PWD STATEMENT NO. 9A

BEFORE THE
PHILADELPHIA WATER, SEWER AND STORM WATER RATE BOARD

In the Matter of the Philadelphia Water Department's Proposed Change in Water, Wastewater and Stormwater Rates and Related Charges	Fiscal Years 2019-2021

Direct Testimony

of

Black & Veatch Management Consulting, LLC

on behalf of

The Philadelphia Water Department

Dated: February 12, 2018

DIRECT TESTIMONY OF BLACK & VEATCH MANAGEMENT CONSULTING, LLC

I. INTRODUCTION

Q1. PLEASE STATE YOUR NAMES AND BUSINESS AFFILIATION.

A1. Our names are Brian Merritt, Dave Jagt, Prabha Kumar, and Ann Bui. We are employed by the firm of Black & Veatch Management Consulting LLC (Black & Veatch), 8400 Ward Parkway, Kansas City, Missouri. On behalf of the City of Philadelphia Water Department (Water Department), we will be presenting our collective testimony in this proceeding as a panel. Appended to this Direct Testimony are our respective resumes of experience.

Q2. PLEASE DESCRIBE THE FIRM OF BLACK & VEATCH MANAGEMENT CONSULTING, LLC (BLACK & VEATCH).

A2. Founded in 1915 and headquartered in Overland Park, Kansas, Black & Veatch serves its clients through a network of collaboratively connected regional offices. The employee owned company has approximately 10,000 professionals operating out of more than 100 offices worldwide. The firm's clients include municipalities, ranging from small townships to large metropolitan regions; public and investor owned utilities; industrial and commercial businesses; local, state, and Federal agencies, international bodies, and governments of overseas nations. Black & Veatch Management Consulting, LLC (Black & Veatch) is a wholly-owned subsidiary of Black & Veatch Holding Company and brings together over 200 professionals, including experienced industry executives, senior analysts, and technology experts from across the electric, water, oil,

natural gas and technology industries. The services we provide include utility financial planning, cost of service rate studies, bond feasibility studies, affordability analysis, systems valuation, utility business efficiency and transformation services, operations technology planning and integration services, and customer engagement and advanced metering/billing solutions implementation, and expert testimony during rate proceedings, litigation support, and regulatory review.

Q3. PLEASE IDENTIFY THE MEMBERS OF THE BLACK & VEATCH TEAM PROVIDING TESTIMONY?

A3. The members of the Black & Veatch team providing testimony are: Mr. Brian Merritt; Mr. Dave Jagt; Ms. Prabha Kumar; and Ms. Ann Bui.

Q4. PLEASE DESCRIBE YOUR RESPECTIVE PROJECT RESPONSIBILITIES WITH REGARD TO THIS RATE PROCEEDING?

A4. Mr. Merritt is a Manager in Black & Veatch, and is the Project Manager for this comprehensive water and wastewater cost of service and rate study. Mr. Merritt manages the overall project schedule and coordination on the various components of the study including coordinating with the Water Department. Mr. Merritt also led the Tiered Assistance Program (TAP) Rate Rider framework development and stormwater analysis and assisted with the miscellaneous fee analysis.

Mr. Jagt is a Manager in Black & Veatch, and is currently the technical lead for all the financial analysis for this comprehensive water and wastewater cost of

service study. He is responsible for the projection of revenues under existing rates and revenue requirements; cost of service analysis for the water and wastewater systems including stormwater cost allocations; and for the design of water, sanitary sewer, and stormwater rates.

Ms. Kumar is a Director in Black & Veatch and provided overall technical review of the multi-year revenue and revenue requirements analysis; the revenue adjustment projections, the TAP Rider framework and related testimony; the stormwater billing units analysis, and the design of stormwater rates. She is responsible for reviewing the stormwater billing units including (a) the development of the billable gross area (GA) and impervious area (IA) units of service; (b) the projection of the reduction in GA and IA units of service due to stormwater credits; incentive programs; and stormwater appeals; (c) the proposed TAP Rate Rider approach; and (d) the design of stormwater GA and IA rates for the Residential and Non-Residential classes of parcels.

Ms. Bui is a Managing Director in Black & Veatch and provided overall technical review of all the Cost of Service analysis, the design of rate schedules, and monthly bill impact. She is also responsible for reviewing the Miscellaneous Fee analysis, and the integration of TAP Revenue Loss projections in to the revenue requirement analysis.

Q5. MR. MERRITT, WILL YOU PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE?

A5. I received a Bachelor of Science Degree in Civil & Environmental Engineering in 2000 and a Master of Science Degree in Civil & Environmental Engineering in 2007, both from Lehigh University. I joined Black & Veatch Management Consulting in 2015 as a Manager. Prior to that I was employed at Amec Foster Wheeler (now the Wood Group) for seven plus years, where I served in varying capacities during my tenure including project manager and Civil/Water Resources Department Manager for the Blue Bell Office. The bulk of my 15 years of experience has been in the water sector assisting clients with various water, wastewater and stormwater infrastructure projects, program evaluation/design, policy development, funding implementation, asset evaluations and regulatory compliance. With Black & Veatch my work focuses on stormwater fee implementation and development, water, sewer and stormwater cost of service analysis, financial planning and rate design including alternative rate structure approaches, public outreach, program evaluations and planning, and funding strategy implementation.

Q6. MR. JAGT, WILL YOU PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE?

A6. I graduated from Virginia Tech with a Bachelor of Science Degree in Civil Engineering. I am a registered professional engineer in Virginia. I joined the firm of Black & Veatch in 1987. During my employment with Black & Veatch I have been involved in various studies related to water and wastewater utility engineering, financial feasibility and rates, serving in increasing levels of responsibility from staff engineer, to project engineer, and to project manager. Among the clients for which I have been involved in studies regarding water,

wastewater and stormwater rates and related matters, in addition to the City of Philadelphia Water Department, are Harford County, Maryland; City of Norfolk, Virginia; City of Columbia, South Carolina; City of Key West, Florida; Chesterfield County, Virginia; and City of Newark, Delaware.

Q7. MS. KUMAR, WILL YOU PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE?

A7. I graduated from the University of California, Riverside with a Master of Business Administration. I have been with Black & Veatch since 1999 and have served in increasing levels of responsibility from staff consultant, project manager, principal consultant and currently director. I currently lead the stormwater utility consulting and practice within the Management Consulting Division.

I specialize in directing and managing water and wastewater financial planning and cost of service rate studies, stormwater utility development and implementation services, including the development and implementation of stormwater credits and appeals programs, and stormwater user fee billing mechanisms. In addition to serving as an expert witness in previous rate cases for the Water Department, I have provided water, wastewater and stormwater utility consulting services to various municipal clients including DC Water, Washington D.C.; Harford County, Maryland; City of Havre de Grace, Maryland; Pittsburgh Water and Sewer Authority, Pennsylvania; City of Wilmington, Delaware; City of Newark, Delaware; City of Springfield, Ohio;

and City of Dallas, Texas. In addition, I am also involved in directing business operations efficiency and implementation services, billing systems evaluation, mediation and litigation support, and benchmarking studies.

I am currently a member of the American Water Works Association (AWWA), the Water Environment Federation (WEF), and an active member within the Strategic Practices Management Committee of AWWA. I am also a member of the Stormwater Committee of the National Association of Clean Water Agencies (NACWA). I am a lead author for the *User Fee Funded Stormwater Manual,* published in 2011 by WEF, and also the lead author for the chapter on Wet Weather Financing and Cost Recovery in the Wastewater Financing and Charges, Manual of Practice 27 (MoP27) published by WEF. I have also presented in multiple webinars and conferences sponsored by organizations such as the AWWA, WEF and Storm Solutions.

Q8. MS. BUI, WILL YOU PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE?

A8. I am a chemical engineer by training, with my undergraduate work completed at the University of British Columbia, Vancouver, Canada and my graduate work at the University of California, Los Angeles. Additionally, I have a Masters of Business Administration from the University of California, Davis.

Currently, I am a Managing Director specializing in Business and Advisory Services for Black & Veatch's Management Consulting Division. Additionally, I am responsible for project delivery QA/QC for all Black & Veatch financial

planning and cost-of-service engagements. I have almost 30 years of experience working with utilities on more than 350 engagements, and have provided financial and business services for public and investor-owned utilities across the US of all sizes ranging from those with only 5,000 service connections to those that serve populations over three million.

Some of my recent focus areas include financial planning and cost-of-service rate studies; affordability and assistance program needs; evaluating the impact of water scarcity and drought; promoting operational excellence through effectiveness studies; developing innovative approaches for structuring alternative delivery projects using private and public financing instruments; and preparing financial feasibility reports supporting over $5 billion of revenue bond sales. In addition to serving as an expert witness in previous rate proceedings for the Water Department, I have provided expert witness testimony in front of the California Public Utilities Commission, the Indiana Utilities Regulatory Commission, and the Kentucky Public Service Commission.

I am a long-standing member of several industry association committees, including the AWWA's, Finance, Accounting, and Management Controls (FAMC) Committee, where I am the immediate past Chair; AWWA's Strategic Practices Committee, AWWA's Rates and Charges Committee, and NACWA's Utility Management Committee.

Some of my contributions to the water industry's rate-making methodology include authorship and / or editorial work for key guidance documents. Under

my six-year tenure as FAMC Vice-Chair and Chair, I was a lead author and editor for AWWA's book Financial Management for Water Utilities: Principles of Finance, Accounting and Management Controls. Additionally, I have been a key reviewer for AWWA's *M1 – Principles of Water Rates, Fees and Charges,* the current version of WEF's *Manual of Practice 27, Financing and Charges for Wastewater Systems (MoP 27),* and WEF's *User-Fee Funded Stormwater Program*. Currently, I am an author for the MoP 27 update (*Chapter 3 – Financial Management and Accounting for Wastewater Systems* and *Chapter 13 – Pricing for Reuse or Reclaimed Water*) and the editor for the next update of AWWA's *Capital Financing for Water Utilities Manual* (M29). Finally, I am the current coordinating editor for the Money Matters column in *Journal AWWA.*

Q9. WHAT IS THE PURPOSE OF THE PANEL'S TESTIMONY?

A9. Our testimony explains key concepts, the analytical approach and results of Black & Veatch's cost of service study related to water, wastewater, and stormwater rates, the miscellaneous fee analysis, and the proposed Tiered Assistance Program (TAP) Rate Rider framework prepared for the City of Philadelphia Water Department.

Q10. PLEASE DESCRIBE BLACK & VEATCH'S ENGAGEMENT WITH REGARD TO THIS PROCEEDING?

A10. The Water Department engaged Black & Veatch to perform the following key tasks in connection with the rate proceeding:

i. Projection of water and wastewater revenue and revenue requirements;

ii. Water, Sewer, and Stormwater wholesale and retail cost of service analysis;

iii. Development of retail water, sewer, and stormwater rate schedules;

iv. Review and update of miscellaneous fees;

v. Development of TAP Rate Rider; and

vi. Preparation of written testimony with all the associated supporting documentation, white papers and response responses to advanced interrogatories.

vii. Assistance with the preparation of discovery responses during the proceeding related to the above testimony and cost of service study; and

viii. Participation in hearings (including presentation of direct testimony and rebuttal testimony, if necessary).

Q11. PLEASE BRIEFLY DESCRIBE THE STUDY PERIOD ENCOMPASSED IN THIS COST OF SERVICE STUDY AND THE TEST PERIOD FOR WHICH RATES ARE BEING PROPOSED.

A11. In the cost of service study, the revenue and revenue requirement projections and the associated revenue adjustment projections span the six-year period of fiscal years (FY) ending June 30, 2018 (FY 2018) through June 30, 2023 (FY 2023). It is important to note that the FY 2018 rates are the final year of the rates approved during the previous rate hearing process which concluded in June 2016.

In this rate proceeding, a "Test Year" is used for the detailed cost of service analysis and rate design. For purposes of this testimony and rate proceeding, the

term "Test Year" refers to the *fully forecasted fiscal year(s)* for which Black & Veatch has developed the schedules of water, wastewater, and stormwater charges, for retail service to recover the cost of service requirements of the fiscal year[1]. In this rate proceeding, the Water Department is proposing schedules of retail water, wastewater, and stormwater charges for three successive "Test Years," namely, '*Test Year-1'* which reflects FY 2019 ending on June 30, 2019, *'Test Year-2'* which reflects FY 2020 ending on June 30, 2020, and Test Year-3 which reflects FY 2021 ending on June 30, 2021.

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[1] AWWA's "Principles of Water Rates, Fees, and Charges Manual of Water Supply Practices M1" acknowledges that government owned utilities can set policies regarding test-year periods and acknowledges the projected test year period as one of the three general types of test periods. AWWA identifies that rates developed for the projected test year "will likely match up to the utility's budget or anticipated costs." The historical and proforma test years may not fully capture the utility's costs. AWWA also acknowledges that government owned utilities may separate a multiple-year rate period into separate annual test year periods to phase in rates over the rate period. (Source: American Water Works Association, *Principles of Water Rates, Fees, and Charges Manual of Water Supply Practices M1,* American Water Works Association, 2017, pp 11-12, and 16).

Similar standards for using a multi-year rate methodology to have gradual changes in rates from year to year are set forth for wastewater systems in the Water Environment Federation's "*Financing and Charges for Wastewater Systems Manual of Practice No. 27*." (Source: Water Environment Federation, *Financing and Charges for Wastewater Systems Manual of Practice No. 27,* 2005, p. 85)

The cost of service rates are proposed for three distinct test years to assure that the Water Department is able to meet all of its general bond covenants, insurance covenants, and rate board ordinance requirements in each of these three fiscal years.

Note - the Water Department is proposing rate increases that will go into effect on September 1st of each respective fiscal year.

Q12. PLEASE IDENTIFY THE ATTACHMENTS YOU ARE SPONSORING IN THIS RATE PROCEEDING.

A12. Black & Veatch sponsors the following attachments in this rate proceeding:

Schedule BV-E1: Summary tables relating to the comprehensive cost of service and rate study, including the projection of revenue and revenue requirements, cost of service allocations, and rate schedules for water, wastewater, and stormwater service.

Schedule BV-E2: Summary tables relating to the allocation of wastewater costs to the ten (10) contract customers.

Schedule BV-E3: Summary tables relating to the development of stormwater billable Gross Area (GA) and Impervious Area (IA) units of service; development of GA and IA rates; and the determination of the stormwater Billing & Collection charges.

Schedule BV-E4: Summary tables relating to the miscellaneous fees analysis.

Schedule BV-E5: Assumptions and white papers.

Schedule BV-E6: Resumes.

Q13. WOULD YOU PLEASE LIST THE CONTENTS OF SCHEDULE BV-E1?

A13. Schedule BV-E1 contains various summary tables from the water and wastewater cost of service study. The summary and detailed tables reflect the following:

Table Reference	Summary of Results
C-1 to C-3	**COMBINED:** Projection of revenues and revenue requirements for the study period FY 2018 through FY 2023
C-4 to C-5	**COMBINED:** Projection of typical residential and non-residential example monthly bills for water, wastewater, and stormwater services for test years FY 2019, FY 2020, and FY 2021
C-6 to C-9	**COMBINED:** Projection of revenue requirements
W-1 through W-6	**WATER:** Projection of revenues under existing rates and revenue requirements for the water system
W-7 through W-10	**WATER:** Allocation of test year 2019 cost of service to *functional components*
W-11 through W-12	**WATER:** Projection of *retail customer type* units of service for test year FY 2019

Table Reference	Summary of Results
W-13A through W-13C	**WATER:** Projection of *wholesale* AQUA PA cost of service and *contractual rates* for test years FY 2019, FY 2020, and FY 2021
W-14 through W-17	**WATER:** Projection of retail cost of service for FY 2019
W-18 through W-19A	**WATER:** Proposed retail rates for General Service and Fire Protection for FY 2019, FY 2020, and FY 2021
WW-1 through WW-6	**WASTEWATER:** Projection of revenues under existing rates and revenue requirements for the wastewater system
WW-7 through WW-17	**WASTEWATER:** Allocation of cost of service to functional components, and to wholesale contract customers and retail customers for test year FY 2019
WW-18	**WASTEWATER:** Proposed retail wastewater Service Charge and Quantity Charge for General Service for FY 2019, FY 2020, and FY 2021

Q14. WOULD YOU PLEASE LIST THE CONTENTS OF SCHEDULE BV-E2?

A14. Schedule BV-E2 includes summary tables relating to the allocation of wastewater costs to the ten (10) contract customers. The summary and detailed tables reflect the following:

Table Reference	Summary of Results
WH-1 through WH-5	**WHOLESALE:** Allocable test year plant investment and operation maintenance expense and units of service.
WH-6 through WH-16	**WHOLESALE:** Allocation of test year *system investment* to the individual contract customers
WH-17 through WH-28	**WHOLESALE:** Allocation of test year *Operation & Maintenance Expense* to the individual contract customers
WH-29 through WH-32	**WHOLESALE:** Summary of Allocated Cost of Service and Proposed Test Year Charges

Q15. WOULD YOU PLEASE LIST THE CONTENTS OF SCHEDULE BV-E3?

A15. Schedule BV-E3 includes supplemental summary tables relating to the stormwater billable impervious area and gross area units of service analysis; development of Gross Area (GA) and Impervious Area (IA) rates; CAP analysis and its impact on non-residential rates and charges; and the determination of the stormwater Billing & Collection charges. The summary and detailed tables in Schedule BV-E3 reflect the following:

Table Reference	Summary of Results
SW-1 through SW-4	**STORMWATER**: Projection of billable Gross Area (GA) and Impervious Area (IA)
SW-5 through SW-11	**STORMWATER**: Projection of billable Gross Area (GA) and Impervious Area (IA) credits

Table Reference	Summary of Results
SW-12	**STORMWATER**: Projection of billable stormwater accounts
SW-13 through SW-18	**STORMWATER:** Projection of test year FY 2019 customer class stormwater costs
SW-19 through SW-19B	**STORMWATER:** Projection of test year 2019 final GA and IA rates, and Billing & Collection charge

Q16. WOULD YOU PLEASE LIST THE CONTENTS OF SCHEDULE BV-E4?

A16. Schedule BV-E4 includes the following summary tables relating to the miscellaneous fees analysis:

- Table M-1: Summary of Miscellaneous Charges (Regular Hours)
- Table M-2: Summary of Miscellaneous Charges (Overtime Hours)

Q17. WOULD YOU PLEASE LIST THE CONTENTS OF SCHEDULE BV-E5?

A17. Schedule BV-E5 includes the following Black & Veatch white papers that provide additional insights in to some of the technical analysis and/or specific issues.

- WP-1: Financial Plan – Revenue and Revenue Requirement Assumptions
- WP-2: Public Fire Protection Costs in Rates and Charges
- WP-3: Capital Account Deposit
- WP-4: Cost of Service Analysis Overview
- WP-5: Wholesale Cost of Service Analysis
- WP-6: Cost Recovery of Discounts, Credits, Grants, and TAP
- WP-7: Senior Citizen Discount Threshold Adjustment

Q18. WOULD YOU BRIEFLY EXPLAIN HOW THE DISCUSSION IN THIS TESTIMONY IS ORGANIZED?

A18. We have organized the discussions in this direct testimony as follows:

a. **Section 1: Overview of the Cost of Service Study.** In this section, we provide a brief overview of the concept of "Cost of Service" in municipal utility rate setting and the overall cost of service study approach. The topics addressed in this section are as follows:

Topics Addressed	Question
Overview of Cost of Service Study	Q19 to Q21

b. **Section 2: Projection of Revenue and Revenue Requirements.** In this section we first discuss the overall summary findings for the six-year study period, and then the details of the projection of revenue and revenue requirements for FY 2019, FY 2020, and FY 2021. The topics addressed in this section are as follows:

Topics Addressed	Question
Overall summary of the revenue requirement projection and the level of revenue increases needed in FY 2019, FY 2020, and FY 2021.	Q22
Summary of water and wastewater "Operating Revenues" under existing rates	Q23 to Q25
Summary of water and wastewater "Other Operating	Q26 to Q31

Topics Addressed	Question
and Non-Operating Revenues"	
Summary of water and wastewater revenue requirement projections	Q32 to Q41
Summary of cash flow results	Q42

c. **Section 3: Projection of Cost of Service Allocations.** In this section we discuss the projection of water and wastewater cost of service for the first test year of FY 2019. The topics addressed in this section are as follows:

Topics Addressed	Question
Overall Summary of Cost of Service Steps	Q43
WATER: Summary of Cost of Service for Test Year FY 2019	Q44
WATER: Discussion on overall approach to allocation of costs to customer types	Q45 to Q46
WATER: Details of the functional cost allocation to cost components	Q47 to Q53
WATER: Details of the customer type cost allocation	Q54 to Q61
WASTEWATER: Summary of Cost of Service for test year FY 2019	Q62
WASTEWATER: Discussion on overall approach to allocation of costs to customer types	Q63 to Q64
WASTEWATER: Details of the functional cost	Q65 to Q70

Topics Addressed	Question
allocation to cost components	
WASTEWATER: Details of the cost allocation to wholesale customers	Q71 to Q72
WASTEWATER: Details of cost allocation to retail customer types	Q73 to Q77
STORMWATER: Details of stormwater revenue requirements	Q78
STORMWATER: Determination of Gross Area (GA) and Impervious Area (IA) cost of service	Q79 to Q86

Section 4: Projection of Cost of Service Water and Wastewater Rates. In this section, we discuss the projection of water and wastewater (sanitary sewer and stormwater) rates for the first test year of FY 2019. The topics discussed are as follows:

Topics Addressed	Question
Summary of Water, Sewer, Stormwater Cost of Service Rates for Test Year FY 2019	Q87 to Q93
Discussion on retail monthly bill impact on average Residential, Senior Residential, and Small Business customer	Q94 to Q96

Section 1: Overview of Cost of Service Study

Q19. WOULD YOU PLEASE DEFINE COST OF SERVICE ANALYSIS IN THE CONTEXT OF UTILITY RATEMAKING?

A19. Cost of Service analysis is a methodology used to reasonably match the costs of providing service to various customer types with their associated service demands. As it is not practical to perform this matching of costs to service at an individual customer level, cost of service is determined at the customer type level. When the Cost of Service Analysis is projected for one or more fiscal years, it provides the basis for designing a rate structure that allows the utility to equitably recover costs from its customers.

Q20. WAS THE COST OF SERVICE STUDY IN THIS PROCEEDING PERFORMED CONSISTENT WITH GENERALLY ACCEPTED INDUSTRY GUIDELINES?

A20. Yes. There are three major industry manuals that provide guidelines for performing Cost of Service analyses. The manual for the water cost of service is AWWA's "Principles of Water Rates, Fees, and Charges Manual of Water Supply Practices M1," commonly referred to as the M1 Manual. The manual for the wastewater cost of service is WEF's "Financing and Charges for Wastewater Systems" Manual of Practice M27, also known as MoP 27. The manual for stormwater cost of service is WEF's "User Fee Funded Stormwater Programs". Industry rate practitioners use these manuals in developing Cost of Service studies and collectively, they serve as generally accepted industry guidelines for such studies. Black & Veatch has used the principles and guidelines from these manuals in performing the Cost of Service study.

The methodology used in this Cost of Service study is consistent with the methodology used in the cost of service studies presented in the previous rate proceedings.

Q21. PLEASE DESCRIBE THE VARIOUS COMPONENTS OF A COST OF SERVICE STUDY.

A21. As illustrated in Figure 1, the Cost of Service analysis consists of three parts: (1) Revenue Requirements & Revenue Requirements, (2) Cost of Service Allocations, and (3) Rate Design.

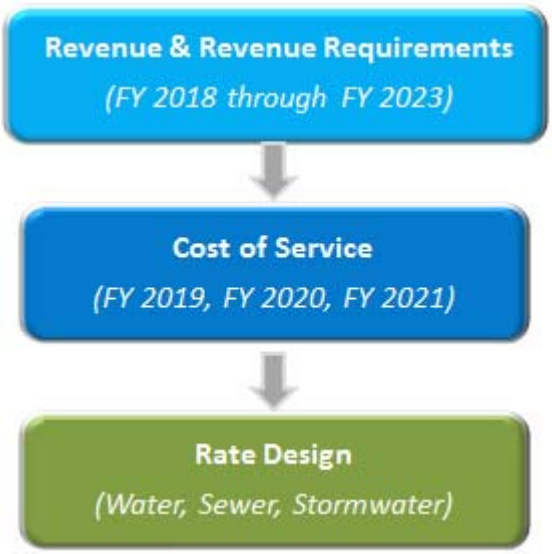


Figure 1 – Comprehensive Cost of Service Study

Revenue & Revenue Requirements: Simply stated, the Revenue & Revenue Requirements part of a Cost of Service study establishes how much money the utility needs to meet its fiscal year operating and capital obligations. The Revenue & Revenue Requirements part of the Cost of Service study includes a review of operations and maintenance (O&M) expenses, debt service payments, funding for specific deposits and reserves, and the cost of capital improvement projects that the utility does not fund via debt or contributions from third parties.

When the revenues generated from existing user rates and charges and other sources of revenue are insufficient to cover operating and capital costs, the utility may require one or more revenue adjustments as part of the revenue

requirements analysis. The Water Department has legal requirements and bond covenants that require the use of receipt-based revenue projections or a legally-enacted basis in the revenue requirements analysis.

Black & Veatch reviewed the revenue requirements of the water and wastewater utilities to determine whether utility revenues are sufficient to cover all the cash expenditures for the study period. Section 2 of this testimony provides additional details on how we project revenue and revenue requirements.

Cost of Service: The Cost of Service analysis begins after determining the revenue requirements for the utility over the study period. In this rate proceeding, the cost of service analysis is performed for a specific prospective fiscal year (known as the "test year"). We use the test year to illustrate the allocation of costs to customer types and the design of rate schedules to recover those costs from the various customer types.

The term cost of service refers to the "net" revenue requirements (less any other operating and or non-operating revenues) that need to be recovered from rates and charges. The cost of service study involves multiple levels of cost allocation, namely, (i) allocation of identified costs (e.g. O&M, debt service, reserves, cash funded capital) to functional cost centers and then to cost components; (ii) calculation of unit cost for each cost component; and (iii) determination of the cost for each customer type by multiplying the unit cost of each component by the number of units of service associated with each customer

type. Section 3 of this testimony provides additional details on the cost of service allocations to customer types.

Rate Design: The final step in conducting a Cost of Service study involves developing the rate structure that allows the utility to recover its costs for a given test year. Since the Water Department uses receipts as the basis for calculating revenues, we need to evaluate the Water Department's "collection lag factor". The lag factor reflects a final adjustment to the cost of service rates to recognize the fact that there will be a proration of billings between the existing and proposed rates during the first month following the effective date of the rate increase, as well as the fact that not all of the fiscal year billings are fully collected within that fiscal year. Section 4 of this testimony provides additional details on the final cost of service rate design.

Section 2: Projection of Revenue and Revenue Requirements

Q22. WOULD YOU BRIEFLY SUMMARIZE THE OVERALL REVENUE REQUIREMENTS AND REVENUE INCREASES PROJECTED IN THE STUDY?

A22. For the water and wastewater utilities combined, the revenue requirements are projected for the three test years of FY 2019, FY 2020, and FY 2021, for which rates are proposed in this proceeding. The revenue requirements analysis indicates the need for the following overall increase in water and wastewater revenues:

- FY 2019: An increase of $9,204,000;
- FY 2020: An increase of $26,133,000; and

- FY 2021: An increase of $27,107,000.

These levels of increase reflect overall increase in revenues from the existing levels (based on FY 2018 rates) of approximately 1.60 percent in FY 2019; 4.50 percent in FY 2020, and 4.50 percent in FY 2021. It is important to note that the annual revenue increase projections for FY 2019 through FY 2023 reflects only ten (10) months of additional revenues in each of those fiscal years.

Table C-1 (Schedule BV-E1) presents a summary of the series of revenue adjustments projected for the combined water and wastewater utilities for the study period of FY 2018 through FY 2023.

Q23. PLEASE SUMMARIZE THE PROJECTION OF WATER AND WASTEWATER UTILITY REVENUES UNDER EXISTING RATES, AND LIST THE KEY COMPONENTS OF THE REVENUES.

A23. The total revenue projections for the study period of FY 2018 through FY 2023 for the water and wastewater utilities include three categories of revenues, namely, "Water and Wastewater Operating Revenues"; "Other Operating Revenues"; and Non-operating Income". Table C-3 (Schedule BV-E1) presents the projection of these three categories of revenues, for the study period.

Total Water Receipts:	**Total Sanitary Sewer Receipts:**	**Total Stormwater Receipts:**
FY 2019: $272.5 Million	FY 2019: $273.3 Million	FY 2019: $157.8 Million
FY 2020: $270.4 Million	FY 2020: $271.8 Million	FY 2020: $156.9 Million
FY 2021: $268.2 Million	FY 2021: $270.1 Million	FY 2021: $150.9 Million

Q24. PLEASE BRIEFLY DESCRIBE THE PROJECTIONS OF WATER AND WASTEWATER UTILITY OPERATING REVENUES UNDER EXISTING RATES.

A24. The total **operating revenues** for the water and wastewater utilities include the following sources of revenues:

a. Retail Water and Sanitary Sewer Service and Quantity charges, Stormwater Management Service Charges, and Extra-Strength surcharge.

b. Wholesale contract customer water and sewer charges

Customer Types

General Customers
- Residential
- Senior Citizens
- Commercial
- Industrial
- Public Utilities

Others
- Housing Authority
- Charities & Schools
- Hospital & Universities
- Hand Billed
- Scheduled (Flat Rate)

Fire Protection
- Public & Private

Groundwater

a. Retail Operating Revenues

The operating revenue is calculated for each customer type as listed in the inset box, through a two-step process.

Step 1: Projection of Gross Billings

- First, to project water and sewer *gross billings*, for each fiscal year of the study period, we apply he FY 2018 schedules of water and sewer usage rates and service to the projections of annual water sales and number of customer accounts, respectively. To project the fiscal year water sales and number of customer accounts, we apply annual projection factors to the FY 2016 sales volume and number of accounts. Determination of the annual projection factors is based on historical billed consumption data received from the Water Department.

- To project stormwater billings, for each fiscal year of the study period, we apply the FY 2018 GA and IA rates to the projected billable Gross Area (GA) and Impervious Area (IA) respectively, and apply the Billing & Collection charge to the projected number of billable accounts.
- In addition, for all customer types that are eligible for discounts, we apply the appropriate discounts.
- Existing schedules of charges also include a charge for private fire protection connections to the water system.
- The Water Department assesses all retail customers that contribute high strength wastewater an extra strength surcharge based upon their monitored strength.

Step 2: Application of Collection Factors

- Next, we apply receipt factors ("collection factors") to the corresponding gross billings to determine the operating retail cash receipts. The historical collection factors are based on five fiscal years (FY 2012 through FY 2016) of billing and associated collections. PWD Statement No. 8 – Direct Testimony of Raftelis Financial Consultants provides additional details regarding the derivation of the collection factors.

b. Wholesale Operating Revenues

Water: Currently, Aqua Pennsylvania is the Water Department's only wholesale water customer.

- Aqua Pennsylvania: The Water Department's service to Aqua Pennsylvania commenced in Fiscal Year 2002. Water charges for this service

Projected Aqua Receipts:

FY 2019: $3.36 Million

FY 2020: $3.36 Million

FY 2021: $3.36 Million

include a commodity charge designed to recover power and chemical costs and a fixed charge designed to recover allocated capital costs and all other allocated operation and maintenance expenses, excluding power and chemical costs.

Wastewater: The Water Department provides wholesale wastewater service to ten (10) suburban customers on a contractual basis. Contractual rates for wastewater service generally consist of charges for operation and maintenance expense and certain capital costs associated with the collection and treatment facilities used in providing the service.

Projected Wastewater Contract Receipts

FY 2019: $37.7 Million

FY 2020: $37.7 Million

FY 2021: $37.7 Million

Q25. ARE THERE ANY CHANGES TO OPERATING REVENUE PROJECTIONS UNDER EXISTING RATES DURING THE STUDY PERIOD?

A25. There is a noteworthy change to operating revenue projections related to Public Fire Protection costs during the Study Period (FY 2018 – FY 2023).

Per the City's directive, effective FY 2019, the Water Fund will recover the annual Public Fire Protection costs through its water rates and charges, from all of its other retail water customers. Table W-1 shows the Public Fire Protection revenues from the City ending in FY 2018. The Water Department estimates the Public Fire Protection related annual revenue at $7.9 Million.

The Water Department proposes to recover the Public Fire Protection cost through the meter size based service charge (i.e. fixed charge), which is consistent with industry accepted practice. This recovery mechanism provides the Water Department with the same level of revenue stability as when the City's General Fund paid these costs. This change is reflected in the revenue projections for the study period, the water cost of service analysis and the schedule of rates filed in this proceeding.

Q26. PLEASE BRIEFLY DESCRIBE THE PROJECTIONS OF WATER AND WASTEWATER UTILITY "OTHER OPERATING" AND "NON-OPERATING" REVENUES.

A26. The Projection of "Other Operating" and "Non-Operating" Revenues are discussed below.

a. *Other Operating Revenue*

Other Operating Revenue consists of penalties on overdue bills for retail service customers and other income from miscellaneous fees, fines, operating grants, permit fees, and transfers from the Debt Reserve Fund to the Revenue Fund. A key component of Other Operating Revenue is the revenue loss associated with the *Tiered Assistance Program* ("TAP"). The City launched the TAP on July 1, 2017 (FY 2018), and as it involves bill discounts, it will cause a reduction in the water, sewer, and stormwater user charge retail revenues, beginning FY 2018.

b. Non-operating Income

Non-operating Income of the Water Department consists primarily of interest earnings on the amounts within certain funds and accounts. In accordance with

the authorizing revenue bond ordinance (the 1989 General Ordinance), the analysis credits interest earnings in the Debt Reserve Fund, Revenue Fund, and the Rate Stabilization Fund as revenue to the Revenue Fund. Interest Earnings in the Debt Reserve Fund are first credited to the extent that they are needed to fulfill the Debt Service Reserve Requirement and then amounts in excess of fulfilling the Debt Service Reserve Requirement are permitted to be transferred to the City's General Fund (up to $4,994,000).

Actual annual fund valuations and interest earnings are based on a mark-to-market valuation which the City performs at the end of the fiscal year. The differential between mark-to-market and the Debt Reserve Fund requirement results in either a transfer from Operating Fund of the Water Department to the Debt Reserve Fund, if there is a deficiency in the Debt Reserve Fund, or a transfer from the Debt Reserve Fund to the Operating Fund of the Water Department, if there is an excess in the Debt Reserve Fund. As noted above, projected transfers from the Debt Reserve Fund to the Operating Fund are included as *Other Operating Revenue.*

Q27. PLEASE BRIEFLY DESCRIBE THE MISCELLANEOUS FEE AS REFERENCED IN THE RATE FILING.

A27. The miscellaneous charge is a special service fee charged by utilities to recover costs associated with providing ancillary water or wastewater services. Examples of such ancillary services are meter testing, hydrant permits and plan review fees. Utilities recover the costs of providing such services from customers who use those services. The Water Department's Rates and Charges

(Attachment A) includes the Water, Sewer, Stormwater, and Fire Service related miscellaneous charges. Refer to PWD Exhibit No. 3 for additional information.

As part of the cost of service study, Black & Veatch performed a review of all miscellaneous charges, including proposed charges for FY 2019 - 2021.

The types of miscellaneous water, sewer, stormwater, and fire service charges are as follows:

a. ***Miscellaneous Water Charges***

i. Meter Test Charges

ii. Furnishing and Installation of Water Meters

iii. Tampering of Meters

iv. Shut-off and Restoration of Water Service

v. Water Connection Charges

vi. Hydrant Permits

b. ***Miscellaneous Sewer Charges***

i. Wastewater Discharge Permit

ii. Groundwater Discharge Permit

iii. Manhole Pump-out Permit

iv. Trucked or Hauled Wastewater Permit

v. Photographic & Video Inspection

c. ***Miscellaneous Stormwater Charges***

i. Stormwater Plan Review Fees

ii. Stormwater Management Fee In-lieu

iii. Stormwater Credit Application Renewal Fee

d. ***Other Miscellaneous Fees Not Included in Attachment A***

i. Sewer Credit Application Fees

ii. Stormwater Credit Application Fees

iii. Sewer Connections Fees

Q28. ARE ANY CHANGES BEING PROPOSED TO THE DEPARTMENT'S MISCELLANEOUS WATER, SEWER, AND STORMWATER CHARGES?

A28. As a result of the review of miscellaneous charges referred to above, the Water Department is proposing changes to certain charges (many of which have not been updated since 2014). Note the following sewer connection fees in Chapter 5 – Sewer & Wastewater Control, added in September 2017:

1. Sewer Lateral Connection Fees
   - 5" or 6" Connection
   - 8" Saddle Connection
   - 8" WYE Connection
   - Approved Generally Prohibited Connections
   - Re-inspection Fees
2. Sewer Lateral Inspection Fees

The miscellaneous charge schedules in this proceeding are proposed for three distinct rate years of FY 2019, FY 2020, and FY 2021. The following approaches are used in the design of the proposed rates and charges:

i. All the proposed rates and charges are rounded to the nearest five or ten dollars;

ii. For fee items where the cost of service rates calculated is lower than the existing rates, the proposed rates reflect the cost of service rates;

iii. For most of the fee items where the cost of service rates calculated is higher than the existing rates, the proposed rates reflect a phase-in where the rate is increased by 40 percent in each fiscal year, or until the cost of service rate is achieved. Note – the Discontinuance of Water under Section 6.8 of Rates and Charges is set be Philadelphia Code 19-1601;

iv. For Meter Test Charges fee item, the proposed charges reflect transition to the full cost of service charge in FY 2019, without any gradual phase-in. A direct transition to full cost of service rates in FY 2019 is proposed to mitigate any frivolous and repeated requests for meter testing. Similarly, for Tampering of Meters, a direct transition to full cost of service rates in FY 2019 along with a 10 percent penalty is proposed to discourage customers from tampering with the meters.

Tables M-1 and M-2, in Schedule BV-E4 provide a list of the proposed Water, Sewer, Stormwater, as well as the Sewer Connection Fees for Regular Hours and Overtime Hours, respectively, for the miscellaneous fee items.

Q29. PLEASE BRIEFLY DESCRIBE THE TIERED ASSISTANCE PROGRAM (TAP).

A29. The Water Department implemented the TAP, effective July 1, 2017, to assist low income water customers with their water, sewer, and stormwater utility bills. TAP is designed to provide bill discounts on the customer's total monthly bill to low income customers who opt into TAP and qualify for the program.

See Direct Testimony of Michelle Bethel and RaVonne Muhammad (PWD Statement No. 7) and Direct Testimony of Raftelis Financial Consultants (PWD Statement No. 8) for additional details concerning TAP.

Q30. PLEASE STATE THE PROJECTED REVENUE LOSS ASSOCIATED WITH THE TAP PROGRAM AS UTILIZED IN THE COST OF SERVICE ANALYSIS.

A30. Raftelis Financial Consultants, Inc. developed the projected annual revenue loss associated with TAP and Black & Veatch incorporated these values into the Cost of Service analysis. The annual TAP revenue loss, during the study period, is as follows:

- FY 2018: $3.9 Million
- FY 2019: $9.8 Million
- FY 2020: $13.7 Million
- FY 2021: $17.0 Million
- FY 2022: $17.0 Million
- FY 2023: $17.0 Million

Note: The direct testimonies of Raftelis Financial Consultants, Inc. (PWD Statement No. 8) and the City of Philadelphia Revenue Department - Water Revenue Bureau (WRB) (PWD Statement No. 7) include additional information regarding TAP, as well as the basis for the revenue loss projections.

Q31. IS ANY APPROACH BEING CONSIDERED IN THIS PROCEEDING TO MANAGE THE REVENUE RISK ASSOCIATED WITH THE TIERED ASSISTANCE PROGRAM?

A31. Yes. To manage the revenue risk associated with TAP and the associated Low Income Conservation Program (LiCAP), the Water Department has proposed a TAP Rate Rider in this rate proceeding. The TAP Rate Rider is a revenue true-up mechanism that will enable the Water Department to reconcile the actual costs of TAP and LiCAP with the projected costs included in the Adopted Rates and approved in a rate proceeding. Specifically, the TAP Rate Rider would help true-up two components:

- Annual TAP revenue losses
- Annual LiCAP expenses

Implementation of the proposed TAP Rate Rider would occur in conjunction with the water, sewer, and stormwater rates adopted pursuant to the Fiscal Year (FY) 2019 through FY 2021 rate proceeding.

Note: Black & Veatch's Supplemental Direct Testimony (PWD Statement No. 9B) provides additional background on the proposed TAP Rate Rider.

Q32. PLEASE BRIEFLY DESCRIBE THE PROJECTIONS OF OPERATION AND MAINTENANCE EXPENSE FOR THE STUDY PERIOD.

A32. The Water Fund's approved FY 2018 budget is used as the beginning base budget for the projections of Operation and Maintenance (O&M) expenses for Fiscal Year 2019 through FY 2023. First, the FY 2018 approved O&M budget is adjusted to reflect the actual to budget spending factors. These adjusted FY 2018 O&M expenditures serve as the basis for projecting O&M expenses for FY 2019 through FY 2023.

Summary Discussion on the FY 2018 O&M Budget Adjustment

Black & Veatch used the following steps in adjusting the FY 2018 O&M Budget, to reflect the actual spend levels:

- First, we evaluated the historical actual expenditures versus budgeted expenses to determine the expected spend factors for each of the object classes such as personal services, pension obligations, pension, benefits, purchases of services, materials and supplies, equipment, transfers, and contributions, indemnities, and taxes. From the analysis, we determined the average spend factors by cost classification for each division within the Water Department and the City Department (for those costs that are funded by the Water Department) based on the two-year average actual spending levels of FY 2015 and FY 2016.
- The spend factors were then utilized to adjust the Fiscal Year 2018 approved O&M budget to a likely expenditure level for Fiscal Year 2018 for each of the cost classes.

Summary Discussion on the O&M Cost Projections

The O&M expenses for each year of the FY 2019 through FY 2023 study period are projected as follows:

Black & Veatch assumed appropriate escalation factors for the various cost categories, and applied those inflation factors to the corresponding categories of costs in the FY 2018 adjusted budget. The escalation factors used in the projection of the O&M budget are discussed in detail in the white paper titled, "*Philadelphia Water Department Financial Plan: Revenue and Revenue Requirement Assumptions"* (Schedule BV-E5).

Personal Services: The personal services costs are projected taking into consideration the following factors: (i) the actual to budget spend levels; (ii) the annual escalation factor for labor costs based on the City's Five Year Financial and Strategic Plan for FY 2018 through FY 2022 (Five-Year Plan), and (iii) the projection of Pensions, Pension Obligation, and Benefits based on the City's Five-Year Plan; and (iv) additional staffing during the study period as anticipated by the Water Department.

- Pension, pension obligation, and benefits, which are directly related to personal services expenses, were estimated based upon current levels of such expenses and the growth rate reflected in the City's 5-Year Plan; Pension and benefits expenses are estimated to increase from $134 Million in FY 2019 to $152.5 Million in FY 2023.

- An annual escalation factor of two and a half percent (2.5%) for FY 2019 and three percent (3.0%) for FY 2020 through 2023 is used to project personnel budget costs; and
- Additional staffing costs account for the additional staff anticipated in the Operations divisions of the Water Department beginning FY 2019 through FY 2022.
- Per City policy, effective FY 2017, fringes for personnel associated with the capital program can no longer be funded via capital financing. Therefore, consistent with this City policy, the operating costs reflect a reclassification (shifting) of $12.5 Million from capital to operating expenditures.

Power Costs: Per the estimates provided by the City Energy Office, no escalation applied for FY 2019 and FY 2020. Black & Veatch has assumed an annual escalation of three percent (3%) for FY 2021 through FY 2023.

Chemical Costs: Chemical costs are projected to increase by 6.8% percent in FY 2019 and 3.7% in FY 2020, based on the Water Department's expectations for these costs. An annual escalation of one percent (1%) is used to project costs for FY 2021 through FY 2023.

SMIP/GARP Costs: The Water Department expects to provide an annual grant amount of $25.0 Million during FY 2019 through FY 2023 towards the Stormwater Management Incentive Program (SMIP) and Greened Acres Retrofit

Program (GARP), and hence this level of annual expenditure is included in the O&M projection.

Indemnities: Per discussions with the Water Department, no escalation in indemnities is expected during FY 2019 and FY 2023, and hence the annual expenditure is projected to remain at $5.6 Million.

Q33. PLEASE DESCRIBE THE WATER DEPARTMENT'S PROJECTED CAPITAL IMPROVEMENT PROGRAM (CIP) AND THE PROPOSED FINANCING OF THE PROGRAM DURING THE STUDY PERIOD.

A33. Tables W-3 and WW-3 summarize the Water Department's capital improvement program for FY 2018 through 2023 on an encumbrance basis. Encumbrance reflects the total cost of each project in the year construction of the project is scheduled to commence. Costs shown in Tables W-3 and WW-3 reflect the estimated total costs of the various projects, which will be financed with amounts available in the Construction Fund, the annual Capital Account Deposit, amounts transferred from the Residual Fund to the Construction Fund, and the proceeds of the issuance and sale of revenue bonds.

Projection of CIP Costs (Tables W-3 and WW-3)

The FY 2018 CIP costs reflect the Water Department's expected FY 2018 expenditure level. The Water Department provides the FY 2019 through FY 2023 CIP budget based on the FY 2018 budget level without any allowance for inflation. Therefore, an annual inflation allowance of two and one-half percent (2.5%) has been applied to the CIP costs beginning with FY 2019, with the

exception of Engineering and Administration which already reflects inflation. The inflation allowance is based upon Black & Veatch's review of industry cost indices including the ENR Construction Cost Index and the Handy-Whitman Construction Cost Index. The cash flow adjustment indicated in Line 9 of Table W-3 and Line 10 of Table WW-3 represents the unspent encumbrances which do not become a cash expenditure until a subsequent year. Line 10 on Table W-3 and Line 11 on WW-3 show the net cash expenditures to be financed from the sale of revenue bonds and other sources of capital.

Projected Capital Improvement Flow of Funds (Tables W-4 and WW-4)

Tables W-4 and WW-4 present an estimate of the flow of funds in the Construction Fund of the Water Department. Note – Table C-8 presents the combined Capital Improvements Fund.

- *Bond Proceeds:* Line 1 indicates the projected total revenue bond principal amounts projected to be issued 2019 through 2023, to finance the proposed capital improvements of the water and wastewater utilities. No bond issuance is planned during FY 2018.

Bond Issuance Projection

FY 2019: $285.0 Million

FY 2020: $295.0 Million

FY 2021: $305.0 Million

FY 2022: $340.0 Million

FY 2023: $335.0 Million

- *Debt Service Reserve:* As shown in Lines 2 through 4, in addition to funding capital construction costs, the bond issuance proceeds are also used to fund required deposits into the Debt Reserve Fund and pay the costs of bond issuance. The annual Debt Reserve Fund balance must equal the maximum future annual debt service estimated for the outstanding and proposed bonds.

- *Projected Debt Service:* The debt service is estimated based on a 30-year amortization schedule and an annual interest rate of 5.50 percent for FY 2019; 5.75 percent for FY 2020; and 6.25 percent for each of the bond issues proposed during FY 2021 through FY 2023. The projected debt service for each fiscal year (FY 2019 through 2023), reflects interest only payments for the first year of the bond amortization.
- *Capital Account Deposit:* In addition to funds from bond proceeds, Line 8 shows that during the six-year projected study period a total of approximately $191.4 Million of Capital Account Deposits will be available to finance water and wastewater capital improvements. It is important to note that capital account deposit amount for FY 2019 through FY 2023 is estimated based on 1.5 percent of prior year depreciated value of plant investment (original cost less depreciation). In addition, Line 10 indicates that $132.5 Million will be available from the Residual Fund as another major source of funding of the Capital Improvement Program.
- *Interest Income:* Interest income on annual average balances in the Construction Fund and the Debt Reserve Fund are shown in Lines 11 and 19. The interest earnings in the Construction Fund, which primarily consists of bond proceeds, are not available to the Revenue Fund as a part of the overall project revenues available for meeting annual revenue requirements of the Water Department. An interest rate of 0.36% percent was assumed to determine the interest income for FY 2019 through FY 2023.

Q34. WOULD YOU PLEASE SUMMARIZE THE ANNUAL DEBT SERVICE REQUIREMENTS OF THE WATER DEPARTMENT?

A34. Tables W-5 and WW-5 summarize the annual debt service payments for the water and wastewater utilities, respectively. Line 1 shows the annual debt service on existing revenue bonds, while Lines 2 through Line 9 show the projected debt service on the proposed revenue bond issues reflected in Tables W-4 and WW-4. The projected debt service on the proposed bonds issued in each of the years FY 2019 through FY 2023 reflects interest only payments during the first year of the bond amortization. Line 11 shows the applicable revenue bond debt service on PennVest Loans allocable to the water and wastewater utilities.

Q35. CAN YOU PLEASE SUMMARIZE THE INTEREST EARNINGS PAYMENT AND CAPITAL ACCOUNT DEPOSIT THAT MUST BE MET FROM WATER AND WASTEWATER REVENUES?

A35. Yes, in addition to the aforementioned revenue requirements, there are two additional revenue requirements.

Interest Earnings Payment: The first is an interest earnings payment to the City. This payment reflects application of the 1989 General Ordinance, as amended and supplemented, that in any fiscal year in which a balance exists in the Department's Operating Fund, a payment may be made to the City's General Fund which does not exceed the lowest of (i) the amount of interest earnings in the Debt Reserve Fund transferred to the Operating Fund during the fiscal year

or (ii) $4,994,000. Projected annual payments for the study period are as follows:

	Water Fund
FY 2018	$756,000
FY 2019	$722,000
FY 2020	$736,000
FY 2021	$751,000
FY 2022	$793,000
FY 2023	$865,000

Capital Account Deposit: The second additional revenue requirement is the required Capital Account Deposit. Under the 1989 General Ordinance, the City covenants to make a deposit to the Capital Account of the Construction Fund in each fiscal year, in an amount not less than one percent (1%) of the total value of the net assets of the Water Department (the "Capital Account Deposit"). The amounts accumulated in the Capital Account are to be used by the Water Department to finance capital improvements to the water and wastewater systems.

