	0	0	0	0	0	0
6	5107 Metered Sewer	9,896	9,896	9,896	9,896	9,896	9,896	9,896
7	6500 Harford Flat (Commercial)	0	0	0	0	0	0	0
8	6601 SW CR Com Flat	0	0	0	0	0	0	0
9	6610 SW CR Com Both	2,968	2,968	2,968	2,968	2,968	2,968	2,968
10	7107 Swan Creek Sewer	0	0	0	0	0	0	0
11	7110 Swan Creek Water & Sewer	11,953	11,953	11,953	11,953	11,953	11,953	11,953
12	8100 Whiteford	0	0	0	0	0	0	0
13	9107 Harford Cubic Ft (American Water)	102,388	101,672	100,960	100,253	99,551	98,854	98,162
14	Hand Billed - Bel Air Unmetered	39,923	39,923	39,923	39,923	39,923	39,923	39,923
15	Hand Billed - Misc (Delta Sludge)	0	0	0	0	0	0	0
16	Total	3,446,323	3,467,419	3,488,744	3,510,302	3,532,099	3,554,140	3,576,431

Table 3a
Service Revenue Under Existing Rates
Sewer Utility

Line #	Customer Class	2009	2010	2011	2012	2013	2014
1	Base Charge	1,370,759	1,444,909	1,449,585	1,493,402	1,572,782	1,647,226
2	Volume Charge	10,020,170	10,639,068	10,611,169	10,693,602	10,569,260	10,933,949
3	Flat Charge	241,198	249,065	249,761	251,965	258,619	234,430
4	Total	11,632,128	12,333,043	12,310,515	12,438,969	12,400,661	12,815,605

Table S-3.1
Base Charge Revenue
Sewer Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
1	1107 Harford Sewer Cubic Ft (Utilities Inc)	16,821	17,950	18,847	19,790	20,779	21,818	22,909
2	1110 Harford Water & Sewer	1,594,155	1,631,103	1,642,521	1,654,019	1,665,597	1,677,256	1,688,997
3	2100 Harford Flat	0	0	0	0	0	0	0
4	4307 Bel Air	0	0	0	0	0	0	0
5	4600 Spring Meadows	0	0	0	0	0	0	0
6	5107 Metered Sewer	4,478	4,548	4,548	4,548	4,548	4,548	4,548
7	6500 Harford Flat (Commercial)	0	0	0	0	0	0	0
8	6601 SW CR Com Flat	0	0	0	0	0	0	0
9	6610 SW CR Com Both	937	952	952	952	952	952	952
10	7107 Swan Creek Sewer	0	0	0	0	0	0	0
11	7110 Swan Creek Water & Sewer	1,896	1,926	1,926	1,926	1,926	1,926	1,926
12	8100 Whiteford	0	0	0	0	0	0	0
13	9107 Harford Cubic Ft (American Water)	67,592	68,195	67,718	67,244	66,773	66,306	65,842
14	Hand Billed - Bel Air Unmetered	0	0	0	0	0	0	0
15	Hand Billed - Misc (Delta Sludge)	0	0	0	0	0	0	0
16	Total	1,685,880	1,724,675	1,736,512	1,748,478	1,760,575	1,772,806	1,785,174

Table S-3.2
Volume Charge Revenue
Sewer Utility

Line #	Customer Class	Fiscal Year						
		2015	2016	2017	2018	2019	2020	2021
1	1107 Harford Sewer Cubic Ft (Utilities Inc)	108,476	115,627	121,408	127,479	133,853	140,545	147,573
2	1110 Harford Water & Sewer	9,542,329	9,754,850	9,823,134	9,891,896	9,961,140	10,030,868	10,101,084
3	4307 Bel Air	909,233	923,840	923,840	923,840	923,840	923,840	923,840
4	5107 Metered Sewer	32,632	33,127	33,127	33,127	33,127	33,127	33,127
5	6610 SW CR Com Both	4,051	4,111	4,111	4,111	4,111	4,111	4,111
6	7107 Swan Creek Sewer	0	0	0	0	0	0	0
7	7110 Swan Creek Water & Sewer	16,316	16,555	16,555	16,555	16,555	16,555	16,555
8	9107 Harford Cubic Ft (American Water)	340,529	343,275	340,872	338,486	336,116	333,763	331,427
9	Hand Billed - Bel Air Unmetered	112,983	114,880	114,880	114,880	114,880	114,880	114,880
10	Hand Billed - Misc (Delta Sludge)	10,000	10,000	10,000	10,000	10,000	10,000	10,000
11	Total	11,199,534	11,441,144	11,512,806	11,585,252	11,658,500	11,732,568	11,807,475