The total annual Capital Account Deposits for each utility are summarized below:

	Water System	Wastewater System
FY 2018	$9,469,000	$13,592,000
FY 2019	$14,686,000	$21,081,000
FY 2020	$15,185,000	$21,798,000

FY 2021	$15,702,000	$22,539,000
FY 2022	$16,235,000	$23,305,000
FY 2023	$16,787,000	$24,098,000

Tables W-6 and WW-6 present an estimate of the interest earnings payment, and the Capital Account Deposit, for the water and wastewater utilities.

Q36. ARE ANY CHANGES BEING PROPOSED TO THE CITY COVENANTS REGARDING THE LEVEL OF CAPITAL ACCOUNT DEPOSIT?

A36. Yes. In prior rate proceedings, the Capital Account Deposit was established at one percent of the depreciated value of water and wastewater systems net capital assets, consistent with the requirements of the 1989 General Ordinance. However, in this rate proceeding, the Water Department proposes that the amount to be deposited to the Capital Account Deposit of the Construction Fund be no less than 1.5 percent of the total value of the net capital assets.

Since FY 2010, the Water Department's annual capital expenditures have increased due to the Consent Order Agreement (COA) to mitigate Combined Sewer Overflows (CSOs); enhanced rehabilitation of aging infrastructure; and enhanced investments in water and wastewater treatment facilities to meet water quality standards and permit requirements. Therefore, Black & Veatch reviewed the historical annual rate of capital spending. The rate of capital spending during FY 2010 through FY 2016 is 1.62 times that of the capital spending during FY 2004 through FY 2009.

Commensurate with this increase in the levels of annual capital expenditure, the level of capital account deposit should also have been increased to maintain the ratio of Capital Account Deposit relative to the level of capital spending. Therefore, adjusting the Capital Account Deposit amount to equate to 1.5 percent of the net capital assets will better align the capital account deposit to the enhanced levels of capital spending that the Water Department is incurring and is likely to incur in the foreseeable future. As the Capital Account Deposit amount, which is generated from rates and charges, provides a critical source of cash financing, consistent with industry best practices, it is imperative to increase the deposit amount from 1.0 percent to 1.5 percent of net capital assets.

Q37. PLEASE DESCRIBE ANY FURTHER REQUIREMENTS THAT MUST BE ADDRESSED IN DETERMINING THE OVERALL LEVELS OF WATER AND WASTEWATER REVENUES NEEDED?

A37. There are three additional revenue requirements that need to be addressed, (i) 1989 General Ordinance Requirement, (ii) Assured Guaranty Municipal Corp (AGM) Insurance Requirement, and (iii) Water Rate Board Ordinance Requirement.

i. 1989 General Ordinance Requirement: In addition to meeting cash revenue requirements (effectively the operation and maintenance expenses and annual capital costs), the 1989 General Ordinance requires that, during any given fiscal year, the Water Department's revenues (for both water and wastewater service combined), must be sufficient to

Bond Coverage Minimum
Senior Debt Coverage: 1.2x
Total Coverage: 1.0x

satisfy the following debt service coverage obligations.

In the first instance, the 1989 General Ordinance requires that, during any given fiscal year the Water Department must, at a minimum, impose, charge, and collect in each fiscal year such water and wastewater rents, rates, fees, and charges as shall yield net revenues which shall be equal to at least 1.20 times the debt service requirements for such fiscal year (excluding the principal and interest payments in respect of Subordinated Bonds). Line 4 in Table C-2 (Schedule BV-E1) presents the projected Senior Debt Coverage for the study period.

In addition, in each fiscal year, water and wastewater rents, rates, fees, and charges shall yield net revenues which shall be at least equal to 1.00 times the sum of the following:

- the debt service requirements for such fiscal year (including debt service requirements in respect of Subordinated Bonds);
- amounts required to be deposited into the Debt Reserve Fund during such fiscal year;
- the principal or redemption price of and interest on General Obligation Bonds issued to fund capital expenditures of the water and wastewater systems payable during such fiscal year;
- debt service requirements on interim debt payable during such fiscal year; and
- the Capital Account Deposit for such fiscal year (less any amounts transferred from the Residual Fund to the Capital Account during such

fiscal year).

Line 5 in Table C-2 (Schedule BV-E1) presents the projected Total Coverage for the study period.

ii. AGM Insurance Requirement: In addition to the rate covenant of the 1989 General Ordinance described above, the City has agreed with Assured Guaranty Municipal Corporation (AGM) that for so long as the Series 2005A Bonds, the Series 2005B Bonds, and the portion of the Series 2010A Bonds insured by AGM are outstanding, the City will establish rates and charges for use by the Water and Wastewater systems sufficient to yield Net Revenues (excluding amounts transferred from the Rate Stabilization Fund into the Revenue Fund during, or as of the end of, such fiscal year) at least equal to 90 percent (90%) of the Debt Service Requirements (excluding debt service due on any Subordinated Bonds) in such fiscal year.

Further, any calculation by a consulting engineer of projected rate covenant compliance in connection with the proposed issuance of additional Bonds for each fiscal year ending on or after June 30, 2000, must confirm that Net Revenues (excluding amounts transferred from the Rate Stabilization Fund into the Revenue Fund during, or as of the end of, such fiscal year) in each fiscal year included in the projection period are projected to be at least 90 percent (90%) of the Debt Service Requirements (excluding debt service due on any Subordinated Bonds) in such fiscal year.

Line 6 in Table C-2 (Schedule BV-E1) presents the projected Senior Debt Coverage from current revenues (Insurance Requirement) for the study period.

iii. Water Rate Board Ordinance Requirement: Section 13-101(4)(a) of the City Code sets the floor for the amounts that rates and charges must generate to support the System. The rates and charges must yield to the City at least an amount equal to the sum of:

1. Operating expenses of the City in respect of the water, sewer, storm water systems;
2. Debt service on all obligations of the City in respect of the water, sewer, storm water systems,
3. In respect of water, sewer and storm water revenue obligations of the City, such additional amounts as will be required to comply with any rate covenant and sinking fund reserve requirements approved by ordinance of Council in connection with the authorization or issuance of water, sewer and storm water revenue bonds, and
4. Proportionate charges for all services performed for the Water Department by all officers, departments, boards or commissions of the City.

In addition, Section 13-101(4)(b) of the City Code states that the rates and charges must not exceed ("ceiling") the total appropriations from the Water Fund, and provides considerations of the elements that are to be included in the calculation of the ceiling. The rates and charges projected for FY 2019, FY 2020, and FY 2021 do not exceed the Water Fund's projected appropriations for

the above years.

Line 11 in Table C-2 (Schedule BV-E1) reflects the compliance with the Water Rate Board Ordinance requirement during the study period.

Q38. PLEASE DESCRIBE HOW THE BOND ORDINANCE COVENANTS ARE RECOGNIZED IN THE REVENUE REQUIREMENT PROJECTIONS.

A38. Since the outstanding revenue bonds are combined water and wastewater bonds, compliance with the debt service coverage obligations is estimated using a combined projected cash flow schedule for the water and wastewater systems.

Q39. WHAT WERE THE FINDINGS WITH REGARD TO THE WATER FUND'S COMPLIANCE WITH THE STATED DEBT SERVICE COVERAGE OBLIGATIONS?

A39. With the inclusion of the overall additional increase in revenues projected as necessary for the water and wastewater systems combined, the Water Fund is able to satisfy the required annual debt service coverage requirements over the six-year study period.

Q40. ARE THERE ANY OTHER CONSIDERATIONS THAT WERE REFLECTED IN EXAMINING THE OVERALL NEED FOR AN INCREASE IN WATER AND WASTEWATER REVENUES?

A40. Yes. The Department must also establish rates and charges to meet the financial management requirements of the 1989 General Ordinance with respect to,

among other things, (1) maintaining the Rate Stabilization Fund; (2) financing a portion of major annual capital improvement requirements directly from annual system revenues; and (3) making required deposits into the Residual Fund of any monies remaining after payment of all current cash obligations.

Q41. WOULD YOU PLEASE BRIEFLY SUMMARIZE THE ABOVE REQUIREMENTS OF THE 1989 GENERAL ORDINANCE?

A41. *Rate Stabilization Fund:* The fund balance in the Rate Stabilization Fund is intended to help stabilize the magnitude of future increases in water and wastewater rates. The funds that are available from annual system revenues, after meeting all financial obligations, are deposited into the Rate Stabilization Fund. The available funds generally result from complying with the minimum 1.20 bond coverage covenant. Additional revenues result from the 20 percent coverage being in excess of revenue bond debt and other cash related capital requirements. Under the 1989 General Ordinance, when revenues are deposited into the Rate Stabilization Fund, they are excluded from being a part of the Net Revenues used in the annual debt service coverage calculation. Conversely, when revenues are transferred from the Rate Stabilization into the Revenue Fund, they are then included as Net Revenues in the debt service coverage calculations.

It should be noted that the Water Department has utilized the Rate Stabilization Fund balances in the past several years to "manage" its revenue increases such that they are effectively used to provide the minimum required 1.20 coverage level stipulated in the 1989 General Ordinance.

The Rate Stabilization Fund balance is projected to decrease from $201.19 Million at the end of FY 2018 to $156.39 Million at the end of FY 2021 (which is the end of the proposed three-year rate increase period). The projected revenue increases were established, taking in to consideration this anticipated draw down from the Rate Stabilization Fund. A targeted combined minimum balance of approximately $140 Million in the Rate Stabilization Fund and the Residual Fund (discussed below) is utilized in the development of the financial plan.

Cash Financing of Capital Program: Consistent with water/wastewater utility industry prudent financial management practices it has been determined that the Water Fund should transition from the minimum 1.2 senior debt service coverage requirement to a higher coverage level of 1.28 beginning FY 2019, and 1.30 beginning FY 2020. Such an approach will also provide additional cash funding for major capital improvements. The financial markets and the rating agencies have been encouraging the Water Department to rely less on debt financing of its major capital improvements.

As previously discussed in response to Q36, under the 1989 General Ordinance, there is a mandatory annual revenue requirement referred to as the Capital Account Deposit. This annual requirement, which ranges from approximately $35.7 Million to $40.8 Million during the study period, is to be used for financing major capital improvements directly from annual system revenues.

Residual Fund: After meeting the annual cash obligation for operation and maintenance expenses, payment of debt service, the Capital Account Deposit, and transfers to/from the Rate Stabilization Fund, any remaining revenues are deposited to the Residual Fund. Balances in the Residual Fund may be used for retirement of debt, payment of capital expenditures, and any other payments as provided by the 1989 General Ordinance.

An annual balance of approximately $15 Million is projected to be maintained in the Residual Fund during each year of the study period as reflected in Line 36 in Table C-1 (Schedule BV-E1). For purposes of projections over the study period, balances in excess of $15 Million are utilized for financing the Capital Improvement Program.

Q42. WOULD YOU PLEASE SUMMARIZE THE ALIGNMENT BETWEEN THE PROJECTION OF REVENUE UNDER EXISTING RATES AND REVENUE REQUIREMENTS FOR THE STUDY PERIOD?

A42. Table C-1 (Schedule BV-E1) presents a cash flow statement of projected revenues and revenue and rate covenant requirements for water and wastewater system operations for the projected period of FY 2018 through FY 2023. The financial projections provide a clear indication of the adequacy of the Department's revenues in complying with the requirements of the 1989 General Ordinance. As indicated on Lines 4 through 9 in Table C-1, annual increases in revenue are required beginning in FY 2019.

For the proposed three-year rate period, a 1.6% revenue adjustment is necessary in FY 2019, followed by a 4.5% increase in each FY 2020 and FY 2021. As stated previously, for this rate proceeding, the increase in each of these three fiscal years is assumed to be effective on September 1 of that fiscal year.

As indicated in Lines 23 and 28 in Table C-1, the debt service coverage requirements discussed previously would be met with these overall levels of increase in revenues. Annual cash requirements for the combined water and wastewater systems would also be met with these levels of increase as indicated by the positive balances shown in Line 31 of Table C-1.

Tables W-6 and WW-6 show the projected cash flow for the water and wastewater utilities, broken down separately. The revenue requirements projected for FY 2019, FY 2020, and FY 2021, respectively, for the water and wastewater systems are then used in the development of the test year cost of service to be allocated for each utility.

As indicated in Table W-6, an overall increase in revenue of 0.30 percent (or $0.67 Million) in FY 2019; 2.60 percent (or $5.77 Million) in FY 2020; and 2.60 percent (or $5.87 Million) in FY 2021 are proposed for the water system. For the wastewater system, an overall increase in revenue of 2.42 percent (or $8.54) in FY 2019; 5.67 percent (or $20.37 Million) in FY 2020; and 5.64 percent (or $21.24 Million) in FY 2021 are proposed as shown in Table WW-6. Note the above referenced percentage increase in revenues are calculated in relation to the water and wastewater service revenues from the immediate prior year.

Section 3: Projection of Cost of Service Allocations

Q43. PLEASE BRIEFLY DESCRIBE WHAT IS INVOLVED IN THE COST OF SERVICE ANALYSIS PHASE OF THE STUDY?

A43. As briefly explained earlier in response to Q21, the cost of service phase of the study consists of essentially three steps: (1) revenue & revenue requirements (the determination of the cost of service to be recovered); (2) cost of service (the allocation of cost of service to functional cost components tied to system characteristics); and (3) rate design (the distribution of functionalized cost of service components to customer types).

The total revenue requirements to be derived from charges for water and wastewater systems are synonymous with, and are the definition of, the total cost of service. To develop an equitable rate structure, the total water and wastewater system costs are allocable to the various customers and further allocated to various customer types according to respective service requirements.

For the water system, allocations of these requirements to customer types should take into account the quantity of water usage, relative peak capacity requirements placed on the system, the number and size of services to customers, and proprietary interest in the water system investment. For the wastewater system, factors considered in allocating costs to each customer type include the annual volume and peak rates of sanitary wastewater, infiltration, and stormwater flows; wastewater strengths; the number and sizes of customers

served; and proprietary interest in the wastewater system investment.

For this rate proceeding, the Cost of Service Analysis is performed for three "Test Years" FY 2019, FY 2020, and FY 2021, as the water, sewer, and stormwater rates are proposed for each of these three years. Please note that, although responses to the rest of the questions in this section are presented based on the FY 2019 cost of service rate analysis, the findings are also applicable to the FY 2020 and FY 2021 test years.

Section 3a: Projection of Water Utility Cost of Service Allocations

Q44. WHAT ARE THE NET REVENUE REQUIREMENTS (COST OF SERVICE) TO BE RECOVERED FROM WATER RATES AND CHARGES FOR THE PROPOSED TEST PERIOD?

A44. FY 2019 is the initial test year for which net annual revenue requirements (cost of service) are allocated to whole customers and to the various retail customer types. In determining the FY 2019 costs of service for water service, projected revenues from other operating revenue and non-operating income are deducted from the total FY 2019 water revenue requirements. Table W-7 (Schedule BV-E1) presents a summary of the FY 2019 cost of service to be recovered from water rates and charges. The FY 2019 water cost of service is comprised of two key categories, namely, the operating expense and capital costs.

Operating Expense: The four key components of the water system's portion of the Operating expenses are: (i) the operation and maintenance expense, (ii) the deposit to the Rate Stabilization Fund, (iii) the year end revenue balance which

is deposited into the Residual Fund and (iv) the cost of treating and disposing water treatment plant sludge that is discharged into the City's wastewater system. The water treatment plant sludge expense of $13.4 Million is shown in Line 3 of Table W-7. A corresponding credit for this amount is shown in the wastewater cost of service in Table WW-7.

Capital Costs: The three key components of the water system's portion of the Capital Costs are: (i) the debt service on existing and proposed bonds and PennVest loans, (ii) the Capital Account Deposit; and (iii) the year-end revenue balance which is deposited into the Residual Fund.

Further, interest earnings on various funds are credited to both operating expense and capital costs. The total FY 2019 cost of service to be met from water rates and charges is $273.3 Million, as shown in Line 12 of Table W-7.

Q45. CAN YOU BRIEFLY EXPLAIN HOW REVENUE REQUIREMENTS ARE DETERMINED TO APPORTION COSTS TO THE WHOLESALE CUSTOMER.

A45. To determine the FY 2019 water cost of service for Aqua Pennsylvania, the Water Department's only wholesale water customer), the FY 2019 Operating Expense and Capital Costs are apportioned between wholesale and retail customer types on a *utility basis*, per the industry accepted guidelines provided in the AWWA M-1 Manual of Practice.

Allocation of Operating Expense: The FY 2019 Operating Expense (presented

in Table W-7) is allocated between the wholesale customer and retail customers, based on service demand characteristics as shown in Table W-8.

Allocation of Capital Costs: In a publicly owned utility, such as the PWD system, to allocate the Capital Costs using a *utility basis* approach, typically the annual Capital Costs are first delineated into two components, namely, the Depreciation Expense and the Return on Investment (or Rate Base). In a "utility" basis approach, the restatement of Capital Costs into these two components is necessary as the Water Department provides service to Aqua Pennsylvania, and hence is entitled to a return on investment.

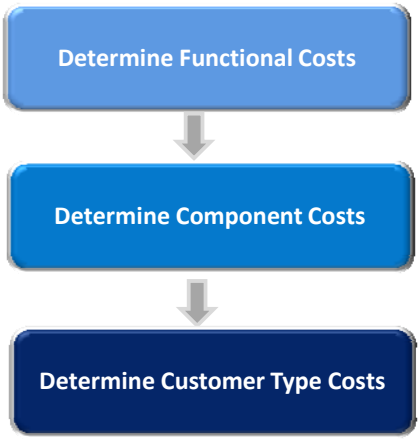
- **Depreciation Expense:** In the case of the water system, depreciation expense is the loss in asset value due to asset deterioration, inadequacy, and obsolescence. Depreciation is determined based on an annual percentage allowance of plant investment that would be needed to sustain the useful life of the facility. The annual depreciation allowance is not customarily accrued as a cash reserve, but is used to meet principal payments for long-term debt or is reinvested in replacements and additions to the water system facilities.

  The depreciation rates, actually used by the water utility for the various categories of plant investment, were applied to the facilities in service (referred to as plant in service) to determine the water system's depreciation expense. The annual test year depreciation expense for the water system is estimated to total $31.3 Million. Table W-9 (Schedule BV-E1) presents the total water utility depreciation expense for the FY

2019 test year.

- **Return on Investment:** The "return on investment" or "rate base", for the test year FY 2019, is calculated as the total capital costs determined less the depreciation expense. The total net capital cost to be recovered from water service revenue, for FY 2019, is projected to be $87.1 Million and is shown in Column 2 of Table W-7 (Schedule BV-E1). Deduction of the estimated water utility depreciation expense of $31.3 Million from the total net capital cost yields a return on investment, on the water system, of $55.8 Million to be recovered from both inside City retail and outside City wholesale customers.

Q46. PLEASE DESCRIBE THE GENERAL APPROACH USED TO ALLOCATE TEST YEAR OPERATING AND CAPITAL COSTS TO THE VARIOUS TYPES OF CUSTOMERS?



A46. The basic underlying principle in developing cost of service rates is the determination of what causes the cost, or what elements in a water system are responsible for causing the level of revenue requirements to be what they are. To allocate the costs to customer types, first the operating and capital costs are aggregated into "Functional Cost Centers" and the functional costs are then further allocated to cost components. Each component cost is then apportioned to customer types. To perform these allocations, one

must have a working knowledge of the functional cost centers, the cost components, and how a water system operates.

Q47. WHAT ARE THE TYPICAL FUNCTIONAL COST CENTERS FOR WATER UTILITIES?

A47. Functional cost centers represent the key operational functions of utility systems. For a water system, the functional cost centers include *source of raw water supply, pumping, storage, treatment, distribution, customer, and general administration.*

Q48. WOULD YOU BRIEFLY DESCRIBE HOW A WATER SYSTEM OPERATES AND SOME OF THE CONSIDERATIONS INVOLVED IN DESIGNING SUCH A SYSTEM?

A48. A water system consists of various facilities each designed and operated to fulfill a given function. In order to provide adequate service to its customers at all times, the system must be capable of supplying water not only at the <u>average</u> annual volume of usage, but also at <u>maximum</u> rates of demand. Different customer types (such as the residential, commercial, and hospitals) exert their respective maximum demands on the water system at various times. The capacities of the various water system components are established to meet the maximum coincidental demand of all types of customers.

The capacities of some facilities, such as certain raw water source of supply facilities, are designed on the basis of <u>annual average</u>, or base, water demands. Other facilities such as raw water pumping and the water treatment plants are

designed to meet maximum day demands. Still other facilities, such as treated water pumping, treated water storage, and transmission and distribution mains, are designed to meet maximum hourly rates of water use. These requirements result in different demand ratios of maximum to average demands to be met by the various parts of the system. The demand ratios, in turn, are used as the basis for allocating the O&M costs of the functional cost centers to the cost components.

Q49. WHAT ARE THE FUNCTIONAL COST COMPONENTS UNDER THE BASE EXTRA CAPACITY METHODOLOGY FOR A WATER SYSTEM?

A49. The total cost of water service is allocated to specific cost elements according to the service requirements of the various types of customers. The Water functional costs are usually classified and assigned to five functional cost components: Base cost, Extra Capacity cost, Customer cost, Public Fire Protection, and Wholesale Direct. The separation of the costs of service into these five principal components provides a means for further allocation of such costs directly to wholesale customers and to the various retail customer types based on each customer type's respective Base, Extra Capacity, and Customer service demands.

Base Costs: Base costs are those which vary directly with the total quantity of water used, as well as those costs associated with serving customers under average load conditions without the elements necessary to meet water use variations or peak demands. Base costs include operating costs of supply,

treatment, pumping and distribution facilities, and a portion of administrative and general 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.

Extra Capacity Costs: Extra Capacity costs represent those operating costs incurred due to demands in excess of average load conditions, and capital costs for additional plant and system capacity beyond that required for the average rate of use. This includes two components: Maximum Day and Maximum Hour.

- Maximum Day Extra Capacity costs are those incurred in meeting demands in excess of average day requirements.
- Maximum Hour Extra Capacity costs are those incurred in meeting demands in excess of maximum day use.

Based on the historical demands experienced, the maximum day demand is approximately 130 percent of average day demand. Consequently, 77 percent (100/130) of the capacity of these maximum day facilities is required for base use, and the remaining 23 percent is required for maximum day extra capacity demands.

Similarly, peak demand for maximum hour facilities is approximately 174 percent of average day demands. Of the facilities designed to meet maximum hour demands, 57 percent (100/174) of the capacity is required for base use, 17 percent [(130-100)/174] is required to meet maximum day extra capacity

requirements, and the remaining 26 percent is needed to meet maximum hour requirements.

Customer Costs: Customer costs are defined as costs which tend to vary in proportion to the number of customers connected to the system. These costs include meter reading, billing, collecting and accounting, a portion of administrative and general costs, and maintenance and capital charges associated with meters and services. Customer costs, such as meter related expenses, billing, collection, and accounting expenses, are usually allocated to customer types on the basis of the number of bills rendered or customers served and are assigned directly to the customer meter and billing cost components.

Public Fire Protection: Costs directly related to public fire protection include operating expenses and capital costs associated with the standard pressure fire system. Costs related to the standard pressure fire system are assigned directly to the cost component for public fire protection.

Wholesale Direct: Costs allocable to Wholesale Direct include the operating expenses and capital costs related to those facilities required to serve Aqua Pennsylvania on a wholesale basis in accordance with the contract terms. The contractual maximum day capacity reserved by Aqua Pennsylvania for the study period is 9.5 mgd.

Q50. PLEASE DESCRIBE THE TEST YEAR PLANT INVESTMENT IN THE WATER SYSTEM USED IN YOUR STUDY TO ALLOCATE CAPITAL COSTS TO THE VARIOUS COST COMPONENTS?

A50. Table W-8 (Schedule BV-E1) summarizes the test year investment in the water system used in the allocation of test year capital related costs of service. The total test year investment of $1.43 Billion is the total original cost investment in facilities which are anticipated to be in service during the FY 2019 test year.

Q51. PLEASE EXPLAIN THE PROCEDURES USED TO ALLOCATE THE TEST YEAR PLANT INVESTMENT TO THE WATER COST COMPONENTS DISCUSSED PREVIOUSLY.

A51. The Test Year (FY 2019) plant investment is allocated to the cost components using a two-step process.

- First, a portion of the water system plant investment costs are allocated to wholesale water customers.
- Then the retail portion of the total plant investment costs (which is the total plant investment less the proportionate share allocated to wholesale customers), are allocated to the other five cost components (Base, Extra Capacity, Customer, and Public Fire Protection).

Wholesale Contract Plant Investment Allocation: Currently, Aqua Pennsylvania is the only wholesale water customer. Aqua Pennsylvania is allocated a share of total water system investment in large transmission mains, defined as 24 inch and larger mains, as well as raw water and treated water storage and pumping facilities, and a share of the investment in the Baxter,

Queen Lane and Belmont treatment facilities.

The plant investment costs are allocated to Aqua Pennsylvania based on the proportionate share of their contract capacity in the various facilities relative to the total design capacity of the various facilities. Aqua Pennsylvania's contract capacity in the various classes of facilities is in the range of 1.15 percent to 1.74 percent of the total design capacity of the facilities.

Allocation of Retail Plant Investment to Cost Components: After deducting the investment directly allocable to Aqua Pennsylvania, the balance of the plant investment is allocated to retail customers as follows:

- ***Source of Supply (Raw Water):*** The investment in the source of supply facilities shown in Lines 1 and 2 of Table W-8 (Schedule BV-E1) includes the Fairmont Dam and associated structures and equipment. These facilities are designed to meet average annual water supply requirements and are allocated 100 percent to the Base cost component.
- ***Raw Water Pumping:*** Lines 3 and 4 of Table W-8 reflect investment in the Baxter, Queen Lane, and Belmont raw water intakes, buildings, structures, and raw water pumping equipment. These facilities not only supply the average annual volume needs, but are also designed to meet the capacity needs of maximum day requirements. Hence, investment in these facilities is allocated 77 percent to Base cost component and 23 percent to Maximum Day Extra Capacity cost component.
- ***Treated Water Pumping:*** The investment in treated water pumping facilities at all three treatment plants, as well as the booster pumping

stations in the distribution system, is included in Lines 6 and 7 of Table W-8. These facilities are designed to fulfill maximum hour capacity needs in addition to meeting the Base and Maximum Day requirements. Hence, the retail portion of the plant investment costs of these facilities are allocated 58 percent to Base, 14 percent to Maximum Day Extra Capacity, and 28 percent to Maximum Hour Extra Capacity cost components.

- ***Water Treatment:*** The water purification and treatment facilities at the Baxter, Queen Lane, and Belmont treatment plants are designed to provide maximum day capacity needs. Hence, 77 percent of these costs are allocated to the Base cost component and 23 percent to the Maximum Day Extra Capacity cost component. The investment for Treatment is shown in Lines 8 and 9 of Table W-8.

- ***Transmission and Distribution:*** Transmission and distribution investment, including transmission and distribution mains, and filtered water storage facilities are designed to meet maximum hour requirements of the system. Investment in these facilities is therefore allocated to Base, Maximum Day, and Maximum Hour cost components, with factors identical to that of the Treated Water Pumping allocation, discussed above.

- ***Customer Meters and Public Fire Protection:*** Investments in customer meters are entirely allocable to the Customer Meters cost component. Public fire protection service is comprised of the standard pressure fire system. Investment in public fire protection facilities is allocated 100 percent to the Public Fire Protection component.

- ***General Plant and Equipment:*** Other general plant and equipment investments are allocated to all the cost components based on the proportion of the total non-general plant and equipment component cost to the total plant investment cost.

Q52. PLEASE EXPLAIN THE PROCEDURES USED TO ALLOCATE THE TEST YEAR DEPRECIATION EXPENSE TO THE WATER COST COMPONENTS.

A52. The annual depreciation expense of the water system is estimated to be $31.3 Million for the test year (FY 2019). The annual depreciation expense to be distributed to water system cost components is based on the application of appropriate depreciation expense rates to the various categories of water system facilities. The allocation of the estimated depreciation expense to functional cost components is shown in Table W-9 (Schedule BV-E1). The various items of depreciation expense are allocated to cost components on the same basis as the proportion of plant investment costs allocated to each of those cost components.

Q53. PLEASE EXPLAIN THE PROCEDURES USED TO ALLOCATE THE TEST YEAR OPERATION AND MAINTENANCE EXPENSE TO THE VARIOUS WATER COST COMPONENTS?

A53. The projected O&M expense for the test year (FY 2019) is $186.15 Million. This expense is allocated to cost components as shown in Table W-10 (Schedule BV-E1). Operation and Maintenance expense is allocated to water cost components generally in the same proportion as the plant investment and depreciation expense allocations.

The Test Year (FY 2019) operation and maintenance is allocated to the cost components using a two-step process.

- First, a portion of the operation and maintenance costs are allocated to wholesale water contract customers.
- Then the retail portion of the total operation and maintenance expense (which is the total operation and maintenance expense less the proportionate share allocated to wholesale contract customers), is allocated to the cost components.

Wholesale Operation and Maintenance Allocation: Currently, Aqua Pennsylvania is the only wholesale water customer. Operation and maintenance expenses are allocated to Aqua Pennsylvania taking into considerations their projected annual usage and maximum day demands for service relative to the annual production and maximum day demand of the overall water system, excluding costs associated with mains less than 24 inches in diameter. As shown in Column 10 of Table W-10, a total of $2.14 Million of test year O&M expense has been allocated to Aqua Pennsylvania.

Allocation of Retail Operation and Maintenance Expense to Cost Components: The O&M expenses that are directly allocable to Aqua Pennsylvania are deducted from the total expenses shown in Column 1 of Table W-10. The remaining expenses are allocated to the retail customer types as follows:

- ***Source of Supply:*** Raw water pumping expense, other than purchased power, is allocated 77 percent to Base and 23 percent to Maximum Day cost components. The power costs associated with raw water pumping is allocated 95 percent to Base and 5 percent to Maximum Day cost components in recognition of the operating characteristics of pumps and the demand structure of electric rates.
- ***Water Treatment Costs:*** Different expense items within the water treatment costs are allocated differently to the cost components.
  - Projected test year operating expense, exclusive of power, chemical costs, and sludge treatment and disposal costs, for the Baxter, Queen Lane, and Belmont treatment plants is allocated 77 percent to Base and 23 percent to Maximum Day.
  - Chemical costs and sludge treatment and disposal costs, which generally vary directly with the quantity of water treated, are assigned 100 percent to the Base cost component.
  - Test year treated water pumping operating expenses, exclusive of power costs, are allocated 58 percent to Base, 14 percent to Maximum Day, and 28 percent to Maximum Hour cost components.

- Treatment plant power costs are allocated 90 percent to Base, 5 percent to Maximum Day Extra Capacity and 5 percent to Maximum Hour Extra Capacity in recognition of the effect of the demand structure of electric rates.

- ***Water Treatment Sludge Costs:*** As shown in Line 12 in Table W-10, the water treatment sludge O&M cost for FY 2019 is determined to be $13.4 Million. This cost represents the cost of treating the water treatment plant sludge. The water treatment sludge, which is discharged into the wastewater system, is ultimately treated in the wastewater treatment facility and thereby becomes a wastewater treatment cost. This wastewater treatment cost is appropriately charged back to the water utility.

- ***Transmission and Distribution:*** Transmission and distribution test year operating expenses associated with mains and reservoirs are allocated to Base, Maximum Day, and Maximum Hour cost components, with factors identical to that of the Treated Water Pumping operation and maintenance expense allocation, discussed above.

- ***Customer Meters and Public Fire Protection:*** Meter maintenance expense is allocated 100 percent to the Meter component of Customer costs. Projected fire hydrant maintenance expense is allocated 100 percent to Direct Public Fire Protection cost component. Test year customer accounting and collection is allocated 100 percent to the Billing component of Customer costs.

- ***Administrative and General:*** Administrative and general expense is allocated to cost components in proportion to the total allocation of all

other expenses to the cost components, excluding expenses for power and chemicals.

- ***Residual Fund and Rate Stabilization Fund Transfers:*** The deposit into the Residual Fund (Line 26) and the deposit from the Rate Stabilization Fund (Line 27), each of which is allocable to operation and maintenance expense, are allocated to the various cost components in proportion to the allocation of the Administrative and General expense (Line 24 of Table W-10).
- ***Net Operating Expense:*** The net operating expense to be recovered from all customers through charges for water service is derived by deducting the "Other Operating Revenue" and the non-operating "Interest Income" from the total operating expense.
  - Other operating revenue is allocated to the various O&M cost components, in proportion to the allocation of the Administrative and General costs (Line 24 of Table W-10). This is shown in Line 29 of Table W-10.
  - The non-operating interest income is allocated to the various O&M cost components, in proportion to the allocation of the Administrative and General costs (Line 24 of Table W-10). This is shown in Line 30 of Table W-10.
  - The total net operation and maintenance expense, of $186.15 Million, to be recovered from water rates is shown on Line 31 of Table W-10.

Q54. AFTER COSTS ARE ALLOCATED TO FUNCTIONAL COST COMPONENTS, WHAT IS THE NEXT STEP IN THE OVERALL COST OF SERVICE ANALYSIS?

A54. The next step in the cost of service analysis is to distribute the retail O&M and capital costs of the water utility to various customer types. To do this, customers with similar characteristics are grouped together into specific customer types. Then for each customer type, the units of service are determined for each cost component to which the capital costs and operation and maintenance costs were allocated. Units of service represent the service requirements that the different customer types place on the water system.

Water system customers are grouped into two distinct categories, namely, *Inside City Retail* and *Outside City Wholesale.* The customer types within the Inside City Retail have already been discussed in response to Q24.

Q55. PLEASE EXPLAIN THE METHODOLOGY USED TO DETERMINE THE <u>RETAIL</u> UNITS OF SERVICE BY CUSTOMER TYPE FOR EACH COST COMPONENT OF THE WATER UTILITY?

A55. Service requirements by customer type were derived from annual water usage, number of customers and capacity factor analysis. Table W-11, (Schedule BV-E1), shows the projected test year service requirements for retail customer types. The table presents for each customer type, the total annual and average day usage (Base), the estimated total capacity factors for both Maximum Day and Maximum Hour requirements, and the resulting Maximum Day requirements in

excess of average day and Maximum Hour requirements in excess of Maximum Day.

Q56. CAN YOU EXPLAIN HOW YOU DERIVED THE CUSTOMER CLASS EXTRA CAPACITY FACTORS?

A56. Black & Veatch derived the customer class extra capacity factors based on previous cost of service studies and rate proceedings. To review and verify the reasonableness of the capacity factors, Black & Veatch performed a capacity factor analysis according to the methodology outlined in Appendix A of AWWA Manual M-1: *Principles of Water Rates, Fees, and Charges*. Black & Veatch used the FY 2016 monthly customer billing data, system historical peak demands, and weekly and hourly usage adjustments to derive an estimate of capacity factors for each customer type.

Q57. WHAT ARE THE OVERALL RESULTS OF THE CAPACITY FACTOR ANALYSIS AND ARE THE RESULTS REASONABLE BASED ON YOUR EXPERIENCE.

A57. The Maximum Day extra capacity and Maximum Hour extra capacity factors are shown in Columns 3 and 6, respectively, in Table W-11. The capacity factors determined are reasonable based on our experience.

Generally, the peak water usage characteristics vary among the different customer types as follows:

- Residential customers place a higher peak demand on the water system than the non-residential customers. For example, the Residential

customers typically would have high water usage in the morning due to shower and other morning chores and similarly may reflect a high usage in the evening when residents are usually back home from work/school, etc.

- The Senior Citizen and Housing Authority types are projected to have usage patterns closely related to the Residential customers.
- Within the non-residential group, typically Commercial customer types and others including Charities and Schools are likely to have higher demand during business hours and very low demand during non-business hours.
- Industrial customer type usually has low peaking factors, as industrial enterprises often have very stable pattern of water usage. Industrial use is generally spread more uniformly throughout the day and hence their maximum rates of use vary less from their average day use.

The capacity factors determined reflects these characteristics and are reasonable based on the capacity factor analysis. In addition, to verify the reasonableness of the capacity factors, Black & Veatch verified that the system peak demand diversity factors based on the capacity factors are within the AWWA industry acceptable range of 1.1 to 1.4.

Q58. PLEASE DESCRIBE THE UNITS OF SERVICE YOU DETERMINED?

A58. ***Determination of <u>Base</u> Units:*** The estimates of total annual water usage (aka 'Base' usage), shown in Column 1 of Table W-11 (Schedule BV-E1), are based

upon units of service projections utilized for determining revenue under existing rates.

Determination of Maximum Day and Maximum Hour Units:

- For each customer type, the maximum day capacity factor presented in Column 3 is applied to the Base usage in Column 2 to derive the total maximum day usage in Column 4. The difference between the total maximum day usage and the base usage yields the "extra capacity" usage for the maximum day component as shown in Column 5.
- Similarly, for each customer type, the maximum hour capacity factor presented in Column 6 is applied to the Base usage in column 2 to derive the total maximum hour usage in Column 7. The difference between the total maximum hour usage and the total maximum day usage yields the "extra capacity" usage for the maximum hour component as shown in Column 8.

Determination of Fire Protection Units: Fire Protection Extra Capacity requirements are based on peak fire flow requirements reflected in previous cost of service studies and rate proceedings. The system wide fire protection demands reflect two simultaneous fires, one requiring 10,000 gallons per minute (gpm) fire flow demand for 10 hours and the second requiring 5,000 gpm for 8 hours. Fire protection capacity requirements are allocated between Public Fire Protection and Private Fire Protection in proportion to the relative total number of equivalent fire connections in each type.

Determination of <u>Customer</u> Units: Customer units of service include two sub-components namely, *Equivalent Meters* and *Equivalent Bills*. The units for these two sub-components are estimated as follows:

- Equivalent meter units for the test year are estimated based of the number and size of water meters in service. Equivalency is expressed as a ratio of the capacity of various sized meters to the capacity of a 5/8-inch meter. Therefore, the number of equivalent meters is estimated for each customer type by translating each customer type's total number of meters *<u>by size</u>* to the capacity of a 5/8-inch meter.
- Billing related Customer units are determined based on the number of equivalent bills for each type of customer. The estimated number of equivalent bills for each type is based upon the respective number of bills rendered and the estimated ratios of meter reading, billing, and collection costs of customers with larger meters to such costs attributable to customers with a 5/8-inch meter. The ratios used for these determinations are shown in Table W-12, Schedule BV-E1.

Q59. PLEASE SUMMARIZE THE TOTAL TEST YEAR COST OF SERVICE ALLOCATED TO AQUA PENNSYLVANIA.

A59. Table W-13A (Schedule BV-E1) summarizes the test year FY 2019 cost of service for Aqua Pennsylvania. The total plant investment, depreciation expense, and operation and maintenance expense for Aqua Pennsylvania derived in Table W-8, W-9, and W-10 are summarized in Column 3 of Table W-13A. The total cost of service allocable to Aqua Pennsylvania amounts to $3.1 Million. This amount includes a return on investment requirement of $0.98 Million, which is

determined based on a 7.50 percent rate of return on allocated investment. Table W-13A also shows the proposed test year FY 2019 contractual rates applicable to Aqua Pennsylvania. Table W-13B and Table W-13C shows the proposed test year FY 2020 and FY 2021 contractual rates, respectively.

Q60. PLEASE DESCRIBE HOW YOU DERIVED THE UNIT COST OF SERVICE FOR THE COST COMPONENTS.

A60. The retail unit cost of service, for each expense category (*Operating*; *Depreciation*; and *Return on Investment*), and for each cost component (*Base*; *Maximum Day*; *Maximum Hour*; *Customer*; and *Public Fire Protection*), is determined. The unit cost is derived by dividing the total cost allocated to each expense category and cost component by the total applicable units of service.

The development of retail unit costs involves the following sub-tasks:

- ***Estimate of the Retail Inside City Rate of Return:*** The capital cost revenue requirement of the system less depreciation is considered the equivalent of return on investment. The system return on investment is recovered from both *Inside City Retail* and *Outside City Wholesale customers.* The *Inside City Retail* rate of return requirement is calculated as follows:
  - The total return on investment in the water system required in the test year amounts to $55.8 Million. This return when applied to the test year FY 2019 water system plant investment of $1.42 billion, results in an overall system rate of return requirement of 3.93 percent.

- As discussed in Q59, for purposes of this study, a return on investment of $0.98 Million has been allocated to the wholesale customer Aqua Pennsylvania.
- The wholesale customer's return on investment of $0.98 Million and the estimated test year management fee revenue of $0.34 Million is deducted from the total system return on investment of $55.8 Million, to derive the Inside City's return on investment of $54.5 Million. Based on this allocation, the Inside City rate of return on plant investment is estimated to be 3.83 percent.

Table W-14 (Schedule BV-E1) presents the Test Year FY 2019 retail unit costs, and is also summarized in the following table.

Cost Components Expense Category	Base ($)	Max Day ($)	Max Hour ($)	Meters ($)	Billing ($)	Direct Public Fire ($)
Operating	17.42	1,449.63	1,054.71	2.89	4.03	2,924,000
Depreciation	2.79	323.25	284.92	3.18		249,000
Return on Investment	5.08	579.37	547.81	1.81		377,000
Total Unit Cost	**5.29**	**2,352.25**	**1,887.44**	**7.88**	**4.03**	**3,550,000**

Lines 4 and 6 present the operating expense and depreciation expense unit costs of service, and Line 8 presents the retail customers' plant investment per unit of service applicable to the relevant cost components. Lines 9 and 10 present the

return on investment and unit costs for return on investment for inside City retail customers. The total retail customer unit costs of service are the sum of the test year unit costs for operating expense, depreciation expense, and return on investment. Line 11 presents total unit costs of service applicable to all inside City retail customers.

Q61. PLEASE DESCRIBE HOW YOU DERIVED THE COST OF SERVICE FOR EACH CUSTOMER TYPE.

A61. The retail customer type cost of service is obtained by applying unit costs of service to the number of units for which each customer type is responsible. The unit cost of the Base component is applicable to Base water usage. The unit cost of the Maximum Day and Maximum Hour are applicable to extra capacity usage. The unit cost of meters is applied to each equivalent meter, while the unit cost of billing is applicable to each equivalent bill issued.

Determination of Costs of Service by Customer Type: Column 2 of Table W-17 (Schedule BV-E1) shows the test year costs of service allocated to the various customer types. The projected revenue under existing rates for each customer type is shown in Column 1.

The proposed cost of service reflects the continuation of the current practice of providing fee discounts to the following customer types:

- Currently Senior Citizens, and Charities and Schools customer types are billed at 75 percent of the general customer rate levels.

- The Philadelphia Housing Authority is billed at 95 percent of general customer rate levels.

The revenue reduction resulting from the discounts is recovered from all inside City retail customer types in order to recover the total Test Year FY 2019 cost of service for retail customers. Key factors that influence the approach used to recover the revenue reduction due to discounts from all customer types include the following: (i) Use of this approach vetted through a history of previous rate proceedings; (ii) the U.S. Environmental Protection Agency's low income discount cost recovery guidelines for grant recipients; (iii) the administrative complexity associated with any potential changes to the rate structure on the City's billing system; and (iv) the potential positive impact on collections due to affordable fees and charges, which then benefits all the rate payers.

Column 3 of Table W-17 presents the adjusted cost of service of the inside City customer types. This adjusted cost of service recognizes the fee reduction due to discounts and the recovery of those discounts from all customer types. A comparison of the adjusted costs of service in Column 3 with revenue under existing rates in Column 1 indicates that the percentage of revenue increase that is needed varies among the various customer types.

Section 3b: Projection of Wastewater Utility Cost of Service Allocations

Q62. TURNING ATTENTION BACK TO THE WASTEWATER UTILITY, WHAT DID YOU DETERMINE TO BE THE OVERALL COST OF SERVICE FOR THE WASTEWATER UTILITY?

A62. FY 2019 is the initial test year for which net annual revenue requirements (cost of service) are allocated between wholesale customers and retail customer types. In determining the FY 2019 costs of service for wastewater service, we deduct projected revenues from other operating revenue and non-operating income from the total FY 2019 wastewater revenue requirements. Table WW-7 (Schedule BV-E1) presents a summary of the FY 2019 cost of service required for recovery from wastewater rates and charges. The FY 2019 wastewater cost of service is comprised of two key categories, namely, the operating expense and capital costs.

Operating Expense: The four key components of the wastewater system's portion of the Operating expenses are: (i) the operation and maintenance expense, (ii) the deposit to the Rate Stabilization Fund, (iii) the year end revenue balance deposited into the Residual Fund and (iv) the cost of treating and disposing water treatment plant sludge discharged into the City's wastewater system. Line 3, column 1 of Table WW-7 shows the water treatment plant sludge operating expense credit of $9.66 Million.

Capital Costs: The four key components of the wastewater system's portion of the Capital Costs are: (i) the debt service on existing and proposed bonds and PENNVEST loans, (ii) the Capital Account Deposit; (iii) the year-end revenue balance deposited into the Residual Fund, and (iv) the cost of treating and disposing water treatment plant sludge discharged to the City's wastewater system. Similar to the Operating Costs discussion above, Line 3, column 2 of Table WW-7 shows the capital component of the water treatment plant sludge

expense credit of $3.77 Million.

Further, we credit revenues from other sources against the total revenue requirements. We credit interest earnings on various funds to both operating expense and capital costs, and credit other operating revenues to just operating expenses. The total FY 2019 cost of service required from wastewater rates and charges is $441.5 Million, as shown in Line 12 of Table WW-7.

Q63. AFTER HAVING DETERMINED THE TEST YEAR TOTAL COST OF SERVICE TO BE RECOVERED FROM RATES FOR WASTEWATER SERVICE, WHAT IS THE NEXT STEP IN THE ALLOCATION OF THESE COSTS TO THE VARIOUS CUSTOMERS TYPES SERVED BY THE UTILITY?

A63. As indicated previously for the water utility, in allocating the test year cost of service, we apportion revenue requirements between wholesale customers and retail customer types on a *utility basis*, per the industry accepted guidelines provided in the WEF Manual of Practice 27.

Allocation of Operating Expense: The FY 2019 Operating Expense presented in Table WW-7 is allocated between wholesale customers and retail customers, based on service demand characteristics.

Allocation of Capital Costs: In a publicly owned utility, to allocate the Capital Costs using a *utility basis* approach, typically we delineate the annual Capital Costs into two components, namely, the Depreciation Expense and the Return

on Investment. In a "utility" basis approach, the restatement of Capital Costs into these two components is necessary as the Water Department provides service to wholesale customers outside the City, and hence is entitled to obtaining a return on investment from those wholesale customers.

- **Depreciation Expense:** In the case of the wastewater system, depreciation expense is the loss in asset value due to asset deterioration, inadequacy, and obsolescence. The accounting treatment for depreciation uses an annual percentage allowance of plant investment needed to sustain the useful life of the facility. In general, utilities typically do not accrue the annual depreciation allowance as a cash reserve, but may use it to meet principal payments for long-term debt or reinvest it in replacements and additions to the wastewater system facilities.

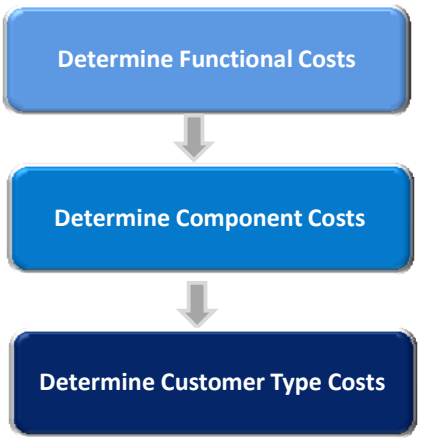
  Black & Veatch applied the depreciation rates, actually used by the Water Department for the various categories of plant investment to the facilities in service (referred to as plant in service) to determine the wastewater system's depreciation expense. The estimated annual test year depreciation expense for the wastewater system totals $44.75 Million. Table WH-1 (Schedule BV-E2) presents the total wastewater utility depreciation expense for the FY 2019 test year.

- **Return on Investment:** The "return on investment", for the test year FY 2019, is the total capital costs determined less the depreciation expense. The total *net* capital cost to be recovered from wastewater service revenue, for FY 2019, is $147.68 Million as shown in Column 2 of Table

WW-7 (Schedule BV-E1). Deduction of the estimated wastewater utility depreciation expense of $44.75 Million from the total annual capital cost requirements for the wastewater utility of $151.45 Million (inclusive of the water treatment plant sludge capital costs of $3.77 Million) yields a Return on Investment, on the wastewater system, of $106.70 Million to be recovered from both inside City retail and outside City wholesale customers.

Q64. HOW ARE THE TEST YEAR OPERATING AND CAPITAL COSTS ASSIGNED OR ALLOCATED TO THE VARIOUS TYPES OF CUSTOMERS?

A64. The basic underlying principle in developing cost of service rates is the determination of what causes the cost, or what elements in a wastewater system are causing the level of revenue requirements to be what they are. To allocate the costs to customer types, first we aggregate the operating and capital costs into "Functional Cost Centers" and the functional costs are then further allocated to cost components. Each component cost is then apportioned to customer types. To perform these allocations, one must have a working knowledge of the functional cost centers, the cost components, and how a wastewater system operates.



Q65. WHAT ARE THE TYPICAL FUNCTIONAL COST CENTERS FOR WASTEWATER UTILITIES?

A65. Functional cost centers represent the key operational functions of utility systems. For a wastewater system, the functional cost centers include *collection system, pumping, treatment, pollutant loadings (strength), customer costs, and general administration*.

Q66. WOULD YOU BRIEFLY DESCRIBE HOW A WASTEWATER SYSTEM OPERATES AND SOME OF THE CONSIDERATIONS INVOLVED IN DESIGNING SUCH A SYSTEM?

A66. A wastewater system includes different facilities each designed and operated to fulfill a given function. The sewage collection system in the City of Philadelphia consists of both separate sanitary and storm sewers as well as combined sanitary and storm sewers designed to handle peak rates of sanitary and stormwater flows. In addition, these conveyance systems transport a large part of these flows to one of the three wastewater treatment plants for treatment prior to discharge into the rivers.

The wastewater treatment plants consist of different facilities as well. The sizing of certain facilities, such as the sedimentation basins, is on the basis of the average annual volume of wastewater received at the plant. The sizing of other facilities, such as the aeration basins, is on the basis of the measurable pollutant, biochemical oxygen demand (BOD), since these facilities are required to reduce this pollutant prior to discharge into the river. Further, the sizing of other facilities is on the basis of suspended solids loading, another readily measurable

pollutant, contained in the influent wastewater. Finally, certain other facilities, such as sludge disposal facilities, are designed to manage both BOD and suspended solids loadings.

Q67. WHAT ARE THE COST COMPONENTS FOR A WASTEWATER SYSTEM?

A67. The total costs of wastewater service are allocated to specific cost elements recognizing the system characteristics of the utility and the parameter or parameters having the most major influence on the magnitude of each element of cost. The cost components of a wastewater system normally include volume, capacity, pollutant strength, and customer cost.

Volume Costs: Volume costs are operating and capital costs associated with the total volume of flow in a system. They include consideration of the volume of wastewater contributed directly by customers and volumes received as a result of nonpoint sources such as infiltration/inflow and stormwater flow into the system.

Capacity Costs: Capacity costs relate to the capital and operating costs associated with meeting peak flow conditions in the wastewater system.

Strength Costs: Strength costs relate to the treatment of BOD and suspended solids loadings in the influent wastewater received at the treatment plants. BOD is a measure of the oxygen requirement for removal of a portion of the influent wastewater pollutant loading, while suspended solids is a measure of the

pollutants in the wastewater which can ordinarily be removed by mechanical means such as screening or sedimentation.

Customer Costs: Customer costs of a wastewater system consist of elements related to meter reading, billing, collecting, and accounting costs related to the provision of wastewater service.

Q68. HAVE YOU PREPARED A SUMMARY OF THE TEST YEAR PLANT INVESTMENT IN WASTEWATER SYSTEM USED IN YOUR STUDY TO ALLOCATE CAPITAL COSTS TO THE VARIOUS FUNCTIONAL COST COMPONENTS?

A68. Yes. Table WW-9 (Schedule BV-E1) summarizes the FY 2019 test year investment in the wastewater system used in the allocation of test year capital related costs of service. The total test year investment of $2.22 Billion is the total original cost investment in facilities which are anticipated to be in service during the test year. Contributed plant investments from federal grants on the three wastewater treatment are deducted in arriving at the plant investment for cost allocation and rate design purposes.

Q69. PLEASE EXPLAIN THE PROCEDURES USED TO ALLOCATE THE TEST YEAR PLANT INVESTMENT TO THE WASTEWATER COST COMPONENTS DISCUSSED PREVIOUSLY.

A69. The FY 2019 test year plant investment is allocated to the cost components using a two-step process.

- First, a portion of the wastewater system plant investment costs are allocated to wholesale wastewater customers.
- Then the retail portion of the total plant investment costs (which is the total plant investment less the proportionate share allocated to wholesale customers), are allocated to the various wastewater cost components.

Wholesale Plant Investment Allocation: The Water Department provides wholesale wastewater service to ten (10) suburban customers on a contractual basis. The various contracts typically provide for maximum short-term flow rates expressed in cubic feet per second (cfs), maximum average daily flow rates expressed in million gallons per day (mgd), and maximum annual suspended solids and BOD loadings expressed in pounds (lbs). The Cost of Service analysis recognizes the City's obligation to provide service to its wholesale customers through the allocation of plant investment and operating expenses. Since installed capacity is the primary concern of the contracts, the basis for wholesale customer allocations uses the relationship of the contract service requirements to the total installed capacity of the respective facilities. Only plant investment associated with facilities used directly by a customer are allocated to that customer.

Table WH-3 (Schedule BV-E2) summarizes the units of service applicable to wholesale customers used in the cost of service analysis. In Table WH-3, the section titled "Contract Maximum Units," is based upon the contractual rate of flow for each customer, including an allowance for infiltration/inflow that can occur downstream from the wholesale customer's discharge point into the City's

wastewater system. To determine the contract maximum units for suspended solids and BOD, Black & Veatch used contractual strength loadings for those customers which have such provisions in their contracts. For those customers which do not have specific loadings in their contracts, Black & Veatch used the estimated measured strength for each customer as applied to their contract maximum daily flow rate, expressed in mgd. The contract maximum units serve as the basis for allocation of capital investment related costs to the wholesale customers.

Each wholesale customer is allocated a share of wastewater system investment in the wastewater collection system (mains, pumping, and Long Term Control Plan) and treatment facilities serving them. The plant investment costs are allocated to the wholesale customers based on the proportionate share of their contract capacity in the various facilities relative to the total design capacity of the various facilities. Tables WH-6 to WH-16 (Schedule BV-E2) present the allocation of plant investment for each wholesale customer. Column 2 of Table WW-9 summarizes the plant investment allocated to the wholesale customers.

Allocation of Retail Plant Investment to Cost Components: After deducting the investment directly allocable to wholesale wastewater customers, the remaining plant investment value is allocated to the retail customers of the wastewater system as follows:

- *Wastewater Collection System - Sewers:* Line 1 of Table WW-9 shows the investment in the wastewater collection system sewers. The collection system is designed to carry maximum rates of wastewater flow

and as such, 100% of the collection system costs are allocated to the capacity cost component.

As the combined sewer system also conveys stormwater, the test year retail customer plant investment associated with the collection system is apportioned between sanitary sewer-related costs and stormwater-related costs. Consistent with the allocation factor presented in prior rate proceedings, Black & Veatch has allocated sixty four percent (64%) of the collection system retail plant investment costs to stormwater. This factor was determined based on an "inch-foot" analysis (the inch (diameter) of pipes times the number of feet of the sewer system), and then further adjusted to reflect the trenching cost savings typically associated with the construction of separate sanitary and storm sewers. As explained in the 2016 rate proceeding, during construction, the sanitary sewer is buried deeper and a storm sewer is placed in the same trench above the sanitary sewer. Our analysis indicates that it is reasonable to allocate 36 percent of the capacity of the system for conveyance of sanitary flows and 64 percent for stormwater drainage.

- *Wastewater Collection System - Pumping:* Line 2 of Table WW-9 shows the investment in the pumping stations located on the collection system. These facilities are designed to meet the maximum rates of wastewater flows and are allocated 100 percent to the capacity cost component.
- *Wastewater Collection System - Long-Term Control Plan:* Line 3 of Table WW-9 shows the Long-Term Control Plan (LTCP) investments for the wastewater collection system. The LTCP investments reduce the

maximum rates of wastewater flows and are allocated 100 percent to the capacity cost component.

- *Wastewater Treatment:* The various functional facilities of the water pollution control plants are designed to manage different wastewater parameters including average and peak flows, BOD, and TSS. Hence, the treatment plant investments in each functional facility are allocated across the key wastewater parameters, as shown in Tables WW-9A, WW-9B and WW-9C, for each of the three water pollution control plants. Table WW-9 presents an overall summary of the allocation of the plant investments.
- *Volume:* The water pollution control plant facilities such as flocculation, sedimentation basins, and recirculation pumping, are designed primarily to handle the total average flow projected for the plant. Therefore, investments in such facilities are allocated to the volume cost component.
- *Capacity:* The investment in facilities such as raw wastewater pumps, preliminary treatment, chlorine contact basins, wastewater conduits, and outfall lines varies according to peak wastewater flow rates, and therefore is allocated to the capacity functional cost component.

Note: Wholesale customers whose flow is tributary to the plant do not use the raw wastewater pumping facilities at the Southwest plant. Consequently, the investment in raw wastewater pumping facilities at the Southwest plant is allocated entirely to the Retail customer group.

- *Strength (BOD and Suspended Solids):* The aeration basins and oxygen, or air blower facilities are designed to handle BOD, and investments in these facilities are allocated to the BOD functional cost component.

The investment in sludge conditioning and disposal facilities depends upon both the suspended solids and BOD parameters, and is allocated to those two components of cost. The design of facilities handling only sludge from the primary sedimentation basins, such as the primary sludge pumps and scum disposal facilities, reflects the suspended solids content of the raw wastewater, and the related investment is therefore allocated to that cost component. The investment in facilities handling waste activated sludge, such as waste activated sludge thickeners, is allocated 50 percent to the suspended solids and 50 percent to the BOD functional cost components based upon the design loadings and degree of treatment provided.

Likewise, the investment in other facilities such as digesters and sludge dewatering and composting facilities, that handle both primary and waste activated sludge, is allocated to the suspended solids functional cost component and to the BOD functional cost component. We determined the allocation of cost between Suspended Solids and BOD based on the relative quantities of sludge generated from BOD and Suspended Solids components, and the relative difficulty of treating waste activated sludge as compared with primary sludge. The resulting allocation percentages are 75 percent to the suspended solids functional cost component and 25

percent to the BOD functional cost component. The investment in the sludge force main at the Southeast plant is allocated 75 percent to suspended solids and 25 percent to BOD functional cost components, based on design flows.

Some of the treatment and sludge related facilities in the wastewater system service multiple treatment facilities. The digesters and the sludge processing and distribution facilities provide treatment and disposal of sludge from both the Southwest treatment plant and the Southeast treatment plant, and provide disposal of sludge from the Northeast treatment plant. To properly recognize cost responsibility for these joint use facilities, a portion of the investment in both existing and expanded plant joint use facilities is allocated to the Southeast and Northeast plants.

- *General Plant and Equipment:* Other general plant and equipment includes investment allocable to all of the above, and is allocated to cost components in proportion to the total of the preceding items of the direct plant investment allocation to those cost components.

Q70. HAVE YOU PREPARED A SUMMARY OF THE TEST YEAR OPERATION AND MAINTENANCE EXPENSE FOR THE PROVISION OF WASTEWATER SERVICE TO THE VARIOUS WASTEWATER COST COMPONENTS IN YOUR STUDY?

A70. Yes, the projected operation and maintenance expense allocable to wholesale customers for FY 2019 is $308.8 Million. This expense is allocated to cost components as shown in Table WW- 10 (Schedule BV-E1).

The FY 2019 operation and maintenance is allocated to the cost components using a two-step process.

- First, a portion of the operation and maintenance costs is allocated to wholesale contract customers.
- Then the retail portion of the total operation and maintenance expense (which is the total operation and maintenance expense less the proportionate share allocated to wholesale contract customers and miscellaneous revenues attributable to retail customers), is allocated to the cost components.

The retail Operation and Maintenance expense is allocated to wastewater cost components generally in the same manner as plant investment.

Q71. PLEASE EXPLAIN THE ALLOCATION OF OPERATION AND MAINTENANCE COSTS TO WHOLESALE CUSTOMERS.

A71. *Wholesale Operation and Maintenance Expense Allocation*: As described earlier, the Water Department provides wholesale wastewater service to ten (10)

suburban customers on a contractual basis. Operation and maintenance expenses are allocated to wholesale customers in the following manner:

- ***Wastewater Treatment:*** The allocations of Wastewater Treatment related operation and maintenance expenses recognize the contract capacities and the projected wastewater volumes and annual strength (BOD and suspended solids) loadings contributed by each wholesale customer relative to the annual treatment volumes and strength loadings and maximum day demand of the system facilities. Only costs associated with facilities used directly by a customer are allocated to that customer.

  Table WH-3 (Schedule BV-E2) summarizes the units of service applicable to wholesale customers used in the cost of service analysis. The section titled "FY 2019 Test Year," indicates each wholesale customer's projected volume and strength units anticipated during this particular test year of the study period. These units are based on the historical measured annual volume, suspended solids, and BOD loadings for these customers and are used in the allocation of test year operation and maintenance expense to the wholesale customers.

- ***Wastewater Collection System - Sewers:*** Total projected sewage system maintenance expense in the test year is approximately 4.0 percent of the total estimated test year collection system investment. Wholesale customers are allocated sewer maintenance expense on the basis of 4.0 percent of their respective allocated investment in the collection system.

- ***Wastewater Collection System – Long Term Control Plan:*** Wholesale customers are allocated a share of the Long Term Control Plan (LTCP)

operating and maintenance expenses in accordance with their contractual agreements. Green infrastructure maintenance expense in the test year is approximately 3.5 percent of the total estimated test year LTCP investment. Wholesale customers are allocated a portion of the sewer maintenance expense on the basis of 3.5 percent of their respective allocated share of LTCP investment. In lieu of recovering the annual Stormwater Management Incentives Program (SMIP) and Greened Acre Retrofit Program (GARP) operating and maintenance costs in the year the expenses are incurred, the Water Department allocates SMIP/GARP costs based on amortized costs determined recognizing expected project completion.

- ***Customer:*** Customer costs allocated to the wholesale customers reflect estimates of costs of billing for wastewater service, including allowances for flow and strength monitoring, bill preparation, and calibration of the flow meters.

Tables WH-18 to WH-28 (Schedule BV-E2) present the operation and maintenance cost allocation for each wholesale customer. Column 2 of WW-10 (Schedule BV-E1) and Column 3 of Table WH-29 (Schedule BV-E2), both summarize the total operation and maintenance expenses allocated to the contract wholesale customers, for FY 2019.

Q72. PLEASE SUMMARIZE THE TOTAL TEST YEAR COST OF SERVICE ALLOCATED TO THE WHOLESALE CUSTOMERS.

A72. Table WH-29 (Schedule BV-E2) summarizes the test year cost of service allocated to the wholesale customers. Specifically, the table presents the total allocated plant investment, depreciable investment, depreciation expense, return on rate base, and operation and maintenance expense for the wholesale customers. The total cost of service allocable to wholesale customers, for test year FY 2019 is estimated at $34.7 Million. This amount includes a return on investment requirement of $4.3 Million, which reflects a 7.50 percent rate of return on allocated investment.

It should be noted, that six of the wholesale customers have made front-end capital contributions related to the investment in plant which provides them service. These customers include Bensalem, Bucks County, DELCORA, Lower Merion, Lower Southampton, and Upper Darby.

The Water Department does not anticipate any contractual changes; as such Bensalem, Lower Merion and Upper Darby will continue to provide upfront annual capital contributions associated with applicable plant improvements. Therefore, there is no cost of service allocation of depreciation or return on rate base for these three wholesale customers.

Bucks County, DELCORA, and Lower Southampton were initially capital contribution based customers. However, their current contracts reflect the *utility basis* for the recovery of allocated capital investment.

- ***Bucks County:*** Bucks County's current contract provides for recovery of depreciation and return on their allocated share of plant investment placed into service after June 30, 2007.
- ***DELCORA:*** DELCORA's current contract provides for recovery of depreciation and return on their allocated share of plant investment placed into service after July 1, 2011.
- ***Lower Southampton:*** Lower Southampton's current contract transitions the township from a capital contribution basis to the utility basis over 18 years starting in FY 2007. Therefore, Test Years FY 2019, FY 2020, and FY 2021 reflect their appropriate allocable share of return on investment and depreciation.

The allocation of return on investment and depreciation, presented in Table WH-29, reflects the terms of the current contracts for these customers. The depreciation expense presented in Column 4 of Table WH-29 reflects 2 percent of the depreciable investment in the collection system and 2.5 percent of the depreciable investment in treatment and pumping facilities.

Q73. PLEASE EXPLAIN THE ALLOCATION OF RETAIL COST OF SERVICE TO COST COMPONENTS.

A73. *Allocation of Retail Operation and Maintenance Costs to Cost Components:* After deducting the operation and maintenance costs directly allocable to wholesale wastewater customers, the remaining operation and maintenance expense is allocated to the retail customers as follows:

- ***Wastewater Collection System - Sewers*:** The operation and maintenance costs of the wastewater collection system sewers are shown in Line 1 of Table WW-10. These facilities are designed to carry maximum rates of wastewater flows and are allocated 100 percent to the capacity cost component.

  We further delineate the test year collection system O&M between sanitary sewer related costs and stormwater costs. Based on an analysis of system-wide ratio of peak wet weather flows to peak dry weather flows performed during the last rate proceeding, 60 percent of the sewer maintenance cost is allocated to stormwater and 40 percent to sanitary wastewater. The rationale for using the peak flow ratio as the basis for apportioning sewer maintenance costs is that those costs would normally be incurred in proportional to the quantity of flow.

- ***Wastewater Collection System – Inlet Cleaning:*** The inlet cleaning related operation and maintenance expenses are shown on Line 2 of Table WW-10. These expenses are allocated 100 percent to the stormwater related capacity cost component.

- ***Wastewater Collection System – Pumping***: The power costs of the pumping stations located in the collection system, shown on Lines 3, 6, and 9 of Table WW-10A, are allocated 85% to the volume cost component and 15% to the capacity cost component. The other operation and maintenance expense of the pumping stations located in the collection system, shown on Lines 5, 8, and 11 of Table WW-10A, is allocated 100 percent to the capacity cost component.

- ***Wastewater Treatment:*** The various functional facilities of the water pollution control plants are designed to process different wastewater parameters. Therefore, those functional O&M expenses are allocated to respective wastewater parameter (cost component). The allocation of the operation and maintenance expense for each of the water pollution control plants is presented in Tables WW-10B, WW-10C and WW-10D and is summarized in Lines 10 to 28 on Table WW-10.

  Volume: Wastewater treatment related power costs are allocated 85% to the volume cost component. Water pollution control plant facilities such as primary and secondary sedimentation basins, recirculation pumping and chlorination, are designed largely on the basis of total average flow projected for the plant. Therefore, most of the operation and maintenance expense excluding power costs, associated with these functions, is allocated largely to the volume cost component.

  Capacity: Wastewater treatment related power costs are allocated 15% to the capacity cost component. Most of the operation and maintenance expenses, excluding power, which is associated with facilities such as raw wastewater pumps, preliminary treatment, and effluent pumping vary according to peak wastewater flow rates. Therefore, the O&M costs of those functions are largely allocated to the capacity functional cost component.

The raw wastewater pumping facilities at the Southwest plant are not used by the wholesale contract customers whose flow is tributary to the plant. Consequently, the operation and maintenance expense of raw wastewater pumping facilities at the Southwest plant is allocated entirely to the Retail customer group.

Strength (BOD and Suspended Solids): Aeration basins and oxygen, or air supply, facilities are designed principally on the basis of BOD, and the related operation and maintenance expense is assigned to the BOD functional cost component.

The operation and maintenance expense of sludge conditioning and disposal facilities pertain to both the suspended solids and BOD parameters, and is allocated to those two cost components. The design of facilities handling only sludge from the primary sedimentation basins, such as the primary sludge pumps and scum disposal facilities, reflects the suspended solids content of the raw wastewater, and the related operating expense is therefore allocated to that cost component.

The operation and maintenance expense of certain other facilities handling both primary and waste activated sludge, such as digesters and sludge dewatering and composting facilities, is allocated to the suspended solids functional cost component and to the BOD functional cost component. The percentage allocation to these cost components is derived from an analysis of the relative quantities of sludge from the two

sources, and reflects the relative difficulty of treating waste activated sludge as compared with primary sludge. The resulting allocation percentages are 75 percent to the suspended solids functional cost component and 25 percent to the BOD functional cost component. The operation and maintenance expense of the sludge force main at the Southeast plant is allocated 85 percent to suspended solids and 15 percent to BOD functional cost components, based on design flows.

Some of the treatment and sludge related facilities in the wastewater system service multiple treatment facilities. The digesters and the sludge processing and distribution facilities provide treatment and disposal of sludge from both the Southwest treatment plant and the Southeast treatment plant, and provide disposal of sludge from the Northeast treatment plant. To properly recognize cost responsibility for these joint use facilities, a portion of the operations and maintenance expense associated with these facilities is allocated to the Southeast and Northeast plants.

- ***Customer:*** Test year customer accounting and collection is allocated 100% to the equivalent bills component of Customer costs. Meter maintenance expense is allocated 100% to the meter component of Customer costs. $1.2 Million in retail stormwater related customer costs are allocated 100% to Direct Stormwater costs and recovered by retail stormwater charges. The operation and maintenance costs of the Industrial Waste Unit are allocated 33% to the excess strength component and 67% to the meter component of Customer costs.

- ***Administrative and General:*** Administrative and general expense is allocated to cost components in proportion to the total allocation of all other expenses to the cost components, excluding expenses for power.
- ***Residual Fund and Rate Stabilization Fund Transfers:*** The deposit into the Residual Fund (Line 7 of Table WW-7) and the deposit from the Rate Stabilization Fund (Line 8 of Table WW-7), each of which is allocable to operation and maintenance expense, are allocated to the various cost components in proportion to the direct operation and maintenance expense Column 4 of Table WW-10E.
- ***Net Operating Expense:*** The net operating expense to be recovered from all customers through charges for water service is derived by deducting the "Other Operating Revenue" and the non-operating "Interest Income" from the total operating expense.
  - Other revenue is allocated to the various cost components applicable to retail customers, as shown on Column 4 of Table WW-10. Since virtually all of these revenues are generated from retail customers, no credit is applicable to wholesale service.
  - The non-operating interest income which is assigned to operation and maintenance expense (Line 11 of Table WW-7) is allocated in proportion to the distribution of the operating and maintenance expenses allocable retail service (Column 3 of Table WW-10).

The total net operation and maintenance expense to be recovered from retail water rates, for test year FY 2019, is estimated at $274.5 Million, and is shown on Line 35 in Column 5 of Table WW-10.

Q74. AFTER COSTS ARE ALLOCATED TO FUNCTIONAL COST COMPONENTS, WHAT IS THE NEXT STEP IN THE OVERALL COST OF SERVICE ANALYSIS?

A74. The next step in the cost of service analysis is to distribute the retail costs of the wastewater system to various customer types. To do this, customers with similar characteristics are grouped together into specific customer types. For each customer type, we first determine the units of service for each of the functional cost components to which the capital costs and operation and maintenance costs were allocated.

The sum of the units of service for all customer types for each particular cost component is then divided into the total cost allocated to that component to arrive at unit costs of service for each cost component.

Q75. PLEASE EXPLAIN THE METHODOLOGY YOU USED TO DISTRIBUTE COSTS TO THE CUSTOMER TYPES SERVED BY THE WASTEWATER UTILITY.

A75. As a basis for estimating the cost of providing wastewater service to each customer type, we distribute each functional component cost among the customer types in proportion to their respective service requirements for each of

those cost components. The resulting cost of service provides a defensible basis for designing a schedule of sewer and stormwater rates and charges.

The retail service requirements (units of service), reflect volume, capacity, the strength of wastewater, the number and size of water meters, the number of bills rendered, and excess strength surcharge, as applicable.

Q76. PLEASE DESCRIBE THE APPROACH YOU USED TO DERIVE THE UNITS OF SERVICE FOR THE VARIOUS CUSTOMER TYPES SERVED BY THE WASTEWATER UTILITY?

A76. We begin our analysis with the development of test year units of services applicable to each customer type served by the wastewater system. Basic customer categories include wholesale customers and retail customer types.

Wholesale Customers: Table WW-8 (Schedule BV-E2), presents a summary of the test year units of service for volume, capacity, strength, and customer units of service for each of the customer types. The test year units of service for the wholesale customers, presented in Table WW-8 reflects the total units of service projected for wholesale customers in Table WH-3 (Schedule BV-E2), Lines 1 through 12. The strength units from wholesale customers are estimated for each customer based on projected study period flows and historical measured wastewater strength concentrations, as measured at the point of their discharge in to City's sewers.

Retail Customers: The units of service for the retail customer types of the wastewater system are determined as follows:

- ***Volume:*** For the retail customer types, we estimate the sanitary wastewater quantities by applying a 95% return factor to the projected test year water sales from each customer type. The return factor reflects an allowance for water consumption which is not discharged into the wastewater system. In addition, we also apportion the test year infiltration/inflow in the wastewater system to the retail customer types based upon the total projected test year flow at all three treatment plants, less the estimated annual sanitary sewage contribution from the retail customers and the total annual flow projected for the wholesale customers.
- ***Collection System – Capacity:*** The sanitary wastewater peak (capacity) flow rate, exclusive of infiltration/inflow, for each retail customer type shown in Column 2 of Table WW-8 (Schedule BV-E1), is estimated to be approximately four times (4 times) the average daily flow rate, computed from the annual volumes shown in Column 1. These estimated capacity requirements reflect the system-wide ratio of maximum to average sanitary wastewater flow rates. The capacity flow rate of infiltration/inflow in the collection system is estimated to be eight times (8 times) the average daily flow rate. Retail customers' infiltration/inflow is largely due to leakage in to sewers and direct extraneous inflows.
- ***Treatment – Capacity:*** The peak sanitary wastewater capacity flow rate, exclusive of infiltration/inflow, shown in Column 3 of Table WW-8, is

estimated to be 1.5 times the average daily flow rate. The capacity flow rate of infiltration/inflow at the water pollution control plants is estimated to be 2.5 times the average daily flow rate.

- ***Strengths (BOD and Suspended Solids):*** The estimated strength units for each customer type are shown in Columns 4 and 5 of Table WW-8 (Schedule BV-E1). Based upon an analysis of historical data, the wastewater reaching the water pollution control plants is estimated to have a weighted average suspended solids concentration of approximately 171 milligrams per liter (mg/l), and a weighted average BOD concentration of approximately 129 mg/l. These weighted averages are based on estimated influent concentrations at the three treatment plants. Infiltration/ inflow is assumed to have a suspended solids and BOD concentration of 70 mg/l and 10 mg/l, respectively. The estimates of strength units for customers with excess strength wastewater are based upon an analysis of surcharge bills.

Additional wastewater strength loadings at the treatment plants are attributable to water plant sludge from the Belmont and Queen Lane treatment plants. An estimate of the volume and pounds of sludge from the water treatment plants has been included in the units of service shown in Table WW-8 in Line 9.

The retail loadings for suspended solids and BOD are determined as the difference between the total influent wastewater loadings at the plant less the sum of I&I and water plant sludge loadings for those two

components respectively. The resulting retail suspended solids and BOD concentrations are 255 mg/l and 265 mg/l, respectively.

- ***Customer***: Units of service applicable for the allocation of customer costs are summarized in Columns 6 to 8 of Table WW-8 (Schedule BV-E1). The number of accounts and bills for each customer type and meter size are derived from billing information prepared by the Water Department. Equivalent meters are based upon capacity factors determined for various size meters relative to the capacity associated with a 5/8-inch meter.

Q77. PLEASE EXPLAIN THE METHODOLOGY USED TO DISTRIBUTE COSTS TO THE RETAIL WASTEWATER CUSTOMER TYPES.

A77. The *retail* cost of service is allocated to the various retail customer types through a two-step process:

- ***Step 1:*** First, the *retail unit costs* of service, for each expense category (*Operating*; *Depreciation*; and *Return on Investment*) and for each cost component [Sewer Capacity, Pumping (Volume and Capacity), Treatment (Volume, Capacity, BOD, and Suspended Solids), Meters, and Bills] is determined. We determined the unit cost for each cost component by dividing the total cost allocated to each expense category and cost component by the total applicable units of service.
- ***Step 2:*** We determine the cost of service for the test year, for each customer type, by applying unit costs of service to the number of units for which each customer type is responsible.

Determination of <u>Retail Unit Costs</u>: The development of retail unit costs involves the following two sub-tasks:

- ***Estimate of the Inside City Rate of Return:*** The capital cost revenue requirement of the system less depreciation is considered the equivalent of return on investment. The system return on investment is recovered from both *Inside City Retail* and *Outside City Wholesale customers.* The *Inside City Retail* rate of return requirement is calculated as follows:
  - The total return on investment in the system required in the test year amounts to $106.70 Million. This return when applied to the test year system plant investment of $2.22 Billion, results in an overall <u>system rate of return</u> requirement of 4.81 percent.
  - A return on investment of $4.3 Million has been allocated to the wholesale customers.
  - The wholesale customer's return on investment of $4.3 Million and the estimated test year management fee revenue of $3.9 Million is deducted from the total system return on investment of $106.7 Million, to allocate the Inside City's return on investment of $98.5 Million, as presented in Table WW-11 (Line 11, Column 1). Based on this allocation, the Inside City rate of return on investment is estimated to be 4.82%.
- ***Calculate the Retail unit costs of service:*** Tables WW-11 and WW-12 (Schedule BV-E1) present the FY 2019 test year retail unit costs of service. Lines 4 and 10 present the operating expense and depreciation expense unit costs of service, and Line 6 presents the retail customers' plant investment

per unit of service applicable to the relevant cost components. Line 12 presents the return on investment for inside City retail customers. The total retail customer unit costs of service are the sum of the test year unit costs for operating expense, depreciation expense, and return on investment. Line 14 presents total unit costs of service applicable to all inside City retail customers.

The unit cost of the Volume component is applicable to retail customer contributed wastewater volumes. The unit cost of the Pumping Capacity, Sanitary Sewer Capacity and Treatment Capacity are applicable to the corresponding capacity requirements. The unit costs of the strength components are applied to the respective strength loadings. The unit cost of meters is applied to each equivalent meter, while the unit cost of billing is applicable to each equivalent bill issued.

Determination of Costs of Service by Customer Type: Table WW-13 (Schedule BV-E1) presents the FY 2019 test year costs of service allocated to the various customer types. The cost of service by cost component is developed by multiplying the unit cost for each component (Line 14 of Tables 11 and 12) by the corresponding units of service for each customer type (Table WW-8).

Table WW-14 (Schedule BV-E1) presents the allocated test year FY 2019 costs of service for each customer types and presents cost of service adjustments for the allocation of system inflow and infiltration costs and fee discounts.

- Infiltration/Inflow: The cost of service allocable to infiltration/inflow must be distributed among the retail service customer types. As in the case of the allocation of stormwater costs, the relative customer type responsibility for infiltration/inflow cost can neither be precisely measured, nor can it be directly associated with the parameters of sanitary wastewater service.

  In general, infiltration/inflow due to leakage in lateral sewers of individual residences would be expected to be less than in the services of individual large commercial or industrial establishments. The greater length, due to larger lot frontage, and greater size of main sewer required for the larger customers would also contribute to potential increased infiltration/inflow with the size of customer. The number of equivalent meters of each customer type, discussed previously in this report, provides a reasonable means of recognizing both numbers and relative sizes of customers and provides a measure of customer type responsibility for infiltration/inflow cost.

Columns 3 and 4 of Table WW-14 reflect the redistribution of the cost of infiltration/inflow to the other customer types based upon equivalent meters and volume. In accordance with the rate proceeding decisions issued in 1993, 2001, and 2004, the rate design for the current study reflects a 30 percent recovery of pumping and treatment related infiltration/inflow costs through the service charge and 70 percent through the volume charge.

- Fee Discounts: The proposed cost of service reflects the continuation of the current practice of providing fee discounts to the following customer types:
  - Currently Senior Citizens, and Charities and Schools customer types are billed at 75 percent of the general customer rate levels.
  - The Philadelphia Housing Authority is billed at 95 percent of general customer rate levels.

  The revenue reduction resulting from the discounts is recovered from all inside City retail customer types in order to recover the total FY 2019 test year cost of service for retail customers. Key factors that influence the approach used to recover the revenue reduction due to discounts from all customer types include the following: (i) Use of this approach vetted through a history of previous rate proceedings; (ii) the U.S. Environmental Protection Agency's low income discount cost recovery guidelines for grant recipients; (iii) the administrative complexity associated with any potential changes to the City's billing system; and (iv) the potential positive impact on collections due to affordable fees and charges, which then benefits all the rate payers.

Column 10 of Table WW-14 presents the adjusted cost of service of the inside City customer types. This adjusted cost of service recognizes the fee reduction due to discounts and the recovery of those discounts from all customer types.

Q78. PLEASE EXPLAIN THE APPROACH USED TO DETERMINE THE STORMWATER REVENUE REQUIREMENTS.

A78. Stormwater management and related costs are an integral component of the Water Department's wastewater system costs. To delineate the stormwater management costs from the balance of annual wastewater costs, Black & Veatch used a multi-step cost allocation approach.

As discussed in detail earlier in this testimony, similar to the approach outlined for wastewater, Black & Veatch followed a multi-step process to derive the stormwater revenue requirement or cost of service:

- ***Step 1:*** Aggregated O&M and capital costs by functional components (Conveyance; Pumping; Treatment; Customer; and Industrial Waste).
- ***Step 2:*** Allocated each functional cost to wastewater cost components. The typical retail wastewater cost components include volume, capacity, strength parameters such as BOD and Suspended Solids, and customer cost parameters such as meters, bills.
- ***Step 3:*** Apportioned capital component costs and O&M component costs between contract customers (wholesale) and retail.
- ***Step 4:*** Apportioned the retail component costs, less applicable non-operating retail revenues, between sanitary sewer and stormwater services. Any exclusive stormwater O&M cost such as inlet cleaning costs were allocated entirely to stormwater.
- ***Step 5:*** Allocated a portion of the retail component cost to Infiltration/Inflow (I&I), and then re- apportioned the I&I cost between retail sanitary sewer and stormwater services.

In our responses to Q73 through Q75, we already discussed in detail the cost of service allocations between sanitary wastewater and stormwater, and the associated rationale for each allocation. Therefore, here we present a summary of the key allocation factors used in determining the stormwater revenue requirements.

Conveyance O&M Cost Allocation: As discussed in response to Q73, 60 percent of the sewer maintenance cost is allocated to stormwater and 40 percent to sanitary wastewater, based on an analysis of system-wide ratio of peak wet weather flows to peak dry weather flows performed during the last rate proceeding, The rationale for using the peak flow ratio as the basis for apportioning sewer maintenance costs is that those costs would normally be incurred in proportion to the quantity of flow conveyed through the system.

Conveyance Capital Cost Allocation: As discussed in response to Q69, 64% of the sewer mains capacity capital cost is allocated to stormwater and 36% to sanitary wastewater based on a cost weighted pipe capacity analysis. Affirmed in prior rate proceedings, these allocation factors are based on the pipe capacity of sanitary sewer and stormwater drainage weighted by the cost of construction.

Pumping & Treatment O&M and Capital Cost: A portion of the retail pumping and treatment component cost is allocated to Infiltration and Inflow. Affirmed in prior rate proceedings, the Infiltration and Inflow cost is allocated 70% to

sanitary sewage and 30% to stormwater services based on the ratio of average dry weather flow to average wet weather flow.

Customer Costs: The allocation approach used in allocating customer costs to stormwater is consistent with the method used in the previous rate proceeding. The customer costs are first allocated one-third to water service and two-thirds to the wastewater service (as wastewater includes sewer and stormwater). The wastewater customer costs less the metering costs are further allocated 60% to sanitary sewer and 40% to stormwater services based on the relative revenue requirement levels in FY 2019 between the two services.

Table SW-13 in Schedule BV-E3, presents the total FY 2019 stormwater revenue requirements. Based on the detailed technical cost allocations, the estimated FY 2019 stormwater revenue requirements are $175.6 Million.

Q79. PLEASE EXPLAIN IF THERE ARE ANY CHANGES TO THE STORMWATER MANAGEMENT SERVICE (SWMS) CHARGE COMPONENTS AND/OR THE ALLOCATION FACTORS TO THE CHARGE COMPONENTS.

A79. There are no changes to the stormwater management service (SWMS) charge components or related allocation factors. As established in the 2008 rate proceedings, the SWMS charge is comprised of two components: an IA charge and a GA charge. The parcel area based portion of the stormwater revenue requirements is allocated 20 percent to GA and 80 percent to IA. Table SW-14

(Schedule BV-E3) presents the FY 2019 test year stormwater GA and IA revenue requirements.

Q80. WHAT ARE THE RESULTS OF THE STORMWATER REVENUE REQUIREMENT ALLOCATIONS TO THE STORMWATER CHARGE COMPONENTS?

A80. The revenue requirement to be recovered from the GA and IA SWMS charge components in FY 2019 test year is $163.9 Million The revenue requirement to be recovered from the billing and collection charge during this same period is $11.7 Million. Table SW-13 (Schedule BV-E3) presents a summary of the test year FY 2019 stormwater revenue requirement results. Table SW-14 (Schedule BV-E3) presents the summary results of the GA and the IA components of the revenue requirements.

Q81. PLEASE BRIEFLY DESCRIBE THE STORMWATER CUSTOMER TYPES DEFINED FOR THE SWMS CHARGE.

A81. As provided in the Water Department's Rates and Charges (Attachment A), there are three customer types for the SWMS charge: (i) residential; (ii) non-residential and (iii) condominium.

Q82. ARE ANY CHANGES PROPOSED TO THE EXISTING STORMWATER CREDIT PROGRAM?

A82. No. The Department is not proposing any changes to the stormwater credit program. The details of the existing credit program are presented in the Water Department's Regulations.

Q83. PLEASE EXPLAIN THE EXPECTED IMPACT OF THE STORMWATER CREDIT PROGRAM ON THE SYSTEM WIDE BILLABLE GA AND IA?

A83. In Test Years FY 2019, FY 2020 and FY 2021, the total projected stormwater GA and IA credits are as follows:

	Test Year FY 19	Test Year FY 20	Test Year FY 21
IA Credit (sf)	108,341,119	115,721,711	124,673,788
GA Credit (sf)	352,820,378	372,241,706	393,187,634

Table SW-5 (Schedule BV-E3) presents the *projected* reduction in billable GA and IA square footage due to credits. The increase in stormwater credits in each succeeding year is due to the additional anticipated credits for parcels meeting stormwater regulations and the anticipated credits for completed SMIP/GARP projects.

Q84. PLEASE DESCRIBE HOW THE GROSS AREA (GA) AND IMPERVIOUS AREA (IA) SQUARE FOOTAGE (UNITS OF SERVICE) WERE DEVELOPED FOR THE THREE CUSTOMER CLASSES.

A84. The billable units of service are critical for projecting the stormwater revenues under existing rates, and for developing the GA and IA rates for the test years. Presented below is a summary of the three-step billable GA and IA units of service development process.

Step 1: Projection of the Initial GA and IA: Black & Veatch used the FY 2016 and FY 2017 parcel data including information on credits and appeals adjustments to determine the initial GA and IA units for each customer class. We determined the existing level of GA and IA (referred to herein as the "Initial GA and IA") for the Residential, Non-Residential, and Condominium classes by applying the Mean GA and IA of the respective customer classes to the projected number of parcels in each of those classes.

- *Residential:* Calculation steps for the initial GA and IA as follows:

  We used the 2-year average of the FY 2016 and FY 2017 parcel data to compute the Mean GA and Mean IA for the residential parcels. The Mean Residential GA is 2,110 square feet and the Mean Residential IA is 1,050 square feet. These values are identical to those used in the prior rate study and rate proceedings. We then applied these Mean GA and Mean IA square footage to the estimated number of residential parcels to determine the initial GA and IA for this class.

- *Non-Residential and Condominium:* Calculation steps for the initial GA and IA as follows:

Using the average of the FY 2016 and FY 2017 7 parcel data, we determined the Mean GA and Mean IA for the various non-residential and condominium sub-groups. Due to the diversity in the types of parcels within the non-residential and Condominium customer classes, we computed the Mean GA and Mean IA at the subgroup level. We then applied these Mean GA and Mean IA square footage of each subgroup to the estimated number of parcels within each subgroup to determine the initial GA and IA for the non-residential and condominium classes.

Table SW-1 (Schedule BV-E3) presents the Mean GA and Mean IA determined for each of the subgroups within the Non-Residential and Condominium customer classes.

Step 2: Projection of the GA and IA Adjustments: Two key factors could impact stormwater GA and IA revenue generation. Hence, to ensure revenue adequacy, rate setting has to account for each of the factors that could impact revenue generation. These two key factors (referred herein as "Adjustment Factors") are:

- *Stormwater Credits Adjustments:* Stormwater credits offered in the form of a reduction in GA and/or IA square footage;
- *Stormwater Appeals/Data Adjustments:* There are two primary sources of stormwater appeals/data adjustments: (i) reduction in GA and IA square footage due to data inaccuracies; and (ii) reduction in GA and IA due to parcel designation as a “Community Garden.”

Note - As a result of the Rate Board's determination on December 22, 2016, eligible Community Gardens may receive a 100 percent discount on their monthly stormwater service charge. As such, the impact is modeled as a reduction in GA and IA square footage. For projections purposes: 1) The GA and IA square footage of properties that were already designated as community gardens prior to June 30, 2017 are not included in the initial IA and GA units of service estimates; and 2) For the remaining potential community gardens, estimated during the December 2016 Special Rate proceeding (i.e. those not designated as community gardens as of June 30, 2017), and estimated reduction of approximately 1.1 Million square feet of GA and 100,000 square feet of IA is assumed to occur in FY 2018.

Hence, we projected the potential reduction in GA and IA square footage that could occur due to the above two adjustment factors. Table SW-2, Table SW-3, and Table SW-4 (Schedule BV-E3) present the Adjustments to Number of Parcels, Adjustments to GA, and Adjustments to IA, respectively.

Step 3: Projection of Billable GA and IA: Finally, we deducted the projected GA and IA adjustments determined in Step 2 from the initial GA and IA square footage determined in Step 1 to derive the final billable GA and IA units of service for the Residential, Non-Residential, and Condominium categories of parcels.

Table SW-10 (Schedule BV-E3) presents the projected system wide billable number of parcels, billable GA, and billable IA for FY 2018 through FY 2023.

Q85. PLEASE EXPLAIN THE METHODOLOGY USED TO DERIVE THE STORMWATER SYSTEM UNIT COSTS OF THE GA AND IA CHARGE COMPONENTS.

A85. The system wide GA and IA unit costs are determined in terms of dollar per 500 square feet of GA and IA, respectively. The GA and IA costs are specifically derived in three steps, as described below, using the FY 2019 as an example of the methodology applied for all test years.

- The FY 2019 GA and IA billable square footage is divided by 500 to express the billable units in terms of 500 square feet;
- The FY 2019 test year GA and IA revenue requirements are then divided by the GA and IA billable units to derive the annual GA and IA unit cost;
- The annual GA and IA unit cost is finally divided by 12 to derive the system wide monthly unit cost of service.

Table SW-14 (Schedule BV-E3) presents the projected system wide GA and IA unit cost for FY 2019.

Step 4: Determination of the Customer Class Test Year GA and IA Cost of Service. Development of the GA and IA cost of service is as follows for the Residential and Non-Residential (includes Condominium) categories of parcels:

- *Residential:* We apply the system GA and IA unit cost from Step 3 to the residential billable GA & IA units of service to determine the FY 2019

Residential cost of service. The estimated residential cost of service for FY 2019 is $72,980,000.

- *Non-Residential:* We then subtract the residential GA and IA cost of service from the total GA and IA revenue requirements to determine the non-residential GA and IA cost of service for each of the test years. To account for the estimated revenue loss due to the Customer Assistance Program (CAP), we increase the non-residential cost of service by the estimated amount of revenue loss due to CAP. The estimated FY 2019 revenue loss due to the CAP program is $2,331,000. The non-residential cost of service, adjusted for CAP, for the test year FY 2019 is $93,267,000. *Note - For FY 2020 through FY 2021, it is assumed that the annual CAP will decrease $100,000 from the prior year level.*

Table SW-15 (Schedule BV-E3) presents the Residential and Non-residential (adjusted for CAP) GA and IA cost of service for the test year FY 2019.

Q86. PLEASE DESCRIBE HOW YOU DERIVED THE CUSTOMER CLASS TEST YEAR GA AND IA COST OF SERVICE?

A86. The GA and IA cost of service for the Test Year, for the Residential and Non-Residential customer classes are determined as follows:

- *Residential:* We applied the system GA and IA unit cost to the residential billable GA & IA units of service to determine the FY 2019 Residential cost of service. The estimated residential cost of service for FY 2019 is $72.98 Million.

- *Non-Residential:* We then subtract the residential GA and IA cost of service from the total GA and IA revenue requirements to determine the non-residential GA and IA cost of service for FY 2019. To account for the estimated revenue loss due to the Customer Assistance Program (CAP), we then increase the non-residential cost of service by the estimated amount of revenue loss due to CAP. The estimated FY 2019 revenue loss due to the CAP program is $2.3 Million. The non-residential cost of service, adjusted for CAP, for the test year FY 2019 is $93.3 Million. *Note - For FY 2020 through FY 2021, it is assumed that the annual CAP will decrease $100,000 from the prior year level.*

  For a more detailed discussion of CAP see Testimony of Erin Williams (PWD Statement No. 6).

Table SW-15 (Schedule BV-E3) presents the Residential and Non-Residential (adjusted for CAP) GA and IA cost of service for the test year FY 2019.

Section 4: Projection of Cost of Service Water, Sewer, and Stormwater Rates and Charges

Q87. ARE ANY CHANGES PROPOSED TO THE WATER, SEWER AND STORMWATER RATE STRUCTURE?

A87. There are no changes proposed for the sewer and stormwater rate structures. However, the Department is proposing to recover public fire protection costs through the service charge.

As note early in this testimony, the Water Department is proposing rate increases that will go into effect on September 1st of each respective fiscal year. However, rates are designed based upon a 12-month period. Because the proposed revenue increase will not go into effect until September 1st of each fiscal year, the proposed rates are designed based on annualizing the 10-month period for which rates are effective.

Q88. PLEASE DESCRIBE THE DESIGN OF THE RETAIL WATER RATES AND CHARGES?

A88. The final step in the Water Cost of Service analysis is the development of the cost of service water retail rates. Utilizing the adjusted costs of service presented in Table W-17, cost of service rates are designed which, when applied to the annual billing units for each customer type, recovers the costs from each customer type as closely as practical to the allocated costs of service.

Application of the Lag Factor: The cost of service water rates that are designed for Test Year-1 (FY 2019) requires the application of a "lag factor." The lag factor reflects a final adjustment to the cost of service rates to recognize the fact that there will be a proration of quantity charge billings between the existing and proposed rates during the first month following the effective date of the rate increase, as well as the fact that the fiscal year billings will not be fully collected within that fiscal year. The lag factor is calculated to recover only the anticipated receipts of the prorated revenue increase projected for FY 2019, recognizing the normally expected historical payment patterns. A lag factor of 1.031 is applied to the FY 2019 water cost of service rates.

Proposed Schedule of Water Rates for Test Years: Table W-18 (Schedule BV-E1) presents the proposed water rates for general service customers. The proposed rates reflect a continuation of the existing rate structure, including a service charge which varies by meter size and a declining block quantity charge. Proposed schedules of rates applicable for Test Year-1 (FY 2019), Test Year-2 (FY 2020) and Test Year-3 (FY 2021) are presented in Table W-18. The proposed rates designed for each fiscal year, are designed to recover the water revenue increase indicated in Table W-6, taking in to consideration the collection factor patterns as applied to billings from current and prior fiscal years.

Fire Protection Charges: Tables W-19 and W-19A (Schedule BV-E1) presents the proposed rates for private fire connections for Test Year-1 (FY 2019), Test Year-2 (FY 2020) and Test Year-3 (FY 2021).

Q89. PLEASE DESCRIBE THE DESIGN OF THE RETAIL SANITARY SEWER RATES AND CHARGES?

A89. The final step in the Sanitary Sewer Cost of Service analysis is the development of the cost of service sanitary sewer retail rates. Utilizing the adjusted costs of service presented in Table WW-14, cost of service rates are designed which, when applied to the annual billing units for each customer type, recovers the costs from each customer type as closely as practical to the allocated costs of service.

Application of the Lag Factor: The cost of service sanitary sewer rates that are designed for Test Year-1 (FY 2019) requires the application of a "lag factor." The lag factor reflects a final adjustment to the cost of service rates to recognize the fact that there will be a proration of quantity charge billings between the existing and proposed rates during the first month following the effective date of the rate increase, as well as the fact that the fiscal year billings will not be fully collected within that fiscal year. The lag factor is calculated to recover only the anticipated receipts of the prorated revenue increase projected for FY 2019, recognizing the normally expected historical payment patterns. A lag factor of 1.049 is applied to the FY 2019 sanitary sewer cost of service rates.

Proposed Schedule of Sanitary Sewer Rates for Test Years: Table WW-18 (Schedule BV-E1) summarizes the proposed charges for sewer service to retail service customers. The proposed sewer rates reflect a continuation of the existing sewer rate structure, which includes a service charge which varies by meter size and a uniform quantity charge applicable to billable water usage. Table WW-18 presents proposed schedules of retail sewer rates applicable to Test Year-1 (FY 2019), Test Year-2 (FY 2020), and Test Year 3 (FY 2021). The design of the proposed rates for each fiscal year recover the cost of service allocations and the overall increases in wastewater revenues indicated in Table WW-6, taking in to consideration the collection factor patterns as applied to billings from the current and two prior fiscal years.

Retail Sewer Surcharges: Table WW-18 (Schedule BV-E1) also presents the proposed surcharges applicable for retail sanitary sewer customers with high suspended solids and/or high BOD strength loadings.

Q90. PLEASE DESCRIBE THE DESIGN OF THE STORMWATER IA AND GA RATES.

A90. The Water Department proposes to retain the existing Residential and Non-Residential stormwater rate structure. The GA and IA rates were determined using a multi-step process as follows:

Step 1: Determination of Initial GA and IA Rates

- *Residential:* The current residential rate structure consists of a uniform monthly GA and IA charge per parcel. To determine the initial Residential uniform monthly GA and IA charge, we multiplied the system-wide GA and IA unit cost (discussed in Q86) by the Residential Mean GA (2,110 square feet) and Residential Mean IA (1,050 square feet). The Test Year-1 (FY 2019) "initial" Residential uniform monthly GA & IA charge is $13.19 per month.

- *Non-Residential IA and GA Stormwater Charges:* For every non-residential parcel, the Water Department individually calculates the monthly GA and IA charge for each parcel based on the Non-Residential GA and IA rate and the parcel's specific billable GA and IA square footage (after adjusting for applicable stormwater credits). To determine the "Initial" Non-Residential GA and IA rate, we divided the Non-

Residential GA and IA cost of service adjusted for CAP (discussed in Q86) by the non-residential billable GA and IA units of service. The test year FY 2019 "initial" Non-Residential GA Rate is $0.67 per 500 square feet of GA, and the IA Rate is $5.09 per 500 square feet of IA.

Table SW-16 (Schedule BV-E3) presents the Residential Initial cost of service GA and IA charge, and the Non-Residential Initial cost of service GA and IA rates for the test year FY 2019.

Step 2: Determination of the monthly Customer Class "Adjusted" GA and IA Rate:

The Water Department provides bill discounts to certain groups of residential and non-residential customers including elderly citizens, charities, educational institutions, and the housing authority. We estimate the potential test year revenue reduction due to discounts, and reapportion that amount to all customer sub-groups within the residential and non-residential classes. To recover this annual revenue loss from all the other rate payers, a "Discount Recovery Factor" is determined and that factor is applied to the "initial" cost of service GA and IA rates.

Table SW-18 (Schedule BV-E3) presents the Discount Recovery Factor in Column 2, and the Adjusted Cost of Service Rates in Column 3, for test year FY 2019.