Table S-3
Service Revenue Under Existing Rates
Sewer Utility

		Fiscal Year						
Line #	Charge Description	2015	2016	2017	2018	2019	2020	2021
1	Base Charge	1,685,880	1,724,675	1,736,512	1,748,478	1,760,575	1,772,806	1,785,174
2	Volume Charge	11,199,534	11,441,144	11,512,806	11,585,252	11,658,500	11,732,568	11,807,475
3	Flat Charge	227,192	230,766	230,766	230,766	230,766	230,766	230,766
4	Total	13,112,605	13,396,584	13,480,084	13,564,496	13,649,841	13,736,140	13,823,414

Table S-5.1
Capital Improvement Program
Sewer Utility

Line #	Project Category	2016	2017	2018	2019	2020	2021	Total (2016 - 2021)
		\$	\$	\$	\$	\$	\$	\$
1	Expansion CIP	9,359,921	10,699,286	17,723,419	3,880,513	4,016,331	0	45,679,469
2	Non Expansion CIP	1,456,250	2,328,750	8,797,437	2,852,178	6,810,551	4,919,990	27,165,155
3	Total	10,816,171	13,028,036	26,520,855	6,732,691	10,826,882	4,919,990	72,844,623

Notes Expansion CIP includes Admin and Customer CIP costs

Table S-5
Capital Improvement Program
Sewer Utility

Line #	Functional Category	2016	2017	2018	2019	2020	2021	Total (2016 - 2021)
		\$	\$	\$	\$	\$	\$	\$
1	Collection	240,000	1,169,550	1,863,932	1,718,513	1,646,697	2,517,894	9,156,586
2	Collection-Spring Meadows	0	0	0	0	0	0	0
3	Collection-Whiteford	0	0	0	0	0	0	0
4	Interceptor	450,000	5,433,750	16,871,795	3,991,385	4,131,083	118,769	30,996,782
5	Pumping Stations	8,669,921	3,146,373	1,285,470	0	573,762	593,843	14,269,369
6	WWTP	700,000	2,070,000	5,088,319	776,103	4,016,331	1,187,686	13,838,439
7	WWTP-Spring Meadows	0	0	0	0	0	0	0
8	Sewer General	0	0	0	0	0	0	0
9	Sewer Admin	756,250	1,208,363	1,411,339	246,690	459,009	501,798	4,583,448
10	Sewer Customer	0	0	0	0	0	0	0
11	Total	10,816,171	13,028,036	26,520,855	6,732,691	10,826,882	4,919,990	72,844,623

Table S-6
Operations and Maintenance Expenses
Sewer Utility

Line #	Expense Category	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$
1	Administration	1,739,262	1,794,470	1,851,484	1,910,366	2,016,076	2,080,505
2	Benefits	354,646	366,096	377,929	390,161	402,804	415,873
3	General Inventory	25,000	25,750	26,523	27,318	28,138	28,982
4	Industrial Waste Management	158,327	164,106	170,110	176,348	182,830	189,566
5	Joppatowne Sewerage Treatment Plant	777,771	808,358	840,321	873,734	908,674	945,227
6	Personnel Matters-W/S Fund	87,018	89,983	93,056	96,239	99,538	102,956
7	Sewer Engineering	682,343	853,635	884,071	915,648	948,411	982,406
8	Sewer O&M-Abingdon	2,646,283	2,880,747	2,984,657	3,173,904	3,288,881	3,451,941
9	Sewer O&M-Pump/Meter Stations	3,030,812	3,143,114	3,259,776	3,380,976	3,506,899	3,637,739
10	Sewer O&M-Sod Run	8,342,245	8,694,424	9,063,895	9,451,667	9,858,819	10,286,506
11	Sewer O&M -Spring Meadows	127,571	132,537	137,708	143,091	148,696	154,532
12	Water & Sewer Accounting	600,219	624,897	650,560	677,244	704,993	733,847
13	Water O&M Abingdon Treatment Plant	795,396	849,938	879,597	926,053	958,512	1,000,601
14	Whiteford/Cardiff Service Community	80,700	83,136	85,646	88,231	90,895	93,639
15	Total Sewer O&M Expenses	19,447,593	20,511,193	21,305,333	22,230,980	23,144,164	24,104,319

Table S-7.1
Construction Fund (Non Expansion): Service Revenue Cash Flow
Sewer Utility

Line #	Description	2016	2017	2018	2019	2020	2021
		\$	\$	\$	\$	\$	\$
New Capital Funding Sources							
1	GO Bond Proceeds	1,782,000	6,732,000	2,574,000	3,643,200	3,564,000	5,049,000
2	Federal Grants	0	0	0	0	0	0
3	Other Sources	0	0	0	0	0	0
4	Total New Funding Sources	1,782,000	6,732,000	2,574,000	3,643,200	3,564,000	5,049,000
Existing Source of Funds							
5	Beginning Balance	1,001,400	2,111,656	6,853,435	1,113,335	4,034,769	3,073,138
6	Transfer from Operations	756,250	258,750	428,490	2,076,075	2,220,458	1,535,085
7	Interest Income	28,257	79,779	54,846	54,337	64,462	72,334
8	Total Existing Sources of Funds	3,567,906	9,182,185	9,910,772	6,886,947	9,883,689	9,729,556
Application of Funds							
9	Major Capital Improvement	1,456,250	2,328,750	8,797,437	2,852,178	6,810,551	4,919,990
10	Total Uses of Funds	1,456,250	2,328,750	8,797,437	2,852,178	6,810,551	4,919,990
11	Ending Fund Balance	2,111,656	6,853,435	1,113,335	4,034,769	3,073,138	4,809,567
12	Required Balance	2,052,500	6,776,710	1,082,077	3,942,570	3,038,679	4,740,931

Table S-7
Operating Fund: Service Revenue Cash Flow
Sewer Utility

Line #	Description	2016	2017	2018	2019	2020	2021
Revenues							
1	Proposed Revenue Increases	29.75%	28.00%	5.00%	5.00%	4.50%	4.50%
		\$	\$	\$	\$	\$	\$
2	Revenues from Existing Rates	13,396,584	13,480,084	13,564,496	13,649,841	13,736,140	13,823,414
3	Revenue Increases	996,371	5,234,654	9,808,216	11,045,915	12,264,028	13,519,391
4	Total Revenues from Rates	14,392,955	18,714,738	23,372,712	24,695,757	26,000,168	27,342,805
5	Interest Income	53,243	21,759	24,221	35,517	38,057	40,013
6	Other Revenues	721,813	721,813	721,813	721,813	721,813	721,813
7	Miscellaneous Revenues	207,500	207,500	207,500	207,500	207,500	207,500
8	Intra County Revenues	88,900	88,900	88,900	88,900	88,900	88,900
9	Total Revenues	15,464,410	19,754,709	24,415,146	25,749,486	27,056,437	28,401,030
Revenue Requirements							
10	O&M Expenses	19,447,593	20,511,193	21,305,333	22,230,980	23,144,164	24,104,319
11	Debt Service	205,006	337,163	836,429	1,028,068	1,298,341	1,563,874
12	Transfer to Construction	756,250	258,750	428,490	2,076,075	2,220,458	1,535,085
12.1	Cash Funded Capital (Non-Expansion Pay-go)	556,250	0	0	1,854,331	1,761,449	1,060,011
12.2	Recurring Capital (Fleet)	200,000	258,750	428,490	221,744	459,009	475,074
13	Transfer to Capital Expansion (Expansion Pay-go)	0	0	0	0	300,000	900,000
14	Total Revenue Requirements	20,408,849	21,107,106	22,570,252	25,335,123	26,962,963	28,103,278
15	Annual Net Balance	-4,944,439	-1,352,397	1,844,894	414,363	93,474	297,752
16	Beginning Balance	7,796,497	2,852,058	1,499,662	3,344,555	3,758,919	3,852,393
17	Ending Fund Balance	2,852,058	1,499,662	3,344,555	3,758,919	3,852,393	4,150,145
18	Required O&M Balance (60 days)	3,196,865	3,371,703	3,502,247	3,654,408	3,804,520	3,962,354
19	Balance Available (days)	54	27	57	62	61	63