Step 3: Determination of the monthly Customer Class "Final" Cost of Service GA and IA Rate: After Step 2, a final adjustment is made to the Adjusted Cost of Service GA and IA rates through the application of a "lag factor." The lag factor reflects a final adjustment to the cost of service rates to recognize the fact that there will be a proration of SWMS charge billings between the existing and proposed rates during the first month following the effective date of the rate increase, as well as the fact that the fiscal year billings will not be collected within the fiscal year. Therefore, to reflect this lag in collections, we apply a wastewater lag factor of 1.049 to the FY 2019 adjusted cost of service GA and IA rates derived in Step 2.

Table SW-19 (Schedule BV-E3) presents in Column 5, the Final Cost of Service GA and IA rates after adjusting for discount recovery, lag factor, and CAP recovery (applies to Non-Residential rates only).

Table SW-19A in Schedule BV-E3, presents the proposed stormwater rate schedules applicable to Test Year-1 (FY 2019), Test Year 2 (FY 2020), and Test Year 3 (FY 2021) for the Residential class.

Table SW-19B in Schedule BV-E3 presents the proposed stormwater rate schedules applicable to Test Year-1 (FY 2019), Test Year 2 (FY 2020), and Test Year-3 (FY 2021), for the Non-Residential class.

Q91. PLEASE DESCRIBE THE DESIGN OF THE MONTHLY STORMWATER BILLING AND COLLECTION CHARGES FOR RESIDENTIAL AND NON-RESIDENTIAL CUSTOMER CLASSES.

A91. The proposed billing and collection charges for stormwater service are based on the cost of service analyses discussed in Section 3.

The Test Year FY 2019 customer costs allocated to stormwater reflects the portion of cost of service that is to be recovered through the monthly stormwater Billing & Collection charge. The determination of the residential and non-residential monthly Billing & Collection charge involves a three-step process:

Step 1: Determination of the Billable Residential and Non-Residential Accounts. To establish a Billing & Collection charge per account, we develop the FY 2019 total "Equivalent Customer Cost Weighted" Billable Accounts. To develop the cost weighted billable accounts, we weigh the total number of non-residential accounts by a factor of 1.3 and the residential accounts by a factor of 1.0. The total cost-weighted accounts are annualized to determine the total bills for FY 2019.

Step 2: Determination of the Initial Residential and Non-Residential Monthly Billing & Collection Charge. The FY 2019 Billing & Collection Charge revenue requirements of $11.7 Million (discussed in Q80) is divided by the total bills discussed in Step 1 to derive the monthly Billing & Collection charge of $1.70 per bill. This charge is set as the initial Residential monthly Billing & Collection charge. This charge is then factored up by 1.3 to set the initial Non-Residential monthly Billing & Collection charge of $2.21 per bill.

Table SW-17 (Schedule BV-E3) presents the *initial* residential and non-residential monthly uniform stormwater charge.

Step 3: Determination of the Final Residential and Non-Residential Monthly Billing & Collection Charge. The FY 2019 *Initial* Billing & Collection Charge discussed in Step 2 is then adjusted to account for the recovery of discounts on the billing & collection charge, and for the lag factor discussed in Q87. The *Final* monthly Residential and Non-Residential Billing & Collection charge adjusted for discounts and lag factor are $1.83 and $2.38 per bill, respectively.

Table SW-19 (Schedule BV-E3) presents, for Test Year FY 2019, the *final* Residential and Non-Residential monthly Billing & Collection charge.

Q92. IN DESIGNING THE RETAIL WATER, SEWER, AND STORMWATER COST OF SERVICE RATE SCHEDULES ARE THERE OTHER FACTORS, IN ADDITION TO THE UNIT COSTS OF SERVICE RESULTING FROM THE COST OF SERVICE ANALYSES, WHICH HAD TO BE CONSIDERED?

A92. Yes. The proposed charges for water service shown in Table W-18 and wastewater service shown in Table WW-18 applicable to general service retail customers recognize that certain retail customer types, including senior citizens, charities and schools, and the Philadelphia Housing Authority, receive services at a discounted rate. The Water Department anticipates that the existing discounts (25 percent for senior citizens, charities and schools and 5 percent for

the Philadelphia Housing Authority) will continue to be applicable for the entire rate period.

In designing the proposed rates, we adjust the retail water, sanitary sewer, and stormwater costs of service determined for each customer type to reflect the fact that these customer types will not pay full cost of service. Accordingly, we increase the proposed retail water, sewer, and stormwater rates to recover this cost of service revenue reduction due to discounts.

In addition, in the case of the non-residential stormwater class, we have to adjust their stormwater rates to address the discounts as well as to recover the reduction in revenue due to the existing stormwater CAP (discussed in Q86).

In this rate proceeding, the Water Department also proposes a new rate adjustment factor, referred to as the "TAP Rate Rider." This TAP Rate Rider is proposed to be applicable only to the Water and Sewer Quantity charge that will go in to effect on September 1, 2019 and September 1, 2020. The supplemental TAP Rate Rider Testimony provides details on the proposed TAP Rate Rider framework.

Q93. BASED UPON THE PROPOSED SCHEDULES OF RETAIL WATER, SEWER, AND STORMWATER RATES, WHAT IS THE INCREASE TO THE TYPICAL RESIDENTIAL CUSTOMER'S COMBINED WATER AND WASTEWATER BILL RELATIVE TO THE BILL UNDER EXISTING RATES?

A93. Table C-4, in Schedule BV-1, presents a series of typical or representative combined residential water, sanitary sewer, and stormwater monthly bills under existing and proposed rates for Test Year-1 (FY 2019), Test Year-2 (FY 2020), and Test Year 3 (FY 2021) for the 5/8-inch meter size. In the City of Philadelphia, the typical residential customer has a 5/8-inch meter and uses about 0.5 Mcf (thousand cubic feet) annually (approximately 500 cubic feet monthly). Under the proposed schedules of water and wastewater rates for Test Year-1 (FY 2019), this customer's monthly bill would increase from $66.50 to $67.24, an increase of $0.74 or about 1.1 percent. In FY 2020, the bill increases to $70.60, an increase of $3.36 over FY 2019 rates, or about 5.0 percent. Finally, in FY 2021, the bill increases to $73.79, an increase of $3.19 over FY 2020 rates, or about 4.5 percent.

Q94. BASED UPON THE PROPOSED SCHEDULES OF RETAIL WATER, SEWER, AND STORMWATER RATES, WHAT IS THE INCREASE TO THE TYPICAL SENIOR RESIDENTIAL CUSTOMER'S COMBINED WATER AND WASTEWATER BILL RELATIVE TO THE BILL UNDER EXISTING RATES?

A94. Table C-4, in Schedule BV-E1, presents a series of typical or representative combined residential water, sanitary sewer, and stormwater monthly bills under existing and proposed rates for Test Year-1 (FY 2019), Test Year-2 (FY 2020), and Test Year 3 (FY 2021) for the 5/8-inch meter size. In the City of Philadelphia, the typical senior residential customer has a 5/8-inch meter and uses about 0.3 Mcf (thousand cubic feet) annually (approximately 300 cubic feet monthly). Under the proposed schedules of water and wastewater rates for Test

Year-1 (FY 2019), this customer's monthly bill would increase from $51.39 to $52.10, an increase of $0.74 or about 1.4 percent. In FY 2020, the bill increases to $54.81, an increase of $2.71 over FY 2019 rates, or about 5.2 percent. Finally, in FY 2021, the bill increases to $57.36, an increase of $2.55 over FY 2020 rates, or about 4.7 percent. Note – eligible senior citizens may receive a 25 percent discount on their entire bill. The total monthly bills presented above do not reflect this discount.

Q95. BASED UPON THE PROPOSED SCHEDULES OF RETAIL WATER, SEWER, AND STORMWATER RATES, WHAT IS THE INCREASE TO THE TYPICAL SMALL BUSINESS CUSTOMER'S COMBINED WATER AND WASTEWATER BILL RELATIVE TO THE BILL UNDER EXISTING RATES?

A95. Table C-5, in Schedule BV-E1, presents a series of typical or representative combined non-residential water, sanitary sewer, and stormwater monthly bills under existing and proposed rates for Test Year-1 (FY 2019), Test Year-2 (FY 2020), and Test Year 3 (FY 2021) for multiple meter sizes and various parcel characteristics (i.e. GA and IA). In the City of Philadelphia, a small commercial business customer has a 5/8-inch meter and uses about 0.6 Mcf (thousand cubic feet) annually (approximately 600 cubic feet monthly). A parcel with gross area of 11,000 square feet and impervious area of 7,000 square feet was assumed for development of the typical bill comparison.

Under the proposed schedules of water and wastewater rates for Test Year-1 (FY 2019), this customer's monthly bill would increase from $108.49 to

$112.90, an increase of $4.41 or about 4.1 percent. In FY 2020, the bill increases to $119.29, an increase of $6.39 over FY 2019 rates, or about 5.7 percent. Finally, in FY 2021, the bill increases to $125.02, an increase of $5.73 over FY 2020 rates, or about 4.8 percent.

Q96. DOES THIS COMPLETE YOUR DIRECT TESTIMONY IN THIS MATTER?

A96. Yes, it does.

In the Matter of the Philadelphia Water Department's Proposed Change in Water, Wastewater and Stormwater Rates and Related Charges

Fiscal Years 2019-2021

Philadelphia Water Department

Black & Veatch Management Consulting, LLC

Schedule BV-E1

Dated: February 9, 2018

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2	TABLE C-2	COMBINED UTILITY: PROJECTED RATE STABILIZATION FUND AND COVENANTS METRICS PERFORMANCE
3	TABLE C-3	COMBINED UTILITY: PROJECTED RECEIPTS UNDER EXISTING RATES
4	TABLE C-4	COMBINED UTILITY: COMPARISON OF TYPICAL BILL FOR RESIDENTIAL CUSTOMERS UNDER EXISTING AND PROPOSED RATES
5	TABLE C-5	COMBINED UTILITY: COMPARISON OF EXAMPLE BILLS FOR NON-RESIDENTIAL CUSTOMERS UNDER EXISTING AND PROPOSED RATES
6	TABLE C-6	COMBINED UTILITY: PROJECTED OPERATION AND MAINTENANCE EXPENSE
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8	TABLE C-8	COMBINED UTILITY: PROJECTED FLOW OF FUNDS - CAPITAL IMPROVEMENTS FUND
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10	TABLE W-1	WATER: PROJECTED RECEIPTS UNDER EXISTING RATES
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12	TABLE W-2	WATER: PROJECTED OPERATION AND MAINTENANCE EXPENSE
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16	TABLE W-6	WATER: PROJECTED REVENUE AND REVENUE REQUIREMENTS
17	TABLE W-7	WATER: ESTIMATED TEST YEAR COST OF SERVICE
18	TABLE W-8	WATER: ALLOCATION OF TEST YEAR PLANT INVESTMENT TO FUNCTIONAL COST COMPONENTS

Schedule REF #		Schedule Name
BV-E1	Black & Veatch Schedule	
19	TABLE W-9	WATER: ALLOCATION OF TEST YEAR PLANT DEPRECIATION EXPENSE
20	TABLE W-10	WATER: ALLOCATION OF TEST YEAR OPERATION AND MAINTENANCE EXPENSE
21	TABLE W-11	WATER: ESTIMATED RETAIL UNITS OF SERVICE
22	TABLE W-12	WATER: EQUIVALENT METER AND BILL RATIOS
23	TABLE W-13A	WATER: SUMMARY OF COST OF SERVICE ALLOCATED TO AQUA PA AND PROPOSED RATES TEST YEAR 2019
24	TABLE W-13B	WATER: SUMMARY OF COST OF SERVICE ALLOCATED TO AQUA PA AND PROPOSED RATES TEST YEAR 2020
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26	TABLE W-14	WATER: TEST YEAR RETAIL UNIT COSTS OF SERVICE
27	TABLE W-15	WATER: TEST YEAR COST OF SERVICE BY FUNCTIONAL COST COMPONENTS
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Schedule REF #		Schedule Name
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37	TABLE WW-2	WASTEWATER: PROJECTED OPERATION AND MAINTENANCE EXPENSE
38	TABLE WW-3	WASTEWATER: PROJECTED CAPITAL IMPROVEMENT PROGRAM
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Schedule REF #		Schedule Name
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54	TABLE WW-11	WASTEWATER: RETAIL UNIT COSTS OF SERVICE - (Part I)
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59	TABLE WW-16	WASTEWATER: DEVELOPMENT OF COST OF SERVICE MONTHLY SERVICE CHARGE FOR CUSTOMERS WITH 5/8-INCH METERS
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61	TABLE WW-18	WASTEWATER: PROPOSED RATES FOR GENERAL SERVICE SANITARY SEWER

TABLE C-1: PROJECTED REVENUE AND REVENUE REQUIREMENTS (in thousands of dollars)

Line No.	Description	Year	Percent Increase	Months Effective	Fiscal Year Ending June 30, 2017 (a)	2018	2019	2020	2021	2022	2023
	OPERATING REVENUE										
1	Water Service - Existing Rates				271,124	280,852	272,455	270,409	268,152	266,038	263,948
2	Wastewater Service - Existing Rates				413,732	430,818	431,108	428,705	425,776	422,912	420,084
3	Total Service Revenue - Existing Rates				684,856	711,670	703,564	699,115	693,929	688,950	684,032
	Additional Service Revenue Required										
4		FY 2019	1.60%	10			9,204	11,186	11,103	11,023	10,945
5		FY 2020	4.50%	10				26,133	31,726	31,499	31,274
6		FY 2021	4.50%	10					27,107	32,916	32,681
7		FY 2022	6.80%	10						42,497	51,607
8		FY 2023	6.80%	10							45,063
9	Total Additional Service Revenue Required				-	-	9,204	37,319	69,936	117,936	171,570
10	Total Water & Wastewater Service Revenue				684,856	711,670	712,767	736,434	763,865	806,886	855,603
	Other Income (b)										
11	Other Operating Revenue				32,287	39,647	16,187	13,008	10,025	9,948	9,871
12	Debt Reserve Fund Interest Income				-	-	-	-	-	-	-
13	Operating Fund Interest Income				386	406	364	358	376	398	417
14	Rate Stabilization Interest Income				733	702	660	601	543	516	508
15	Total Revenues				718,260	752,425	729,978	750,401	774,810	817,748	866,398
	OPERATING EXPENSES										
16	Total Operating Expenses				(455,742)	(464,118)	(485,844)	(500,535)	(514,420)	(528,771)	(543,451)
	NET REVENUES										
17	Transfer From/(To) Rate Stabilization Fund				4,563	12,200	11,400	21,200	11,100	3,900	700
18	NET REVENUES AFTER OPERATIONS				267,082	300,508	255,534	271,066	271,490	292,876	323,647
	DEBT SERVICE										
	Senior Debt Service										
	Revenue Bonds										
19	Outstanding Bonds				(193,841)	(185,756)	(133,964)	(123,040)	(115,891)	(109,229)	(105,309)
20	Pennvest Parity Bonds				(11,816)	(11,500)	(11,682)	(11,636)	(11,636)	(11,636)	(11,636)
21	Projected Future Bonds				-	(22,770)	(53,933)	(73,782)	(81,257)	(104,356)	(132,006)
22	Total Senior Debt Service				(205,657)	(220,026)	(199,579)	(208,458)	(208,783)	(225,221)	(248,951)
23	TOTAL SENIOR DEBT SERVICE COVERAGE (L18/L22)				1.29 x	1.36 x	1.28 x	1.30 x	1.30 x	1.30 x	1.30 x
24	Subordinate Debt Service				-	-	-	-	-	-	-
25	Transfer to Escrow				(11,000)	(19,000)	-	-	-	-	-
26	Total Debt Service on Bonds				(216,657)	(239,026)	(199,579)	(208,458)	(208,783)	(225,221)	(248,951)
27	CAPITAL ACCOUNT DEPOSIT				(22,302)	(23,061)	(35,767)	(36,983)	(38,241)	(39,541)	(40,885)
28	TOTAL COVERAGE (L18/(L22+L24+L27))				1.17 x	1.23 x	1.08 x	1.10 x	1.09 x	1.10 x	1.11 x
	RESIDUAL FUND										
29	Beginning of Year Balance				15,189	15,065	15,040	15,083	15,061	15,082	15,051
30	Interest Income				54	54	54	54	54	54	54
	Plus:										
31	End of Year Revenue Fund Balance				28,122	38,421	20,188	25,625	24,466	28,115	33,810
32	Deposit for Transfer to City General Fund (c)				1,866	756	722	736	751	793	865
	Less:										
33	Transfer to Construction Fund				(28,300)	(38,500)	(20,200)	(25,700)	(24,500)	(28,200)	(33,900)
34	Transfer to City General Fund				(1,866)	(756)	(722)	(736)	(751)	(793)	(865)
35	Transfer to Debt Service Reserve Fund				-	-	-	-	-	-	-
36	End of Year Balance				15,065	15,040	15,083	15,061	15,082	15,051	15,015
	RATE STABILIZATION FUND										
37	Beginning of Year Balance				205,761	201,198	188,998	177,598	156,398	145,298	141,398
38	Deposit From/(To) Revenue Fund				(4,563)	(12,200)	(11,400)	(21,200)	(11,100)	(3,900)	(700)
39	End of Year Balance				201,198	188,998	177,598	156,398	145,298	141,398	140,698

(a) FY 2017 is projected and subject to change.

(b) Includes other operating and nonoperating income, including interest income on funds and accounts transferable to the Revenue Fund. Includes Debt Service Reserve Fund Release in FY 2017 and FY 2018 and projected contra revenue credits for Affordability Program Discounts in FY 2018 to FY 2023.

(c) Transfer of interest earnings from the Bond Reserve Account to the Residual Fund as shown in Line 32 to satisfy the requirements for the transfer to the City General Fund shown on Line 34.

TABLE C-2
COMBINED UTILITY: PROJECTED RATE STABILIZATION FUND AND COVENANTS METRICS PERFORMANCE

Line #	Description	2017 (a)	2018	2019	2020	2021	2022	2023
	RATE STABILIZATION FUND	in thousand dollars (1,000 dollars)						
1	Beginning Balance: Rate Stabilization Fund	205,761	201,198	188,998	177,598	156,398	145,298	141,398
2	Transfers **From (To)** Revenue Fund (b)	(4,563)	(12,200)	(11,400)	(21,200)	(11,100)	(3,900)	(700)
3	Year-End Rate Stabilization Fund Balance (Line 1 + Line 2)	201,198	188,998	177,598	156,398	145,298	141,398	140,698
	1989 General Bond Ordinance Covenants							
4	Senior Debt Coverage (c)	1.29	1.36	1.28	1.30	1.30	1.30	1.30
5	Total Debt Coverage (d)	1.17	1.23	1.08	1.10	1.09	1.10	1.11
	Insurance Covenants							
6	Senior Debt Coverage from Current Revenues (e)	1.27	1.31	1.22	1.19	1.24	1.28	1.29
	O&M Actual to Budget Ratio							
7	Projected O&M Budget (f)	510,458	539,141	575,774	592,242	608,122	624,537	641,380
8	O&M Actual to Budget Ratio	89.3%	86.1%	84.4%	84.5%	84.6%	84.7%	84.7%
	Rate Board Ordinance Requirements							
9	Projected Total Revenues	718,260	752,425	729,978	750,401	774,810	817,748	866,398
10	Projected Total Appropriations (g)	777,540	839,649	831,308	863,308	879,611	917,413	965,027
11	Ordinance Requirement Compliance (h)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Cash Funding							
12	Cash Funded Capital (i)	20.2%	19.3%	17.0%	18.5%	18.0%	18.0%	19.3%

(a) FY 2017 is projected and subject to change.

(b) See Line 19 in Table C-1.

(c) Senior Debt Coverage = (Total Revenues - Operating Expenses + Transfer From (to) Rate Stabilization) divided by Senior Debt. The 1989 General Ordinance requires the minimum Senior Debt Service Coverage of 1.20.

(d) Total Debt Coverage = (Total Revenues - Operating Expenses + Rate Stabilization Transfer) divided by (Senior Debt + Subordinate Debt + Capital Account Deposit). The 1989 General Ordinance requires the minimum Total Debt Service Coverage of 1.00.

(e) Senior Debt Coverage from Current Revenues = (Total Revenues - Operating Expenses - Transfer to Rate Stabilization Fund) divided by Senior Debt. Transfers from Rate Stabilization are excluded from the Total Revenues. The insurance covenants with Assured Guaranty Municipal Corporation require a minimum Senior Debt Service Coverage of 0.90 from current revenues.

(f) FY 2017 and FY 2018 budget reflects the PWD adopted budget; FY 2019 through FY 2023 budget reflects annual cost escalation factors.

(g) Total Appropriation = Total O&M Budget + Senior Debt + Subordinate Debt + Transfer to Escrow + Capital Account Deposit + Transfer to Rate Stabilization Fund + Transfer to Residual Fund. Costs to service the City included as required by the 1989 General Ordinance rate covenants.

(h) Rate Board Ordinance requires that Total Revenues not exceed Total Appropriations.

(i) Cash Funded Capital Ratio = (Capital Account Deposit + Residual Transfer to Construction Fund) divided by Capital Improvement Program annual expenses.

TABLE C-3: PROJECTED RECEIPTS UNDER EXISTING RATES
(in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
1	Water Sales Receipts	271,124	280,852	272,455	270,409	268,152	266,038	263,948
	Wastewater Sales Receipts							
2	Sanitary Sewer	259,934	272,887	273,347	271,833	270,079	268,433	266,806
3	Stormwater	153,798	157,931	157,761	156,872	155,697	154,479	153,278
4	Subtotal Wastewater Service Receipts	413,732	430,818	431,108	428,705	425,776	422,912	420,084
5	Total Water & Wastewater Receipts	684,856	711,670	703,564	699,115	693,929	688,950	684,032
	Other Income							
6	Penalties	9,897	10,277	10,217	10,138	10,055	9,978	9,901
7	Miscellaneous City Revenue	2,300	2,300	2,300	2,300	2,300	2,300	2,300
8	Other	8,200	8,600	10,100	10,900	11,300	11,300	11,300
9	State & Federal Grants	1,400	1,000	1,000	1,000	1,000	1,000	1,000
10	Permits Issued by L&I	2,990	2,520	2,520	2,520	2,520	2,520	2,520
11	Miscellaneous (Procurement)	500	500	500	500	500	500	500
12	City & UESF Grants	(4,000)	(650)	(650)	(650)	(650)	(650)	(650)
13	Affordability Program Discount Cost (a)	-	(3,900)	(9,800)	(13,700)	(17,000)	(17,000)	(17,000)
14	Release from Debt Service Reserve (b)	11,000	19,000	-	-	-	-	-
15	Other Operating Revenues	32,287	39,647	16,187	13,008	10,025	9,948	9,871
	Nonoperating Income							
16	Interest Income on Debt Service Reserve Fund (c)	-	-	-	-	-	-	-
17	Other (d)	1,118	1,109	1,023	959	920	914	925
18	Total Nonoperating Income	1,118	1,109	1,023	959	920	914	925
19	Total Receipts	718,260	752,425	720,774	713,081	704,874	699,812	694,828

(a) Affordability Program Discounts represent anticipated lost revenue due to the Tiered Assistance Program (TAP).

(b) Projected Release from Debt Reserve Fund based on outstanding and proposed debt service payments.

(c) Excludes deposit into Residual Fund for Transfer to City General Fund.

(d) Includes interest income on Operating and Rate Stabilization Funds.

TABLE C-4
COMBINED UTILITY: COMPARISON OF TYPICAL BILL FOR RESIDENTIAL CUSTOMERS UNDER EXISTING AND PROPOSED RATES

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		FY 2018	FY 2019		FY 2020		FY 2021	
Meter Size	Monthly Use	Existing Rates	Proposed Rates	% Proposed of Existing	Proposed Rates	% Proposed of FY 2019	Proposed Rates	% Proposed of FY 2020
Inches	Mcf	$	$	%	$	%	$	%
5/8	0.0	28.73	29.39	2.3%	31.12	5.9%	32.73	5.2%
5/8	0.2	43.84	44.53	1.6%	46.91	5.4%	49.15	4.8%
5/8	0.3	51.39	52.10	1.4%	54.81	5.2%	57.36	4.7%
5/8	0.4	58.95	59.67	1.2%	62.70	5.1%	65.57	4.6%
5/8	0.5	66.50	67.24	1.1%	70.60	5.0%	73.79	4.5%
5/8	0.6	74.05	74.80	1.0%	78.50	4.9%	82.00	4.5%
5/8	0.7	81.61	82.37	0.9%	86.39	4.9%	90.21	4.4%
5/8	0.8	89.16	89.94	0.9%	94.29	4.8%	98.42	4.4%
5/8	1.7	157.15	158.06	0.6%	165.35	4.6%	172.32	4.2%
5/8	2.7	228.90	229.45	0.2%	239.95	4.6%	249.98	4.2%
5/8	3.3	270.98	271.17	0.1%	283.59	4.6%	295.44	4.2%

Mcf - Thousand cubic feet

TABLE C-5
COMBINED UTILITY: COMPARISON OF EXAMPLE BILLS FOR NON-RESIDENTIAL CUSTOMERS UNDER EXISTING AND PROPOSED RATES

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
				FY 2018	FY 2019		FY 2020		FY 2021	
Meter Size	Monthly Use	Impervious Area	Gross Area	Existing Rates	Proposed Rates	% Proposed of Existing	Proposed Rates	% Proposed of FY 2019	Proposed Rates	% Proposed of FY 2020
Inches	Mcf	sf	sf	$	$	%	$	%	$	%
5/8	0.0	1,794	2,110	39.72	41.26	3.9	43.80	6.2	46.08	5.2
5/8	0.2	1,794	2,110	54.83	56.40	2.9	59.60	5.7	62.50	4.9
5/8	0.3	1,794	2,110	62.38	63.97	2.5	67.49	5.5	70.71	4.8
5/8	0.4	1,794	2,110	69.93	71.54	2.3	75.39	5.4	78.92	4.7
5/8	0.5	1,794	2,110	77.49	79.10	2.1	83.28	5.3	87.13	4.6
5/8	0.6	4,000	5,500	108.48	112.90	4.1	119.29	5.7	125.02	4.8
5/8	0.7	4,000	5,500	116.04	120.46	3.8	127.19	5.6	133.23	4.8
5/8	0.8	26,000	38,000	380.80	415.75	9.2	443.51	6.7	467.08	5.3
5/8	1.7	26,000	38,000	448.78	483.87	7.8	514.58	6.3	540.98	5.1
5/8	2.7	4,000	5,500	263.33	267.54	1.6	280.74	4.9	293.01	4.4
5/8	3.3	4,000	5,500	305.41	309.26	1.3	324.38	4.9	338.46	4.3
5/8	11.0	7,000	11,000	881.83	885.50	0.4	928.12	4.8	967.97	4.3
1	1.7	7,700	7,900	242.87	253.03	4.2	266.86	5.5	279.31	4.7
1	5.0	22,500	24,000	638.60	666.15	4.3	703.60	5.6	736.95	4.7
1	8.0	7,700	7,900	686.31	692.97	1.0	726.92	4.9	758.50	4.3
1	17.0	22,500	24,000	1,480.16	1,500.63	1.4	1,576.36	5.0	1,646.07	4.4
2	7.6	1,063	1,250	618.89	619.72	0.1	648.22	4.6	675.35	4.2
2	16.0	22,500	24,000	1,442.73	1,466.17	1.6	1,540.32	5.1	1,608.58	4.4
2	33.0	66,500	80,000	3,137.98	3,210.77	2.3	3,379.61	5.3	3,532.99	4.5
2	100.0	7,700	7,900	7,170.97	7,125.73	(0.6)	7,454.77	4.6	7,766.69	4.2
4	30.0	7,700	7,900	2,373.97	2,375.91	0.1	2,487.07	4.7	2,592.12	4.2
4	170.0	10,500	12,000	11,636.59	11,549.65	(0.7)	12,091.60	4.7	12,603.93	4.2
4	330.0	26,000	38,000	21,704.93	21,523.25	(0.8)	22,548.93	4.8	23,515.25	4.3
4	500.0	140,000	160,000	33,479.97	33,323.85	(0.5)	34,949.95	4.9	36,470.54	4.4
6	150.0	10,500	12,000	10,560.12	10,497.23	(0.6)	10,988.31	4.7	11,452.97	4.2
6	500.0	41,750	45,500	32,531.42	32,254.35	(0.9)	33,799.18	4.8	35,253.32	4.3
6	1,000.0	26,000	38,000	63,249.76	62,588.43	(1.0)	65,584.94	4.8	68,407.99	4.3
6	1,500.0	140,000	160,000	95,408.90	94,532.23	(0.9)	99,096.06	4.8	103,384.18	4.3
8	750.0	10,500	12,000	47,807.63	47,318.76	(1.0)	49,576.94	4.8	51,706.37	4.3
8	1,500.0	66,500	80,000	94,771.23	93,809.84	(1.0)	98,316.66	4.8	102,558.58	4.3
8	2,000.0	26,000	38,000	125,205.27	123,825.96	(1.1)	129,761.57	4.8	135,353.39	4.3
8	3,000.0	140,000	160,000	187,449.41	185,489.76	(1.0)	194,437.69	4.8	202,854.58	4.3
10	600.0	22,500	24,000	38,904.68	38,553.18	(0.9)	40,393.64	4.8	42,128.75	4.3
10	1,700.0	41,750	45,500	107,070.42	105,941.64	(1.1)	111,022.67	4.8	115,808.38	4.3
10	3,300.0	26,000	38,000	204,695.76	202,379.72	(1.1)	212,109.43	4.8	221,274.05	4.3
10	6,000.0	140,000	160,000	370,588.90	366,451.52	(1.1)	384,140.55	4.8	400,788.24	4.3

(a) Examples with gross area less than 5,000 square feet reflect an impervious area of 85% of the gross area consistent with PWD Regulations section 304.3.

Mcf - Thousand cubic feet
sf - square feet

TABLE C-6: PROJECTED OPERATION AND MAINTENANCE EXPENSE (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Water and Wastewater Operations							
1	Personal Services	125,010	133,333	137,250	141,951	146,723	151,564	156,111
2	Pension and Benefits	121,567	128,521	134,080	139,285	143,403	147,677	152,473
3	Subtotal	246,577	261,853	271,330	281,236	290,126	299,242	308,584
	Purchase of Services (a)							
4	Power	15,612	15,670	15,837	15,837	16,310	16,797	17,298
5	Gas	2,698	3,990	4,196	4,196	4,323	4,455	4,590
6	Other	130,253	128,064	137,587	141,338	145,229	149,335	153,518
7	Subtotal	148,562	147,724	157,619	161,371	165,862	170,587	175,406
	Materials and Supplies (a)							
8	Chemicals	16,036	17,648	19,024	19,746	19,934	20,123	20,315
9	Other	22,997	23,058	23,345	23,462	23,579	23,697	23,815
10	Subtotal	39,033	40,705	42,369	43,208	43,513	43,820	44,130
11	Equipment	2,120	2,263	2,292	2,322	2,352	2,383	2,414
12	Indemnities and Transfers	19,449	11,572	12,233	12,398	12,567	12,740	12,917
13	Total Expenses	455,742	464,118	485,844	500,535	514,420	528,771	543,451

(a) Net of Liquidated Encumbrances.

TABLE C-7: PROJECTED CAPITAL IMPROVEMENT PROGRAM
(in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
1	Engineering and Administration (a)	34,325	35,698	36,769	37,872	39,008	40,178	41,384
2	Plant Improvements	110,000	120,000	120,000	120,000	120,000	120,000	120,000
3	Distribution System Rehabilitation	46,060	50,060	52,060	54,060	56,060	58,060	60,060
4	Large Meter Replacement	5,000	25,000	25,000	25,000	5,000	5,000	5,000
5	Storm Flood Relief	15,000	10,000	10,000	10,000	15,000	15,000	15,000
6	Reconstruction of Sewers	35,000	50,900	50,900	50,900	56,160	51,560	51,560
7	Green Infrastructure	48,244	47,000	47,000	47,000	57,000	77,390	77,390
8	Vehicles	8,000	15,000	15,000	15,000	15,000	15,000	15,000
9	Total Improvements	301,629	353,658	356,729	359,832	363,228	382,188	385,394
10	Inflation Adjustment (b)	-	-	7,999	16,299	24,930	35,505	45,206
11	Inflated Total	301,629	353,658	364,728	376,131	388,158	417,693	430,600
12	Cash Flow Adjustment	(51,629)	(35,366)	(36,473)	(37,613)	(38,816)	(41,769)	(43,060)
13	Net Cash Financing Required	250,000	318,292	328,255	338,518	349,342	375,924	387,540

(a) Beginning in FY 2017, Engineering and Administration Costs no longer include pension and benefits costs per City policy.

(b) Allowance for inflation of 2.5 percent per year after fiscal year 2018.

TABLE C-8: PROJECTED FLOW OF FUNDS - CAPITAL IMPROVEMENTS FUND (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Disposition of Bond Proceeds							
1	Proceeds From Sale of Bonds	313,651	-	285,000	295,000	305,000	340,000	335,000
	Transfers:							
2	Debt Reserve Fund (a)	11,888	-	-	7,953	325	22,975	17,194
3	Cost of Bond Issuance (b)	1,762	-	2,850	2,950	3,050	3,400	3,350
4	Construction Fund (c)	300,000	-	282,150	284,097	301,625	313,625	314,456
5	Total Issue	313,651	-	285,000	295,000	305,000	340,000	335,000
	Construction Fund							
6	Beginning Balance	283,140	392,111	136,329	146,699	155,504	171,115	177,183
7	Transfer From Bond Proceeds	300,000	-	282,150	284,097	301,625	313,625	314,456
8	Capital Account Deposit	29,458	23,061	35,767	36,983	38,241	39,541	40,885
9	Penn Vest Loan	-	-	-	-	-	-	-
10	Transfer from Residual Fund	28,300	38,500	20,200	25,700	24,500	28,200	33,900
11	Interest Income on Construction Fund	1,213	949	509	543	587	626	641
12	Total Available	642,111	454,621	474,954	494,022	520,457	553,107	567,065
13	Net Cash Financing Required	250,000	318,292	328,255	338,518	349,342	375,924	387,540
14	Ending Balance	392,111	136,329	146,699	155,504	171,115	177,183	179,525
	Debt Reserve Fund							
15	Beginning Balance	218,617	219,505	200,505	200,505	208,458	208,783	231,757
16	Transfer From Bond Proceeds	11,888	-	-	7,953	325	22,975	17,194
17	Debt Service Reserve Release	(11,000)	(19,000)	-	-	-	-	-
18	Ending Balance	219,505	200,505	200,505	208,458	208,783	231,757	248,951
19	Interest Income on Debt Reserve Fund	1,866	756	722	736	751	793	865

(a) Amount of Debt Reserve Fund estimated based on outstanding and proposed debt service payments.

(b) Cost of bonds issuance assumed at 1.0 percent of issue amount. FY 2017 based on actual issuance costs.

(c) Deposits equal proceeds from sale of bonds less transfers to Debt Reserve Fund and Costs of Issuance.

TABLE C-9: SUMMARY OF EXISTING AND PROPOSED DEBT SERVICE (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Revenue Bonds							
1	Existing (a)	193,841	185,756	133,964	123,040	115,891	109,229	105,309
	Proposed							
2	Fiscal Year 2017 (b)	-	13,646	33,616	32,616	12,116	12,116	12,116
3	Fiscal Year 2018 (c)		9,124	8,560	8,560	14,391	11,323	14,530
4	Fiscal Year 2019 (d)			11,756	19,884	19,884	19,884	19,884
5	Fiscal Year 2020 (e)				12,722	21,141	21,141	21,141
6	Fiscal Year 2021 (f)					13,725	22,442	22,442
7	Fiscal Year 2022 (f)						17,450	24,701
8	Fiscal Year 2023 (f)							17,194
9	Total Proposed	-	22,770	53,933	73,782	81,257	104,356	132,006
10	Total Revenue Bonds	193,841	208,526	187,897	196,823	197,147	213,585	237,316
	Pennvest Loans							
11	Pennvest Loans - Parity Pennvest	11,816	11,500	11,682	11,636	11,636	11,636	11,636
12	Total Senior Debt Service	205,657	220,026	199,579	208,458	208,783	225,221	248,951

(a) Assumes the average interest rates of 3.0 % for the Variable Rate Series 1997B Bonds and 4.53% for the Variable Rate Series 2005B Bonds. Reflects savings from Series 2017B Refunding Bonds.

(b) Reflects actual Series 2017A Bonds debt service.

(c) Reflects actual Series 2017B Bonds debt service.

(d) Assumes interest only payments through FY 2018 based on 5.50% interest. Assumed to be issued during the first quarter of the fiscal year.

(e) Assumes 5.75% interest rate. Assumed to be issued during the first quarter of the fiscal year.

(f) Assumes 6.00% interest rate. Assumed to be issued during the first quarter of the fiscal year.

TABLE W-1: PROJECTED RECEIPTS UNDER EXISTING RATES
(in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
1	Residential	157,497	162,389	161,416	159,533	157,528	155,668	153,823
2	Senior Citizens	4,722	4,846	4,808	4,751	4,692	4,632	4,573
3	Commercial	56,716	59,309	59,525	59,386	59,196	59,005	58,822
4	Industrial	3,150	3,289	3,306	3,306	3,302	3,299	3,296
5	Public Utilities	409	429	432	432	432	431	431
6	Subtotal General Customers	222,493	230,262	229,487	227,408	225,150	223,035	220,945
7	Housing Authority	5,846	6,115	6,156	6,162	6,162	6,162	6,162
8	Charities and Schools	5,394	5,684	5,728	5,733	5,733	5,733	5,733
9	Hospitals and Universities	6,975	7,298	7,344	7,351	7,351	7,351	7,351
10	Hand Billed	16,116	16,873	16,986	17,002	17,002	17,002	17,002
11	Scheduled (Flat Rate)	1	1	1	1	1	1	1
	Fire Protection							
12	Private	3,343	3,389	3,390	3,390	3,390	3,390	3,390
13	Public	7,617	7,866	-	-	-	-	-
14	Subtotal Retail Customers	267,785	277,488	269,092	267,046	264,789	262,674	260,584
15	Aqua Pennsylvania	3,339	3,364	3,364	3,364	3,364	3,364	3,364
16	Total Water Sales	271,124	280,852	272,455	270,409	268,152	266,038	263,948
17	Other Operating Revenues (a)	15,484	17,734	9,389	8,038	6,751	6,719	6,686
	Interest Income							
18	Interest Income on Debt Service Reserve Fund (b)	-	-	-	-	-	-	-
19	Other (c)	499	543	514	497	472	464	473
20	Total Interest Income	499	543	514	497	472	464	473
21	Total Receipts	287,107	299,129	282,359	278,945	275,375	273,220	271,107

(a) Includes Debt Service Reserve Fund Release in FY 2017 and FY 2018 and projected contra revenue credits for Affordability Program Discounts in FY 2018 to FY 2023.

(b) Excludes deposit into Residual Fund for Transfer to City General Fund.

(c) Includes interest income on Operating and Rate Stabilization Funds. Excludes Debt Service Reserve Fund release

TABLE W-1A: OTHER REVENUE PROJECTED RECEIPTS
(in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Other Income							
1	Penalties	4,020	4,156	4,127	4,092	4,057	4,025	3,992
2	Miscellaneous City Revenue	2,300	2,300	2,300	2,300	2,300	2,300	2,300
3	Other	4,100	4,300	5,050	5,450	5,650	5,650	5,650
4	State & Federal Grants	1,400	1,000	1,000	1,000	1,000	1,000	1,000
5	Permits Issued by Licenses & Inspections	1,495	1,260	1,260	1,260	1,260	1,260	1,260
6	Miscellaneous (Procurement)	250	250	250	250	250	250	250
7	City & UESF Grants	(1,760)	(286)	(286)	(286)	(286)	(286)	(286)
8	Affordability Program Discount Cost (a)	-	(1,716)	(4,312)	(6,028)	(7,480)	(7,480)	(7,480)
9	Release from Debt Service Reserve (b)	3,678	6,470	-	-	-	-	-
10	Total Water Other Income	15,484	17,734	9,389	8,038	6,751	6,719	6,686
	Interest Income							
11	Debt Reserve Fund (c)	-	-	-	-	-	-	-
12	Other (d)	499	543	514	497	472	464	473
13	Total Water Operations	15,983	18,277	9,903	8,535	7,223	7,182	7,159

(a) Affordability Program Discounts represent anticipated lost revenue due to the Tiered Assistance Program (TAP).

(b) Projected Release from Debt Reserve Fund based on outstanding and proposed debt service payments.

(c) Excludes deposit into Residual Fund for Transfer to City General Fund.

(d) Includes interest income on Operating and Rate Stabilization Funds.

TABLE W-2: PROJECTED OPERATION AND MAINTENANCE EXPENSE (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Water Operations							
1	Personal Services	49,406	53,066	54,430	56,101	57,804	59,538	61,324
2	Pension and Benefits	48,045	51,926	53,997	55,920	57,409	58,965	60,881
3	Subtotal	97,451	104,992	108,427	112,021	115,212	118,503	122,205
	Purchase of Services (a)							
4	Power	8,308	8,363	8,448	8,447	8,695	8,950	9,213
5	Gas	290	431	453	453	466	480	494
6	Other	33,715	32,021	33,300	34,402	35,528	36,721	37,932
7	Subtotal	42,312	40,816	42,201	43,303	44,690	46,151	47,638
	Materials and Supplies (a)							
8	Chemicals	13,644	15,029	16,199	16,813	16,970	17,129	17,289
9	Other	9,382	9,385	9,499	9,546	9,589	9,633	9,676
10	Subtotal	23,026	24,414	25,697	26,359	26,559	26,762	26,965
11	Equipment	785	890	901	913	925	937	949
12	Indemnities and Transfers	7,127	4,282	4,525	4,585	4,645	4,708	4,772
13	Total Expenses	170,701	175,394	181,752	187,180	192,032	197,061	202,529

(a) Net of Liquidated Encumbrances.

TABLE W-3: PROJECTED CAPITAL IMPROVEMENT PROGRAM
(in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
1	Engineering and Administration (a)	15,790	16,421	16,914	17,421	17,944	18,482	19,037
2	Water Treatment Plant Improvements	43,120	44,000	44,000	44,000	44,000	44,000	44,000
3	Distribution System Rehabilitation	46,060	50,060	52,060	54,060	56,060	58,060	60,060
4	Large Meter Replacement	5,000	25,000	25,000	25,000	5,000	5,000	5,000
5	Vehicles	4,000	7,500	7,500	7,500	7,500	7,500	7,500
6	Total Improvements	113,970	142,981	145,474	147,981	130,504	133,042	135,597
7	Inflation Adjustment (b)	-	-	3,214	6,610	8,655	11,893	15,317
8	Inflated Total	113,970	142,981	148,688	154,591	139,159	144,935	150,914
9	Cash Flow Adjustment	(19,508)	(14,298)	(14,869)	(15,459)	(13,916)	(14,493)	(15,091)
10	Net Cash Financing Required	94,462	128,683	133,819	139,132	125,243	130,441	135,822

(a) Beginning in FY 2017, Engineering and Administration Costs no longer include pension and benefits costs per City policy.

(b) Allowance for inflation of 2.5 percent per year after fiscal year 2018.

TABLE W-4: PROJECTED FLOW OF FUNDS - CAPITAL IMPROVEMENTS FUND (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Disposition of Bond Proceeds							
1	Proceeds From Sale of Bonds	130,000	-	120,000	120,000	110,000	120,000	120,000
	Transfers:							
2	Debt Reserve Fund (a)	4,927	-	-	3,235	117	8,109	6,159
3	Cost of Bond Issuance (b)	730	-	1,200	1,200	1,100	1,200	1,200
4	Construction Fund (c)	124,342	-	118,800	115,565	108,783	110,691	112,641
5	Total Issue	130,000	-	120,000	120,000	110,000	120,000	120,000
	Construction Fund							
6	Beginning Balance	114,471	164,536	56,719	62,300	59,437	63,800	67,121
7	Transfer From Bond Proceeds	124,342	-	118,800	115,565	108,783	110,691	112,641
8	Capital Account Deposit	11,783	9,469	14,686	15,185	15,702	16,235	16,787
9	Penn Vest Loan	-	-	-	-	-	-	-
10	Transfer from Residual Fund	7,900	11,000	5,700	5,300	4,900	6,600	8,700
11	Interest Income on Construction Fund	501	398	214	219	221	235	246
12	Total Available	258,997	185,402	196,119	198,569	189,043	197,562	205,495
13	Net Cash Financing Required	94,462	128,683	133,819	139,132	125,243	130,441	135,822
14	Ending Balance	164,536	56,719	62,300	59,437	63,800	67,121	69,673
	Debt Reserve Fund							
15	Beginning Balance	73,105	74,354	67,884	67,884	71,119	71,236	79,345
16	Transfer From Bond Proceeds	4,927	-	-	3,235	117	8,109	6,159
17	Debt Service Reserve Release	(3,678)	(6,470)	-	-	-	-	-
18	Ending Balance	74,354	67,884	67,884	71,119	71,236	79,345	85,504
19	Interest Income on Debt Reserve Fund	628	256	244	250	256	271	297

(a) Amount of Debt Reserve Fund estimated based on outstanding and proposed debt service payments.

(b) Cost of bonds issuance assumed at 1.0 percent of issue amount. FY 2017 based on actual issuance costs.

(c) Deposits equal proceeds from sale of bonds less transfers to Debt Reserve Fund and Costs of Issuance.

TABLE W-5: SUMMARY OF EXISTING AND PROPOSED DEBT SERVICE (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Revenue Bonds							
1	Existing (a)	63,516	61,273	45,528	33,563	32,156	30,907	30,621
	Proposed							
2	Fiscal Year 2017 (b)	-	5,656	13,933	13,519	5,022	5,022	5,022
3	Fiscal Year 2018 (c)		2,596	2,435	2,435	4,094	3,221	4,134
4	Fiscal Year 2019 (d)			4,950	8,372	8,372	8,372	8,372
5	Fiscal Year 2020 (e)				5,175	8,600	8,600	8,600
6	Fiscal Year 2021 (f)					4,950	8,094	8,094
7	Fiscal Year 2022 (f)						6,159	8,718
8	Fiscal Year 2023 (f)	-	-	-	-	-	-	6,159
9	Total Proposed	-	8,252	21,318	29,501	31,038	39,468	49,098
10	Total Revenue Bonds	63,516	69,525	66,847	63,064	63,194	70,375	79,719
	Pennvest Loans							
11	Pennvest Loans - Parity Pennvest	5,256	5,401	5,427	5,351	5,351	5,351	5,351
12	Total Senior Debt Service	68,771	74,926	72,274	68,416	68,545	75,726	85,071

(a) Assumes the average interest rates of 3.0 % for the Variable Rate Series 1997B Bonds and 4.53% for the Variable Rate Series 2005B Bonds. Reflects savings from Series 2017B Refunding Bonds.

(b) Reflects actual Series 2017A Bonds debt service.

(c) Reflects actual Series 2017B Bonds debt service.

(d) Assumes interest only payments through FY 2018 based on 5.50% interest. Assumed to be issued during the first quarter of the fiscal year.

(e) Assumes 5.75% interest rate. Assumed to be issued during the first quarter of the fiscal year.

(f) Assumes 6.00% interest rate. Assumed to be issued during the first quarter of the fiscal year.

TABLE W-6: PROJECTED REVENUE AND REVENUE REQUIREMENTS (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017 (a)	2018	2019	2020	2021	2022	2023
	OPERATING REVENUE							
1	Water Service - Existing Rates (b)	271,124	280,852	272,455	270,409	268,152	266,038	263,948
2	Additional Service Revenue Required							
	Year / Percent Increase / Months Effective							
3	FY 2019 0.30% 10			668	811	804	798	792
4	FY 2020 2.60% 10				5,766	6,993	6,938	6,883
5	FY 2021 2.60% 10					5,866	7,118	7,062
6	FY 2022 8.60% 10						19,751	23,967
7	FY 2023 8.60% 10							21,281
8	Total Additional Service Revenue Required	-	-	668	6,577	13,663	34,605	59,985
9	Total Water Service Revenue	271,124	280,852	273,124	276,986	281,816	300,643	323,933
	Other Income (c)							
10	Other Operating Revenue	15,484	17,734	9,389	8,038	6,751	6,719	6,686
11	Debt Reserve Fund Interest Income	-	-	-	-	-	-	-
12	Operating Fund Interest Income	177	178	141	142	137	148	161
13	Rate Stabilization Interest Income	322	365	373	356	334	315	311
14	Total Revenues	287,107	299,129	283,027	285,521	289,039	307,825	331,092
	OPERATING EXPENSES							
15	Water Operations	(170,701)	(175,394)	(181,752)	(187,180)	(192,032)	(197,061)	(202,529)
16	Water Treatment Plant Sludge (d)	(12,329)	(12,605)	(13,428)	(14,172)	(14,993)	(15,657)	(16,807)
17	Total Operating Expenses	(183,030)	(187,999)	(195,180)	(201,352)	(207,025)	(212,718)	(219,337)
18	Transfer From/(To) Rate Stabilization Fund	(14,400)	(9,200)	4,700	4,800	7,100	3,400	(1,160)
19	NET REVENUES AFTER OPERATIONS	89,677	101,930	92,547	88,969	89,114	98,507	110,595
	DEBT SERVICE							
	Senior Debt Service							
	Revenue Bonds							
20	Outstanding Bonds	(63,516)	(61,273)	(45,528)	(33,563)	(32,156)	(30,907)	(30,621)
21	Pennvest Parity Bonds	(5,256)	(5,401)	(5,427)	(5,351)	(5,351)	(5,351)	(5,351)
22	Projected Future Bonds	-	(8,252)	(21,318)	(29,501)	(31,038)	(39,468)	(49,098)
23	Total Senior Debt Service	(68,771)	(74,926)	(72,274)	(68,416)	(68,545)	(75,726)	(85,071)
24	TOTAL SENIOR DEBT SERVICE COVERAGE (L19/L23)	1.30 x	1.36 x	1.28 x	1.30 x	1.30 x	1.30 x	1.30 x
25	Subordinate Debt Service	-	-	-	-	-	-	-
26	Transfer to Escrow	(3,678)	(6,470)	-	-	-	-	-
27	Total Debt Service on Bonds	(68,771)	(74,926)	(72,274)	(68,416)	(68,545)	(75,726)	(85,071)
28	CAPITAL ACCOUNT DEPOSIT	(9,157)	(9,469)	(14,686)	(15,185)	(15,702)	(16,235)	(16,787)
29	TOTAL COVERAGE (L19/(L23+L25+L28))	1.15 x	1.20 x	1.06 x	1.06 x	1.05 x	1.07 x	1.08 x
	RESIDUAL FUND							
30	Beginning of Year Balance	6,141	6,333	6,421	6,332	6,423	6,413	6,382
31	Interest Income	22	23	23	23	23	23	23
	Plus:							
32	End of Year Revenue Fund Balance	8,070	11,066	5,588	5,368	4,867	6,545	8,737
33	Deposit for Transfer to City General Fund (e)	628	256	244	250	256	271	297
	Less:							
34	Transfer to Construction Fund	(7,900)	(11,000)	(5,700)	(5,300)	(4,900)	(6,600)	(8,700)
35	Transfer to City General Fund (e)	(628)	(256)	(244)	(250)	(256)	(271)	(297)
36	Transfer to Debt Service Reserve Fund	-	-	-	-	-	-	-
37	End of Year Balance	6,333	6,421	6,332	6,423	6,413	6,382	6,442
	RATE STABILIZATION FUND							
38	Beginning of Year Water Utility Balance	82,304	96,704	105,904	101,204	96,404	89,304	85,904
39	Deposit From/(To) Revenue Fund	14,400	9,200	(4,700)	(4,800)	(7,100)	(3,400)	1,160
40	End of Year Water Utility Balance	96,704	105,904	101,204	96,404	89,304	85,904	87,064

(a) FY 2017 is projected and subject to change.