Table S-8
Service Charge Cost of Service
Sewer Utility
Test Year 2016

Line #	Component	Service Charges Cost of Service		
		Operating	Capital	Total
		\$	\$	\$
	REVENUE REQUIREMENTS			
1	Operation and Maintenance Expense	19,447,593	0	19,447,593
	Debt Service			
2	Proposed GO Bonds	0	205,006	205,006
3	Cash Funded Capital	0	756,250	756,250
4	Transfer to Capital (Expansion)	0	0	0
5	Fund Balance Increase	0	0	0
6	Total Revenue Requirement	19,447,593	961,256	20,408,849
	Less: Other Sources of Revenue			
7	Interest Income	(50,735)	(2,508)	(53,243)
8	Other Revenues (excluding Purchased Water)	(687,815)	(33,998)	(721,813)
9	Miscellaneous Revenues	(197,727)	(9,773)	(207,500)
10	Intra-County Revenues	(84,713)	(4,187)	(88,900)
11	Fund Balance Decrease	(4,711,556)	(232,883)	(4,944,439)
12	Net Revenue Requirement	13,715,047	677,908	14,392,955

Table S-9
Allocation of Plant Investment
Sewer Utility
Test Year 2016

Line #	Functional Components	Total Plant Investment	Treatment	Pumping & Conveyance	Collection	Meters & Services	Customer Billing	Industrial Strength	Spring Meadows	Whiteford	Notes
	Original Cost										
	Sewer Collection System										
1	Conveyance	33,579,652		33,579,652							Conveyance
2	Collection	87,767,468			87,767,468						Local Collection
3	Sewer Collection System - Spring Meadows	0							0		Spring Meadows
4	Sewer Collection System - Whiteford	4,004,042								4,004,042	Whiteford
5	Sewer Interceptor	30,609,104		30,609,104							Conveyance
6	Sewer Pumping Stations	15,778,818		15,778,818							Conveyance
7	Sewer Treatment	99,255,397	99,255,397								Treatment
8	Sewer Treatment - Spring Meadows	389,928							389,928		Spring Meadows
9	Water Meters	1,965,676				1,965,676					Meters & Services
	General										
10	Admin	20,653,276	7,499,354	6,042,041	6,631,371	148,519			29,461	302,530	Distribution of Rate Base
11	Admin - Customer	500,000					500,000				Customer
12	Admin - Abingdon Maintenance Shop	3,564,062	995,052	801,688	879,884	678,651	164,736		3,909	40,141	Dist of Abingdon Maint Shop O&M
13	Total	298,067,423	107,749,803	86,811,304	95,278,724	2,792,845	664,736	0	423,299	4,346,713	
14	Total Excluding General	273,350,085	99,255,397	79,967,574	87,767,468	1,965,676	0	0	389,928	4,004,042	
	Original Cost Less Depreciation										
	Sewer Collection System										
15	Conveyance	24,018,311		24,018,311							Conveyance
16	Collection	62,776,896			62,776,896						Local Collection
17	Sewer Collection System - Spring Meadows	0									Spring Meadows
18	Sewer Collection System - Whiteford	3,326,423								3,326,423	Whiteford
19	Sewer Interceptor	22,214,875		22,214,875							Conveyance
20	Sewer Pumping Stations	11,222,167		11,222,167							Conveyance
21	Sewer Treatment	25,609,461	25,609,461								Treatment
22	Sewer Treatment - Spring Meadows	0									Spring Meadows
23	Water Meters	898,832				898,832					Meters & Services
	General										
24	Admin	13,111,779	4,760,981	3,835,803	4,209,941	94,288			18,704	192,062	Distribution of Rate Base
25	Admin - Customer	317,426					317,426				Customer
26	Admin - Abingdon Maintenance Shop	1,336,670	373,185	300,666	329,993	254,522	61,783		1,466	15,055	Dist of Abingdon Maint Shop O&M
27	Total	164,832,839	30,743,627	61,591,821	67,316,830	1,247,642	379,209	0	20,170	3,533,540	
28	Total Excluding General	150,066,964	25,609,461	57,455,352	62,776,896	898,832				3,326,423	

Table S-10
Allocation of Capital Net Revenue Requirement
Sewer Utility
Test Year 2016

Line #	Cost Components	Annual Cost of Service	Treatment	Pumping & Conveyance	Collection	Meters & Services	Customer Billing	Industrial Strength	Spring Meadows	Whiteford	Notes
	Debt Service										
1	Debt Service	205,006	38,236	76,603	83,723	1,552	472		25	4,395	Distribution of Rate Base (OCLD)
2	Subtotal	205,006	38,236	76,603	83,723	1,552	472	0	25	4,395	
3	Cash Funded Capital	756,250	273,380	220,256	241,739	7,086	1,687		1,074	11,028	Distribution of Rate Base (Original Cost)
4	Transfer to Capital (Expansion)	0									Distribution of Rate Base (Original Cost)
5	Fund Balance Increase	0									Distribution of Rate Base (Original Cost)
6	Total Revenue Requirements	961,256	311,616	296,859	325,462	8,638	2,159	0	1,099	15,423	
7	Interest Income	(2,508)	(813)	(774)	(849)	(23)	(6)	0	(3)	(40)	Distribution of Total Revenue Requirements
8	Other Revenues	(33,998)	(11,022)	(10,499)	(11,511)	(306)	(76)	0	(39)	(545)	Distribution of Total Revenue Requirements
9	Miscellaneous Revenues	(9,773)	(3,168)	(3,018)	(3,309)	(88)	(22)	0	(11)	(157)	Distribution of Total Revenue Requirements
10	Intra-County Revenues	(4,187)	(1,357)	(1,293)	(1,418)	(38)	(9)	0	(5)	(67)	Distribution of Total Revenue Requirements
11	Fund Balance Decrease	(232,883)	(75,495)	(71,920)	(78,849)	(2,093)	(523)	0	(266)	(3,737)	Distribution of Total Revenue Requirements
12	Total Net Revenue Requirement	677,908	219,762	209,355	229,526	6,090	1,523	0	775	10,877	