(b) Revenue from rates effective July 1, 2016 and July 1, 2017.

(c) Includes other operating and nonoperating income, including interest income on funds and accounts transferable to the Revenue Fund. Includes Debt Service Reserve Fund Releases in FY 2017 and FY 2019 and projected contra revenue credits for Affordability Program Discounts in FY 2018 to FY 2023

(d) Cost to process the Water Treatment Sludge at the wastewater treatement plants based on wastewater cost of service analysis.

(e) Transfer of interest earnings from the Bond Reserve Account to the Residual Fund as shown in Line 33 to satisfy the requirements for the transfer to the City General Fund shown on Line 35.

TABLE W-7: ESTIMATED TEST YEAR COST OF SERVICE
Test Year 2019
(in thousands of dollars)

Line No.		(1) Operating Expense	(2) Capital Cost	(3) Total
		$	$	$
	REVENUE REQUIREMENTS			
1	Operations & Maintenance Expense	102,580		102,580
2	Direct Interdepartmental Charges	79,172		79,172
3	Water Treatment Plant Sludge	13,428		13,428
	Existing Bond Debt Service			
4	Revenue Bonds		50,955	50,955
	Subordinate Bonds		-	-
5	Proposed Bond Debt Service		21,318	21,318
6	Capital Account Deposit		14,686	14,686
7	Residual Fund Deposit	3,851	1,716	5,567
8	Deposit (From)/To Rate Stabilization Fund	(3,134)	(1,396)	(4,530)
9	Total	195,897	87,280	283,177
	DEDUCTIONS OF FUNDS FROM OTHER SOURCES			
10	Other Operating Revenue	(9,389)	-	(9,389)
11	Interest Income	(356)	(159)	(515)
12	COST OF SERVICE TO BE DERIVED FROM RATES	186,151	87,121	273,273

TABLE W-8
WATER: ALLOCATION OF TEST YEAR PLANT INVESTMENT TO FUNCTIONAL COST COMPONENTS
TEST YEAR 2019

Line No.	Description	(1) Estimated Test Year Plant Investment	(2) Base	(3) Extra Capacity Maximum Day In Excess of Base	(4) Extra Capacity Maximum Hour In Excess of Maximum Day	(5) Customer Meters	(6) Public Fire Protection - Direct Standard Pressure	(7) Public Fire Protection - Direct High Pressure	(8) Wholesale Direct
		$	$	$	$	$	$	$	$
	Raw Water Supply and Pumping								
	Source of Supply								
1	Land	200,000	200,000						
2	Buildings and Equipment	6,452,000	6,452,000						
	Power and Pumping								
3	Land	31,000	22,000	9,000					-
4	Buildings and Equipment	19,066,000	13,381,000	5,466,000					219,000
5	Total Raw Water Supply and Pumping	25,749,000	20,055,000	5,475,000	-	-	-	-	219,000
	Purification and Treatment								
	Power and Pumping (a)								
6	Land	71,000	37,000	9,000	24,000				1,000
7	Buildings and Equipment	71,377,000	37,189,000	9,122,000	23,856,000				1,210,000
	Treatment								
8	Land	1,325,000	924,000	378,000					23,000
9	Buildings and Equipment	382,577,000	266,903,000	109,017,000					6,657,000
10	Total Purification and Treatment	455,350,000	305,053,000	118,526,000	23,880,000	-	-	-	7,891,000
	Transmission and Distribution								
11	Mains	793,442,000	418,560,000	102,666,000	268,510,000				3,706,000
12	Meters	27,778,000				27,778,000			-
13	Hydrants	9,200,000					9,200,000		-
	Filtered Water Storage								
14	Land	182,000	95,000	23,000	61,000				3,000
15	Buildings and Equipment	29,206,000	15,210,000	3,731,000	9,757,000				508,000
	High Pressure Fire System								
16	Land	-						-	-
17	Mains	-						-	-
18	Buildings and Equipment	7,000						7,000	-
19	Total Transmission and Distribution	859,815,000	433,865,000	106,420,000	278,328,000	27,778,000	9,200,000	7,000	4,217,000
20	Subtotal	1,340,914,000	758,973,000	230,421,000	302,208,000	27,778,000	9,200,000	7,000	12,327,000
	Administrative and General (b)								
21	Land	205,000	117,000	35,000	46,000	4,000	1,000	-	2,000
22	Buildings and Equipment	93,233,000	52,770,000	16,020,000	21,011,000	1,931,000	640,000	-	861,000
23	Total Administrative and General	93,438,000	52,887,000	16,055,000	21,057,000	1,935,000	641,000	-	863,000
24	Total Water Plant Investment	1,434,352,000	811,860,000	246,476,000	323,265,000	29,713,000	9,841,000	7,000	13,190,000

(a) Includes booster pumping
(b) Administrative and General allocated based on allocation of system investment.

TABLE W-9
WATER: ALLOCATION OF TEST YEAR PLANT DEPRECIATION EXPENSE
TEST YEAR 2019

Line No.	Description	(1) Total Test Year Depreciation Expense	(2) Base	(3) Extra Capacity Maximum Day In Excess of Base	(4) Extra Capacity Maximum Hour In Excess of Maximum Day	(5) Customer Meters	(6) Public Fire Protection - Direct Standard Pressure	(7) Public Fire Protection - Direct High Pressure	(8) Wholesale Direct
		$	$	$	$	$	$	$	$
	Raw Water Supply and Pumping								
1	Source of Supply	161,000	161,000	-					
2	Power and Pumping	391,000	275,000	112,000					4,000
3	Total Supply and Pumping	552,000	436,000	112,000	-	-	-	-	4,000
	Purification and Treatment								
4	Power and Pumping (a)	1,411,000	735,000	180,000	472,000				24,000
5	Treatment	8,648,000	6,034,000	2,464,000					150,000
6	Total Purification and Treatment	10,059,000	6,769,000	2,644,000	472,000	-	-	-	174,000
	Transmission and Distribution								
7	Mains	14,779,000	7,796,000	1,912,000	5,002,000				69,000
8	Meters	1,944,000				1,944,000			-
9	Hydrants	230,000					230,000		-
10	Filtered Water Storage	1,074,000	559,000	137,000	359,000				19,000
11	High Pressure Fire System	-						-	-
12	Total Transmission and Distribution	18,027,000	8,355,000	2,049,000	5,361,000	1,944,000	230,000	-	88,000
13	Subtotal	28,638,000	15,560,000	4,805,000	5,833,000	1,944,000	230,000	-	266,000
14	Administrative and General	2,701,000	1,528,000	464,000	609,000	56,000	19,000	-	25,000
15	Total Water Plant Depreciation Expense	31,339,000	17,088,000	5,269,000	6,442,000	2,000,000	249,000	-	291,000

(a) Includes booster pumping

TABLE W-10
WATER: ALLOCATION OF TEST YEAR OPERATION AND MAINTENANCE EXPENSE
TEST YEAR 2019

Line No.	Description	(1) Test Year Operation & Maintenance Expense	(2)	(3) Extra Capacity	(4) Extra Capacity	(5) Customer Costs	(6) Customer Costs	(7) Customer Costs	(8) Public Fire Protection	(9) Public Fire Protection	(10)
				Maximum Day In Excess of	Maximum Hour In Excess of				Direct Standard	High	Wholesale
			Base	Base	Maximum Day	Meters	Billing	Warranty	Pressure	Pressure	Direct
		$	$	$	$	$	$	$	$	$	$
	Raw Water Pumping										
1	Purchased Power	3,119,000	2,925,000	154,000							40,000
2	Purchased Gas	1,000	1,000	-							-
3	Other	2,822,000	1,965,000	802,000							55,000
4	Total Raw Water Pumping	5,942,000	4,891,000	956,000	-	-	-	-	-	-	95,000
	Purification and Treatment										
	Power and Pumping (a)										
5	Purchased Power	5,168,000	4,592,000	255,000	255,000						66,000
6	Purchased Gas	373,000	195,000	48,000	125,000						5,000
7	Other	10,556,000	5,486,000	1,346,000	3,518,000						206,000
	Treatment										
8	Purchased Power	80,000	71,000	4,000	4,000						1,000
9	Purchased Gas	45,000	31,000	13,000	-						1,000
10	Chemicals	16,137,000	15,930,000								207,000
	Other										
11	Other	42,735,000	29,750,000	12,152,000							833,000
12	Water Treatment Plant Sludge	13,428,000	13,212,000								216,000
13	Subtotal Other (b)	56,163,000	42,962,000	12,152,000	-	-	-	-	-	-	1,049,000
14	Total Purification and Treatment	88,522,000	69,267,000	13,818,000	3,902,000	-	-	-	-	-	1,535,000
	Transmission and Distribution										
15	Mains	51,098,000	26,928,000	6,605,000	17,275,000						290,000
16	Meters	1,661,000				1,661,000					-
17	Hydrants	2,667,000							2,667,000		-
18	Filtered Water Storage	1,894,000	983,000	241,000	630,000						40,000
19	High Pressure Fire System	2,000								2,000	-
20	Total Transmission and Distribution	57,322,000	27,911,000	6,846,000	17,905,000	1,661,000	-	-	2,667,000	2,000	330,000
21	Customer Accounting and Collection	22,977,000					22,977,000				-
22	Warranty Program	-						-			
23	Subtotal	174,763,000	102,069,000	21,620,000	21,807,000	1,661,000	22,977,000	-	2,667,000	2,000	1,960,000
24	Administrative and General	20,417,000	9,746,000	3,165,000	3,206,000	249,000	3,439,000	-	399,000	-	213,000
25	Subtotal Water Operating Expense	195,180,000	111,815,000	24,785,000	25,013,000	1,910,000	26,416,000	-	3,066,000	2,000	2,173,000
26	Residual Fund Deposit	3,851,000	2,206,000	489,000	494,000	38,000	521,000	-	60,000	-	43,000
27	Deposit (from) to RSF	(3,134,000)	(1,795,000)	(398,000)	(402,000)	(31,000)	(424,000)	-	(49,000)	-	(35,000)
28	Total Water Operating Expense	195,897,000	112,226,000	24,876,000	25,105,000	1,917,000	26,513,000	-	3,077,000	2,000	2,181,000
29	Other Operating Revenue	9,389,000	5,418,000	1,202,000	1,212,000	93,000	1,280,000	-	149,000	-	35,000
30	Non-Operating Income	356,000	204,000	45,000	46,000	3,000	48,000	-	6,000	-	4,000
31	Total Operating Expense Less Other Operating Revenue and Non-Operating Income	186,152,000	106,604,000	23,629,000	23,847,000	1,821,000	25,185,000	-	2,922,000	2,000	2,142,000

(a) Includes booster pumping.
(b) Includes wastewater utility cost of treating water treatment plant sludge of $13,428,000.

TABLE W-11
WATER: ESTIMATED RETAIL UNITS OF SERVICE
TEST YEAR 2019

Line No.	Customer Class	(1) Total Test Year Water Use	(2) Average Daily Water Use (Base)	(3) Maximum Day Extra Capacity Capacity Factor	(4) Maximum Day Extra Capacity Total Capacity	(5) Maximum Day Extra Capacity Extra Capacity (a)	(6) Maximum Hour Extra Capacity Capacity Factor	(7) Maximum Hour Extra Capacity Total Capacity	(8) Maximum Hour Extra Capacity Extra Capacity (b)	(9) Customer Costs Equiv. Meters	(10) Customer Costs Equiv. Bills
		Mcf	Mcf/day (1) / 365	%	Mcf/day (2) x (3) /100	Mcf/day (4) - (2)	%	Mcf/day (2) x (6) / 100	Mcf/day (7) - (4)		
1	Residential	3,158,500	8,650	200	17,300	8,650	360	31,140	13,840	442,037	5,022,020
2	Senior Citizens	115,500	320	200	640	320	360	1,150	510	21,405	256,680
3	Commercial	1,531,100	4,190	180	7,540	3,350	265	11,100	3,560	108,383	512,963
4	Industrial	93,100	260	160	420	160	200	520	100	5,582	17,992
5	Public Utilities	10,800	30	160	50	20	200	60	10	1,295	2,971
6	Total General Service	4,909,000	13,450		25,950	12,500		43,970	18,020	578,702	5,812,626
7	Housing Authority	166,200	460	190	870	410	313	1,440	570	9,241	73,024
8	Charities & Schools	189,200	520	180	940	420	270	1,400	460	20,369	52,800
9	Hospital/University	290,900	800	180	1,440	640	233	1,860	420	11,327	20,570
10	Hand Billed	554,400	1,520	180	2,740	1,220	270	4,100	1,360	6,417	11
11	Scheduled (Flat Rate)	0	0	200	0	0	360	0	0	3	36
	Fire Protection (c)										
12	Public		0		980	980		2,550	1,570		
13	Private	11,400	30		160	130		370	210	3,412	298,089
14	Total Retail Customers	6,121,100	16,780		33,080	16,300		55,690	22,610	629,471	6,257,156

(a) Capacity in excess of average daily use.

(b) Capacity in excess of maximum day.

(c) System wide fire protection demands reflect two simultaneous fires, one requiring 10,000 gallons per minute (gpm) fire flow demand for 10 hours and the second requiring 5,000 gpm for 8 hours. These demands are allocated between standard pressure public fire service and private fire service based upon equivalent 6-inch connections for each of the two fire service classes.

TABLE W-12
WATER: EQUIVALENT METER AND BILL RATIOS

Line No.	Meter Size (Inches)	(1) Equivalent Factors Meters Capacity Basis	(2) Equivalent Factors Bills
1	5/8	1.0	1.0
2	3/4	1.5	1.0
3	1	2.5	1.1
4	1-1/4	3.8	1.2
5	1-1/2	5.0	1.2
6	2	8.0	1.5
7	3	15.0	2.0
8	4	25.0	4.0
9	6	50.0	7.0
10	8	80.0	10.0
11	10	115.0	15.0
12	12	215.0	20.0

TABLE W-13A
WATER: SUMMARY OF COST OF SERVICE ALLOCATED TO AQUA PA AND PROPOSED RATES
Test Year 2019

Line No.	Description	(1) Allocated Investment	(2) Cost of Service
1	Operating Expense (Table W-10, Line 31, Column 10)		$ 2,137,000
2	Depreciation Expense (Table W-9, Line 15, Column 8)		291,000
3	Return on Investment		
4	Allocated Investment (Table W-8, Line 24, Column 8)	$ 13,190,000	
5	Return @ 7.50%		989,000
6	Total Allocated Cost of Service		3,417,000
	CONTRACTUAL RATES		
7	Commodity Charge ($/Mg)		0.421
8	Lump Sum Payment ($/year)		3,103,000

Mg - Thousand gallons

TABLE W-13B
WATER: SUMMARY OF COST OF SERVICE ALLOCATED TO AQUA PA AND PROPOSED RATES
Test Year 2020

Line No.	Description	(1) Allocated Investment	(2) Cost of Service
1	Operating Expense		$ 2,233,000
2	Depreciation Expense		291,000
3	Return on Investment		
4	Allocated Investment	$ 13,190,000	
5	Return @ 7.50%		989,000
6	Total Allocated Cost of Service		3,513,000
	FY 2020 CONTRACTUAL RATES		
7	Commodity Charge ($/Mg)		0.436
8	Lump Sum Payment ($/year)		3,188,000

TABLE W-13C
WATER: SUMMARY OF COST OF SERVICE ALLOCATED TO AQUA PA AND PROPOSED RATES
Test Year 2021

Line No.	COST OF SERVICE	(1) Allocated Investment	(2) Cost of Service
1	Operating Expense		$ 2,297,000
2	Depreciation Expense		$ 291,000
3	Return on Investment		
4	Allocated Investment	$ 13,190,000	
5	Return @ 7.50%		$ 989,000
6	Total Allocated Cost of Service		$ 3,577,000
	FY 2021 CONTRACTUAL RATES		
7	Commodity Charge ($/Mg)		$ 0.448
8	Lump Sum Payment ($/year)		$ 3,243,000

Mg - Thousand gallons

TABLE W-14
WATER: TEST YEAR RETAIL UNIT COSTS OF SERVICE
TEST YEAR 2019

Line No.	Description	(1) Total Test Year Retail Costs	(2) Base	(3) Extra Capacity Maximum Day In Excess of Base	(4) Extra Capacity Maximum Hour In Excess of Maximum Day	(5) Customer Costs Meters	(6) Customer Costs Billing	(7) Direct Public Fire Protection
		$						
	Total Retail Customer Units of Service							
1	Number		6,121,100	16,300	22,610	629,471	6,257,156	
2	Units		Mcf	Mcf/day	Mcf/day	Equiv. Meters	Equiv. Bills	Total
	Operating Expense							
3	Total Expense - $	184,010,000	106,604,000	23,629,000	23,847,000	1,821,000	25,185,000	2,924,000
4	Unit Expense - $/Unit		17.4158	1,449.6319	1,054.7103	2.8929	4.0250	
	Depreciation Expense							
5	Total Expense - $	31,048,000	17,088,000	5,269,000	6,442,000	2,000,000		249,000
6	Unit Expense - $/Unit		2.7917	323.2515	284.9182	3.1773		
	Plant Investment							
7	Total Investment - $	1,421,162,000	811,860,000	246,476,000	323,265,000	29,713,000		9,848,000
8	Unit Investment - $/Unit		132.6330	15,121.2270	14,297.4348	47.2031		
	Unit Return on Investment							
9	Total Return - $	54,451,000	31,106,000	9,444,000	12,386,000	1,138,000		377,000
10	Inside City - $/Unit (a)		5.0818	579.3698	547.8062	1.8086		
	Total Unit Costs of Service							
11	Inside City - $/Unit		25.2893	2,352.2532	1,887.4347	7.8788	4.0250	

(a) Retail rate of return = Retail allocation of Return on Investment / Retail Allocation of System Plant Investment = $54,451,000 / $1,421,162,000 = 3.8315%
Mcf - thousand cubic feet

TABLE W-15
WATER: TEST YEAR COST OF SERVICE BY FUNCTIONAL COST COMPONENTS
TEST YEAR 2019

Line No.	Customer Class	(1) Total Allocated Cost Of Service	(2) Base	(3) Extra Capacity Maximum Day	(4) Extra Capacity Maximum Hour In Excess of Maximum Day	(5) Customer Costs Meters	(6) Customer Costs Billing	(7) Direct Public Fire Protection	(8) Allocate Public Fire Protection (a)
	Retail								
	General Service								
1	Senior Citizens	$ 6,139,000	$ 2,921,000	$ 753,000	$ 963,000	$ 169,000	$ 1,033,000	$ -	$ 300,000
2	Residential	156,235,000	79,876,000	20,347,000	26,122,000	3,483,000	20,214,000	-	6,193,000
3	Commercial	57,756,000	38,720,000	7,880,000	6,719,000	854,000	2,065,000	-	1,518,000
4	Industrial	3,113,000	2,354,000	376,000	189,000	44,000	72,000	-	78,000
5	Public Utilities	379,000	273,000	47,000	19,000	10,000	12,000	-	18,000
6	Subtotal General Service	223,622,000	124,144,000	29,403,000	34,012,000	4,560,000	23,396,000	-	8,107,000
7	Housing Authority	6,739,000	4,203,000	964,000	1,076,000	73,000	294,000	-	129,000
8	Charities & Schools	7,299,000	4,785,000	988,000	868,000	160,000	213,000	-	285,000
9	Hospitals & University	9,986,000	7,357,000	1,505,000	793,000	89,000	83,000	-	159,000
10	Hand Billed	19,598,000	14,020,000	2,870,000	2,567,000	51,000	-	-	90,000
11	Scheduled (Flat Rate)	-	-	-	-	-	-	-	-
	Fire Protection								
12	Private	2,265,000	288,000	306,000	396,000	27,000	1,200,000	-	48,000
	Public								
13	Standard Pressure	-	-	2,305,000	2,963,000	-	-	3,548,000	(8,816,000)
14	High Pressure	-	-	-	-	-	-	2,000	(2,000)
15	Subtotal Public Fire Protection	-	-	2,305,000	2,963,000	-	-	3,550,000	(8,818,000)
16	Total Retail Service	$ 269,509,000	$ 154,797,000	$ 38,341,000	$ 42,675,000	$ 4,960,000	$ 25,186,000	$ 3,550,000	$ -

(a) Public Fire Protection costs allocated to customer types based on equivalent meters.

TABLE W-16
WATER: TEST YEAR ADJUSTED COST OF SERVICE
TEST YEAR 2019

Line No.	Customer Class	(1) Allocated Cost of Service	(2) Discount	(3) Cost of Service w Discount	(4) Recovery of Discount	(5) Adjusted Cost of Service	(6) Percent Change
		$	$	$	$	$	%
1	Residential	156,235,000	-	156,235,000	3,675,000	159,910,000	2.35%
2	Senior Citizens	6,139,000	1,535,000	4,604,000	108,000	4,712,000	-23.24%
3	Commercial	57,756,000	-	57,756,000	1,359,000	59,115,000	2.35%
4	Industrial	3,113,000	-	3,113,000	73,000	3,186,000	2.35%
5	Public Utilities	379,000	-	379,000	9,000	388,000	2.37%
6	Housing Authority	6,739,000	337,000	6,402,000	151,000	6,553,000	-2.76%
	Charities and Schools						
7	Charities & Schools	7,299,000	1,825,000	5,474,000	129,000	5,603,000	-23.24%
8	Hospital/University	9,986,000	2,497,000	7,489,000	176,000	7,665,000	-23.24%
9	Subtotal Charities and Schools	17,285,000	4,322,000	12,963,000	305,000	13,268,000	-23.24%
10	Hand Billed	19,598,000	-	19,598,000	461,000	20,059,000	0.00%
11	Scheduled (Flat Rate)	-	-	-	-	-	0.00%
	Fire Protection						
12	Private	2,265,000	-	2,265,000	53,000	2,318,000	2.34%
13	Subtotal Retail Service	269,509,000	6,194,000	263,315,000	6,194,000	269,509,000	0.00%
14	Wholesale	3,759,000	-	3,759,000	-	3,759,000	0.00%
15	Total System	273,268,000	6,194,000	267,074,000	6,194,000	273,268,000	0.00%

TABLE W-17
WATER: COMPARISON OF TEST YEAR COSTS OF SERVICE AND ADJUSTED COST OF SERVICE WITH REVENUES UNDER EXISTING RATES TEST YEAR 2019

Line No.	Customer Class	(1) Revenue Under Existing Rates	(2) Allocated Cost of Service	(3) Adjusted Cost of Service	(4) Increase (Decrease) Required
		$	$	$	%
	Retail				
	General Service				
1	Senior Citizens	4,808,089	6,139,000	4,712,000	-2.00%
2	Residential	161,416,441	156,235,000	159,910,000	-0.90%
3	Commercial	59,524,948	57,756,000	59,115,000	-0.70%
4	Industrial	3,306,084	3,113,000	3,186,000	-3.60%
5	Public Utilities	431,736	379,000	388,000	-10.10%
6	Subtotal General Service	229,487,298	223,622,000	227,311,000	-0.90%
7	Housing Authority	6,156,440	6,739,000	6,553,000	6.40%
8	Charities & Schools	5,727,773	7,299,000	5,603,000	-2.20%
9	Hospitals & University	7,343,824	9,986,000	7,665,000	4.40%
10	Hand Billed	16,985,587	19,598,000	20,059,000	18.10%
11	Scheduled (Flat Rate)	1,227	-	-	-100.00%
	Fire Protection				
12	Private	3,271,631	2,265,000	2,318,000	-29.10%
13	Total Retail Service	268,973,780	269,509,000	269,509,000	0.20%
	Wholesale				
14	Total Wholesale (Aqua Pennsylvania)	3,246,853	3,417,000	3,417,000	5.20%
15	Total System	272,220,633	272,926,000	272,926,000	0.30%

TABLE W-18
WATER: PROPOSED RATES FOR GENERAL SERVICE

		(1)	(2)	(3)
	SERVICE CHARGE			
Line No.	**Meter Size**	**FY 2019 Monthly**	**FY 2020 Monthly**	**FY 2021 Monthly**
	Inches	$	$	$
1	5/8	6.18	6.40	6.55
2	3/4	7.13	7.37	7.53
3	1	9.48	9.77	9.97
4	1-1/2	14.72	15.09	15.38
5	2	21.76	22.27	22.69
6	3	37.36	38.16	38.83
7	4	65.10	66.56	67.75
8	6	125.96	128.66	130.95
9	8	196.44	200.54	204.03
10	10	285.03	291.04	296.15
11	12	498.73	508.41	516.98

	QUANTITY CHARGE			
Line No.	**Monthly Water Usage**	**FY 2019 Charge per Mcf**	**FY 2020 Charge per Mcf**	**FY 2021 Charge per Mcf**
		$	$	$
12	First 2 Mcf	43.93	45.15	46.37
13	Next 98 Mcf	37.78	38.92	40.02
14	Next 1,900 Mcf	29.28	30.16	30.99
15	Over 2,000 Mcf	28.48	29.34	30.15

Mcf - Thousand cubic feet

TABLE W-19
WATER: PROPOSED RATES FOR PRIVATE FIRE PROTECTION

Line No.	Size of Meter or Connection	(1) FY 2019 Monthly Charge	(2) FY 2020 Monthly Charge	(3) FY 2021 Monthly Charge
	Inches	$	$	$
1	4" or less	26.38	27.36	28.08
2	6	48.51	50.28	51.60
3	8	72.52	75.11	77.08
4	10	106.90	110.75	113.66
5	12	165.71	171.34	175.81

TABLE W-19A
PROPOSED RATES FOR
FIRE PROTECTION
RESIDENTIAL PRIVATE FIRE PROTECTION

Line No.	Size of Meter or Connection	(1) FY 2019 Monthly Charge	(2) FY 2020 Monthly Charge	(3) FY 2021 Monthly Charge
	Inches	$	$	$
	Water Service Charge Including Fire Protection			
1	3/4	10.05	10.33	10.57
2	1	12.40	12.73	13.01
4	1-1/2	17.64	18.05	18.42
5	2	24.68	25.23	25.73
	Sewer Service Charge			
6	3/4	7.20	7.58	8.03
7	1	7.20	7.58	8.03
9	1-1/2	7.20	7.58	8.03
10	2	7.20	7.58	8.03

TABLE WW-1: PROJECTED RECEIPTS UNDER EXISTING RATES (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
1	Sanitary Sewer Receipts	259,934	272,887	273,347	271,833	270,079	268,433	266,806
2	Stormwater Receipts	153,798	157,931	157,761	156,872	155,697	154,479	153,278
3	Total Wastewater Service Receipts	413,732	430,818	431,108	428,705	425,776	422,912	420,084
4	Other Operating Revenues (a)	16,803	21,913	6,797	4,969	3,274	3,229	3,184
	Nonoperating Income							
5	Interest Income on Debt Service Reserve Fund (b)	-	-	-	-	-	-	-
6	Other (c)	619	566	509	462	448	451	452
7	Total Nonoperating Income	619	566	509	462	448	451	452
8	Total Receipts	431,154	453,296	438,415	434,137	429,499	426,592	423,721

(a) Includes Debt Service Reserve Fund Releases in FY 2017 and FY 2019 and projected contra revenue credits for Affordability Program Discounts in FY 2018 to FY 2023.

(b) Excludes deposit into Residual Fund for Transfer to City General Fund.

(c) Includes interest income on Operating and Rate Stabilization Fund.

TABLE WW-1A: PROJECTED RECEIPTS UNDER EXISTING SANITARY SEWER RATES (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
1	Residential	128,887	135,203	134,800	133,395	131,854	130,423	129,005
2	Senior Citizens	3,928	4,108	4,091	4,049	4,004	3,958	3,913
3	Commercial	48,792	51,697	51,975	51,866	51,700	51,532	51,373
4	Industrial	2,738	2,901	2,921	2,922	2,919	2,916	2,913
5	Public Utilities	365	388	391	391	390	390	390
6	Sewer Only	2,283	2,418	2,437	2,440	2,440	2,440	2,440
7	Groundwater	2,289	2,398	2,416	2,419	2,419	2,419	2,419
8	Subtotal General Customers	189,284	199,112	199,030	197,480	195,725	194,079	192,452
9	Housing Authority	5,133	5,452	5,500	5,506	5,506	5,506	5,506
10	Charities and Schools	4,692	4,999	5,045	5,051	5,051	5,051	5,051
11	Hospitals and University	6,641	7,054	7,114	7,122	7,122	7,122	7,122
12	Hand Bill	12,738	13,480	13,593	13,609	13,609	13,609	13,609
13	Scheduled	1	1	1	1	1	1	1
14	Fire Service	137	146	146	146	146	146	146
15	Contract Service	36,413	37,438	37,713	37,713	37,713	37,713	37,713
16	Surcharge	4,895	5,205	5,205	5,205	5,205	5,205	5,205
17	Total Sanitary Sewer Service Receipts	259,934	272,887	273,347	271,833	270,079	268,433	266,806

TABLE WW-1B: PROJECTED RECEIPTS UNDER EXISTING STORMWATER RATES (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
1	**Residential**							
2	Non Discount	70,822	73,204	73,562	73,620	73,622	73,622	73,622
3	Discount: Elderly, Education & Charities	2,818	2,889	2,901	2,902	2,902	2,902	2,902
4	Discount PHA	670	693	697	697	697	697	697
5	**Non Residential**							
6	Non Discount	67,413	68,789	68,271	67,402	66,329	65,221	64,130
7	Discount: Elderly, Education & Charities	8,583	8,838	8,829	8,776	8,707	8,635	8,562
8	Discount PHA	1,038	1,051	1,055	1,055	1,055	1,055	1,055
9	**Condominium**							
10	Non Discount	2,380	2,388	2,370	2,343	2,310	2,275	2,240
11	Discount: Elderly, Education & Charities	75	79	77	75	73	70	67
12	Discount PHA	1	1	1	1	1	1	1
13	Total Receipts	153,798	157,931	157,761	156,872	155,697	154,479	153,278

TABLE WW-1C: OTHER REVENUE PROJECTED RECEIPTS (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Other Income							
1	Penalties	5,876	6,121	6,089	6,045	5,998	5,953	5,908
2	Miscellaneous City Revenues	-	-	-	-	-	-	-
3	Other	4,100	4,300	5,050	5,450	5,650	5,650	5,650
4	State & Federal Grants	-	-	-	-	-	-	-
5	Permits Issued by Licenses & Inspections	1,495	1,260	1,260	1,260	1,260	1,260	1,260
6	Miscellaneous (Procurement)	250	250	250	250	250	250	250
7	City & UESF Grants	(2,240)	(364)	(364)	(364)	(364)	(364)	(364)
8	Affordability Program Discount Cost (a)	-	(2,184)	(5,488)	(7,672)	(9,520)	(9,520)	(9,520)
9	Release from Debt Service Reserve (b)	7,322	12,530	-	-	-	-	-
10	Total Wastewater Other Income	16,803	21,913	6,797	4,969	3,274	3,229	3,184
	Interest Income							
11	Debt Reserve Fund (c)	-	-	-	-	-	-	-
12	Other (d)	619	566	509	462	448	451	452
13	Total Wastewater Operations	17,422	22,479	7,307	5,431	3,722	3,680	3,636

(a) Affordability Program Discounts represent anticipated lost revenue due to the Tiered Assistance Program (TAP).

(b) Projected Release from Debt Reserve Fund based on outstanding and proposed debt service payments.

(c) Excludes deposit into Residual Fund for Transfer to City General Fund.

(d) Includes interest income on Operating and Rate Stabilization Funds.

TABLE WW-2: PROJECTED OPERATION AND MAINTENANCE EXPENSE (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Wastewater Operations							
1	Personal Services	75,604	80,267	82,820	85,850	88,919	92,026	94,787
2	Pension and Benefits	73,522	76,595	80,083	83,366	85,995	88,712	91,593
3	Subtotal	149,126	156,861	162,903	169,215	174,913	180,739	186,380
	Purchase of Services (a)							
4	Power	7,304	7,307	7,389	7,389	7,614	7,846	8,085
5	Gas	2,408	3,559	3,743	3,743	3,857	3,975	4,096
6	Other	96,538	96,042	104,287	106,936	109,701	112,614	115,586
7	Subtotal	106,250	106,908	115,419	118,068	121,173	124,435	127,767
	Materials and Supplies (a)							
8	Chemicals	2,392	2,618	2,825	2,933	2,963	2,994	3,026
9	Other	13,615	13,673	13,846	13,916	13,990	14,064	14,139
10	Subtotal	16,007	16,291	16,671	16,849	16,953	17,059	17,165
11	Equipment	1,335	1,373	1,391	1,409	1,428	1,446	1,465
12	Indemnities and Transfers	12,322	7,290	7,708	7,813	7,921	8,032	8,146
13	Total Expenses	285,040	288,724	304,092	313,355	322,389	331,711	340,922

(a) Net of Liquidated Encumbrances.

TABLE WW-3: PROJECTED CAPITAL IMPROVEMENT PROGRAM (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Wastewater Collection and Treatment							
1	Engineering and Administration (a)	18,536	19,277	19,855	20,451	21,064	21,696	22,347
2	Water Pollution Control Plant	66,880	76,000	76,000	76,000	76,000	76,000	76,000
3	Storm Flood Relief	15,000	10,000	10,000	10,000	15,000	15,000	15,000
4	Reconstruction of Sewers	35,000	50,900	50,900	50,900	56,160	51,560	51,560
5	Green Infrastructure	48,244	47,000	47,000	47,000	57,000	77,390	77,390
6	Vehicles	4,000	7,500	7,500	7,500	7,500	7,500	7,500
7	Total Improvements	187,660	210,677	211,255	211,851	232,724	249,146	249,797
8	Inflation Adjustment (b)	-	-	4,785	9,690	16,275	23,612	29,889
9	Inflated Total	187,660	210,677	216,040	221,541	248,999	272,758	279,686
10	Cash Flow Adjustment	(32,121)	(21,068)	(21,604)	(22,154)	(24,900)	(27,276)	(27,969)
11	Net Cash Financing Required	155,538	189,609	194,436	199,386	224,099	245,483	251,718

(a) Beginning in FY 2017, Engineering and Administration Costs no longer include pension and benefits costs per City policy.

(b) Allowance for inflation of 2.5 percent per year after fiscal year 2018.

TABLE WW-4: PROJECTED FLOW OF FUNDS - CAPITAL IMPROVEMENTS FUND (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Disposition of Bond Proceeds							
1	Proceeds From Sale of Bonds	183,651	-	165,000	175,000	195,000	220,000	215,000
	Transfers:							
2	Debt Reserve Fund (a)	6,961	-	-	4,718	207	14,866	11,035
3	Cost of Bond Issuance (b)	1,032	-	1,650	1,750	1,950	2,200	2,150
4	Construction Fund (c)	175,658	-	163,350	168,532	192,843	202,934	201,815
5	Total Issue	183,651	-	165,000	175,000	195,000	220,000	215,000
	Construction Fund							
6	Beginning Balance	168,669	227,575	79,610	84,400	96,067	107,315	110,062
7	Transfer From Bond Proceeds	175,658	-	163,350	168,532	192,843	202,934	201,815
8	Capital Account Deposit	17,675	13,592	21,081	21,798	22,539	23,305	24,098
9	Penn Vest Loan	-	-	-	-	-	-	-
10	Transfer from Residual Fund	20,400	27,500	14,500	20,400	19,600	21,600	25,200
11	Interest Income on Construction Fund	712	552	295	324	365	391	395
12	Total Available	383,114	269,219	278,836	295,454	331,414	355,545	361,570
13	Net Cash Financing Required	155,538	189,609	194,436	199,386	224,099	245,483	251,718
14	Ending Balance	227,575	79,610	84,400	96,067	107,315	110,062	109,852
	Debt Reserve Fund							
15	Beginning Balance	145,512	145,151	132,621	132,621	137,339	137,547	152,413
16	Transfer From Bond Proceeds	6,961	-	-	4,718	207	14,866	11,035
17	Debt Service Reserve Release	(7,322)	(12,530)	-	-	-	-	-
18	Ending Balance	145,151	132,621	132,621	137,339	137,547	152,413	163,447
19	Interest Income on Debt Reserve Fund	1,238	500	477	486	495	522	569

(a) Amount of Debt Reserve Fund estimated based on outstanding and proposed debt service payments.

(b) Cost of bonds issuance assumed at 1.0 percent of issue amount. FY 2017 based on actual issuance costs.

TABLE WW-5: SUMMARY OF EXISTING AND PROPOSED DEBT SERVICE (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017	2018	2019	2020	2021	2022	2023
	Revenue Bonds							
1	Existing (a)	130,325	124,483	88,436	89,477	83,735	78,322	74,688
	Proposed							
2	Fiscal Year 2017 (b)	-	7,990	19,683	19,098	7,094	7,094	7,094
3	Fiscal Year 2018 (c)		6,528	6,125	6,125	10,297	8,101	10,396
4	Fiscal Year 2019 (d)			6,806	11,512	11,512	11,512	11,512
5	Fiscal Year 2020 (e)				7,547	12,541	12,541	12,541
6	Fiscal Year 2021 (f)					8,775	14,348	14,348
7	Fiscal Year 2022 (f)						11,291	15,983
8	Fiscal Year 2023 (f)							11,035
9	Total Proposed	-	14,518	32,614	44,281	50,219	64,888	82,909
10	Total Revenue Bonds	130,325	139,001	121,050	133,758	133,954	143,210	157,596
	Pennvest Loans							
11	Parity Pennvest	6,561	6,099	6,255	6,284	6,284	6,284	6,284
12	Total Debt Service	136,886	145,100	127,305	140,042	140,238	149,494	163,881

(a) Assumes the average interest rates of 3.0 % for the Variable Rate Series 1997B Bonds and 4.53% for the Variable Rate Series 2005B Bonds. Reflects savings from Series 2017B Refunding Bonds.

(b) Reflects actual Series 2017A Bonds debt service.

(c) Reflects actual Series 2017B Bonds debt service.

(d) Assumes interest only payments through FY 2018 based on 5.50% interest. Assumed to be issued during the first quarter of the fiscal year.

(f) Assumes 6.00% interest rate. Assumed to be issued during the first quarter of the fiscal year.

TABLE WW-6: PROJECTED REVENUE AND REVENUE REQUIREMENTS (in thousands of dollars)

Line No.	Description	Fiscal Year Ending June 30, 2017 (a)	2018	2019	2020	2021	2022	2023
	OPERATING REVENUE							
1	Wastewater Service - Existing Rates (b)	413,732	430,818	431,108	428,705	425,776	422,912	420,084
2	Additional Service Revenue Required							
	Year / Percent Increase / Months Effective							
3	FY 2019 2.42% 10			8,535	10,375	10,298	10,225	10,153
4	FY 2020 5.67% 10				20,368	24,734	24,561	24,391
5	FY 2021 5.64% 10					21,241	25,798	25,619
6	FY 2022 5.76% 10						22,747	27,640
7	FY 2023 5.73% 10							23,783
8	Total Additional Service Revenue Required	-	-	8,535	30,742	56,273	83,331	111,585
9	Total Wastewater Service Revenue	413,732	430,818	439,644	459,448	482,049	506,243	531,670
	Other Income (c)							
10	Other Operating Revenue	16,803	21,913	6,797	4,969	3,274	3,229	3,184
11	Debt Reserve Fund Interest Income	-	-	-	-	-	-	-
12	Operating Fund Interest Income	209	228	222	216	239	250	256
13	Rate Stabilization Interest Income	410	338	287	245	209	201	196
14	Total Revenues	431,154	453,296	446,950	464,879	485,771	509,923	535,306
	OPERATING EXPENSES							
15	Wastewater Operations	(285,040)	(288,724)	(304,092)	(313,355)	(322,389)	(331,711)	(340,922)
16	Water Treatment Plant Sludge (d)	12,329	12,605	13,428	14,172	14,993	15,657	16,807
17	Total Operating Expenses	(272,712)	(276,119)	(290,664)	(299,182)	(307,395)	(316,054)	(324,115)
18	Transfer From/(To) Rate Stabilization Fund	18,963	21,400	6,700	16,400	4,000	500	1,860
19	NET REVENUES AFTER OPERATIONS	177,405	198,577	162,986	182,097	182,376	194,369	213,051
	DEBT SERVICE							
	Senior Debt Service							
	Revenue Bonds							
20	Outstanding Bonds	(130,325)	(124,483)	(88,436)	(89,477)	(83,735)	(78,322)	(74,688)
21	Pennvest Parity Bonds	(6,561)	(6,099)	(6,255)	(6,284)	(6,284)	(6,284)	(6,284)
22	Projected Future Bonds	-	(14,518)	(32,614)	(44,281)	(50,219)	(64,888)	(82,909)
23	Total Senior Debt Service	(136,886)	(145,100)	(127,305)	(140,042)	(140,238)	(149,494)	(163,881)
24	TOTAL SENIOR DEBT SERVICE COVERAGE (L19/L23)	1.29 x	1.36 x	1.28 x	1.30 x	1.30 x	1.30 x	1.30 x
25	Subordinate Debt Service	-	-	-	-	-	-	-
26	Transfer to Escrow	(7,322)	(12,530)	0	0	0	0	0
27	Total Debt Service on Bonds	(136,886)	(145,100)	(127,305)	(140,042)	(140,238)	(149,494)	(163,881)
28	CAPITAL ACCOUNT DEPOSIT	(13,145)	(13,592)	(21,081)	(21,798)	(22,539)	(23,305)	(24,098)
29	TOTAL COVERAGE (L19/(L23+L25+L28))	1.18 x	1.25 x	1.09 x	1.12 x	1.12 x	1.12 x	1.13 x
	RESIDUAL FUND							
30	Beginning of Year Balance	9,048	8,733	8,619	8,750	8,638	8,668	8,669
31	Interest Income	32	31	31	31	31	31	31
	Plus:							
32	End of Year Revenue Fund Balance	20,053	27,355	14,600	20,257	19,599	21,570	25,073
33	Deposit for Transfer to City General Fund (e)	1,238	500	477	486	495	522	569
	Less:							
34	Transfer to Construction Fund	(20,400)	(27,500)	(14,500)	(20,400)	(19,600)	(21,600)	(25,200)
35	Transfer to City General Fund (e)	(1,238)	(500)	(477)	(486)	(495)	(522)	(569)
36	Transfer to Debt Service Reserve Fund	-	-	-	-	-	-	-
37	End of Year Balance	8,733	8,619	8,750	8,638	8,668	8,669	8,573
	RATE STABILIZATION FUND							
38	Beginning of Year Balance for Sewer Utility	123,456	104,493	83,093	76,393	59,993	55,993	55,493
39	Deposit From/(To) Revenue Fund	(18,963)	(21,400)	(6,700)	(16,400)	(4,000)	(500)	(1,860)
40	End of Year Sewer Utility Balance	104,493	83,093	76,393	59,993	55,993	55,493	53,633

(a) FY 2017 is projected and subject to change.

(b) Revenue from rates effective July 1, 2016 and July 1, 2017.

(c) Includes other operating and nonoperating income, including interest income on funds and accounts transferable to the Revenue Fund. Includes Debt Service Reserve Fund Release in FY 2019 and projected contra revenue credits for Affordability Program Discounts in FY 2018 to FY 2021.

(d) Cost to process the Water Treatment Sludge at the wastewater treatement plants based on wastewater cost of service analysis.

(e) Transfer of interest earnings from the Bond Reserve Account to the Residual Fund as shown in Line 33 to satisfy the requirements for the transfer to the City General Fund shown on Line 35.

TABLE WW-7: ESTIMATED TEST YEAR COST OF SERVICE
Test Year 2019
(in thousands of dollars)

Line No.		(1) Operating Expense	(2) Capital Cost	(3) Total
		$	$	$
	REVENUE REQUIREMENTS			
1	Operations & Maintenance Expense	188,776		188,776
2	Direct Interdepartmental Charges	115,316		115,316
3	Water Treatment Plant Sludge	(9,661)	(3,767)	(13,428)
	Existing Bond Debt Service			
4	Revenue Bonds		94,691	94,691
	Subordinate Bonds		-	-
5	Proposed Bond Debt Service		32,614	32,614
6	Capital Account Deposit		21,081	21,081
7	Residual Fund Deposit	9,778	4,803	14,581
8	Deposit (From)/To Rate Stabilization Fund	(3,199)	(1,571)	(4,770)
9	Total	301,010	147,851	448,862
	DEDUCTIONS OF FUNDS FROM OTHER SOURCES			
10	Other Operating Revenue	(6,797)	-	(6,797)
11	Interest Income	(349)	(167)	(516)
12	COST OF SERVICE TO BE DERIVED FROM RATES	293,864	147,684	441,548

TABLE WW - 8
WASTEWATER: TEST YEAR UNITS OF SERVICE BY CUSTOMER TYPE
Test Year 2019

Line No.	Customer Type	(1) FY 2019 Test Year Volume	(2) Capacity Flow Rate Collection System	(3) Capacity Flow Rate Pumping and Treatment	(4) Strength Suspended Solids	(5) Strength BOD	(6) Customer Costs Equiv. Meters	(7) Customer Costs Equiv. Bills	(8) Customer Costs Bills
		Mcf	Mcf/day	Mcf/day	1,000 lbs	1,000 lbs			
1	Residential	2,987,411	32,736	12,276	47,536	49,400	429,455	4,984,873	4,971,672
2	Commercial	1,421,736	15,581	5,843	22,623	23,510	84,207	471,319	418,812
3	Industrial	82,254	901	338	1,309	1,360	3,908	15,186	12,384
4	Public Utilities	10,272	113	42	163	170	1,069	2,700	1,620
5	Senior Citizens	109,642	1,202	451	1,745	1,813	21,375	256,420	256,416
6	Sewer Only	73,150	802	301	1,164	1,210	541	1,532	924
7	Groundwater	210,000	4,603	1,438	917	131	0	0	0
8	Surcharge	0	0	0	2,340	11,520	0	0	0
9	Water Treatment Plant Sludge	292,800	3,209	1,203	26,000	0	0	0	0
10	Housing Authority	157,846	1,730	649	2,512	2,610	8,077	70,386	67,428
11	Charities & Schools	178,825	1,960	735	2,845	2,957	16,817	46,692	29,088
12	Hospital/University	276,290	3,028	1,135	4,396	4,569	8,295	15,457	5,112
13	Hand Bill	405,375	4,442	1,666	6,450	6,703	5,181	9,364	2,904
14	Fire Meters	4,275	47	18	68	71	380	1,301	924
15	Scheduled (Flat Rate)	23	0	0	0	0	3	36	36
16	Subtotal Retail Service	6,209,900	70,354	26,095	120,068	106,024	579,308	5,875,266	5,767,320
17	Infiltration/Inflow	8,926,000	195,638	61,137	38,978	5,568	-	-	-
18	Total Retail Service	15,135,900	265,992	87,232	159,046	111,592	579,308	5,875,266	5,767,320
	Contract Service								
19	Sanitary	3,887,000	32,577	32,577	42,706	39,151			
20	Infiltration/Inflow	105,100	420	420	656	164			
21	Total Contract Service	3,992,100	32,997	32,997	43,362	39,315			
22	Total System	19,128,000	298,989	120,229	202,408	150,907	579,308	5,875,266	5,767,320

Mcf - Thousand cubic feet
lbs - pounds

TABLE WW - 9
WASTEWATER: TEST YEAR PLANT INVESTMENT
SUMMARY OF ALLOCATIONS TO
FUNCTIONAL COST COMPONENTS
Test Year 2019

Line No.	Cost Component	(1) Total Direct Investment	(2) Investment Allocated to Contract Service	(3) Investment Allocated to Retail Service
		$	$	$
	Collection System:			
1	Sewers-Capacity	1,494,948,000	17,991,000	1,476,957,000
2	Pumping Stations Capacity	30,239,000	252,000	29,987,000
3	LTCP Investment	54,692,000	10,446,000	44,246,000
4	Total Collection System	1,579,879,000	28,689,000	1,551,190,000
	Water Pollution Control Plants			
	Northeast Plant Retail, Abington, Bensalem, Bucks Cty. W&SA, Cheltenham, Lower Moreland, & Lower Southampton			
5	Volume	67,307,000	18,745,000	48,562,000
6	Capacity	31,988,000	7,350,000	24,638,000
7	Suspended Solids	72,697,000	13,704,000	58,993,000
8	BOD	94,462,000	23,524,000	70,938,000
9	Total Northeast Plant	266,454,000	63,323,000	203,131,000
	Southwest Plant Retail, DELCORA, Lower Merion, Springfield (excluding Wyndmoor), & Upper Darby			
10	Volume	70,838,000	30,245,000	40,593,000
11	Capacity	39,761,000	8,489,000	31,272,000
12	Suspended Solids	59,757,000	16,885,000	42,872,000
13	BOD	53,583,000	26,228,000	27,355,000
14	Total Southwest Plant	223,939,000	81,847,000	142,092,000
	Southeast Plant Retail & Springfield (Wyndmoor)			
15	Volume	46,556,000	423,000	46,133,000
16	Capacity	49,385,000	275,000	49,110,000
17	Suspended Solids	25,344,000	79,000	25,265,000
18	BOD	25,288,000	69,000	25,219,000
19	Total Southeast Plant	146,573,000	846,000	145,727,000
20	Total Allocated Treatment Plants	636,966,000	146,016,000	490,950,000
21	**Total Allocated System Investment**	**2,216,845,000**	**174,705,000**	**2,042,140,000**

(a) Plant Investment as of 6/30/2016. Includes Administration & General Costs

TABLE WW - 9A
WASTEWATER: ALLOCATION OF TEST YEAR PLANT INVESTMENT FOR THE NORTHEAST WATER POLLUTION CONTROL PLANT
Test Year 2019

Line No.	Description	(1) Total Investment (a)	(2) Retail, Abington, Bensalem, Bucks Cty W&SA, & Lower Southampton Capacity	(3) Retail, Abington, Bensalem, Bucks Cty W&SA, Cheltenham, Lower Moreland, and Lower Southampton Volume	(4) Capacity	(5) Suspended Solids	(6) BOD
		$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
	NON-WATER POLLUTION ABATEMENT PROGRAM FACILITIES						
1	Primary Sedimentation Basins	6,166	-	6,166	-	-	-
2	Pumping Station	1,286	-	-	1,286	-	-
3	Aeration Facilities	20,376	-	-	-	-	20,376
4	Primary Sludge Pumps	1,367	-	-	-	1,367	-
5	Scum Ejectors	214	-	-	-	214	-
6	Effluent Conduit	-	-	-	-	-	-
7	Final Sedimentation Basins	10,724	-	10,724	-	-	-
8	Recirculation Pumps	1,930	-	1,930	-	-	-
9	Digesters	20,995	-	-	-	15,746	5,249
10	Sludge Dewatering	4,096	-	-	-	3,072	1,024
11	Frankford Grit Chamber	-	-	-	-	-	-
12	Chlorination Facilities	5,066	-	-	5,066	-	-
13	Aeration Tank No. 1	3,658	-	-	-	-	3,658
14	Sludge Thickener Building	4,852	-	-	-	2,426	2,426
15	Sludge Transfer Station	357	-	-	-	268	89
16	Subtotal All Above	81,087	-	18,820	6,352	23,093	32,822
	Administrative and General Facilities						
17	Administrative and General Plant	60,421	-	-	-	-	-
18	Land	966	-	-	-	-	-
19	Subtotal	61,387	1,686	15,911	6,458	16,472	20,860
20	Total Non-Water Pollution Abatement Program Facilities	142,474	1,686	34,731	12,810	39,565	53,682
	WATER POLLUTION ABATEMENT PROGRAM FACILITIES						
21	New Preliminary Treatment Building	41,933	10,483	-	31,450	-	-
22	Primary Sedimentation Tanks Modifications	53,953	-	53,953	-	-	-
23	Blower Building	16,919	-	-	-	-	16,919
24	Aeration Tank No. 1	39,448	-	-	-	-	39,448
25	Chlorination Facilities	-	-	-	-	-	-
26	New Sludge Thickener Building	42,165	-	-	-	21,083	21,082
27	Effluent Conduits	2,342	-	-	2,342	-	-
28	New Final Sedimentation Tanks	26,142	-	26,142	-	-	-
29	Sludge Digestion System Modifications	35,203	-	-	-	26,402	8,801
30	Composting Facilities	-	-	-	-	-	-
31	Sludge Dewatering	11,831	-	-	-	8,873	2,958
32	Sludge Transfer Station	25,000	-	-	-	18,750	6,250
33	Loading Terminal/Barges	5,596	-	-	-	4,197	1,399
34	Subtotal	300,532	10,483	80,095	33,792	79,305	96,857
35	Admin. and General Facilities	48,601	1,335	12,597	5,113	13,041	16,515
36	Adjustment for Joint Use Facilities	1,751	-	-	-	1,313	438
37	Total Water Pollution Abatement Program Facilities	350,884	11,818	92,692	38,905	93,659	113,810
38	TOTAL NORTHEAST WPC PLANT BOOK COST	493,358	13,504	127,423	51,715	133,224	167,492
39	Less Federal Grants	226,904	7,869	60,116	25,362	60,527	73,030
40	ADJUSTED TOTAL NORTHEAST WPC PLANT INVESTMENT	266,454	5,635	67,307	26,353	72,697	94,462

(a) Plant Investment as of 6/30/2016.