Table S-11
Allocation of Budgeted O&M
Sewer Utility
Test Year 2016

Line #	O&M Cost Centers	Total O&M	Treatment	Pumping & Conveyance	Collection	Meters & Services	Customer Billing	Industrial Strength	Spring Meadows	Whiteford	General	Notes
1	304110 Administration	1,739,262									1,739,262	General
2	681510 Benefits	354,646									354,646	General
3	304140 General Inventory	25,000	9,077	7,314	8,027	180			36	366		Allocated based on Plant (OC)
4	304200 Industrial Waste Management	158,327						158,327				Industrial Strength
5	671510 Insurance	0										General
6	304300 Joppatowne Sewerage Treatment Plant	777,771	777,771									Treatment
7	229051 Natural Disasters	0										Allocated based on Plant (OC)
8	084510 Personnel Matters - W/S Fund	87,018									87,018	General
9	306101 Sewer Engineering	682,343	247,764	199,617	219,087	4,907			973	9,995		Allocated based on Plant (OC)
10	306210 Sewer O&M Abingdon	2,646,283	960,884	774,160	849,671	19,030			3,775	38,763		Allocated based on Plant (OC)
11	306260 Sewer O&M Joppatowne	0										Allocated based on Plant (OC)
12	306220 Sewer O&M Pump/Meter Stations	3,030,812		3,030,812								Pump Stations
13	306230 Sewer O&M Sod Run	8,342,245	8,342,245									Treatment
14	306240 Sewer O&M Spring Meadows	127,571							127,571			Spring Meadows
15	045000 Water & Sewer Accounting	600,219					540,219				60,000	General
16	305101 Water Engineering	0										
17	305210 Water O&M Abingdon	795,396				636,317	159,079					80% Meters / 20% Billing
18	305280 Water O&M Abingdon Water Plant	0										
19	305250 Water O&M Havre de Grace	0										
20	305255 Water O&M Havre de Grace - Solids	0										
21	305260 Water O&M Joppatowne	0										
22	305240 Water O&M Long Booster Stations	0										
23	305220 Water O&M Perryman	0										
24	305290 Water O&M - Carbon Treatment Plant	0										
25	307110 Whiteford/Cardiff Service Community	80,700								80,700		Whiteford
26	Total	19,447,593	10,337,741	4,011,903	1,076,785	660,434	699,298	158,327	132,355	129,824	2,240,926	
27	Total Excluding General	17,206,667	10,337,741	4,011,903	1,076,785	660,434	699,298	158,327	132,355	129,824		
28	Allocation of General	0	1,346,345	522,494	140,236	86,012	91,074	20,620	17,237	16,908	(2,240,926)	Distribution of Total Excluding General
28	Total	19,447,593	11,684,086	4,534,397	1,217,021	746,446	790,372	178,947	149,592	146,732	0	

Table S-12
Allocation of Operating Net Revenue Requirement
Sewer Utility
Test Year 2016

Line #	Cost Components	Annual Cost of Service	Treatment	Pumping & Conveyance	Local Collection	Meters & Services	Customer Billing	Industrial Strength	Spring Meadows	Whiteford	Notes
1	O&M Expense	19,447,593	11,684,086	4,534,397	1,217,021	746,446	790,372	178,947	149,592	146,732	
2	Fund Balance Increase	0	0	0	0	0	0	0	0	0	
	Less Other Sources of Revenue										
3	Interest Income	(50,735)	(30,482)	(11,829)	(3,175)	(1,947)	(2,062)	(467)	(390)	(383)	
4	Other Revenues	(687,815)	(389,789)	(151,271)	(40,601)	(24,902)	(26,367)	(45,000)	(4,991)	(4,895)	\$45k Allocated Directly to Industrial Waste
5	Miscellaneous Revenues	(197,727)	(118,794)	(46,102)	(12,374)	(7,589)	(8,036)	(1,819)	(1,521)	(1,492)	
6	Intra-County Revenues	(84,713)	(50,895)	(19,752)	(5,301)	(3,251)	(3,443)	(779)	(652)	(639)	
7	Fund Balance Decrease	(4,711,556)	(2,830,696)	(1,098,545)	(294,847)	(180,841)	(191,483)	(43,353)	(36,242)	(35,549)	
8	Total Net Revenue Requirement	13,715,047	8,263,430	3,206,898	860,724	527,915	558,981	87,528	105,797	103,774	