TABLE WW - 9B
WASTEWATER: ALLOCATION OF TEST YEAR PLANT INVESTMENT FOR THE SOUTHWEST WATER POLLUTION CONTROL PLANT
Test Year 2019

Line No.	Description	(1) Total Investment (a)	(2) Retail Capacity	(3) Retail, DELCORA, Lower Merion, Springfield (excluding Wyndmoor), and Upper Darby Volume	(4) Capacity	(5) Suspended Solids	(6) BOD
		$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
	NON-WATER POLLUTION ABATEMENT PROGRAM FACILITIES						
1	Raw Wastewater Pumping Station	8,265	8,265	-	-	-	-
2	Sludge Digestion Facilities	5,149	-	-	-	3,757	1,392
3	Scum Incineration	1,990	-	-	-	1,990	-
4	Settling Tanks	28,646	-	28,646	-	-	-
5	Sludge Handling	8,040	-	-	-	6,030	2,010
6	Chlorination Facilities	1,244	-	-	1,244	-	-
7	Aeration Tanks	716	-	-	-	-	716
8	Oxygen Supply	3,255	-	-	-	-	3,255
9	Effluent Pump Station	207	-	-	207	-	-
10	Sludge Thickener Building	1,959	-	-	-	980	979
11	Composting Facilities	1,046	-	-	-	785	261
12	Sludge Gas Facilities	9,144	-	-	-	6,858	2,286
13	Subtotal	69,661	8,265	28,646	1,451	20,400	10,899
	Administrative and General Facilities						
14	Administrative and General Plant	87,688	-	-	-	-	-
15	Land	702	-	-	-	-	-
16	Subtotal	88,390	5,132	24,395	11,267	24,143	23,453
17	Adjustment for Joint Use Facilities	(3,046)	-	-	-	(2,413)	(633)
18	Total Non-Water Pollution Abatement Program Facilities	155,005	13,397	53,041	12,718	42,130	33,719
	WATER POLLUTION ABATEMENT PROGRAM FACILITIES						
19	Influent Pumping Station	6,468	6,468	-	-	-	-
20	Preliminary Treatment Building	24,830	-	-	24,830	-	-
21	Primary Sedimentation Tanks	11,393	-	11,393	-	-	-
22	Aeration Tanks	16,780	-	-	-	-	16,780
23	Oxygen Supply System	14,432	-	-	-	-	14,432
24	Compressor Building	3,819	-	-	-	-	3,819
25	Final Tanks	29,999	-	29,999	-	-	-
26	Scum Concentration Building	1,405	-	-	-	1,405	-
27	Sludge Thickener Building	12,847	-	-	-	6,424	6,423
28	Sludge Digestion Facilities	31,848	-	-	-	23,238	8,610
29	Effluent Pumping Station	6,067	-	-	6,067	-	-
30	New Centrifuges	8,279	-	-	-	6,041	2,238
31	Composting Facilities	-	-	-	-	-	-
32	Sludge Dewatering	8,522	-	-	-	6,392	2,130
33	Sludge Gas Facilities	7,420	-	-	-	5,414	2,006
34	Subtotal	184,109	6,468	41,392	30,897	48,914	56,438
35	Admin. and Gen'l. Facilities	34,798	2,020	9,604	4,436	9,505	9,233
36	Adjust. for Joint Use Facilities	(7,095)	-	-	(625)	(4,819)	(1,651)
37	Total Water Pollution Abatement Program Facilities	211,812	8,488	50,996	34,708	53,600	64,020
38	TOTAL SOUTHWEST WPC PLANT BOOK COST	366,817	21,885	104,037	47,426	95,730	97,739
39	Less Federal Grants	142,878	5,189	33,199	24,361	35,973	44,156
40	ADJUSTED TOTAL SOUTHWEST WPC PLANT INVESTMENT	223,939	16,696	70,838	23,065	59,757	53,583

(a) Plant Investment as of 6/30/2016.

TABLE WW - 9C
WASTEWATER: ALLOCATION OF TEST YEAR PLANT INVESTMENT FOR THE SOUTHEAST WATER POLLUTION CONTROL PLANT
Test Year 2019

Line No.	Description	(1) Total Investment (a)	(2) Retail and Springfield (Wyndmoor) Volume	(3) Retail and Springfield (Wyndmoor) Capacity	(4) Retail and Springfield (Wyndmoor) Suspended Solids	(5) Retail and Springfield (Wyndmoor) BOD
		$1,000	$1,000	$1,000	$1,000	$1,000
	NON-WATER POLLUTION ABATEMENT PROGRAM FACILITIES					
1	Main Pumping Station	2,146	-	2,146	-	-
2	Grit Chambers	12,843	-	12,843	-	-
3	Outfall Line	583	-	583	-	-
4	Sludge Digestion Facilities	2,487	-	-	1,970	517
5	Settling Tanks & Floc. Channel	16,054	16,054	-	-	-
6	Sludge Force Main	5,133	-	-	3,850	1,283
7	Subtotal	39,246	16,054	15,572	5,820	1,800
	Administrative and General Facilities					
8	Administrative and General Plant	28,385	-	-	-	-
9	Land	160	-	-	-	-
10	Subtotal	28,545	8,627	9,434	4,539	5,945
11	Adjustment for Joint Use Facilities	3,046	-	-	2,413	633
12	Total Non-Water Pollution Abatement Program Facilities	70,837	24,681	25,006	12,772	8,378
	WATER POLLUTION ABATEMENT PROGRAM FACILITIES					
13	Influent Pump. Stat. and Screen & Grit Chamber	25,549	-	25,549	-	-
14	Primary Sedimentation Tanks	21,654	21,654	-	-	-
15	Compressor Building	10,161	-	-	-	10,161
16	Air Supply Facilities	23,731	-	-	-	23,731
17	Final Sedimentation	26,697	26,697	-	-	-
18	Effluent Pumping Station	13,211	-	13,211	-	-
19	Effluent Conduit	11,878	-	11,878	-	-
20	Scum Concentration Facilities	2,885	-	-	2,885	-
21	Sludge Force Main	1,991	-	-	1,493	498
22	Preliminary Treatment Bldg.	4,225	-	4,225	-	-
23	Sludge Thickeners	4,770	-	-	2,385	2,385
24	Sludge Digesters	15,377	-	-	12,181	3,196
25	Sludge Disposal Facilities	3,997	-	-	3,166	831
26	Composting Facilities	-	-	-	-	-
27	Sludge Dewatering	4,157	-	-	3,118	1,039
28	Sludge Gas Facilities	3,582	-	-	2,838	744
29	Subtotal	173,865	48,351	54,863	28,066	42,585
30	Admin. and Gen'l. Facilities	44,331	13,397	14,652	7,049	9,233
31	Adjustment for Joint Use Facilities	5,344	-	625	3,506	1,213
32	Total Water Pollution Abatement Program Facilities	223,540	61,748	70,140	38,621	53,031
33	TOTAL SOUTHEAST WPC PLANT BOOK COST	294,377	86,429	95,146	51,393	61,409
34	Less Federal Grants	147,804	39,873	45,761	26,049	36,121
35	ADJUSTED TOTAL SOUTHEAST WPC PLANT INVESTMENT	146,573	46,556	49,385	25,344	25,288

(a) Plant Investment as of 6/30/2016.

TABLE WW - 10
WASTEWATER: OPERATION AND MAINTENANCE EXPENSE
SUMMARY OF ALLOCATIONS TO FUNCTIONAL COST COMPONENTS
Test Year 2019

Line No.	Cost Component	(1) Net Operation and Maintenance Expense	(2) Less Operation and Maintenance Expense Allocated to Contract Service	(3) Operation and Maintenance Expense Allocated to Retail Service	(4) Less Retail Operation & Maintenance Expense Deductions: Other Operating Revenue	(5) Net Operation and Maintenance Expense To Be Allocated To Retail Service
		$1,000	$1,000	$1,000	$1,000	$1,000
	COLLECTION SYSTEM					
	Sewer Maintenance					
1	All Customers - Capacity	85,259	1,094	84,165	1,591	82,574
	Inlet Cleaning					
2	Retail - Storm Capacity	16,527	-	16,527	312	16,215
	Neill Drive Pumping Station					
	Retail and Lower Merion					
3	Total Volume	54	11	43	1	42
4	Total Capacity	175	55	120	2	118
	Central Schuylkill Pumping Station					
	Retail and Springfield (excl. Wyndmoor)					
5	Total Volume	691	39	652	12	640
6	Total Capacity	407	7	400	8	392
	All Other Pumping Stations					
	Retail					
7	Total Volume	2,386	-	2,386	45	2,341
8	Total Capacity	17,944	-	17,944	339	17,605
9	Total Collection Systems	144,177	1,572	142,605	2,695	139,910
	WATER POLLUTION CONTROL PLANTS					
	Northeast Plant:					
	Retail and Cheltenham					
10	Volume	-	-	-	-	-
11	Capacity	-	-	-	-	-
	Retail, Abington, Bensalem, Bucks County W&SA,					
	Lower Moreland, and Lower Southampton					
12	Volume	587	151	436	8	428
13	Capacity	2,334	686	1,648	31	1,617
	Retail, Abington, Bensalem, Bucks County W&SA,					
	Cheltenham, Lower Moreland, and					
	Lower Southampton					
14	Volume	12,147	2,856	9,291	176	9,115
15	Capacity	3,708	1,026	2,682	51	2,631
16	Suspended Solids	18,610	4,262	14,348	274	14,074
17	BOD	16,638	4,726	11,912	225	11,687
	Southwest Plant:					
	Retail					
18	Volume	75	-	75	1	74
19	Capacity	467	-	467	9	458
	Retail, DELCORA, Lower Merion, Springfield					
	(Excluding Wyndmoor), and Upper Darby					
20	Volume	12,318	3,461	8,857	167	8,690
21	Capacity	4,163	1,670	2,493	47	2,446
22	Suspended Solids	15,221	4,357	10,864	205	10,659
23	BOD	11,003	3,842	7,161	135	7,026
	Southeast Plant:					
	Retail and Springfield (Wyndmoor)					
24	Volume	8,412	45	8,367	158	8,209
25	Capacity	4,460	32	4,428	84	4,344
26	Suspended Solids	9,330	46	9,284	175	9,109
27	BOD	3,255	16	3,239	61	3,178
28	Total Water Pollution Control Plants	122,728	27,176	95,552	1,807	93,745
	CUSTOMER COSTS					
	All Customers					
29	Equivalent Bills	30,730	228	30,502	576	29,926
	Equivalent Meters					
30	Industrial Waste Unit	3,475	68	3,407	64	3,343
31	Other	4,724	-	4,724	89	4,635
32	Stormwater - Direct	1,268	-	1,268	24	1,244
33	Excess Strength Wastewater - Direct	1,712	-	1,712	32	1,680
34	Total Customer Costs	41,909	296	41,613	785	40,828
35	**Total Operation and Maintenance Expense**	**308,814**	**29,044**	**279,770**	**5,287**	**274,483**

TABLE WW - 10A
WASTEWATER: ALLOCATION OF TEST YEAR OPERATION AND MAINTENANCE EXPENSE FOR THE COLLECTION SYSTEM
Test Year 2019

Line No.	Description	(1) Total	(2) All Customers Capacity	(3) Retail Volume	(4) Retail Capacity	(5) Storm Capacity	(6) Retail & Lower Merion Volume	(7) Retail & Lower Merion Capacity	(8) Retail & Springfield (excluding Wyndmoor) Volume	(9) Retail & Springfield (excluding Wyndmoor) Capacity
		$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
1	Sewer Maintenance	28,699	28,699	-	-	-	-	-	-	-
2	Inlet Cleaning	11,271	-	-	-	11,271	-	-	-	-
	Pump Stations									
	Neill Drive									
3	Power	64	-	-	-	-	54	10	-	-
4	Gas	-					-	-		
5	Other	111	-	-	-	-	-	111	-	-
	Central Schuylkill									
6	Power	814	-	-	-	-	-	-	692	122
7	Gas	-							-	-
8	Other	156	-	-	-	-	-	-	-	156
	All Other Pumping Stations									
9	Power	2,810	-	2,389	421	-	-	-	-	-
10	Gas	-		-	-					
11	Other	12,449	-	-	12,449	-	-	-	-	-
12	GSI Maintenance	6,884	6,884	-	-	-	-	-	-	-
13	Total Collection System	63,258	35,583	2,389	12,870	11,271	54	121	692	278

TABLE WW - 10B
WASTEWATER: ALLOCATION OF OPERATION AND MAINTENANCE EXPENSE FOR THE NORTHEAST WPC PLANT
Test Year 2019

Line No.	Description	(1) Total Operation & Maintenance Expense	(2) Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton Volume	(3) Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton Capacity	(4) Retail, Cheltenham, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton Volume	(5) Retail, Cheltenham, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton Capacity	(6) Retail, Cheltenham, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton Suspended Solids	(7) Retail, Cheltenham, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton BOD
		$	$	$	$	$	$	$
	Personal Services:							
1	Raw Wastewater Pumping	782,514	-	782,514	-	-	-	-
2	Preliminary Treatment	1,521,556	-	-	1,080,305	441,251	-	-
3	Primary Sedimentation	614,056	-	-	614,056	-	-	-
4	Aeration	2,537,738	-	-	-	-	-	2,537,738
5	Secondary Sedimentation	619,491	-	-	619,491	-	-	-
6	Recirculating Pumping	456,467	-	-	456,467	-	-	-
7	Chlorination	429,296	-	-	261,871	167,425	-	-
8	Primary Sludge Pumping	124,985	-	-	-	-	124,985	-
9	Secondary Sludge Thickening	304,311	-	-	-	-	152,156	152,155
10	Sludge Digestion	2,391,016	-	-	-	-	1,793,262	597,754
11	Sludge Holding Tanks	173,892	-	-	-	-	130,419	43,473
12	Sludge Dewatering	440,164	-	-	-	-	330,123	110,041
13	Grit and Screening Incineration	978,143	-	-	655,356	322,787	-	-
14	Scum and Grease Incineration	233,667	-	-	-	-	233,667	-
15	Laboratory	809,685	-	-	-	-	404,843	404,842
16	Subtotal Personal Services	12,416,981	-	782,514	3,687,546	931,463	3,169,455	3,846,003
	Purchase of Services, Materials, Supplies, and Equipment:							
17	Raw Wastewater Pumping	497,846	-	497,846	-	-	-	-
18	Preliminary Treatment	786,719	-	-	-	786,719	-	-
19	Primary Sedimentation	368,774	-	-	368,774	-	-	-
20	Aeration	553,162	-	-	-	-	-	553,162
21	Secondary Sedimentation	424,091	-	-	424,091	-	-	-
22	Recirculating Pumping	159,802	-	-	159,802	-	-	-
23	Chlorination	2,211,362	-	-	2,211,362	-	-	-
24	Primary Sludge Pumping	67,609	-	-	-	-	67,609	-
25	Secondary Sludge Thickening	79,901	-	-	-	-	39,951	39,950
26	Sludge Digestion	1,038,715	-	-	-	-	779,036	259,679
27	Sludge Holding Tanks	147,510	-	-	-	-	110,633	36,877
28	Sludge Dewatering	116,779	-	-	-	-	87,584	29,195
29	Grit and Screening Incineration	331,897	-	-	-	331,897	-	-
30	Scum and Grease Incineration	92,194	-	-	-	-	92,194	-
31	Laboratory	712,964	-	-	-	-	356,482	356,482
32	Subtotal Purchase of Services, Materials, Supplies & Equipment	7,589,325	-	497,846	3,164,029	1,118,616	1,533,489	1,275,345
33	**Subtotal All Above**	**20,006,306**	**-**	**1,280,360**	**6,851,575**	**2,050,079**	**4,702,944**	**5,121,348**
	Administrative and General:							
34	Personal Services	3,195,268	-	201,365	948,918	239,694	815,597	989,694
35	Other	1,031,196	-	67,645	429,911	151,991	208,362	173,287
36	Subtotal Administration & General	4,226,464	-	269,010	1,378,829	391,685	1,023,959	1,162,981
	Power Requirements:							
37	Raw Wastewater Pumping	699,534	594,604	104,930	-	-	-	-
38	Preliminary Treatment	5,781	-	-	4,914	867	-	-
39	Primary Sedimentation	46,250	-	-	39,313	6,937	-	-
40	Aeration	3,832,985	-	-	-	-	-	3,832,985
41	Secondary Sedimentation	46,250	-	-	39,313	6,937	-	-
42	Recirculating Pumping	161,876	-	-	137,595	24,281	-	-
43	Chlorination	11,563	-	-	9,829	1,734	-	-
44	Primary Sludge Pumping	5,781	-	-	-	-	5,781	-
45	Secondary Sludge Thickening	433,596	-	-	-	-	216,798	216,798
46	Sludge Digestion	98,282	-	-	-	-	73,712	24,570
47	Sludge Dewatering	104,063	-	-	-	-	78,047	26,016
48	Grit and Screening Incineration	92,500	-	-	78,625	13,875	-	-
49	Scum and Grease Incineration	5,781	-	-	-	-	5,781	-
50	Subtotal Power Requirements	5,544,242	594,604	104,930	309,589	54,631	380,119	4,100,369
	Gas Requirements:							
51	Raw Wastewater Pumping	66,430	-	66,430	-	-	-	-
52	Preliminary Treatment	104,976	-	-	-	104,976	-	-
53	Primary Sedimentation	49,207	-	-	49,207	-	-	-
54	Aeration	73,811	-	-	-	-	-	73,811
55	Secondary Sedimentation	56,588	-	-	56,588	-	-	-
56	Recirculating Pumping	21,323	-	-	21,323	-	-	-
57	Chlorination	9,021	-	-	9,021	-	-	-
58	Primary Sludge Pumping	9,021	-	-	-	-	9,021	-
59	Secondary Sludge Thickening	10,662	-	-	-	-	5,331	5,331
60	Sludge Digestion	138,600	-	-	-	-	103,950	34,650
61	Sludge Dewatering	15,582	-	-	-	-	11,687	3,895
62	Grit and Screening Incineration	44,287	-	-	-	44,287	-	-
63	Scum and Grease Incineration	12,302	-	-	-	-	12,302	-
64	Subtotal Gas Requirements	726,627	-	66,430	136,139	149,263	204,620	170,175
65	Sludge Disposal	9,321,893	-	-	-	-	6,991,420	2,330,473
66	**Total Northeast WPC Plant Expense**	**39,825,532**	**594,604**	**1,720,730**	**8,676,132**	**2,645,658**	**13,303,062**	**12,885,346**

TABLE WW - 10C
WASTEWATER: ALLOCATION OF OPERATION AND MAINTENANCE EXPENSE FOR THE SOUTHWEST WPC PLANT
Test Year 2019

Line No.	Description	(1) Total Operation & Maintenance Expense	(2) Retail Volume	(3) Retail Capacity	(4) Retail, DELCORA, Lower Merion, Springfield (w/o Wyndmoor) and Upper Darby Volume	(5) Retail, DELCORA, Lower Merion, Springfield (w/o Wyndmoor) and Upper Darby Capacity	(6) Retail, DELCORA, Lower Merion, Springfield (w/o Wyndmoor) and Upper Darby Suspended Solids	(7) Retail, DELCORA, Lower Merion, Springfield (w/o Wyndmoor) and Upper Darby BOD
		$	$	$	$	$	$	$
	Personal Services							
1	Raw Wastewater Pumping	151,871	-	151,871	-	-	-	-
2	Preliminary Treatment	2,004,693	-	-	1,463,426	541,267	-	-
3	Flocculation	364,490	-	-	364,490	-	-	-
4	Primary Sedimentation	528,510	-	-	528,510	-	-	-
5	Aeration	1,075,245	-	-	-	-	-	1,075,245
6	Secondary Sedimentation	911,224	-	-	911,224	-	-	-
7	Recirculating Pumping	340,190	-	-	340,190	-	-	-
8	Chlorination	516,360	-	-	304,652	211,708	-	-
9	Effluent Pumping	425,238	-	-	-	425,238	-	-
10	Primary Sludge Pumping	388,789	-	-	-	-	388,789	-
11	Secondary Sludge Thickening	321,966	-	-	-	-	157,763	164,203
12	Sludge Digestion	1,230,153	-	-	-	-	922,615	307,538
13	Sludge Holding Tanks	209,581	-	-	-	-	157,186	52,395
14	Sludge Dewatering	956,785	-	-	-	-	717,589	239,196
15	Sludge Lagoon	9,112	-	-	-	-	6,834	2,278
16	Grit and Screening Incineration	842,882	-	-	573,160	269,722	-	-
17	Scum and Grease Incineration	214,138	-	-	-	-	214,138	-
18	Laboratory	777,578	-	-	-	-	388,789	388,789
19	Subtotal Personal Services	11,268,805	-	151,871	4,485,652	1,447,935	2,953,703	2,229,644
	Purchase of Services, Materials, Supplies, and Equipment:							
20	Raw Wastewater Pumping	44,727	-	44,727	-	-	-	-
21	Preliminary Treatment	512,013	-	-	-	512,013	-	-
22	Flocculation	265,378	-	-	265,378	-	-	-
23	Primary Sedimentation	149,515	-	-	149,515	-	-	-
24	Aeration	291,362	-	-	-	-	-	291,362
25	Secondary Sedimentation	313,938	-	-	313,938	-	-	-
26	Recirculating Pumping	130,772	-	-	130,772	-	-	-
27	Chlorination	1,136,561	-	-	1,136,561	-	-	-
28	Effluent Pumping	14,909	-	-	-	14,909	-	-
29	Primary Sludge Pumping	168,257	-	-	-	-	168,257	-
30	Secondary Sludge Thickening	29,818	-	-	-	-	14,611	15,207
31	Sludge Digestion	294,237	-	-	-	-	220,678	73,559
32	Sludge Holding Tanks	103,830	-	-	-	-	77,873	25,957
33	Sludge Dewatering	622,019	-	-	-	-	466,514	155,505
34	Sludge Lagoon	5,750	-	-	-	-	4,313	1,437
35	Grit and Screening Incineration	131,624	-	-	-	131,624	-	-
36	Scum and Grease Incineration	42,171	-	-	-	-	42,171	-
37	Laboratory	336,089	-	-	-	-	168,045	168,044
38	Subtotal Purchase of Services, Materials, Supplies & Equipment	4,592,970	-	44,727	1,996,164	658,546	1,162,462	731,071
39	**Subtotal All Above**	**15,861,775**	**-**	**196,598**	**6,481,816**	**2,106,481**	**4,116,165**	**2,960,715**
	Administrative & General							
40	Personal Services	2,727,600	-	36,760	1,085,746	350,471	714,940	539,683
41	Other	690,000	-	6,719	299,883	98,933	174,637	109,828
42	Subtotal Administration & General	3,417,600	-	43,479	1,385,629	449,404	889,577	649,511
	Power Requirements							
43	Raw Wastewater Pumping	88,901	75,566	13,335	-	-	-	-
44	Preliminary Treatment	5,927	-	-	5,038	889	-	-
45	Flocculation	284,908	-	-	242,172	42,736	-	-
46	Primary Sedimentation	22,437	-	-	19,071	3,366	-	-
47	Aeration	2,775,843	-	-	-	-	-	2,775,843
48	Secondary Sedimentation	57,151	-	-	48,578	8,573	-	-
49	Recirculating Pumping	151,556	-	-	128,823	22,733	-	-
50	Chlorination	12,277	-	-	10,435	1,842	-	-
51	Effluent Pumping	37,254	-	-	31,666	5,588	-	-
52	Primary Sludge Pumping	3,387	-	-	-	-	3,387	-
53	Secondary Sludge Thickening	370,846	-	-	-	-	181,715	189,131
54	Sludge Digestion	86,679	-	-	-	-	65,009	21,670
55	Sludge Dewatering	63,501	-	-	-	-	47,626	15,875
56	Grit and Screening Incineration	39,370	-	-	33,465	5,905	-	-
57	Scum and Grease Incineration	6,032	-	-	-	-	6,032	-
58	Subtotal Power Requirements	4,006,069	75,566	13,335	519,248	91,632	303,769	3,002,519
	Gas Requirements							
59	Raw Wastewater Pumping	29,524	-	29,524	-	-	-	-
60	Preliminary Treatment	337,984	-	-	-	337,984	-	-
61	Flocculation	175,178	-	-	175,178	-	-	-
62	Primary Sedimentation	98,696	-	-	98,696	-	-	-
63	Aeration	192,330	-	-	-	-	-	192,330
64	Secondary Sedimentation	207,233	-	-	207,233	-	-	-
65	Recirculating Pumping	86,324	-	-	86,324	-	-	-
66	Chlorination	29,524	-	-	29,524	-	-	-
67	Effluent Pumping	9,841	-	-	-	9,841	-	-
68	Primary Sludge Pumping	111,068	-	-	-	-	111,068	-
69	Secondary Sludge Thickening	19,683	-	-	-	-	9,645	10,038
70	Sludge Digestion	194,228	-	-	-	-	145,671	48,557
71	Sludge Dewatering	410,599	-	-	-	-	307,949	102,650
72	Grit and Screening Incineration	86,886	-	-	-	86,886	-	-
73	Scum and Grease Incineration	27,837	-	-	-	-	27,837	-
74	Subtotal Gas Requirements	2,311,124	-	29,524	596,955	434,711	767,348	482,586
75	Sludge Disposal	6,628,737	-	-	-	-	4,971,553	1,657,184
76	**Total Southwest WPC Plant Expense**	**32,225,305**	**75,566**	**282,936**	**8,983,648**	**3,082,228**	**11,048,412**	**8,752,515**

TABLE WW - 10D
WASTEWATER: ALLOCATION OF OPERATION AND MAINTENANCE EXPENSE FOR THE SOUTHEAST WPC PLANT
Test Year 2019

Line No.	Description	(1) Total Operation & Maintenance Expense	(2) Retail and Springfield (Wyndmoor) Volume	(3) Retail and Springfield (Wyndmoor) Capacity	(4) Retail and Springfield (Wyndmoor) Suspended Solids	(5) Retail and Springfield (Wyndmoor) BOD
		$	$	$	$	$
	Personal Services					
1	Raw Wastewater Pumping	810,075	-	810,075	-	-
2	Preliminary Treatment	1,150,541	828,390	322,151	-	-
3	Flocculation	352,206	352,206	-	-	-
4	Primary Sedimentation	410,908	410,908	-	-	-
5	Aeration	410,908	-	-	-	410,908
6	Secondary Sedimentation	510,699	510,699	-	-	-
7	Recirculating Pumping	246,545	246,545	-	-	-
8	Chlorination	393,297	247,777	145,520	-	-
9	Effluent Pumping	311,116	-	311,116	-	-
10	Primary Sludge Pumping	328,726	-	-	328,726	-
11	Waste Sludge Pumping	240,674	-	-	204,573	36,101
12	Sludge Digestion	410,051	-	-	348,543	61,508
13	Sludge Holding Tanks	240,094	-	-	204,080	36,014
14	Sludge Dewatering	318,929	-	-	271,090	47,839
15	Sludge Lagoon	3,038	-	-	2,582	456
16	Grit and Screening Incineration	280,961	191,053	89,908	-	-
17	Scum and Grease Incineration	71,379	-	-	71,379	-
18	Scum Pumping	328,726	-	-	328,726	-
19	Primary Sludge Transfer Pumping	170,233	-	-	170,233	-
20	Waste Activated Sludge Xfer Pumping	158,493	-	-	134,719	23,774
21	Laboratory	563,530	-	-	281,765	281,765
22	Subtotal Personal Services	7,711,129	2,787,578	1,678,770	2,346,416	898,365
	Purchase of Services, Materials, Supplies, and Equipment:					
23	Raw Wastewater Pumping	148,143	-	148,143	-	-
24	Preliminary Treatment	432,481	-	432,481	-	-
25	Flocculation	181,594	181,594	-	-	-
26	Primary Sedimentation	117,081	117,081	-	-	-
27	Aeration	181,594	-	-	-	181,594
28	Secondary Sedimentation	148,143	148,143	-	-	-
29	Recirculating Pumping	88,408	88,408	-	-	-
30	Chlorination	1,175,254	1,175,254	-	-	-
31	Effluent Pumping	76,461	-	76,461	-	-
32	Primary Sludge Pumping	138,585	-	-	138,585	-
33	Waste Sludge Pumping	88,408	-	-	75,147	13,261
34	Sludge Digestion	98,079	-	-	83,367	14,712
35	Sludge Holding Tanks	103,903	-	-	88,318	15,585
36	Sludge Dewatering	207,340	-	-	176,239	31,101
37	Sludge Lagoon	1,917	-	-	1,629	288
38	Grit and Screening Incineration	43,875	-	43,875	-	-
39	Scum and Grease Incineration	14,057	-	-	14,057	-
40	Scum Pumping	138,585	-	-	138,585	-
41	Primary Sludge Transfer Pumping	50,177	-	-	50,177	-
42	Waste Activated Sludge Xfer Pumping	47,788	-	-	40,620	7,168
43	Laboratory	193,541	-	-	96,771	96,770
44	Subtotal Purchase of Services, Materials, Supplies & Equipment	3,675,414	1,710,480	700,960	903,495	360,479
45	**Subtotal All Above**	**11,386,543**	**4,498,058**	**2,379,730**	**3,249,911**	**1,258,844**
	Administrative & General					
46	Personal Services	2,157,464	779,924	469,696	656,494	251,350
47	Other	320,837	149,313	61,189	78,868	31,467
48	Gas	4,436	820	3,318	(2,922)	3,220
49	Subtotal Administration & General	2,482,737	930,057	534,203	732,440	286,037
	Power Requirements					
50	Raw Wastewater Pumping	260,003	221,003	39,000	-	-
51	Flocculation	400,268	340,228	60,040	-	-
52	Primary Sedimentation	15,965	13,570	2,395	-	-
53	Aeration	346,671	-	-	-	346,671
54	Secondary Sedimentation	11,404	9,693	1,711	-	-
55	Recirculating Pumping	27,369	23,264	4,105	-	-
56	Chlorination	3,421	2,908	513	-	-
57	Effluent Pumping	30,790	26,172	4,618	-	-
58	Primary Sludge Pumping	1,140	-	-	1,140	-
59	Waste Sludge Pumping	3,421	-	-	2,908	513
60	Sludge Digestion	28,893	-	-	24,559	4,334
61	Sludge Dewatering	21,167	-	-	17,992	3,175
62	Grit and Screening Incineration	13,124	11,155	1,969	-	-
63	Scum and Grease Incineration	2,011	-	-	2,011	-
64	Scum Pumping	3,421	-	-	3,421	-
65	Primary Sludge Transfer Pumping	23,948	-	-	23,948	-
66	Waste Activated Sludge Xfer Pumping	12,544	-	-	10,662	1,882
67	Subtotal Power Requirements	1,205,560	647,993	114,351	86,641	356,575
	Gas Requirements					
68	Raw Wastewater Pumping	2,594	-	2,594	-	-
69	Flocculation	3,180	3,180	-	-	-
70	Primary Sedimentation	2,050	2,050	-	-	-
71	Aeration	3,180	-	-	-	3,180
72	Secondary Sedimentation	2,594	2,594	-	-	-
73	Recirculating Pumping	1,548	1,548	-	-	-
74	Chlorination	628	628	-	-	-
75	Effluent Pumping	1,339	-	1,339	-	-
76	Primary Sludge Pumping	2,427	-	-	2,427	-
77	Waste Sludge Pumping	1,548	-	-	1,316	232
78	Sludge Digestion	64,743	-	-	55,032	9,711
79	Sludge Dewatering	136,867	-	-	116,337	20,530
80	Grit and Screening Incineration	28,962	-	28,962	-	-
81	Scum and Grease Incineration	9,279	-	-	9,279	-
82	Scum Pumping	2,427	-	-	2,427	-
83	Primary Sludge Transfer Pumping	879	-	-	879	-
84	Waste Activated Sludge Xfer Pumping	837	-	-	711	126
85	Subtotal Gas Requirements	301,369	10,000	40,469	211,628	39,272
86	Sludge Disposal	2,831,068	-	-	2,406,408	424,660
87	**Total Southeast WPC Plant Expense**	**18,207,277**	**6,086,108**	**3,068,753**	**6,687,028**	**2,365,388**

TABLE WW - 10E
WASTEWATER: TEST YEAR OPERATION AND MAINTENANCE EXPENSE
SUMMARY NET OPERATION & MAINTENANCE EXPENSE
Test Year 2019

Line No.	Cost Component	(1) Direct Operation & Maintenance Expense	(2) Administrative & General Expenses: Direct Assignment	(3) Administrative & General Expenses: Allocated	(4) Total Operation & Maintenance Expense	(5) O&M Expense Deductions: Less Interest Income	(6) O&M Expense Deductions: Less Grants	(7) Net Operation & Maintenance Expense
		$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
	COLLECTION SYSTEM							
	Sewer Maintenance							
1	All Customers - Capacity	28,699	26,079	30,577	85,355	96	-	85,259
	Inlet Cleaning							
2	Retail - Storm Capacity	11,271	537	4,738	16,546	19	-	16,527
	Neill Drive Pumping Station							
	Retail and Lower Merion							
3	Total Volume	54	-	-	54	-	-	54
4	Total Capacity	121	-	54	175	-	-	175
	Central Schuykill Pumping Station							
	Retail and Springfield (excl. Wyndmoor)							
5	Total Volume	692	-	-	692	1	-	691
6	Total Capacity	278	-	129	407	-	-	407
	All Other Pumping Stations							
	Retail							
7	Total Volume	2,389	-	-	2,389	3	-	2,386
8	Total Capacity	12,870	-	5,094	17,964	20	-	17,944
	Green Stormwater Infrastructure Maintenance							
9	All Customers - Capacity	6,884	7,704	6,169	20,757	23	-	20,734
10	Total Collection Systems	63,258	34,320	46,761	144,339	162	-	144,177
	WATER POLLUTION CONTROL PLANTS							
	Northeast Plant:							
	Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland & Lower Southampton							
11	Volume	595	-	-	595	1	7	587
12	Capacity	1,721	-	645	2,366	3	29	2,334
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham,							
	Lower Moreland, and Lower Southampton							
13	Volume	8,676	-	3,634	12,310	14	149	12,147
14	Capacity	2,646	-	1,112	3,758	4	46	3,708
15	Suspended Solids	13,303	45	5,512	18,860	21	229	18,610
16	BOD	12,885	-	3,977	16,862	19	205	16,638
	Southwest Plant:							
	Retail							
17	Volume	76	-	-	76	-	1	75
18	Capacity	283	-	191	474	1	6	467
	Retail, DELCORA, Lower Merion, Springfield (Excluding Wyndmoor), and Upper Darby							
19	Volume	8,984	-	3,500	12,484	14	152	12,318
20	Capacity	3,082	-	1,137	4,219	5	51	4,163
21	Suspended Solids	11,048	46	4,329	15,423	15	187	15,221
22	BOD	8,753	-	2,398	11,151	13	135	11,003
	Southeast Plant:							
	Retail and Springfield (Wyndmoor)							
23	Volume	6,086	-	2,439	8,525	10	103	8,412
24	Capacity	3,069	-	1,451	4,520	5	55	4,460
25	Suspended Solids	6,687	45	2,724	9,456	11	115	9,330
26	BOD	2,365	-	934	3,299	4	40	3,255
27	Total Water Pollution Control Plants	90,259	136	33,983	124,378	140	1,510	122,728
	CUSTOMER COSTS							
	All Customers							
28	Equivalent Bills	22,904	-	7,861	30,765	35	-	30,730
	Equivalent Meters							
29	Industrial Waste Unit	2,590	-	889	3,479	4	-	3,475
30	Other	3,521	-	1,208	4,729	5	-	4,724
31	Excess Strength Wastewater - Direct	1,276	-	438	1,714	2	-	1,712
32	Stormwater Incentive Programs	945	-	324	1,269	1	-	1,268
33	Total Customer Costs	31,236	-	10,720	41,956	47	-	41,909
34	Total Operation & Maintenance Expens	184,753	34,456	91,464	310,673	349	1,510	308,814

TABLE WW - 11
WASTEWATER: RETAIL UNIT COSTS OF SERVICE - (Part I)
Test Year 2019

Line No.	Description	(1) Total	(2) Collection System: Pumping Station Volume	(3) Collection System: Pumping Station Capacity	(4) Collection System: Sanitary Sewers Capacity	(5) Storm Costs	(6) Water Pollution Control Plants: Volume	(7) Water Pollution Control Plants: Capacity	(8) Water Pollution Control Plants: Suspended Solids	(9) Water Pollution Control Plants: BOD
	Total Units of Service									
1	Units	$	Mcf	Mcf/day	Mcf/day		Mcf	Mcf/day	1,000 lbs.	1,000 lbs.
2	Quantity		15,135,900	87,232	265,992		15,135,900	87,232	159,046	111,592
	Operation and Maintenance Expense									
3	Total Expense - $	233,655,199	3,023,000	18,115,400	41,022,800	77,749,200	26,516,000	11,496,000	33,841,799	21,891,000
4	Unit Expense - $/unit		0.1997	207.6692	154.2257		1.7519	131.7865	212.7799	196.1700
	Capital Costs									
5	Total Plant Investment - $	2,042,140,000		29,987,000	547,633,100	973,569,900	135,288,000	105,020,000	127,130,000	123,512,000
6	Unit Plant Investment - $/unit			343.7615	2,058.8330		8.9382	1,203.9160	799.3285	1,106.8177
7	Depreciable Plant Investment - $	2,038,959,723		29,987,000	546,979,300	972,407,700	134,925,000	104,779,000	126,751,000	123,130,723
8	Unit Depreciable Plant Investment - $/unit			343.7615	2,056.3750		8.9142	1,201.1533	796.9455	1,103.4010
9	Depreciation Expense - $	43,377,100		749,600	10,939,600	19,448,200	3,373,100	2,619,500	3,168,800	3,078,300
10	Unit Depreciation Expense - $/unit			8.5940	41.1275		0.2229	30.0288	19.9236	27.5850
	Unit Return on Investment									
11	Total Return - $ (a)	98,526,000		1,446,800	26,421,300	46,971,300	6,527,200	5,066,800	6,133,600	5,959,000
12	Inside City - $/Unit (a)			16.5853	99.3314		0.4312	58.0847	38.5648	53.4000
	Total Unit Capital Costs									
13	(Line 10 + Line 12) - $/unit			25.1793	140.4589		0.6541	88.1135	58.4884	80.9850
	Total Unit Costs of Service									
14	Inside City (Line 4 + Line 13) - $/unit		0.1997	232.8485	294.6846		2.4060	219.9000	271.2683	277.1550

(a) Retail rate of return = Retail allocation of Return on Investment / Retail Allocation of System Plant Investment = $98,526,000 / $2,042,140,000 = 4.8246 %.

Mcf - Thousand cubic feet

lbs - pounds

TABLE WW - 12
WASTWATER: RETAIL UNIT COSTS OF SERVICE - (Part 2)
Test Year 2019

Line No.	Description	(1)	(2)	(3)	(4)	(5)	(6)
		Customer Costs			Industrial Waste Unit		
			Billing			Direct Excess Strength	
		Meter Costs	Sanitary	Stormwater	Retail Customers	Wastewater	Direct Stormwater
	Total Units of Service						
1	Units	Eq. Meters	Eq. Bills		Eq. Meters		
2	Quantity	579,308	5,875,266		579,308		
	Operation and Maintenance Expense						
3	Total Expense - $	4,635,000	18,069,000	11,856,836	3,343,000	1,680,000	1,244,000
4	Unit Expense - $/unit	8.0009	3.0754		5.7707		
	Capital Costs						
5	Total Plant Investment - $						
6	Unit Plant Investment - $/unit						
7	Depreciable Plant Investment - $						
8	Unit Depreciable Plant Investment - $/unit						
9	Depreciation Expense - $						
10	Unit Depreciation Expense - $/unit						
	Unit Return on Investment						
11	Total Return - $						
12	Inside City - $/Unit (a)						
	Total Unit Capital Costs						
13	(Line 10 + Line 12) - $/unit						
	Total Unit Costs of Service						
14	Inside City (Line 4 + Line 13) - $/unit	8.0009	3.0754		5.7707	-	

(a) Retail rate of return = Retail allocation of Return on Investment / Retail Allocation of System Plant Investment = $98,526,000 / $2,042,140,000 = 4.8246 %.

Mcf - Thousand cubic feet

lbs - pounds

TABLE WW - 13
WASTEWATER: RETAIL COSTS OF SERVICE (a)
(in thousands of dollars)
Test Year FY 2019

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			Collection System			Treatment				Customer		Industrial Waste	
Line No.	Customer Type	Allocated Cost of Service	Pumping Volume	Pumping Capacity	Sewer Capacity	Volume	Capacity	TSS	BOD	Meter	Billing & Collection	Surcharge	Meter
1	Residential	$ 70,820	$ 597	$ 2,858	$ 9,647	$ 7,188	$ 2,699	$ 12,895	$ 13,691	$ 3,436	$ 15,331	$ -	$ 2,478
2	Commercial	26,203	284	1,361	4,591	3,421	1,285	6,137	6,516	674	1,449	-	486
3	Industrial	1,465	16	79	266	198	74	355	377	31	47	-	23
4	Public Utilities	193	2	10	33	25	9	44	47	9	8	-	6
5	Senior Citizens	2,903	22	105	354	264	99	473	502	171	789	-	123
6	Wastewater Only	1,226	15	70	236	176	66	316	335	4	5	-	3
7	Groundwater	2,840	42	335	1,356	505	316	249	36	-	-	-	-
8	Surcharge	5,500	-	-	-	-	-	635	3,193	-	-	1,673	-
9	Housing Authority	2,947	32	151	510	380	143	681	723	65	216	-	47
10	Charities & Schools	3,343	36	171	578	430	162	772	820	135	144	-	97
11	Hospital/University	4,747	55	264	892	665	250	1,192	1,266	66	48	-	48
12	Hand Bill	6,827	81	388	1,309	975	366	1,750	1,858	41	29	-	30
13	Water Treatment Plant Sludge	9,306	58	280	946	704	265	7,053	-	-	-	-	-
14	Private Fire Connections	80	1	4	14	10	4	18	20	3	4	-	2
15	Scheduled (Flat Rate)	0	0	-	-	0	-	-	-	0	0	-	0
	Infiltration/Inflow												
16	Conveyance	57,652	-	-	57,652	-	-	-	-	-	-	-	-
17	Pumping & Treatment	63,053	1,783	14,235	-	21,475	13,444	10,573	1,543	-	-	-	-
18	Total	$ 259,108	$ 3,023	$ 20,311	$ 78,384	$ 36,416	$ 19,182	$ 43,144	$ 30,928	$ 4,635	$ 18,069	$ 1,673	$ 3,343

Notes: (a) Annual Cost of Service by component for each customer type based on the customer type units of service (Table WW-8) and the total unit cost for each component (Tables WW-11 and WW-12).

TABLE WW - 14
WASTEWATER: ADJUSTED COSTS OF SERVICE (AFTER ALLOCATION OF I/I AND DISCOUNTS)
(in thousands of dollars)
Test Year FY 2019

Line No.	Customer Type	(1) Allocated Cost of Service	(2) Re-allocation of I/I (a) Sanitary Sewer	(3) Re-allocation of I/I (a) Stormwater	(4) Adjusted Cost of Service	(5) Discounts	(6) Adjusted Cost of Service with Discounts	(7) Recovery of Discounts (b)	(8) Adjusted Cost of Service
1	Residential	$ 70,820	$ 54,892	$ -	$ 125,712	$ -	$ 125,712	$ 3,040	$ 128,752
2	Commercial	26,203	22,536		48,739		48,739	1,179	49,918
3	Industrial	1,465	1,275		2,740		2,740	66	2,807
4	Public Utilities	193	177		370		370	9	379
5	Senior Citizens	2,903	2,182		5,085	(1,271)	3,814	92	3,906
6	Wastewater Only	1,226	1,046		2,273		2,273	55	2,328
7	Groundwater	2,840	-		2,840		2,840	69	2,908
8	Surcharge	5,500	-		5,500		5,500	133	5,633
9	Housing Authority	2,947	2,464		5,411	(271)	5,141	124	5,265
10	Charities & Schools	3,343	3,020		6,363	(1,591)	4,772	115	4,888
11	Hospital/University	4,747	4,138		8,885	(2,221)	6,664	161	6,825
12	Hand Bill	6,827	5,863		12,691		12,691	307	12,997
13	Water Treatment Plant Sludge	9,306	4,123		13,430		13,430		13,430
14	Private Fire Connections	80	72		152		152	4	156
15	Scheduled	0	0		1		1	0	1
	Infiltration/Inflow								
16	Conveyance	57,652	(57,652)						
17	Pumping & Treatment	63,053	(44,137)	(18,916)	-	-	-	-	-
18	Total	259,108	-	(18,916)	240,192	(5,354)	234,838	5,354	240,192
	Allocation of I/I								
19	Sanitary Sewer	259,108		(18,916)	240,192				
20	Stormwater	-	-	18,916	18,916	-	-	-	-
21	Total	$ 259,108	$ -	$ -	$ 259,108	$ -	$ -	$ -	$ -

Notes:

(a) 70% of allocated I/I costs are recovered by sanitary sewer rates and charges. 30% of allocated I/I costs are recovered by stormwater rates and charges.

(b) Reflects current policy of recovering discounts from all customer types.