Table S-13
Units of Service
Sewer Utility
Test Year 2016

Line #	Customer Class	First Block Billed Volume	Second Block Billed Volume	Total Billed Volume	Average Number of Accounts	Bills	Equivalent Meters & Services	EDUs
		1,000 gallons	1,000 gallons	1,000 gallons				
1	1107 Harford Sewer Cubic Ft (Utilities Inc)	34,541	0	34,541	739	2,955	739	739
2	1110 Harford Water & Sewer	2,835,352	65,960	2,901,312	38,969	155,876	41,329	45,345
3	2100 Harford Flat	0	0	0	573	2,292	573	573
4	4307 Bel Air	365,154	0	365,154	4	16	152	460
5	4600 Spring Meadows	0	0	0	53	212	53	53
6	5107 Metered Sewer	9,896	0	9,896	4	16	100	260
7	6500 Harford Flat (Commercial)	0	0	0	9	36	11	15
8	6601 SW CR Com Flat	0	0	0	2	0	3	5
9	6610 SW CR Com Both	2,968	0	2,968	10	40	30	59
10	7107 Swan Creek Sewer	0	0	0	0	0	0	0
11	7110 Swan Creek Water & Sewer	11,953	0	11,953	41	164	61	71
12	8100 Whiteford	0	0	0	178	712	178	178
13	9107 Harford Cubic Ft (American Water)	95,783	5,889	101,672	1,498	5,991	1,580	1,799
14	Hand Billed - Bel Air Unmetered	39,923	0	39,923	0	0	0	0
15	Hand Billed - Misc (Delta Sludge)	0	0	0	0	0	0	0
16	Total	3,395,570	71,849	3,467,419	42,079	168,309	44,808	49,556
	Adjustments							
17	Spring Meadows & Whiteford	0	0	0	(231)	0	(231)	0
18	Swan Creek (Pumping & Conveyance ONLY)	(14,921)	0	(14,921)	0	0	0	0
19	Harford Flat	41,366	0	41,366	0	0	0	0
20	Subtotal	3,422,015	71,849	3,493,864	41,848	168,309	44,577	49,556
21	Adjustment for Second Block Volume Rate Pricing Factor		14,370	14,370				
22	Total Adjusted Units of Service	3,422,015	86,219	3,508,234	41,848	168,309	44,577	49,556

Table S-14
Unit Costs of Service
Sewer Utility
Test Year 2016

Line #	Cost Components	Total Annual Cost	Treatment	Pumping & Conveyance	Local Collection	Meters & Services	Customer Billing	Industrial Strength	Spring Meadows	Whiteford
1	Allocation of O&M Net Revenue Requirement	\$ 13,715,047	\$ 8,263,430	\$ 3,206,898	\$ 860,724	\$ 527,915	\$ 558,981	\$ 87,528	\$ 105,797	\$ 103,774
2	Allocation of Capital Net Revenue Requirement	677,908	219,762	209,355	229,526	6,090	1,523	-	775	10,877
3	Total Net Revenue Requirement	\$ 14,392,955	\$ 8,483,192	\$ 3,416,253	\$ 1,090,250	\$ 534,005	\$ 560,504	\$ 87,528	\$ 106,572	\$ 114,651
4	Units of Service		3,508,234	3,523,155	3,508,234	44,577	168,309	44,577	212	712
5	Units		1,000 gallons	1,000 gallons	1,000 gallons	Eq M & S	Bills	Eq M & S	Bills	Bills
6	Unit Cost		\$ 2.42	\$ 0.97	\$ 0.31	\$ 11.98	\$ 3.33	\$ 1.96	\$ 502.70	\$ 161.03