TABLE WW - 15
WASTEWATER: INSIDE CITY RETAIL SERVICE UNIT COSTS OF SERVICE FOR RATE DESIGN
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Unadjusted Unit Cost	(3) COS Deficit Recovery Factor	(4) Billing Units Conversion Factor	(5) Total Adjustment Factor	(6) Adjusted Unit Cost
			$/Unit				$/Unit
	Collection System						
	Pumping Station						
1	Volume	Mcf	0.1997	1.0242	0.95	0.9730	0.1943
2	Capacity	Mcf/day	232.8485	1.0242	0.95	0.9730	226.5616
3	Sanitary Sewers - Capacity	Mcf/day	294.6846	1.0242	0.95	0.9730	286.7281
	WPC Plants						
4	Volume	Mcf	2.4060	1.0242	0.95	0.9730	2.3410
5	Capacity	Mcf/day	219.9000	1.0242	0.95	0.9730	213.9627
6	Suspended Solids	1,000 lbs	271.2683	1.0242	1.00	1.0242	277.8330
7	BOD	1,000 lbs	277.1550	1.0242	1.00	1.0242	283.8622
	Customer Costs						
8	Meter Costs	Eq. Meters	8.0009	1.0242	1.00	1.0242	8.1945
	Billing Costs						
9	Sanitary	Eq. Bills	3.0754	1.0242	1.00	1.0242	3.1498
10	Industrial Waste Unit - Retail	Eq. Meters	5.7707	1.0242	1.00	1.0242	5.9104
11	Infiltration/Inflow - Customer Related	Eq. Meters	29.8554	1.0242	1.00	1.0242	30.5779
12	Infiltration/Inflow - Volume Related	Volume	14.0824	1.0242	0.95	0.9730	13.7022

Mcf - Thousand cubic feet
lbs - pounds

TABLE WW - 16
WASTEWATER: DEVELOPMENT OF COST OF SERVICE
MONTHLY SERVICE CHARGE FOR CUSTOMERS WITH 5/8-INCH METERS
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Unit Cost	(3) Number of Units	(4) Total Cost
			$/Unit		$
	Customer Costs				
1	Meter Costs	Eq. Meter	0.6829	1.0	0.6829
2	Billing Costs	Eq. Bills	3.1498	1.0	3.1498
3	Industrial Waste Unit	Eq. Meter	0.4925	1.0	0.4925
4	Infiltration/Inflow Costs - Sanitary	Eq. Meter	2.5482	1.0	2.5482
5	Total Service Charge (a)				6.8734
6	Total Service Charge - Rounded (a)				6.87

(a) Prior to lag factor.

TABLE WW - 17
WASTEWATER: DEVELOPMENT OF COST OF SERVICE
VOLUME CHARGE PER MCF
OF NORMAL STRENGTH SANITARY WASTEWATERS
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Adjusted Unit Cost	(3) Number of Units	(4) Total Cost
			$/Unit		$
	Collection System				
	Pumping Stations				
1	Volume	Mcf	0.1943	1.0000	0.1943
2	Capacity	Mcf/day/mo.	18.8801	0.0493	0.9308
3	Sanitary Sewers: Capacity	Mcf/day/mo.	23.8940	0.1316	3.1445
	Water Pollution Control Plants				
4	Volume	Mcf	2.3410	1.0000	2.3410
5	Capacity	Mcf/day/mo.	17.8302	0.0493	0.8790
6	Suspended Solids	1,000 lbs	277.8330	0.0159	4.4175
7	BOD	1,000 lbs	283.8622	0.0165	4.6837
8	Total Cost per Mcf				16.5908
9	Infiltration/Inflow Cost	Mcf	13.7022	1.0000	13.7022
10	Total Cost + Infiltration/Inflow per Mcf (e)				30.2930
11	Total Cost per Mcf - Rounded (e)				30.29

(a) (1.0 Mcf * 1 month/30.4 days) * 1.5
(b) (1.0 Mcf * 1 month/30.4 days) * 4.0
(c) 1.0 Mcf @ 235 mg/l
(d) 1.0 Mcf @ 230 mg/l
(e) Prior to lag factor.

Mcf - Thousand cubic feet
Mcf/day - Thousand cubic feet/day
lbs - pounds
mg/l - milligram per liter

TABLE WW - 18
WASTEWATER: PROPOSED RATES FOR GENERAL SERVICE SANITARY SEWER

METER BASED SERVICE CHARGE

Line No.	Meter Size	(1) FY 2019 Monthly Charge	(2) FY 2020 Monthly Charge	(3) FY 2021 Monthly Charge
	Inches	$	$	$
1	5/8	7.20	7.58	8.03
2	3/4	9.16	9.64	10.22
3	1	13.39	14.14	14.97
4	1 1/2	23.49	24.85	26.29
5	2	36.19	38.33	40.52
6	3	65.17	69.09	72.99
7	4	110.83	117.44	124.10
8	6	218.35	231.45	244.53
9	8	345.40	366.20	386.86
10	10	498.57	528.56	558.40
11	12	905.54	960.64	1,014.55

QUANTITY CHARGE

Line No.		FY 2019 Charge per Mcf	FY 2020 Charge per Mcf	FY 2021 Charge per Mcf
		$	$	$
12	All billable water usage	31.76	33.81	35.74
13	Groundwater Charge	14.19	15.01	15.72

SURCHARGE RATES

Line No.		FY 2019 Charge per lb	FY 2020 Charge per lb	FY 2021 Charge per lb
		$	$	$
14	BOD (excess of 250 mg/l)	0.407	0.428	0.452
15	SS (excess of 350 mg/l)	0.398	0.417	0.443

Mcf-Thousand cubic feet
mg/l-milligrams per liter

In the Matter of the Philadelphia Water Department's Proposed Change in Water, Wastewater and Stormwater Rates and Related Charges

Fiscal Years 2019-2021

Philadelphia Water Department

Black & Veatch Management Consulting, LLC

Schedule BV-E2

Dated: February 9, 2018

Schedule REF #		Schedule Name
BV-E2	Black & Veatch Schedules	
1	TABLE WH-1	WASTEWATER WHOLESALE: ALLOCATION OF TEST YEAR PLANT INVESTMENT
2	TABLE WH-2	WASTEWATER: TEST YEAR OPERATION AND MAINTENANCE EXPENSE SUMMARY OF ALLOCATIONS
3	TABLE WH-3	WASTEWATER WHOLESALE: OUTSIDE CITY CONTRACT SERVICE UNITS OF SERVICE
4	TABLE WH-4	WASTEWATER: ESTIMATED AVERAGE WASTEWATER STRENGTH CONCENTRATIONS
5	TABLE WH-5	WASTEWATER WHOLESALE: WATER POLLUTION CONTROL PLANT INVESTMENT PER UNIT OF CAPACITY
6	TABLE WH-6	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO ABINGTON TOWNSHIP
7	TABLE WH-7	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO BENSALEM TOWNSHIP
8	TABLE WH-8	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO BUCKS COUNTY
9	TABLE WH-9	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO CHELTENHAM TOWNSHIP
10	TABLE WH-10	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO DELCORA
11	TABLE WH-11	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO LOWER MERION TOWNSHIP
12	TABLE WH-12	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO LOWER MORELAND TOWNSHIP
13	TABLE WH-13	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO LOWER SOUTHAMPTON TOWNSHIP
14	TABLE WH-14	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO SPRINGFIELD (EXCL. WYNDMOOR) TOWNSHIP
15	TABLE WH-15	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO SPRINGFIELD (WYNDMOOR) TOWNSHIP
16	TABLE WH-16	WASTEWATER WHOLESALE: SYSTEM INVESTMENT ALLOCATED TO UPPER DARBY

Schedule REF #		Schedule Name
BV-E2	Black & Veatch Schedules	
17	TABLE WH-17	WASTEWATER WHOLESALE: UNIT PUMPING AND TREATMENT OPERATION AND MAINTENANCE EXPENSE APPLICABLE TO CONTRACT SERVICE
18	TABLE WH-18	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO ABINGTON TOWNSHIP
19	TABLE WH-19	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO BENSALEM TOWNSHIP
20	TABLE WH-20	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO BUCKS COUNTY W&SA
21	TABLE WH-21	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO CHELTENHAM TOWNSHIP
22	TABLE WH-22	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO DELCORA
23	TABLE WH-23	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO LOWER MERION TOWNSHIP
24	TABLE WH-24	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO LOWER MORELAND TOWNSHIP
25	TABLE WH-25	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO LOWER SOUTHAMPTON TOWNSHIP
26	TABLE WH-26	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO SPRINGFIELD (EXCLUDING WYNDMOOR) TOWNSHIP
27	TABLE WH-27	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO SPRINGFIELD (INCLUDING WYNDMOOR) TOWNSHIP
28	TABLE WH-28	WASTEWATER WHOLESALE: OPERATING EXPENSE ALLOCATED TO UPPER DARBY TOWNSHIP
29	TABLE WH-29	WASTEWATER WHOLESALE: SUMMARY OF ALLOCATED COST OF SERVICE FOR CONTRACT CUSTOMERS
30	TABLE WH-30	WASTEWATER WHOLESALE: SUMMARY OF TEST YEAR 2019 CHARGES FOR WHOLESALE CONTRACT CUSTOMERS
31	TABLE WH-31	WASTEWATER WHOLESALE: SUMMARY OF PROJECTED FY2020 CHARGES FOR WHOLESALE CONTRACT CUSTOMERS
32	TABLE WH-32	WASTEWATER WHOLESALE: SUMMARY OF TEST YEAR 2021 CHARGES FOR WHOLESALE CONTRACT CUSTOMERS

TABLE WH - 1
WASTEWATER WHOLESALE: ALLOCATION OF TEST YEAR PLANT INVESTMENT AND DEPRECIATION
Test Year 2019

Line No.	Cost Component	(1) Total Direct Investment (a)	(2) Annual Depreciation Expense (b)
		$	$
	COLLECTION SYSTEM		
1	Sewers - Capacity	1,494,948,000	29,723,000
2	Pumping Stations - Capacity	30,239,000	751,000
3	LTCP Investment	54,692,000	1,094,000
4	Total Collection System	1,579,879,000	31,568,000
	WATER POLLUTION CONTROL PLANTS		
	Northeast Plant:		
	Retail, Abington, Bensalem, Bucks Cty. W&SA,		
	Lower Moreland, and Lower Southampton		
5	Capacity	5,635,000	
	Retail, Abington, Bensalem, Bucks Cty. W&SA,		
	Cheltenham, Lower Moreland, & Lower Southampton		
6	Volume	67,307,000	
7	Capacity	26,353,000	
8	Suspended Solids	72,697,000	
9	BOD	94,462,000	
10	Total Northeast Plant	266,454,000	5,783,000
	Southwest Plant:		
	Retail		
11	Capacity	16,696,000	
	Retail, DELCORA, Lower Merion, Springfield		
	excl. Wyndmoor), & Upper Darby		
12	Volume	70,838,000	
13	Capacity	23,065,000	
14	Suspended Solids	59,757,000	
15	BOD	53,583,000	
16	Total Southwest Plant	223,939,000	3,734,000
	Southeast Plant:		
	Retail and Springfield (Wyndmoor)		
17	Volume	46,556,000	
18	Capacity	49,385,000	
19	Suspended Solids	25,344,000	
20	BOD	25,288,000	
21	Total Southeast Plant	146,573,000	3,660,000
22	Total Water Pollution Control Plants	636,966,000	13,177,000
23	Total Investment	2,216,845,000	44,745,000

(a) Plant Investment as of 6/30/2016. Includes Administration & General Costs.

(b) Based upon 2 percent of the depreciable investment in the collection system and 2.5 percent of the depreciable investment in treatment and pumping facilities.

TABLE WH - 2
WASTEWATER: TEST YEAR OPERATION AND MAINTENANCE EXPENSE
SUMMARY OF ALLOCATIONS
Test Year 2019

Line No.	Cost Component	(1) Direct Operation & Maintenance Expense	(2) Administrative & General Expenses: Direct Assignment	(3) Administrative & General Expenses: Allocated	(4) Total Operation & Maintenance Expense	(5) O&M Expense Deductions: Less Interest Income	(6) O&M Expense Deductions: Less Grants	(7) Net Operation & Maintenance Expense
		$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
	COLLECTION SYSTEM							
	Sewer Maintenance							
1	All Customers - Capacity	28,699	26,079	30,577	85,355	96	-	85,259
	Inlet Cleaning							
2	Retail - Storm Capacity	11,271	537	4,738	16,546	19	-	16,527
	Neill Drive Pumping Station							
	Retail and Lower Merion							
3	Total Volume	54	-	-	54	-	-	54
4	Total Capacity	121	-	54	175	-	-	175
	Central Schuykill Pumping Station							
	Retail and Springfield (excl. Wyndmoor)							
5	Total Volume	692	-	-	692	1	-	691
6	Total Capacity	278	-	129	407	-	-	407
	All Other Pumping Stations							
	Retail							
7	Total Volume	2,389	-	-	2,389	3	-	2,386
8	Total Capacity	12,870	-	5,094	17,964	20	-	17,944
	Green Stormwater Infrastructure Maintenance							
9	All Customers - Capacity	6,884	7,704	6,169	20,757	23	-	20,734
10	Total Collection Systems	63,258	34,320	46,761	144,339	162	-	144,177
	WATER POLLUTION CONTROL PLANTS							
	Northeast Plant:							
	Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland & Lower Southampton							
11	Volume	595	-	-	595	1	7	587
12	Capacity	1,721	-	645	2,366	3	29	2,334
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham,							
	Lower Moreland, and Lower Southampton							
13	Volume	8,676	-	3,634	12,310	14	149	12,147
14	Capacity	2,646	-	1,112	3,758	4	46	3,708
15	Suspended Solids	13,303	45	5,512	18,860	21	229	18,610
16	BOD	12,885	-	3,977	16,862	19	205	16,638
	Southwest Plant:							
	Retail							
17	Volume	76	-	-	76	-	1	75
18	Capacity	283	-	191	474	1	6	467
	Retail, DELCORA, Lower Merion, Springfield (Excluding Wyndmoor), and Upper Darby							
19	Volume	8,984	-	3,500	12,484	14	152	12,318
20	Capacity	3,082	-	1,137	4,219	5	51	4,163
21	Suspended Solids	11,048	46	4,329	15,423	15	187	15,221
22	BOD	8,753	-	2,398	11,151	13	135	11,003
	Southeast Plant:							
	Retail and Springfield (Wyndmoor)							
23	Volume	6,086	-	2,439	8,525	10	103	8,412
24	Capacity	3,069	-	1,451	4,520	5	55	4,460
25	Suspended Solids	6,687	45	2,724	9,456	11	115	9,330
26	BOD	2,365	-	934	3,299	4	40	3,255
27	Total Water Pollution Control Plants	90,259	136	33,983	124,378	140	1,510	122,728
	CUSTOMER COSTS							
	All Customers							
28	Equivalent Bills	22,904	-	7,861	30,765	35	-	30,730
	Equivalent Meters							
29	Industrial Waste Unit	2,590	-	889	3,479	4	-	3,475
30	Other	3,521	-	1,208	4,729	5	-	4,724
31	Excess Strength Wastewater - Direct	1,276	-	438	1,714	2	-	1,712
32	Stormwater Incentive Programs	945	-	324	1,269	1	-	1,268
33	Total Customer Costs	31,236	-	10,720	41,956	47	-	41,909
34	Total Operation & Maintenance Expens	184,753	34,456	91,464	310,673	349	1,510	308,814

TABLE WH - 3
WASTEWATER WHOLESALE: OUTSIDE CITY CONTRACT SERVICE UNITS OF SERVICE
Test Year 2019

Line No.		(1) Units	(2) Abington	(3) Bensalem	(4) Bucks County	(5) Cheltenham	(6) Lower Moreland	(7) Lower Southhampton	(8) Total Northeast	(9) DELCORA	(10) Lower Merion	(11) Springfield (Excluding Wyndmoor)	(12) Upper Darby	(13) Total Southwest	(14) Springfield (Wyndmoor)	(15) Total
	FY 2019 Test Year															
	Volume															
1	Sanitary Wastewater	(Mcf)	98,000	170,000	800,000	325,000	55,000	260,000	1,708,000	1,200,000	350,000	150,000	460,000	2,160,000	19,000	3,887,000
2	Infiltration	(Mcf)	4,500	5,600	35,100	15,000	2,800	7,500	70,500	-	14,900	2,200	16,600	33,700	900	105,100
3	Total	(Mcf)	102,500	175,600	835,100	340,000	57,800	267,500	1,778,500	1,200,000	364,900	152,200	476,600	2,193,700	19,900	3,992,100
	Suspended Solids															
4	Sanitary Wastewater	(1,000 lbs)	1,003	2,249	10,483	2,799	601	2,498	19,633	13,029	3,494	1,797	4,593	22,913	160	42,706
5	Infiltration	(1,000 lbs)	28	35	219	94	17	47	440	-	93	14	104	211	6	657
6	Total	(1,000 lbs)	1,031	2,284	10,702	2,893	618	2,545	20,073	13,029	3,587	1,811	4,697	23,124	166	43,363
	BOD															
7	Sanitary Wastewater	(1,000 lbs)	1,400	2,705	9,884	2,393	450	2,093	18,925	11,307	3,101	1,704	3,990	20,102	124	39,151
8	Infiltration	(1,000 lbs)	7	9	55	23	4	12	110	-	23	3	26	52	1	163
9	Total	(1,000 lbs)	1,407	2,714	9,939	2,416	454	2,105	19,035	11,307	3,124	1,707	4,016	20,154	125	39,314
	Contract Maximum Units															
	Capacity															
10	Sanitary Wastewater	(Mcf/day)	824	1,014	6,416	2,743	508	1,364	12,869	13,392	2,728	397	3,024	19,541	167	32,577
11	Infiltration	(Mcf/day)	20	20	140	60	10	30	280	-	60	10	70	140	-	420
12	Total	(Mcf/day)	844	1,034	6,556	2,803	518	1,394	13,149	13,392	2,788	407	3,094	19,681	167	32,997
	Volume															
13	Sanitary Wastewater	(Mcf)	217,292	299,271	1,171,123	654,370	92,714	348,409	2,783,179	2,439,840	707,553	156,150	829,545	4,133,088	48,797	6,965,064
14	Infiltration	(Mcf)	4,500	5,600	35,100	15,000	2,800	7,500	70,500	-	14,900	2,200	16,600	33,700	900	105,100
15	Total	(Mcf)	221,792	304,871	1,206,223	669,370	95,514	355,909	2,853,679	2,439,840	722,453	158,350	846,145	4,166,788	49,697	7,070,164
	Suspended Solids															
16	Sanitary Wastewater	(1,000 lbs)	2,481	3,734	13,400	5,635	966	6,000	32,216	19,487	7,250	3,300	7,349	37,386	200	69,802
17	Infiltration	(1,000 lbs)	28	35	219	94	17	47	440	-	93	14	104	211	6	657
18	Total	(1,000 lbs)	2,509	3,769	13,619	5,729	983	6,047	32,656	19,487	7,343	3,314	7,453	37,597	206	70,459
	BOD															
19	Sanitary Wastewater	(1,000 lbs)	2,102	5,340	13,400	4,818	729	5,500	31,889	21,771	6,871	3,100	6,831	38,573	155	70,617
20	Infiltration	(1,000 lbs)	7	9	55	23	4	12	110	-	23	3	26	52	1	163
21	Total	(1,000 lbs)	2,109	5,349	13,455	4,841	733	5,512	31,999	21,771	6,894	3,103	6,857	38,625	156	70,780

Mcf - thousand cubic feet
Mcf/day - thousand cubic feet per day
lbs - pounds

TABLE WH - 4
WASTEWATER: ESTIMATED AVERAGE WASTEWATER STRENGTH CONCENTRATIONS
Test Year 2019

Customer	(1) Average Wastewater Strength Concentration Suspended Solids	(2) Average Wastewater Strength Concentration BOD
	mg/l	mg/l
Abington	164	229
Bensalem	212	255
Bucks County	210	198
Cheltenham	138	118
DELCORA	174	151
Lower Merion	160	142
Lower Moreland	175	131
Lower Southhampton	154	129
Springfield (excluding Wyndoor)	192	182
Springfield (Wyndoor)	135	105
Upper Darby	160	139

mg/l - milligram per liter

TABLE WH - 5
WATER POLLUTION CONTROL PLANT INVESTMENT PER UNIT OF CAPACITY
Test Year 2019

Line No.	Cost Component	(1) Direct Investment (a)	(2) Units of Capacity	(3) Unit Investment	
		$		$	
	Northeast Water Pollution Control Plant Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton				
1	- Capacity	5,635,000	370 mgd = 49,470 Mcf/day	113.9074	/Mcf/day
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton				
2	Volume	67,307,000	76,650 mg = 10,247,000 Mcf	6.5685	/Mcf
3	Capacity	26,353,000	420 mgd = 56,150 Mcf/day	469.3321	/Mcf/day
4	Suspended Solids	72,697,000	173,240,000 lbs	419.6317	/1,000 lbs
5	BOD	94,462,000	128,491,000 lbs	735.1643	/1,000 lbs
	Southwest Water Pollution Control Plant				
6	Retail - Capacity	16,696,000	50 mgd = 6,684 Mcf/day	2,497.9054	/Mcf/day
	Retail, DELCORA, Lower Merion, Springfield, (excluding Wyndmoor), and Upper Darby				
7	Volume	70,838,000	73,000 mg = 9,759,000 Mcf	7.2587	/Mcf
8	Capacity	23,065,000	400 mgd = 53,476 Mcf/day	431.3150	/Mcf/day
9	Suspended Solids	59,757,000	133,057,000 lbs	449.1083	/1,000 lbs
10	BOD	53,583,000	78,907,000 lbs	679.0674	/1,000 lbs
	Southeast Water Pollution Control Plant Retail and Springfield (Wyndmoor)				
11	Volume	46,556,000	40,880 mg = 5,465,000 Mcf	8.5189	/Mcf
12	Capacity	49,385,000	224 mgd = 29,947 Mcf/day	1,649.0800	/Mcf/day
13	Suspended Solids	25,344,000	66,065,000 lbs	383.6222	/1,000 lbs
14	BOD	25,288,000	56,940,000 lbs	444.1166	/1,000 lbs

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.

mg - million gallons
mgd - million gallons per day
Mcf - thousand cubic feet
Mcf/day - thousand cubic feet per day
lbs - pounds

TABLE WH - 6
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
ABINGTON TOWNSHIP
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton						
1	Capacity	Mcf/day	113.9074	844	-	96,138	96,000
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton						
2	Volume	Mcf	6.5685	221,792	-	1,456,841	1,457,000
3	Capacity	Mcf/day	469.3321	844	-	396,116	396,000
4	SS	1,000 lbs	419.6317	2,509	-	1,052,856	1,053,000
5	BOD	1,000 lbs	735.1643	2,109	-	1,550,462	1,550,000
6	Total Treatment		-	-	-	4,552,413	4,552,000
	Conveyance						
7	Shady Lane & City Line	cfs	58,421	1.3680	1.0225	81,718	82,000
8	Pennypack & City Line	cfs	49,045	7.6940	1.0225	385,843	386,000
9	Cottman and Orville	cfs	45,328	0.4800	1.0225	22,247	22,000
10	Total Conveyance		-	-	-	489,808	490,000

Long Term Control Plan (LTCP)

Line No.	Cost Component	System Investment		Allocation		Allocated Investment (a)	Allocated Investment Rounded (a)
		$				$	$
11	LTCP Infrastructure Investment	54,692,000		0.58244%		318,546	319,000
12	Total Allocated System Investment	-	-	0.00000%	-	$ 5,360,767	$ 5,361,000

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 7
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
BENSALEM TOWNSHIP
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton						
1	Capacity	Mcf/day	113.9074	1,034	-	117,780	118,000
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton						
2	Volume	Mcf	7	304,871	-	2,002,545	2,003,000
3	Capacity	Mcf/day	469	1,034	-	485,289	485,000
4	SS	1,000 lbs	420	3,769	-	1,581,592	1,582,000
5	BOD	1,000 lbs	735	5,349	-	3,932,394	3,932,000
6	Total Treatment			-	-	8,119,600	8,120,000
	Conveyance						
7	A-1	cfs	84,833	0.3700	1.02250	32,094	32,000
8	A-2	cfs	105,688	0.8800	1.02250	95,098	95,000
9	A-3	cfs	117,743	0.1200	1.02250	14,447	14,000
10	A-4	cfs	115,847	0.0800	1.02250	9,476	9,000
11	B	cfs	131,354	0.8400	1.02250	112,820	113,000
12	C	cfs	72,634	0.7500	1.02250	55,701	56,000
13	D	cfs	67,910	0.4600	1.02250	31,941	32,000
14	E	cfs	204,911	0.3800	1.02250	79,618	80,000
15	F	cfs	49,726	0.5800	1.02250	29,490	29,000
16	G-1	cfs	48,680	0.2700	1.02250	13,439	13,000
17	G-2	cfs	48,680	0.5100	1.02250	25,385	25,000
18	H	cfs	64,044	2.7200	1.02250	178,119	178,000
19	J-1	cfs	133,427	0.6760	1.02250	92,226	92,000
20	J-2	cfs	38,820	0.1610	1.02250	6,391	6,000
21	J-3	cfs	258,008	0.3830	1.02250	101,040	101,000
22	K-1	cfs	204,907	0.4300	1.02250	90,092	90,000
23	K-2	cfs	66,776	2.1300	1.02250	145,433	145,000
24	Total Conveyance	-	-	-	-	1,112,810	1,110,000

Long Term Control Plan (LTCP)

Line No.	Cost Component	System Investment	Allocation	Allocated Investment (a)	Allocated Investment Rounded (a)
		$		$	$
25	LTCP Infrastructure Investment	54,692,000	0.0000%	-	-
26	Total Allocated System Investment	-	0.0000%	$ 9,232,410	$ 9,230,000

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 8
WASTEWATER SYSTEM INVESTMENT ALLOCATED TO BUCKS COUNTY
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton						
1	Capacity	Mcf/day	113.9074	6,556	-	746,777	747,000
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton						
2	Volume	Mcf	6.5685	1,206,223	-	7,923,076	7,923,000
3	Capacity	Mcf/day	469.3321	6,556	-	3,076,941	3,077,000
4	SS	1,000 lbs	419.6317	13,619	-	5,714,964	5,715,000
5	BOD	1,000 lbs	735.1643	13,455	-	9,891,636	9,892,000
6	Total Treatment			-	-	27,353,394	27,354,000
	Conveyance						
7	Large Sewers	cfs	18,000	85.08	1.02250	1,565,897	1,566,000
8	Total Conveyance	-	-		-	1,565,897	1,566,000

Long Term Control Plan (LTCP)

Line No.	Cost Component	System Investment	Allocation		Allocated Investment (a)	Allocated Investment Rounded (a)
		$			$	$
9	LTCP Infrastructure Investment	54,692,000	4.53163%		2,478,441	2,478,000
10	Total Allocated System Investment				**31,397,732**	**31,398,000**

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 9
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
CHELTENHAM TOWNSHIP
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton						
1	Capacity	Mcf/day	-	2,803	-	-	-
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton						
2	Volume	Mcf	6.5685	669,370	-	4,396,757	4,397,000
3	Capacity	Mcf/day	469.3321	2,803	-	1,315,538	1,316,000
4	SS	1,000 lbs	419.6317	5,729	-	2,404,070	2,404,000
5	BOD	1,000 lbs	735.1643	4,841	-	3,558,930	3,559,000
6	Total Treatment					11,675,295	11,676,000
	Conveyance						
7	Cheltenham and Tacony Creek	cfs	15,378	29.00	1.02250	455,996	456,000
8	Bouvier Street	cfs	23,315	2.75	1.02250	65,559	66,000
9	Total Conveyance					521,555	522,000

Long Term Control Plan (LTCP)

Line No.	Cost Component	System Investment		Allocation		Allocated Investment (a)	Allocated Investment Rounded (a)
		$				$	$
10	LTCP Infrastructure Investment	54,692,000		2.42801%		1,327,924	1,328,000
11	Total Allocated System Investment					**13,524,774**	**13,526,000**

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 10
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
DELCORA
Fiscal Year 2019

	(1)	(2)	(3)	(4)	(5)
Treatment					
Line No.	**Cost Component**	**Units**	**Investment Per Unit (a)**	**Number of Contract Units**	**Allocated Investment (a)**	**Allocated Investment Rounded (a)**
			$		$	$
	SW Treatment Plant: Retail, DELCORA, Lower Merion, Springfield, (excluding Wyndmoor), and Upper Darby					
1	Volume	Mcf	7.2587	2,439,840	17,710,067	17,710,000
2	Capacity	Mcf/day	431.3150	13,392	5,776,170	5,776,000
3	SS	1,000 lbs	449.1083	19,487	8,751,773	8,752,000
4	BOD	1,000 lbs	679.0674	21,771	14,783,976	14,784,000
5	Total Treatment				47,021,986	47,022,000

Long Term Control Plan (LTCP)					
Line No.		**System Investment**	**Allocation**	**Allocated Investment (a)**	**Allocated Investment Rounded (a)**
		$		$	$
6	LTCP Infrastructure Investment	54,692,000	9.44287%	5,164,495	5,164,000
7	Total Allocated System Investment			**$ 52,186,481**	**$ 52,186,000**

(a) Estimated Plant Investment as of 6/30/2016. Includes Administration and General costs.

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 11
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
LOWER MERION TOWNSHIP
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, DELCORA, Lower Merion, Springfield, (excluding Wyndmoor), and Upper Darby						
1	Volume	Mcf	7.2587	722,453	-	5,244,070	5,244,000
2	Capacity	Mcf/day	431.3150	2,788	-	1,202,506	1,203,000
3	SS	1,000 lbs	449.1083	7,343	-	3,297,802	3,298,000
4	BOD	1,000 lbs	679.0674	6,894	-	4,681,491	4,681,000
5	Total Treatment					14,425,869	14,426,000
	Conveyance						
6	City Avenue & 73rd Street	cfs	30,189	2.860	1.0225	88,283	88,000
7	City Avenue & 66th Street	cfs	35,407	15.880	1.0225	574,914	575,000
8	City Avenue & Overbrook Station	cfs	69,259	2.290	1.0225	162,172	162,000
9	City Avenue & 59th Street	cfs	132,481	0.330	1.0225	44,702	45,000
10	City Avenue & 54th Street	cfs	57,917	0.050	1.0225	2,961	3,000
11	City Avenue & 51st Street	cfs	60,355	8.470	1.0225	522,709	523,000
12	City Avenue & Conshohocken Avenue	cfs	103,583	0.390	1.0225	41,306	41,000
	City Avenue & Presidential Boulevard						
13	Sewers and Meter Station	cfs	134,831	1.300	1.0225	179,224	179,000
14	Neill Drive Pump Station	cfs	143,297	1.300	1.0225	190,478	190,000
	Barclay Building & Friends Central School						
15	Charged Inside Rates	cfs	43,227	0.052	1.0225	2,298	2,000
16	Total Conveyance					1,809,047	1,808,000

Long Term Control Plan (LTCP):

Line No.	Cost Component	System Investment	Allocation	Allocated Investment (a)	Allocated Investment Rounded (a)
		$		$	$
17	LTCP Infrastructure Investment	54,692,000	0.00000%	-	-
18	Total Allocated System Investment			**16,234,916**	**16,234,000**

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 12
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
LOWER MORELAND TOWNSHIP
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton						
1	Capacity	Mcf/day	113.9074	518	-	59,004	59,000
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton						
2	Volume	Mcf	6.5685	95,514.00	-	627,384	627,000
3	Capacity	Mcf/day	469.3321	518.00	-	243,114	243,000
4	SS	1,000 lbs	419.6317	983.00	-	412,498	412,000
5	BOD	1,000 lbs	735.1643	733.00	-	538,875	539,000
6	Total Treatment					1,880,875	1,880,000
	Conveyance						
7	Woodhaven Road and City Line	cfs	195,719	0.4140	1.0225	82,851	83,000
8	Erwin Street and County Line	cfs	94,589	0.0650	1.0225	6,287	6,000
9	Moreland Road and Pine Road	cfs	64,910	0.0350	1.0225	2,323	2,000
10	Pine Road and Radburn Road	cfs	66,406	0.0380	1.0225	2,580	3,000
11	Welsh Road and County Line	cfs	66,860	0.6060	1.0225	41,429	41,000
12	City Line and Red Lion	cfs	66,860	0.0170	1.0225	1,162	1,000
13	Conveyance Line	cfs	62,555	7.7960	1.0225	498,652	499,000
14	PC-30 Improvements (b)					70,102	70,000
15	Total Conveyance					705,386	705,000

Long Term Control Plan (LTCP):

Line No.	Cost Component	System Investment	Allocation	Allocated Investment (a)	Allocated Investment Rounded (a)
		$		$	$
16	LTCP Infrastructure Investment	54,692,000	0.35883%	196,251	196,000
17	Total Allocated System Investment			2,782,512	2,781,000

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.
(b) Allocated 0.15 percent of the Sewer Fund's share of the project funding ($46,734,645).

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 13
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
LOWER SOUTHAMPTON TOWNSHIP
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton						
1	Capacity	Mcf/day	113.9074	1,394	-	158,787	159,000
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton						
2	Volume	Mcf	6.5685	355,909	-	2,337,788	2,338,000
3	Capacity	Mcf/day	469.3321	1,394	-	654,249	654,000
4	SS	1,000 lbs	419.6317	6,047	-	2,537,513	2,538,000
5	BOD	1,000 lbs	735.1643	5,512	-	4,052,226	4,052,000
6	Total Treatment					9,740,563	9,741,000
	Conveyance						
7	Trevose and City Line	cfs	92,315	15.79	1.0225	1,490,451	1,490,000
8	PC-30 Improvements (b)					8,730,032	8,730,000
9	Total Conveyance					10,220,483	10,220,000

Long Term Control Plan (LTCP)

Line No.	Cost Component		System Investment	Allocation		Allocated Investment (a)	Allocated Investment Rounded (a)
			$			$	$
10	LTCP Infrastructure Investment		54,692,000	0.96317%		526,778	527,000
11	Total Allocated System Investment					**20,487,824**	**20,488,000**

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.
(b) Allocated 18.68 percent of the Sewer Fund's share of the project funding ($4,6734,645).

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 14
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
SPRINGFIELD (EXCL. WYNDMOOR) TOWNSHIP
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, DELCORA, Lower Merion, Springfield, (excluding Wyndmoor), and Upper Darby						
1	Volume	Mcf	7.2587	158,350	-	1,149,415	1,149,000
2	Capacity	Mcf/day	431.3150	407	-	175,545	176,000
3	SS	1,000 lbs	449.1083	3,314	-	1,488,345	1,488,000
4	BOD	1,000 lbs	679.0674	3,103	-	2,107,146	2,107,000
5	Total Treatment					4,920,451	4,920,000
	Conveyance (b)						
	Erdenheim and Stenton						
6	Sewers	cfs	139,780	2.00	1.0225	285,850	286,000
7	Central Schuylkill Pump Station	cfs	13,211	2.00	1.0225	27,016	27,000
8	Meter Station	ea	35,702	1.00	1.0225	36,505	37,000
9	Total					349,371	350,000
	Northwestern and Stenton						
10	Sewers	cfs	139,780	2.60	1.0225	371,605	372,000
11	Central Schuylkill Pump Station	cfs	13,211	2.60	1.0225	35,121	35,000
12	Meter Station	ea	10,270	1.00	1.0225	10,501	11,000
13	Total	-	-	-	-	417,227	418,000
14	Total Conveyance					766,598	768,000

Long Term Control Plan (LTCP)

Line No.	Cost Component	System Investment	Allocation	Allocated Investment (a)	Allocated Investment Rounded (a)
		$		$	$
15	LTCP Infrastructure Investment	54,692,000	0.79320%	433,817	434,000
16	Total Allocated System Investment			**6,120,866**	**6,122,000**

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.
(b) Excludes connection at Northwestern and Thomas which accounts for less than one half of one percent of township flow.

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 15
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
SPRINGFIELD (WYNDMOOR) TOWNSHIP
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail and Springfield (Wyndmoor)						
1	Volume	Mcf	8.5189	49,697	-	423,364	423,000
2	Capacity	Mcf/day	1,649.0800	167	-	275,396	275,000
3	SS	1,000 lbs	383.6222	206	-	79,026	79,000
4	BOD	1,000 lbs	444.1166	156	-	69,282	69,000
5	Total Treatment					847,068	846,000
	Conveyance						
6		cfs	167,854	1.93	1.0225	331,247	331,000
7	Total Conveyance					331,247	331,000
8	Total Allocated System Investment					**1,178,315**	**1,177,000**

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 16
WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
UPPER DARBY
Test Year 2019

Line No.	Cost Component	(1) Units	(2) Investment Per Unit (a)	(3) Number of Contract Units	(4) Infiltration/Inflow Capacity Allocation Factor	(5) Allocated Investment (a)	(6) Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, DELCORA, Lower Merion, Springfield,						
	(excluding Wyndmoor), and Upper Darby						
1	Volume	Mcf	7.2587	846,145	-	6,141,913	6,142,000
2	Capacity	Mcf/day	431.3150	3,094	-	1,334,489	1,334,000
3	SS	1,000 lbs	449.1083	7,453	-	3,346,980	3,347,000
4	BOD	1,000 lbs	679.0674	6,857	-	4,656,365	4,656,000
5	Total Treatment					15,479,747	15,479,000
	Conveyance						
6	60th Street and Cobbs Creek Parkway	cfs	20,191	35.00	1.0225	722,585	723,000
7	Total Conveyance					722,585	723,000

Long Term Control Plan (LTCP)

Line No.	Cost Component	System Investment	Allocation		Allocated Investment (a)	Allocated Investment Rounded (a)
		$			$	$
8	LTCP Infrastructure Investment	54,692,000	0.00%		-	-
9	Total Allocated System Investment				**16,202,332**	**16,202,000**

(a) Plant Investment as of 6/30/2016. Includes Administration and General costs.

cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 17
WASTEWATER WHOLESALE: UNIT PUMPING AND TREATMENT OPERATION AND MAINTENANCE EXPENSE APPLICABLE TO CONTRACT SERVICE
Test Year 2019

Line No.	Cost Component	(1) Net Operating Expense	(2) Projected TY Units of Service		(3) Unit Operating Expense
		$			$/Unit
	PUMPING STATIONS				
	Neill Drive Pumping Station				
	Retail and Lower Merion				
1	Total Volume	54,000	69,650	Mcf	0.7753
2	Total Capacity	175,400	370	Mcf/day	474.0541
	Central Schuykill Pumping Station				
	Retail and Springfield (excl. Wyndmoor)				
3	Total Volume	691,000	2,715,700	Mcf	0.2544
4	Total Capacity	407,000	22,110	Mcf/day	18.4080
	WATER POLLUTION CONTROL PLANTS				
	Northeast Plant				
	Retail and Cheltenham				
5	Volume	-	NA	Mcf	-
6	Capacity	-	NA	Mcf/day	-
	Retail, Abington, Bensalem, Bucks County W&SA,				
	Lower Moreland, and Lower Southampton				
7	Volume	587,000	5,597,000	Mcf	0.1049
8	Capacity	2,334,000	35,180	Mcf/day	66.3445
	Retail, Abington, Bensalem, Bucks County W&SA,				
	Lower Moreland, and Lower Southampton				
9	Volume	12,147,000	7,564,000	Mcf	1.6059
10	Capacity	3,708,000	47,544	Mcf/day	77.9909
11	Suspended Solids	18,610,000	87,641	1,000 lbs	212.3435
12	BOD	16,638,000	67,015	1,000 lbs	248.2728
	Southwest Plant:				
	Retail, DELCORA, Lower Merion, Springfield				
	(Excluding Wyndmoor), and Upper Darby				
13	Volume	12,318,000	7,807,000	Mcf	1.5778
14	Capacity	4,163,000	49,071	Mcf/day	84.8363
15	Suspended Solids	15,220,799	80,781	1,000 lbs	188.4205
16	BOD	11,003,000	57,721	1,000 lbs	190.6239
	Southeast Plant:				
	Retail and Springfield (Wyndmoor)				
17	Volume	8,412,000	3,757,000	Mcf	2.2390
18	Capacity	4,460,000	23,614	Mcf/day	188.8710
19	Suspended Solids	9,330,000	33,986	1,000 lbs	274.5248
20	BOD	3,255,000	26,171	1,000 lbs	124.3743

NA - Not Applicable
Mcf - thousand cubic feet
Mcf/day - thousand cubic feet per day
lbs - pounds

TABLE WH - 18
OPERATING EXPENSE
ALLOCATED TO
ABINGTON TOWNSHIP
Test Year 2019

		(1)		(2)		(3)	(4)	(5)
	Collection System:							
Line No.	**Cost Component**	**Allocated Investment**				**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
		$				$	$	$
1	Sewer Maintenance (a)	490,000	x	4.00%		19,600	-	19,600
	Treatment:							
Line No.	**Cost Component**	**Operating Expense Per Unit**		**Test Yr. No. of Units**		**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
		$				$	$	$
	NE Treatment Plants: Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton							
2	Volume	0.1049	$/Mcf	102,500	Mcf	10,752	-	10,752
3	Capacity	66.3445	$/Mcf/day	844	Mcf/day	55,995	-	55,995
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton							
4	Volume	1.6059	$/Mcf	102,500	Mcf	164,605	-	164,605
5	Capacity	77.9909	$/Mcf/day	844	Mcf/day	65,824	-	65,824
6	Suspended Solids	212.3435	$/1,000 lbs	1,031	1,000 lbs	218,926	-	218,926
7	BOD	248.2728	$/1,000 lbs	1,407	1,000 lbs	349,320	-	349,320
8	Customer Costs					13,800	-	13,800
9	Total Treatment					898,822	-	898,822
	Long Term Control Plan (LTCP)							
Line No.	**LTCP O&M Costs**			**System Annual Cost**	**Allocation**	**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
				$		$	$	$
10	Amortization of SMIP/GARP Expenses (b)			1,926,509	0.58244%	11,221		11,221
11	LTCP O&M Costs			1,914,220	0.58244%	11,149	-	11,149
12	Total Annual Operating Expense					921,192	-	921,192
13	Total - Rounded					921,000		921,000

(a) Based on investment in sewers serving Abington.
(b) Reflects amortization of SMIP/GARP costs over 20 years at 5.5% long term bond interest rate.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 19
OPERATING EXPENSE
ALLOCATED TO
BENSALEM TOWNSHIP
Test Year 2019

		(1)		(2)		(3)	(4)	(5)
	Collection System:							
Line No.	**Cost Component**	**Allocated Investment**				**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
		$				$	$	$
1	Sewer Maintenance (a)	1,110,000	x	4.00%		44,400	-	44,400
	Treatment:							
Line No.	**Cost Component**	**Operating Expense Per Unit**		**Test Yr. No. of Units**		**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
		$				$	$	$
	NE Treatment Plants: Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton							
2	Volume	0.1049	$/Mcf	175,600	Mcf	18,420	-	18,420
3	Capacity	66.3445	$/Mcf/day	1,034	Mcf/day	68,600	-	68,600
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton							
4	Volume	1.6059	$/Mcf	175,600	Mcf	281,996	-	281,996
5	Capacity	77.9909	$/Mcf/day	1,034	Mcf/day	80,643	-	80,643
6	Suspended Solids	212.3435	$/1,000 lbs	2,284	1,000 lbs	484,993	-	484,993
7	BOD	248.2728	$/1,000 lbs	2,714	1,000 lbs	673,812	-	673,812
8	Customer Costs					49,400	-	49,400
9	Total Treatment					1,702,264	-	1,702,264
	Long Term Control Plan (LTCP):							
Line No.	**LTCP O&M Costs**			**System Annual Cost**	**Allocation**	**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
				$		$	$	$
10	Amortization of SMIP/GARP Expenses (b)			1,926,509	0.00000%	-	-	-
11	LTCP O&M Costs			1,914,220	0.00000%	-	-	-
12	Total					1,702,264	-	1,702,264
13	Total - Rounded					1,702,000		1,702,000

(a) Based on investment in sewers serving Bensalem.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 20
OPERATING EXPENSE
ALLOCATED TO
BUCKS COUNTY W&SA
Test Year 2019

Collection System:

Line No.	Cost Component	(1) Allocated Investment		(2)		(3) Allocated Operating Expense	(4) Adjustment for Contract	(5) Total Adjusted Operating Expense
		$				$	$	$
1	Sewer Maintenance (a)	1,566,000.00	x	4.00%		62,640	-	62,640

Treatment:

Line No.	Cost Component	Operating Expense Per Unit		Test Yr. No. of Units		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
	NE Treatment Plants: Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton							
2	Volume	0.1049	$/Mcf	835,100	Mcf	87,602	-	87,602
3	Capacity	66.3445	$/Mcf/day	6,556	Mcf/day	434,955	-	434,955
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton							
4	Volume	1.6059	$/Mcf	835,100	Mcf	1,341,087	-	1,341,087
5	Capacity	77.9909	$/Mcf/day	6,556	Mcf/day	511,308	-	511,308
6	Suspended Solids	212.3435	$/1,000 lbs	10,702	1,000 lbs	2,272,500	-	2,272,500
7	BOD	248.2728	$/1,000 lbs	9,939	1,000 lbs	2,467,583	-	2,467,583
8	Customer Costs					16,200	-	16,200
9	Total Treatment					7,193,875	-	7,193,875

Long Term Control Plan (LTCP):

Line No.	LTCP O&M Costs	System Annual Cost	Allocation	Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$		$	$	$
10	Amortization of SMIP/GARP Expenses (b)	1,926,509	4.53163%	87,302	-	87,302
11	LTCP O&M Costs	1,914,220	4.53163%	86,745	-	86,745
12	Total			7,367,922	-	7,367,922
13	Total - Rounded			7,368,000		7,368,000

(a) Based on investment in sewers serving Bucks County W&SA.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 21
OPERATING EXPENSE
ALLOCATED TO
CHELTENHAM TOWNSHIP
Test Year 2019

Collection System:

Line No.	Cost Component	(1) Allocated Investment		(2)		(3) Allocated Operating Expense	(4) Adjustment for Contract	(5) Total Adjusted Operating Expense
		$				$	$	$
1	Sewer Maintenance (a)	522,000	x	4.00%		20,880	-	20,880

Treatment:

Line No.	Cost Component	Operating Expense Per Unit		Test Yr. No. of Units		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
	NE Treatment Plants: Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton							
2	Volume	NA	$/Mcf	340,000	Mcf	-	-	-
3	Capacity	NA	$/Mcf/day	2,803	Mcf/day	-	-	-
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton							
4	Volume	1.6059	$/Mcf	340,000	Mcf	546,006	-	546,006
5	Capacity	77.9909	$/Mcf/day	2,803	Mcf/day	218,608	-	218,608
6	Suspended Solids	212.3435	$/1,000 lbs	2,893	1,000 lbs	614,310	-	614,310
7	BOD	248.2728	$/1,000 lbs	2,416	1,000 lbs	599,827	-	599,827
8	Customer Costs					33,700	-	33,700
9	Total Treatment					2,033,331	-	2,033,331

Long Term Control Plan (LTCP):

Line No.	Cost Component	System Annual Cost		Allocation		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
	LTCP O&M Costs							
10	Amortization of SMIP/GARP Expenses (b)	1,926,509		2.42801%		46,776		46,776
11	LTCP O&M	1,914,220		2.42801%		46,477		46,477
12	Total					2,126,584	-	2,126,584
13	Total - Rounded					2,127,000		2,127,000

(a) Based on investment in sewers serving Cheltenham.
(b) Reflects amortization of SMIP/GARP costs over 20 years at 5.5% long term bond interest rate.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 22
OPERATING EXPENSE
ALLOCATED TO
DELCORA
Fiscal Year 2019

		(1)		(2)		(3)	(4)	(5)
	Treatment:							
Line No.	**Cost Component**	**Operating Expense Per Unit**		**Test Yr. No. of Units**		**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
		$				$	$	$
	SW Treatment Plant: Retail, DELCORA, Lower Merion, Springfield (Excluding Wyndmoor), and Upper Darby							
1	Volume	1.5778	$/Mcf	1,200,000	Mcf	1,893,360	-	1,893,360
2	Capacity	84.8363	$/Mcf/day	13,392	Mcf/day	1,136,128	-	1,136,128
3	Suspended Solids	188.4205	$/1,000 lbs	13,029	1,000 lbs	2,454,931	-	2,454,931
4	BOD	190.6239	$/1,000 lbs	11,307	1,000 lbs	2,155,384	-	2,155,384
5	Customer Costs					43,000	-	43,000
6	Total Treatment					7,682,803	-	7,682,803

	Long Term Control Plan (LTCP):					
Line No.	**Cost Component**	**System Annual Cost**	**Allocation**	**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
		$		$	$	$
	LTCP O&M Costs					
7	Amortization of SMIP/GARP Expenses (a)	1,926,509	9.44287%	181,918		181,918
8	LTCP O&M	1,914,220	9.44287%	180,757	-	180,757
9	Total Annual Operating Expense			8,045,478		8,045,478
10	Total - Rounded			8,045,000		8,045,000

(a) Reflects amortization of SMIP/GARP costs over 20 years at 5.5% long term bond interest rate.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 23
OPERATING EXPENSE
ALLOCATED TO
LOWER MERION TOWNSHIP
Test Year 2019

		(1)		(2)		(3)	(4)	(5)
Collection System:								
Line No.	Cost Component	Allocated Investment				Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
1	Sewer Maintenance (a)	1,808,000	x	4.00%		72,320	-	72,320

Treatment:								
Line No.	Cost Component	Operating Expense Per Unit		Test Yr. No. of Units		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
	Neill Drive Pump Station Retail and Lower Merion							
2	Volume	0.7753	$/Mcf	14,300	Mcf	11,087	-	11,087
3	Capacity	474.0541	$/Mcf/day	115	Mcf/day	54,516	-	54,516
	SW Treatment Plants: Retail, DELCORA, Lower Merion, Springfield (Excluding Wyndmoor), and Upper Darby							
4	Volume	1.5778	$/Mcf	364,900	Mcf	575,739	-	575,739
5	Capacity	84.8363	$/Mcf/day	2,788	Mcf/day	236,524	-	236,524
6	Suspended Solids	188.4205	$/1,000 lbs	3,587	1,000 lbs	675,864	-	675,864
7	BOD	190.6239	$/1,000 lbs	3,124	1,000 lbs	595,509	-	595,509
8	Customer Costs					53,900	-	53,900
9	Total Treatment					2,275,459	-	2,275,459

Long Term Control Plan (LTCP):								
Line No.	Cost Component	System Annual Cost		Allocation		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
	LTCP O&M Costs							
10	Amortization of SMIP/GARP Expenses (a)	1,926,509		0.00000%		-	-	-
11	LTCP O&M	1,914,220		0.00000%		-	-	-
12	Total Annual Operating Expense					2,275,459	-	2,275,459
13	Total - Rounded					2,275,000		2,275,000

(a) Based on investment in sewers serving Lower Merion.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 24
OPERATING EXPENSE
ALLOCATED TO
LOWER MORELAND TOWNSHIP
Test Year 2019

Collection System:

Line No.	Cost Component	(1) Allocated Investment		(2)		(3) Allocated Operating Expense	(4) Adjustment for Contract	(5) Total Adjusted Operating Expense
		$				$	$	$
1	Sewer Maintenance (a)	705,000	x	4.00%		28,200	-	28,200

Treatment:

Line No.	Cost Component	Operating Expense Per Unit		Test Yr. No. of Units		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
	NE Treatment Plants: Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton							
2	Volume	0.1049	$/Mcf	57,800	Mcf	6,063	-	6,063
3	Capacity	66.3445	$/Mcf/day	518	Mcf/day	34,366	-	34,366
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton							
4	Volume	1.6059	$/Mcf	57,800	Mcf	92,821	-	92,821
5	Capacity	77.9909	$/Mcf/day	518	Mcf/day	40,399	-	40,399
6	Suspended Solids	212.3435	$/1,000 lbs	618	1,000 lbs	131,228	-	131,228
7	BOD	248.2728	$/1,000 lbs	454	1,000 lbs	112,716	-	112,716
8	Customer Costs					20,700	-	20,700
9	Total Treatment					466,493	-	466,493

Long Term Control Plan (LTCP):

Line No.	LTCP O&M Costs	System Annual Cost	Allocation	Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$		$	$	$
10	Amortization of SMIP/GARP Expenses (b)	1,926,509	0.35883%	6,913		6,913
11	LTCP O&M Costs	1,914,220	0.35883%	6,869		6,869
12	Total Annual Operating Expense			480,275		480,275
13	Total - Rounded			480,000		480,000

(a) Based on investment in sewers serving Lower Moreland.
(b) Reflects amortization of SMIP/GARP costs over 20 years at 5.5% long term bond interest rate.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 25
OPERATING EXPENSE
ALLOCATED TO
LOWER SOUTHAMPTON TOWNSHIP
Test Year 2019

		(1)		(2)		(3)	(4)	(5)
	Collection System:							
Line No.	Cost Component	Allocated Investment				Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
1	Sewer Maintenance (a)	10,220,000	x	4.00%		408,800	-	408,800
	Treatment:							
Line No.	Cost Component	Operating Expense Per Unit		Test Yr. No. of Units		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
	NE Treatment Plants: Retail, Abington, Bensalem, Bucks County W&SA, Lower Moreland, and Lower Southampton							
2	Volume	0.1049	$/Mcf	267,500	Mcf	28,061	-	28,061
3	Capacity	66.3445	$/Mcf/day	1,394	Mcf/day	92,484	-	92,484
	Retail, Abington, Bensalem, Bucks County W&SA, Cheltenham, Lower Moreland, and Lower Southampton							
4	Volume	1.6059	$/Mcf	267,500	Mcf	429,578	-	429,578
5	Capacity	77.9909	$/Mcf/day	1,394	Mcf/day	108,719	-	108,719
6	Suspended Solids	212.3435	$/1,000 lbs	2,545	1,000 lbs	540,414	-	540,414
7	BOD	248.2728	$/1,000 lbs	2,105	1,000 lbs	522,614	-	522,614
8	Customer Costs					16,200	-	16,200
9	Total Treatment					2,146,870	-	2,146,870
	Long Term Control Plan (LTCP):							
Line No.	LTCP O&M Costs	System Annual Cost		Allocation		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
10	Amortization of SMIP/GARP Expenses (b)	1,926,509		0.96317%		18,556		18,556
11	LTCP O&M Costs	1,914,220		0.96317%		18,437		18,437
12	Total Annual Operating Expense					2,183,863		2,183,863
13	Total - Rounded					2,184,000		2,184,000

(a) Based on investment in sewers serving Lower Southampton.
(b) Reflects amortization of SMIP/GARP costs over 20 years at 5.5% long term bond interest rate.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 26
OPERATING EXPENSE
ALLOCATED TO
SPRINGFIELD (EXCL. WYNDMOOR) TOWNSHIP
Test Year 2019

		(1)		(2)		(3)	(4)	(5)
Collection System:								
Line No.	Cost Component	Allocated Investment				Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
1	Sewer Maintenance (a)	768,000	x	4.00%		30,720	-	30,720

Treatment:								
Line No.	Cost Component	Operating Expense Per Unit		Test Yr. No. of Units		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
	Central Schuylkill Pump Station Retail and Springfield (excluding Wyndmoor)							
2	Volume	0.2544	$/Mcf	152,200	Mcf	38,720	-	38,720
3	Capacity	18.4080	$/Mcf/day	407	Mcf/day	7,492	-	7,492
	SW Treatment Plants: Retail, DELCORA, Lower Merion, Springfield (Excluding Wyndmoor), and Upper Darby							
4	Volume	1.5778	$/Mcf	152,200	Mcf	240,141	-	240,141
5	Capacity	84.8363	$/Mcf/day	407	Mcf/day	34,528	-	34,528
6	Suspended Solids	188.4205	$/1,000 lbs	1,811	1,000 lbs	341,230	-	341,230
7	BOD	190.6239	$/1,000 lbs	1,707	1,000 lbs	325,395	-	325,395
8	Customer Costs					27,200	-	27,200
9	Total Treatment					1,045,426	-	1,045,426

Long Term Control Plan (LTCP):					
Line No.	LTCP O&M Costs	System Annual Cost	Allocation	Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$		$	$	$
10	Amortization of SMIP/GARP Expenses (b)	1,926,509	0.79320%	15,281		15,281
11	LTCP O&M Costs	1,914,220	0.79320%	15,184		15,184
12	Total Annual Operating Expense			1,075,891		1,075,891
13	Total - Rounded			1,076,000		1,076,000

(a) Based on investment in sewers serving Springfield (excluding Wyndmoor).
(b) Reflects amortization of SMIP/GARP costs over 20 years at 5.5% long term bond interest rate.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 27
OPERATING EXPENSE
ALLOCATED TO
SPRINGFIELD (WYNDMOOR) TOWNSHIP
Test Year 2019

		(1)		(2)		(3)	(4)	(5)
	Collection System:							
Line No.	**Cost Component**	**Allocated Investment**				**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
		$				$	$	$
1	Sewer Maintenance (a)	331,000	x	4.00%		13,240	-	13,240
	Treatment:							
Line No.	**Cost Component**	**Operating Expense Per Unit**		**Test Yr. No. of Units**		**Allocated Operating Expense**	**Adjustment for Contract**	**Total Adjusted Operating Expense**
		$				$	$	$
	SE Treatment Plants: Retail, Springfield (Wyndmoor)							
2	Volume	2.2390	$/Mcf	19,900	Mcf	44,556	-	44,556
3	Capacity	188.8710	$/Mcf/day	167	Mcf/day	31,541	-	31,541
4	Suspended Solids	274.5248	$/1,000 lbs	166	1,000 lbs	45,571	-	45,571
5	BOD	124.3743	$/1,000 lbs	125	1,000 lbs	15,547	-	15,547
6	Customer Costs					7,700	-	7,700
7	Total					158,155	-	158,155
8	Total - Rounded					158,000		158,000

(a) Based on investment in sewers serving Springfield (Wyndmoor).