**Table S-15
Proposed Rates
Sewer Utility**

Line #	Description	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
1	Effective Date	1/1/2016	1/1/2017	7/1/2017	7/1/2018	7/1/2019
Base Charge (per Bill)						
2	5/8" Meter Size	\$ 7.60	\$ 8.91	\$ 10.29	\$ 11.49	\$ 12.68
3	3/4" Meter Size	31.90	27.90	23.71	18.84	13.91
4	1" Meter Size	51.63	43.39	34.72	24.99	15.13
5	1 1/4" Meter Size	73.52	60.53	46.86	31.70	16.35
6	1 1/2" Meter Size	100.89	81.89	61.89	39.87	17.58
7	2" Meter Size	160.69	129.54	96.76	60.75	24.32
8	3" Meter Size	345.92	284.08	219.00	146.93	73.96
9	4" Meter Size	505.17	411.08	312.06	202.87	92.35
10	6" Meter Size	1,001.04	803.06	594.70	366.32	135.25
11	8" Meter Size	2,375.32	1,872.60	1,343.42	767.10	184.27
12	10" Meter Size	3,742.53	2,938.17	2,091.46	1,170.59	239.43
13	12" Meter Size	4,903.84	3,842.31	2,724.88	1,510.36	282.33
Volume Charge (per thousand gallons)						
14	First Block	\$ 4.99	\$ 5.42	\$ 6.77	\$ 6.79	\$ 7.22
15	Second Block	5.99	6.50	8.12	8.15	8.67
Swan Creek Base Charge (per Bill)						
16	5/8" Meter Size	\$ 8.38	\$ 9.51	\$ 10.70	\$ 11.69	\$ 12.68
17	3/4" Meter Size	11.57	12.26	12.99	13.46	13.91
18	1" Meter Size	17.85	17.39	16.91	16.04	15.13
19	1 1/4" Meter Size	24.93	23.13	21.25	18.83	16.35
20	1 1/2" Meter Size	33.21	29.80	26.22	21.94	17.58
21	2" Meter Size	52.73	46.45	39.85	32.15	24.32
22	3" Meter Size	103.69	97.64	91.31	82.75	73.96
23	4" Meter Size	151.43	141.29	130.11	114.26	92.35
24	6" Meter Size	300.06	276.02	247.95	206.31	135.25
25	8" Meter Size	712.01	643.62	560.13	432.03	184.27
26	10" Meter Size	1,121.83	1,009.87	872.01	659.27	239.43
27	12" Meter Size	1,469.93	1,320.62	1,136.11	850.62	282.33
Swan Creek Volume Charge (per thousand gallons)						
23	First Block	\$ 1.73	\$ 1.87	\$ 2.57	\$ 2.61	\$ 2.81
24	Second Block	2.51	2.71	3.73	3.78	4.07

**Table S-15
Proposed Rates
Sewer Utility**

Line #	Description	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
1	Effective Date	1/1/2016	1/1/2017	7/1/2017	7/1/2018	7/1/2019
Metered Sewer Base Charge (per Bill)						
25	6" Meter Size	\$ 185.03	\$ 163.63	\$ 154.17	\$ 144.71	\$ 135.25
26	8" Meter Size	371.41	306.65	265.85	225.06	184.27
27	10" Meter Size	539.00	438.01	371.82	305.62	239.43
28	12" Meter Size	969.10	797.41	625.71	454.02	282.33
Flat Sewer Charges (per Bill)						
29	Harford	\$ 77.46	\$ 84.79	\$ 105.07	\$ 106.55	\$ 113.76
30	Harford Commercial	186.36	189.73	217.51	208.32	210.07
31	Swan Creek	32.60	35.69	46.68	48.23	52.02
32	Swan Creek Commercial	64.56	67.88	86.30	86.51	91.00
33	Spring Meadows	112.20	119.53	139.81	141.29	148.50
34	Whiteford	104.32	111.65	131.93	133.41	140.62
Asset Reinvestment Charge (per Bill)						
35	5/8" Meter Size	\$ -	\$ -	\$ 3.89	\$ 3.89	\$ 3.89
36	3/4" Meter Size	-	-	5.84	5.84	5.84
37	1" Meter Size	-	-	9.73	9.73	9.73
38	1 1/4" Meter Size	-	-	14.78	14.78	14.78
39	1 1/2" Meter Size	-	-	19.45	19.45	19.45
40	2" Meter Size	-	-	31.12	31.12	31.12
41	3" Meter Size	-	-	62.24	62.24	62.24
42	4" Meter Size	-	-	97.25	97.25	97.25
43	6" Meter Size	-	-	194.50	194.50	194.50
44	8" Meter Size	-	-	311.20	311.20	311.20
45	10" Meter Size	-	-	447.35	447.35	447.35
46	12" Meter Size	-	-	486.25	486.25	486.25