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 28
OPERATING EXPENSE
ALLOCATED TO
UPPER DARBY TOWNSHIP
Test Year 2019

		(1)		(2)		(3)	(4)	(5)
Collection System:								
Line No.	Cost Component	Allocated Investment				Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
1	Sewer Maintenance (a)	723,000	x	4.00%		28,920	-	28,920

Treatment:								
Line No.	Cost Component	Operating Expense Per Unit		Test Yr. No. of Units		Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$				$	$	$
	SW Treatment Plants: Retail, DELCORA, Lower Merion, Springfield (Excluding Wyndmoor), and Upper Darby							
2	Volume	1.5778	$/Mcf	476,600	Mcf	751,979	-	751,979
3	Capacity	84.8363	$/Mcf/day	3,094	Mcf/day	262,484	-	262,484
4	Suspended Solids	188.4205	$/1,000 lbs	4,697	1,000 lbs	885,011	-	885,011
5	BOD	190.6239	$/1,000 lbs	4,016	1,000 lbs	765,546	-	765,546
6	Customer Costs					13,800	-	13,800
7	Total Treatment					2,707,740	-	2,707,740

Long Term Control Plan (LTCP):							
Line No.	LTCP O&M Costs	System Annual Cost		Allocation	Allocated Operating Expense	Adjustment for Contract	Total Adjusted Operating Expense
		$			$	$	$
8	Amortization of SMIP/GARP Expenses (b)	1,926,509		0.00000%	-	-	-
9	LTCP O&M Costs	1,914,220		0.00000%	-	-	-
10	Total Annual Operating Expense				2,707,740	-	2,707,740
11	Total - Rounded				2,708,000		2,708,000

(a) Based on investment in sewers serving Upper Darby.

Mcf - Thousand cubic feet
lbs - pounds

TABLE WH - 29
WASTEWATER WHOLESALE: SUMMARY OF ALLOCATED COST OF SERVICE FOR CONTRACT CUSTOMERS
Test Year 2019

Line No.	Customer	(1) Allocated Investment (a)	(2) Allocated Depreciable Investment (a)	(3) O&M Expense	(4) Depreciation Expense	(5) Return on Investment	(6) Allocated Cost of Service
		$	$	$	$	$	$
1	Abington	5,361,000	5,344,000	921,000	129,555	402,075	1,452,630
2	Bensalem	9,230,000	9,201,000	1,702,000	(a)	(a)	1,702,000
3	Bucks County (b)	31,398,000	31,299,000	7,368,000	129,485	425,625	7,923,110
4	Cheltenham	13,526,000	13,483,000	2,127,000	327,825	1,014,450	3,469,275
5	DELCORA (c)	52,186,000	52,039,000	8,045,000	173,365	597,450	8,815,815
6	Lower Merion	16,234,000	16,189,000	2,275,000	(a)	(a)	2,275,000
7	Lower Moreland	2,781,000	2,774,000	480,000	64,845	208,575	753,420
8	Lower Southampton (d)	20,488,000	20,453,000	2,184,000	330,481	1,109,767	3,624,248
9	Springfield (less Wyndmoor)	6,122,000	6,106,000	1,076,000	146,950	459,150	1,682,100
10	Springfield (Wyndmoor)	1,177,000	1,176,000	158,000	27,745	88,275	274,020
11	Upper Darby	16,202,000	16,153,000	2,708,000	(a)	(a)	2,708,000
12	Total	$ 174,705,000	$ 174,217,000	$ 29,044,000	$ 1,330,251	$ 4,305,367	$ 34,679,618

(a) It is assumed that Bensalem, Lower Merion and Upper Darby contribute their entire allocated plant investment, and therefore, are not allocated any depreciation expense or return on investment.

(b) Bucks County allocated Return on Investment and Depreciation Expense based on assets in service after 6/30/2007.

(c) DELCORA allocated Return on Investment and Depreciation Expense based on assets in service after 7/1/2011.

(d) Lower Southampton phased into Return on Investment and Depreciation Expense on total rate base uniformly over18 years staring in FY 2007.

TABLE WH - 30
WASTEWATER WHOLESALE: SUMMARY OF ALLOCATED COST OF SERVICE FOR CONTRACT CUSTOMERS
Test Year 2020

Line No.	Customer	(1) Allocated Investment (a)	(2) Allocated Depreciable Investment (a)	(3) O&M Expense	(4) Depreciation Expense	(5) Return on Investment	(6) Allocated Cost of Service
		$	$	$	$	$	$
1	Abington	5,361,000	5,344,000	947,000	129,555	402,075	1,478,630
2	Bensalem	9,230,000	9,201,000	1,752,000	(a)	(a)	1,752,000
3	Bucks County (b)	31,398,000	31,299,000	7,581,000	129,485	425,625	8,136,110
4	Cheltenham	13,526,000	13,483,000	2,184,000	327,825	1,014,450	3,526,275
5	DELCORA (c)	52,186,000	52,039,000	8,232,000	173,365	597,450	9,002,815
6	Lower Merion	16,234,000	16,189,000	2,330,000	(a)	(a)	2,330,000
7	Lower Moreland	2,781,000	2,774,000	493,000	64,845	208,575	766,420
8	Lower Southampton (d)	20,488,000	20,453,000	2,244,000	355,904	1,195,133	3,795,037
9	Springfield (less Wyndmoor)	6,122,000	6,106,000	1,101,000	146,950	459,150	1,707,100
10	Springfield (Wyndmoor)	1,177,000	1,176,000	162,000	27,745	88,275	278,020
11	Upper Darby	16,202,000	16,153,000	2,774,000	(a)	(a)	2,774,000
12	Total	$ 174,705,000	$ 174,217,000	$ 29,800,000	$ 1,355,674	$ 4,390,733	$ 35,546,407

(a) It is assumed that Bensalem, Lower Merion and Upper Darby contribute their entire allocated plant investment, and therefore, are not allocated any depreciation expense or return on investment.

(b) Bucks County allocated Return on Investment and Depreciation Expense based on assets in service after 6/30/2007.

(c) DELCORA allocated Return on Investment and Depreciation Expense based on assets in service after 7/1/2011.

(d) Lower Southampton phased into Return on Investment and Depreciation Expense on total rate base uniformly over18 years staring in FY 2007.

TABLE WH - 31
WASTEWATER WHOLESALE: SUMMARY OF ALLOCATED COST OF SERVICE FOR CONTRACT CUSTOMERS
Test Year 2021

Line No.	Customer	(1) Allocated Investment (a)	(2) Allocated Depreciable Investment (a)	(3) O&M Expense	(4) Depreciation Expense	(5) Return on Investment	(6) Allocated Cost of Service
		$	$	$	$	$	$
1	Abington	5,361,000	5,344,000	997,000	129,555	402,075	1,528,630
2	Bensalem	9,230,000	9,201,000	1,846,000	(a)	(a)	1,846,000
3	Bucks County (b)	31,398,000	31,299,000	7,988,000	129,485	425,625	8,543,110
4	Cheltenham	13,526,000	13,483,000	2,296,000	327,825	1,014,450	3,638,275
5	DELCORA (c)	52,186,000	52,039,000	8,652,000	173,365	597,450	9,422,815
6	Lower Merion	16,234,000	16,189,000	2,452,000	(a)	(a)	2,452,000
7	Lower Moreland	2,781,000	2,774,000	518,000	64,845	208,575	791,420
8	Lower Southampton (d)	20,488,000	20,453,000	2,361,000	381,325	1,280,501	4,022,826
9	Springfield (less Wyndmoor)	6,122,000	6,106,000	1,157,000	146,950	459,150	1,763,100
10	Springfield (Wyndmoor)	1,177,000	1,176,000	170,000	27,745	88,275	286,020
11	Upper Darby	16,202,000	16,153,000	2,922,000	(a)	(a)	2,922,000
12	Total	$ 174,705,000	$ 174,217,000	$ 31,359,000	$ 1,381,095	$ 4,476,101	$ 37,216,196

(a) It is assumed that Bensalem, Lower Merion and Upper Darby contribute their entire allocated plant investment, and therefore, are not allocated any depreciation expense or return on investment.

(b) Bucks County allocated Return on Investment and Depreciation Expense based on assets in service after 6/30/2007.

(c) DELCORA allocated Return on Investment and Depreciation Expense based on assets in service after 7/1/2011.

(d) Lower Southampton phased into Return on Investment and Depreciation Expense on total rate base uniformly over18 years staring in FY 2007.

In the Matter of the Philadelphia Water Department's Proposed Change in Water, Wastewater and Stormwater Rates and Related Charges

Fiscal Years 2019-2021

Philadelphia Water Department

Black & Veatch Management Consulting, LLC

Schedule BV-E3

Dated: February 9, 2018

Schedule REF #		Schedule Name
BV-E3	Black & Veatch Schedules	
1	TABLE SW-1	STORMWATER: NON RESIDENTIAL MEAN GROSS AREA AND IMPERVIOUS AREA
2	TABLE SW-2	STORMWATER: DETERMINATION OF BILLABLE PARCELS
3	TABLE SW-3	STORMWATER: DETERMINATION OF BILLABLE GROSS AREA
4	TABLE SW-4	STORMWATER: DETERMINATION OF BILLABLE IMPERVIOUS AREA
5	TABLE SW-5	STORMWATER: CREDIT PROJECTIONS
6	TABLE SW-6	STORMWATER: SMIP/GARP PROGRAM ANNUAL COST ESTIMATES
7	TABLE SW-7	STORMWATER: SMIP/GARP PROGRAM AWARDED PROJECT PROJECTIONS
8	TABLE SW-8	STORMWATER: SMIP/GARP PROGRAM AS-BUILT & VERIFIED PROJECT PROJECTIONS
9	TABLE SW-9	STORMWATER: SMIP/GARP PROGRAM PROJECTED CREDIT IMPACT
10	TABLE SW-10	STORMWATER: PROJECTIONS OF BILLABLE PARCELS, GROSS AREA AND IMPERVIOUS AREA
11	TABLE SW-11	STORMWATER: GA AND IA MANAGED CREDIT PROJECTION FACTORS
12	TABLE SW-12	STORMWATER: PROJECTED NUMBER OF BILLABLE ACCOUNTS
13	TABLE SW-13	STORMWATER: SUMMARY OF STORMWATER COSTS
14	TABLE SW-14	STORMWATER: ESTIMATE OF GROSS AREA (GA) AND IMPERVIOUS AREA (IA) UNIT COSTS ADJUSTED FOR CUSTOMER ASSISTANCE PROGRAM (CAP)

Schedule REF #		Schedule Name
BV-E3	**Black & Veatch Schedules**	
15	**TABLE SW-15**	STORMWATER: ESTIMATE OF CUSTOMER CLASS GA AND IA COST OF SERVICE ADJUSTED FOR CUSTOMER ASSISTANCE PROGRAM (CAP)
16	**TABLE SW-16**	STORMWATER: GA AND IA COST OF SERVICE RATES PRIOR TO DISCOUNT AND LAG FACTOR ADJUSTMENTS
17	**TABLE SW-17**	STORMWATER: STORMWATER BILLING and COLLECTION UNIT COSTS
18	**TABLE SW-18**	STORMWATER: STORMWATER ADJUSTED COSTS OF SERVICE (AFTER DISCOUNTS)
19	**TABLE SW-19**	STORMWATER: STORMWATER FINAL COST OF SERVICE RATES
20	**TABLE SW-19A**	STORMWATER: PROPOSED RATES FOR RESIDENTIAL SERVICES
21	**TABLE SW-19B**	STORMWATER: PROPOSED RATES FOR NON-RESIDENTIAL SERVICES

TABLE SW-1: NON-RESIDENTIAL MEAN GROSS AREA & IMPERVIOUS AREA (SF)

Line No.	Description	FY 2018 MEAN GA	FY 2018 MEAN IA
	Non-Residential Sub-Classes		
	Non-Discount		
1	Water & Sewer	28,494	15,704
2	SW Only	8,468	2,494
	Discount: Elderly, Education & Charities		
3	Water & Sewer	90,550	47,573
4	SW Only	18,825	11,008
	Discount: PHA		
5	Water & Sewer	62,807	32,081
6	SW Only	4,061	1,041
	Condominiums Sub-Classes		
	Non-Discount		
7	Water & Sewer	16,416	11,364
8	SW Only	12,106	5,847
	Discount: Elderly, Education & Charities		
9	Water & Sewer	40,388	19,099
10	SW Only	24,687	20,647
	Discount: PHA		
11	Water & Sewer	9,358	6,158
12	SW Only	-	-

TABLE SW-2: DETERMINATION OF BILLABLE PARCELS

Line No.	Description	Fiscal Year Ending June 30, 2018	2019	2020	2021	2022	2023
	Residential						
1	Initial Parcel Count	461,129	461,129	461,129	461,129	461,129	461,129
2	Less Residential Zero Rate[1]	2	2	2	2	2	2
3	Subtotal Residential	461,127	461,127	461,127	461,127	461,127	461,127
	Non-Residential						
4	Initial Parcel Count	72,993	72,993	72,993	72,993	72,993	72,993
5	Less Non-Residential Zero Rate[2]	222	222	222	222	222	222
6	Subtotal Non Residential	72,771	72,771	72,771	72,771	72,771	72,771
	Condominium						
7	Initial Parcel Count	1,806	1,806	1,806	1,806	1,806	1,806
8	Less Stormwater Appeals Adjustments	-	-	-	-	-	-
9	Subtotal Condominium	1,806	1,806	1,806	1,806	1,806	1,806
10	TOTAL: System Billable Parcels	535,704	535,704	535,704	535,704	535,704	535,704

1: Comprises Community Gardens under Residential Category

2: Comprises Community Gardens under Non-Residential Category

TABLE SW-3: DETERMINATION OF BILLABLE GROSS AREA (sf)

Line No.	Description	Fiscal Year Ending June 30, FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
	Residential						
1	Initial GA	972,982,190	972,982,190	972,982,190	972,982,190	972,982,190	972,982,190
2	Less Residential Zero Rate[1]	6,000	6,000	6,000	6,000	6,000	6,000
3	Subtotal Residential Billable GA (sf)	972,976,190	972,976,190	972,976,190	972,976,190	972,976,190	972,976,190
	Non-Residential						
4	Initial GA	1,436,544,607	1,436,544,607	1,436,544,607	1,436,544,607	1,436,544,607	1,436,544,607
5	Less Credits Adjustments	328,139,380	346,575,457	365,653,028	386,228,213	407,102,350	427,976,487
6	Less Stormwater Appeals/Non-Residential Zero Rate[2]	2,028,500	2,783,500	3,375,500	3,805,500	4,072,500	4,072,500
7	Subtotal Non Residential Billable GA (sf)	1,106,376,727	1,087,185,650	1,067,516,079	1,046,510,894	1,025,369,757	1,004,495,620
	Condominium						
8	Initial GA	30,630,541	30,630,541	30,630,541	30,630,541	30,630,541	30,630,541
9	Less Credits Adjustments	5,912,722	6,244,921	6,588,678	6,959,421	7,335,551	7,711,681
10	Subtotal Condominium Billable GA (sf)	24,717,819	24,385,620	24,041,863	23,671,120	23,294,990	22,918,860
11	TOTAL: System Billable GA (sf)	2,104,070,736	2,084,547,460	2,064,534,132	2,043,158,204	2,021,640,937	2,000,390,670

1: Comprises Community Gardens under Residential Category

2: Includes adjustments for GA data inaccuracies & Community Gardens in the Non-Residential Category. This line reflects the net impact from these two adjustments.

TABLE SW-4: DETERMINATION OF BILLABLE IMPERVIOUS AREA (sf)

Line No.	Description	Fiscal Year Ending June 30, FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
	Residential						
1	Initial IA	484,185,000	484,185,000	484,185,000	484,185,000	484,185,000	484,185,000
2	Less Residential Zero Rate[1]	3,000	3,000	3,000	3,000	3,000	3,000
3	Subtotal Residential Billable IA (sf)	484,182,000	484,182,000	484,182,000	484,182,000	484,182,000	484,182,000
	Non-Residential						
4	Initial IA	705,865,000	705,865,000	705,865,000	705,865,000	705,865,000	705,865,000
5	Less Credits Adjustments	98,508,991	104,982,544	112,134,338	120,808,901	129,823,801	138,895,492
6	Less Stormwater Appeals/Non-Residential Zero Rate[2]	934,800	1,623,800	2,163,800	2,555,800	2,799,800	2,799,800
7	Subtotal Non Residential Billable IA (sf)	606,421,209	599,258,656	591,566,862	582,500,299	573,241,399	564,169,708
	Condominium						
8	Initial IA	20,728,795	20,728,795	20,728,795	20,728,795	20,728,795	20,728,795
9	Less Credits Adjustments	3,151,474	3,358,575	3,587,373	3,864,887	4,153,290	4,443,509
10	Subtotal Condominium Billable IA (sf)	17,577,321	17,370,220	17,141,422	16,863,908	16,575,505	16,285,286
11	TOTAL: System Billable IA (sf)	1,108,180,530	1,100,810,876	1,092,890,284	1,083,546,207	1,073,998,904	1,064,636,994

1: Comprises Community Gardens under Residential Category

2: Includes adjustments for IA data inaccuracies & Community Gardens in the Non-Residential Category. This line reflects the net impact from these two adjustments.

TABLE SW-5: CREDITS PROJECTIONS

Line No.	Description	Fiscal Year Ending June 30, 2018	2019	2020	2021	2022	2023
	PARCELS (#)						
1	IAR Practices	414	453	496	543	594	650
2	GA/IA Management Practices [1]	614	632	646	656	662	663
3	SMIP/GARP	96	126	147	167	187	207
4	Subtotal	1,124	1,211	1,289	1,366	1,443	1,520
	IMPERVIOUS AREA (sf)						
5	IAR Practices	4,852,689	5,309,827	5,813,850	6,364,759	6,962,554	7,618,957
6	GA/IA Management Practices [1]	81,737,950	86,410,382	91,082,815	95,755,247	100,427,680	105,100,112
7	SMIP/GARP	15,069,826	16,620,910	18,825,046	22,553,782	26,586,857	30,619,932
8	Subtotal	101,660,465	108,341,119	115,721,711	124,673,788	133,977,091	143,339,001
	GROSS AREA (sf)						
9	IAR Practices	-	-	-	-	-	-
10	GA/IA Management Practices [1]	316,589,873	333,807,065	351,024,257	368,241,449	385,458,641	402,675,833
11	SMIP/GARP	17,462,229	19,013,313	21,217,449	24,946,185	28,979,260	33,012,335
12	Subtotal	334,052,102	352,820,378	372,241,706	393,187,634	414,437,901	435,688,168

Notes

1: GA/IA Management Practices Credits include Surface and Non-Surface Discharge credits for IA managed and open space. Refer to Table SW-11 for additional information.

TABLE SW-6: SMIP/GARP PROGRAM - ANNUAL COST ESTIMATES

Line No.	Description	Fiscal Year Ending June 30, FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
1	**Annual Grant Budget**	$ 20,000,000	$ 25,000,000	$ 25,000,000	$ 25,000,000	$ 25,000,000	$ 25,000,000
2	**PIDC Annual Administration Fee (a)**	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
3	**Service Fee % (b)**	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
4	**PIDC Estimated Service Fee Cost** (Line 1 - Line 2) X Line 3	$ 398,000	$ 498,000	$ 498,000	$ 498,000	$ 498,000	$ 498,000
5	**TOTAL PIDC SMIP/GARP FEE** (Line 2 + Line 4)	**$ 498,000**	**$ 598,000**	**$ 598,000**	**$ 598,000**	**$ 598,000**	**$ 598,000**
6	**Available Award Amount** (Line 1 - Line 5)	**$ 19,502,000**	**$ 24,402,000**	**$ 24,402,000**	**$ 24,402,000**	**$ 24,402,000**	**$ 24,402,000**

Notes:

(a) Annual Administration Fee for SMIP/GARP Program is $100K. Paid to PIDC each fiscal year.

(b) Service Fee is calculated as 2% of annual grant budget less the annual administration fee paid to PIDC.

TABLE SW-7: SMIP/GARP PROGRAM -AWARDED PROJECT PROJECTIONS

Line No.	Description	Fiscal Year Ending June 30, FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
	INPUT PARAMETERS						
1	Available Award Amount (a)	$ 19,502,000	$ 24,402,000	$ 24,402,000	$ 24,402,000	$ 24,402,000	$ 24,402,000
2	$/Greened Acre **Group 1** Projects (b)	$ 135,000	$ 135,000	$ 135,000	$ 135,000	$ 135,000	$ 135,000
3	$/Greened Acre **Group 2** Projects (c)	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000
4	Group 1 - % of Award Amount	60%	60%	60%	60%	60%	60%
5	Group 2 - % of Award Amount	40%	40%	40%	40%	40%	40%
6	Acre conversion to square feet	43,560	43,560	43,560	43,560	43,560	43,560
6	Runoff Depth Managed per Greended Acre (inches)	1.5	1.5	1.5	1.5	1.5	1.5
Stormwater GA/IA Managed Area Projections (FY 2018 - FY 2023) - Anticipated Awards							
	Group 1 - Projects						
7	Anticipated Award Amount (Line 1 x Line 4)	$ 11,701,200	$ 14,641,200	$ 14,641,200	$ 14,641,200	$ 14,641,200	$ 14,641,200
8	**Greened Acres** (Line 7 / Line 2)	86.7	108.5	108.5	108.5	108.5	108.5
9	Gross Area to be Managed (sf)	2,517,768	3,150,840	3,150,840	3,150,840	3,150,840	3,150,840
10	Impervious Area to be Managed (sf)	2,517,768	3,150,840	3,150,840	3,150,840	3,150,840	3,150,840
	Group 2 - Projects						
11	Anticipated Award Amount (Line 1 x Line 5)	$ 7,800,800	$ 9,760,800	$ 9,760,800	$ 9,760,800	$ 9,760,800	$ 9,760,800
12	**Greened Acres** (Line 11 / Line 3)	52.0	65.1	65.1	65.1	65.1	65.1
13	Gross Area to be Managed (sf)	1,510,080	1,890,504	1,890,504	1,890,504	1,890,504	1,890,504
14	Impervious Area to be Managed (sf)	1,510,080	1,890,504	1,890,504	1,890,504	1,890,504	1,890,504
	Annual Totals						
15	**GA to be Managed (sf)**	4,027,848	5,041,344	5,041,344	5,041,344	5,041,344	5,041,344
16	**IA to be Managed (sf)**	4,027,848	5,041,344	5,041,344	5,041,344	5,041,344	5,041,344
17	**Total Greened Acres**	138.7	173.6	173.6	173.6	173.6	173.6

Notes:

(a) See Line 6 - Table 6: SMIP/GARP Program - Annual Cost Estimates

(b) Group 1 Projects - Projects with a cost of $135,000 per greened acre and with a 18 months or less project completion time.

(c) Group 2 Projects - Projects with a cost of $150,000 per greened acre and with an average 36 months of project completion time.

TABLE SW-8: SMIP/GARP PROGRAM AS-BUILT & VERIFIED PROJECT PROJECTIONS

As-Built & Verified Projections (FY 2018 - FY 2023)

Line No.	Description	Fiscal Year Ending June 30, FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
	Awarded Projects Pre-FY2018 (a)	26	10	1			
1	**Greened Acres**	227.58	51.15	5.45	-	-	-
2	Gross Area Managed (sf)	7,649,572	1,938,856	237,402	-	-	-
3	Impervious Area Managed (sf)	7,649,572	1,938,856	237,402	-	-	-
	Estimated Awarded Projects Post FY2015						
	Group 1 - Projects (b)						
4	**Greened Acres**	-		86.7	108.5	108.5	108.5
5	Gross Area Managed (sf)	-		2,517,768	3,150,840	3,150,840	3,150,840
6	Impervious Area Managed (sf)	-		2,517,768	3,150,840	3,150,840	3,150,840
	Group 2 - Projects (c)						
7	**Greened Acres**	-	-		52.0	65.1	65.1
8	Gross Area Managed (sf)	-	-		1,510,080	1,890,504	1,890,504
9	Impervious Area Managed (sf)	-	-		1,510,080	1,890,504	1,890,504
	Annual Totals						
10	**Greened Acres** (Line 1 + Line 4 + Line 7)	227.6	51.1	92.2	160.5	173.6	173.6
11	**Gross Area Managed (sf)**	7,649,572	1,938,856	2,755,170	4,660,920	5,041,344	5,041,344
12	**Impervious Area Managed (sf)**	7,649,572	1,938,856	2,755,170	4,660,920	5,041,344	5,041,344

Notes:

(a) Completed Greened Acres based upon actuals from PWD's SMIP/GARP Grant Tracking.
FY2018 - FY 2020 estimated based upon projects awarded prior to FY18 but not yet completed/verified.

(b) From Table 2: SMIP/GARP Program - Project Projections. Group 1 - projects are expected to be completed and verified within 18 months.

(c) From Table 2: SMIP/GARP Program - Project Projections. Group 2 - are expected to be completed and verified within 36 months.

TABLE SW-9: SMIP/GARP PROGRAM PROJECTED CREDIT IMPACTS
Credit Impact Projections (FY 2018 - FY 2023)

Line No.	Description	Fiscal Year Ending June 30, FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
	INPUT PARAMETERS						
1	**% of GA and IA Credits (a)**	80%	80%	80%	80%	80%	80%
		Credit Impact					
	Annual Total Credits						
2	**GA Managed Credit (sf)** (Line 1 X Table 8: Line 11)	6,119,657	1,551,084	2,204,136	3,728,736	4,033,075	4,033,075
3	**IA Managed Credit (sf)** (Line 1 X Table 8: Line 12)	6,119,657	1,551,084	2,204,136	3,728,736	4,033,075	4,033,075
	Cumulative Total Credits						
4	**GA Managed Credit (sf)**	6,119,657	7,670,741	9,874,877	13,603,613	17,636,688	21,669,763
5	**IA Managed Credit (sf)**	6,119,657	7,670,741	9,874,877	13,603,613	17,636,688	21,669,763

Notes:

(a) Assumes all SMIP/GARP projects will be granted Non-Surface Discharge Credit based upon 80% of managed IA and 80% of managed GA.

TABLE SW-10: PROJECTIONS OF BILLABLE PARCELS, GROSS AREA, AND IMPERVIOUS AREA

Line No.	Customer Class	Fiscal Year Ending June 30, 2018	2019	2020	2021	2022	2023
	SECTION A: NUMBER OF BILLABLE PARCELS (PROJECTED)						
1	Residential	461,127	461,127	461,127	461,127	461,127	461,127
2	Non-Residential	72,771	72,771	72,771	72,771	72,771	72,771
3	Condominium	1,806	1,806	1,806	1,806	1,806	1,806
4	Total: Number of Billable Parcels	535,704	535,704	535,704	535,704	535,704	535,704
	SECTION B: BILLABLE GROSS AREA (PROJECTED - sf)						
5	Residential	972,976,190	972,976,190	972,976,190	972,976,190	972,976,190	972,976,190
6	Non-Residential	1,106,376,727	1,087,185,650	1,067,516,079	1,046,510,894	1,025,369,757	1,004,495,620
7	Condominium	24,717,819	24,385,620	24,041,863	23,671,120	23,294,990	22,918,860
8	Total: Billable Gross Area	2,104,070,736	2,084,547,460	2,064,534,132	2,043,158,204	2,021,640,937	2,000,390,670
	SECTION C: BILLABLE IMPERVIOUS AREA (PROJECTED - sf)						
9	Residential	484,182,000	484,182,000	484,182,000	484,182,000	484,182,000	484,182,000
10	Non-Residential	606,421,209	599,258,656	591,566,862	582,500,299	573,241,399	564,169,708
11	Condominium	17,577,321	17,370,220	17,141,422	16,863,908	16,575,505	16,285,286
12	Total: Billable Impervious Area	1,108,180,530	1,100,810,876	1,092,890,284	1,083,546,207	1,073,998,904	1,064,636,994

TABLE SW-11: GA/IA MANAGEMENT CREDIT PROJECTION FACTORS

Line No.	Description	FY 2018 Increase in Parcels	FY 2018 Average GA Credit	FY 2018 Average IA Credit
	Credit Type		(sf)	(sf)
1	Impervious Area Managed	57	80,182	81,707
2	Open Space		221,415	
3	NPDES		460	266

TABLE SW-12: PROJECTED NUMBER OF BILLABLE ACCOUNTS

Line No.	CUSTOMER CLASS	Fiscal Year Ending June 30, FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
1	Residential	462,658	462,658	462,658	462,658	462,658	462,658
2	Non-Residential	80,305	80,305	80,305	80,305	80,305	80,305
3	Condominium	4,307	4,307	4,307	4,307	4,307	4,307
4	Total	547,270	547,270	547,270	547,270	547,270	547,270

TABLE SW-13: SUMMARY OF STORMWATER COSTS
(in thousands of dollars)
TEST YEAR FY 2019

Line No.	Cost Component	(1) Allocated Cost of Service
1	Billing & Collection Costs	$ 11,696
2	Impervious Area and Gross Area Costs *(Excluding CAP Costs)*	163,918
3	Total	$ 175,614

TABLE SW-14: ESTIMATE OF GROSS AREA (GA) AND IMPERVIOUS AREA (IA) UNIT COSTS ADJUSTED FOR CUSTOMER ASSISTANCE PROGRAM (CAP)

Line No.	DESCRIPTION	(1) FY 2019 GA	(2) FY 2019 IA	(3) FY 2019 Total
		20%	80%	
1	Annual Cost of Service ($ 1000) from GA & IA **(Excluding CAP)**	$ 32,784	$ 131,135	$ 163,918
2	Stormwater Units of Service (500 Square Feet)	4,169,095	2,201,622	
3	System **Annual** Unit Cost ($/500 Square Feet)	7.86	59.56	
4	System **Monthly** Unit Cost ($/500 Square Feet)	0.66	4.96	

TABLE SW-15: ESTIMATE OF CUSTOMER CLASS GA AND IA COST OF SERVICE ADJUSTED FOR CUSTOMER ASSISTANCE PROGRAM (CAP) (in thousands of dollars)

Line No.	DESCRIPTION	(1) FY 2019 GA	(2) FY 2019 IA	(3) FY 2019 Total
	RESIDENTIAL			
1	Residential Cost of Service (a)	$ 15,302	$ 57,679	$ 72,981
	NON-RESIDENTIAL			
2	Initial Non-Residential Cost of Service (b)	17,482	73,456	90,938
3	Adjustment for CAP (c)	466	1,865	2,331
4	Adjusted Non-Residential Cost of Service	17,948	75,321	93,269
5	Total GA & IA Cost of Service	$ 33,250	$ 133,000	$ 166,250

(a) Calculated as Residential GA and IA square footage times the GA and IA unit cost.
(b) Total GA and IA Cost of Service LESS Residential cost of service.
(c) To recover Non-residential CAP Loss from the Non-residential stormwater customer class.

TABLE SW-16: GA AND IA COST OF SERVICE RATES PRIOR TO DISCOUNT AND LAG FACTOR ADJUSTMENTS

Line No.	DESCRIPTION	(1) FY 2019 GA	(2) FY 2019 IA	(3) FY 2019 Total
1	Residential **Monthly** GA & IA Charge (a)	$ 2.77	$ 10.42	$ 13.19
2	Non-Residential **Monthly** GA & IA Unit Cost (Adjusted for CAP)	0.67	5.09	
3	Impact of CAP on Non-Residential GA & IA Rate	0.02	0.13	

(a) Calculated based on Residential Mean GA (2,110 sf) and Mean IA (1,050 sf).

TABLE SW-17: STORMWATER BILLING and COLLECTION UNIT COSTS

Line No.	Description	Units	(1) FY 2019
1	Stormwater Billing & Collection Annual Revenue Requirements	$	11,695,801
2	Monthly Billable Accounts: Residential	# Accounts	462,658
3	Non-Residential Cost Weighting Factor (a)		1.3
4	Weighted Monthly Billable Accounts: Non-Residential	# Accounts	109,996
5	Total Weighted Monthly Billable Accounts (Line 2+ Line 4)	# Accounts	572,654
6	Annual Billable Accounts: Residential (Line 2 x 12)	# Accounts	5,551,896
7	Weighted Annual Billable Accounts: Non-Residential (Line 4 x 12)	# Accounts	1,319,947
8	Total Weighted Annual Billable Accounts (Line 6 + Line 7)	# Accounts	6,871,843
9	Residential Billing & Collection Unit Cost per Billing Cycle	$/Unit	2
10	Non-Residential Billing & Collection Unit Cost per Billing Cycle (Line 9 x Line 3)	$/Unit	2

(a) A higher weighting factor is assigned to non-residential due to the additional time and effort needed to address billing issues and parcel data issues for non-residential class, as the charges are individually calculated for each parcel.

TABLE SW-18: STORMWATER ADJUSTED COSTS OF SERVICE (AFTER DISCOUNTS)
(in thousands of dollars)
TEST YEAR FY 2019

Line No.	Customer Class	(1) Allocated Cost of Service (a)	(2) Discounts	(3) Adjusted Cost of Service with Discounts	(4) Recovery of Discounts (b) Residential	(5) Recovery of Discounts (b) Non-Residential	(6) Recovery of Discounts (b) All (b)	(7) Adjusted Cost of Service
	Residential							
1	Non-Discount	$ 77,590,639	$ -	$ 77,590,639	$ -	$ -	$ 1,939,966	$ 79,530,606
2	Discount - Non-PHA	4,058,628	(1,014,657)	3,043,971			76,107	3,120,078
3	Discount - PHA	776,137	(38,807)	737,330			18,435	755,766
	Non-Residential							
4	Non-Discount	78,859,290		78,859,290			1,971,686	80,830,976
5	Discount - Non-PHA	12,793,526	(3,198,382)	9,595,145			239,903	9,835,048
6	Discount - PHA	1,242,533	(62,127)	1,180,406			29,513	1,209,919
	Condominiums							
7	Non-Discount	2,522,385		2,522,385			63,066	2,585,451
8	Discount - Non-PHA	106,730	(26,682)	80,047			2,001	82,049
9	Discount - PHA	930	(46)	883			22	906
10	Total	$ 177,950,798	$ (4,340,701)	$ 173,610,097	$ -	$ -	$ 4,340,701	$ 177,950,798

Notes:
(a) Non-Residential Customer cost of service includes the cost of CAP
(b) Reflects current policy of recovering discounts from all customer classes

TABLE SW-19: STORMWATER FINAL COST OF SERVICE RATES
TEST YEAR FY 2019

Line No.	Service Type	(1) Cost of Service Rate	(2) Discount Recovery Factor	(3) Cost of Service Rate	(4) Lag Factor Adjustment	(5) Proposed Rate
	Billing & Collection Charge					
1	Residential	$ 1.70	$ 1.03	$ 1.74	$ 1.05	$ 1.83
2	Non-Residential	2.21	1.03	2.27	1.05	2.38
3	Condominiums	2.21	1.03	2.27	1.05	2.38
	IA/GA Charge					
4	Residential	13.19	1.03	13.52	1.05	14.18
	Non-Residential					
5	IA Charge	5.09	1.03	5.22	1.05	5.47
6	GA Charge	0.67	1.03	0.69	1.05	0.72
	Condominiums					
7	IA Charge	5.09	1.03	5.22	1.05	5.47
8	GA Charge	0.67	1.03	0.69	1.05	0.72

Notes: Non-Residential and Condominium have the same Billing & Collection and GA/IA rate

TABLE SW-19A
STORMWATER: PROPOSED RATES FOR RESIDENTIAL SERVICE

Line No.	Description	(1) FY 2019 Monthly Charge	(2) FY 2020 Monthly Charge	(3) FY 2021 Monthly Charge
STORMWATER MANAGEMENT SERVICE CHARGE				
1	Charge Per Parcel	$ 14.18	$ 15.23	$ 16.12
BILLING AND COLLECTION CHARGE				
2	Charge Per Bill	$ 1.83	$ 1.91	$ 2.03

TABLE SW-19B
STORMWATER: PROPOSED RATES FOR NON-RESIDENTIAL SERVICE

Line No.	Description	(1) FY 2019 Monthly Charge	(2) FY 2020 Monthly Charge	(3) FY 2021 Monthly Charge
STORMWATER MANAGEMENT SERVICE CHARGE				
1	Min Charge	$ 14.18	$ 15.23	$ 16.12
2	GA (per 500 sf)	0.723	0.777	0.821
3	IA (per 500 sf)	5.471	5.862	6.188
BILLING AND COLLECTION CHARGE				
4	Charge Per Bill	$ 2.38	$ 2.49	$ 2.64

In the Matter of the Philadelphia Water Department's Proposed Change in Water, Wastewater and Stormwater Rates and Related Charges

Fiscal Years 2019-2021

Philadelphia Water Department

Black & Veatch Management Consulting, LLC

Schedule BV-E4

Dated: February 9, 2018

Schedule REF #		Schedule Name
BV-E4	**Black & Veatch Schedules**	
1	**TABLE M-1**	Summary of Miscellaneous Charges (Regular Hours)
2	**TABLE M-2**	Summary of Miscellaneous Charges (Overtime Hours)

TABLE M-1 : Summary of Miscellaneous Charges (Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges	New - Calculated Charges	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
	Section 6- Miscellaneous Water Charges						
1	Meter Test Charges	6.1					
a	5/8"		$60.00	$202.56	$210.00	$210.00	$210.00
b	1",1.5",2"		$125.00	$273.66	$280.00	$280.00	$280.00
c	3",4",6",8",10",12"		$315.00	$652.15	$660.00	$660.00	$660.00
d	Field Tests 3" and above		$350.00	$652.15	$660.00	$660.00	$660.00
2	Charges for Furnishing and Installation of Water Meters	6.2					
a	Setting both Meter and Meter Interface Unit (MIU)						
	5/8"		$195.00	$249.79	$250.00	$250.00	$250.00
	3/4 RFSS		$285.00	$427.97	$400.00	$430.00	$430.00
	1"		$275.00	$422.49	$385.00	$425.00	$425.00
	1" RFSS		$355.00	$516.44	$500.00	$520.00	$520.00
	1 1/2		$480.00	$800.99	$675.00	$805.00	$805.00
	1 1/2 RFSS		$650.00	$746.38	$750.00	$750.00	$750.00
	2"		$600.00	$901.35	$840.00	$905.00	$905.00
	2" RFSS		$825.00	$964.44	$965.00	$965.00	$965.00
	3" Compound		$1,930.00	$2,376.72	$2,380.00	$2,380.00	$2,380.00
	3" Turbine		$805.00	$1,490.44	$1,130.00	$1,495.00	$1,495.00
	3" Fire Series		$2,725.00	$3,377.90	$3,380.00	$3,380.00	$3,380.00
	4" Compound		$2,510.00	$2,790.79	$2,795.00	$2,795.00	$2,795.00
	4" Turbine		$1,485.00	$2,531.72	$2,080.00	$2,535.00	$2,535.00
	4" Fire Series		$3,275.00	$3,665.96	$3,670.00	$3,670.00	$3,670.00
	4" Fire Assembly		$5,200.00	$6,021.72	$6,025.00	$6,025.00	$6,025.00
	6" Compound		$4,040.00	$4,821.72	$4,825.00	$4,825.00	$4,825.00
	6" Turbine		$2,550.00	$4,071.72	$3,570.00	$4,075.00	$4,075.00
	6" Fire Series		$4,575.00	$5,316.75	$5,320.00	$5,320.00	$5,320.00

TABLE M-1 : Summary of Miscellaneous Charges (Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges	New - Calculated Charges	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
	6" Fire Assembly		$7,100.00	$7,921.72	$7,925.00	$7,925.00	$7,925.00
	8" Turbine		$3,175.00	$5,452.78	$4,445.00	$5,455.00	$5,455.00
	8" Fire Series		$5,850.00	$6,089.15	$6,090.00	$6,090.00	$6,090.00
	8" Fire Assembly		$9,350.00	$11,142.42	$11,145.00	$11,145.00	$11,145.00
	10" Turbine		$4,570.00	$7,793.89	$6,400.00	$7,795.00	$7,795.00
	10" Fire Series		$7,950.00	$8,521.72	$8,525.00	$8,525.00	$8,525.00
	10" Fire Assembly		$13,675.00	$15,306.14	$15,310.00	$15,310.00	$15,310.00
	12" Turbine		$5,275.00	$7,907.38	$7,385.00	$7,910.00	$7,910.00
	12" Fire Series		$8,450.00	$8,711.29	$8,715.00	$8,715.00	$8,715.00
	12" Fire Assembly		$14,600.00	$16,176.80	$16,180.00	$16,180.00	$16,180.00
b	Furnishing and Setting Meter Interface Unit (MIU)						
	5/8"		$170.00	$101.97	$105.00	$105.00	$105.00
	3/4 RFSS		$170.00	$101.97	$105.00	$105.00	$105.00
	1"		$215.00	$182.44	$185.00	$185.00	$185.00
	1" RFSS		$215.00	$182.44	$185.00	$185.00	$185.00
	1 1/2		$215.00	$182.44	$185.00	$185.00	$185.00
	1 1/2 RFSS		$215.00	$182.44	$185.00	$185.00	$185.00
	2"		$215.00	$182.44	$185.00	$185.00	$185.00
	2" RFSS		$215.00	$182.44	$185.00	$185.00	$185.00
	3" Compound		$495.00	$521.72	$525.00	$525.00	$525.00
	3" Turbine		$290.00	$521.72	$410.00	$525.00	$525.00
	4" Compound		$495.00	$521.72	$525.00	$525.00	$525.00
	4" Turbine		$290.00	$521.72	$410.00	$525.00	$525.00
	6" Compound		$495.00	$521.72	$525.00	$525.00	$525.00
	6" Turbine		$290.00	$521.72	$410.00	$525.00	$525.00
	8"		$290.00	$521.72	$410.00	$525.00	$525.00
	10"		$290.00	$521.72	$410.00	$525.00	$525.00

TABLE M-1 : Summary of Miscellaneous Charges (Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges	New - Calculated Charges	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
3	Tampering of Meter	6.3					
a	5/8" or 3/4"		$45.00	$101.97	$120.00	$120.00	$120.00
b	1", 1.5" or 2"		$85.00	$182.44	$210.00	$210.00	$210.00
c	3" and larger		$260.00	$521.72	$580.00	$580.00	$580.00
4	Shut-Off and Restoration of Water Service	6.4					
a	Non-payment		$50.00	$101.97	$70.00	$100.00	$105.00
b	Non-compliance with Notice of Defect		$60.00	$101.97	$85.00	$105.00	$105.00
c	Operating service valve 2" and smaller service lines		$60.00	$101.97	$85.00	$105.00	$105.00
d	Operating service valve larger than 2" service lines		$100.00	$407.75	$140.00	$200.00	$280.00
e	Obstructed curb stop, missing access box, requires excavation		$300.00	$815.51	$420.00	$590.00	$820.00
f	Curb stop inoperable, requires installation of new curb stop		$450.00	$862.09	$630.00	$885.00	$885.00
g	Obstructed curb stop, missing access box, requires excavation and footway paving		$600.00	$815.51	$820.00	$820.00	$820.00
h	Curb stop inoperable, requires installation of new curb stop and footway paving		$875.00	$862.09	$865.00	$865.00	$865.00
i	Excavation and shutoff of ferrule at the water main		$1,805.00	$1,984.56	$1,985.00	$1,985.00	$1,985.00
5	Pumping of Properties	6.5	Actual Cost	$705.15	Actual Cost	Actual Cost	Actual Cost
6	Charges for Water Main Shutdown Service	6.6	$200.00	$210.54	$210.00	$210.00	$210.00
7	Water Connection Charges						
	Ferrule Connections	6.7 (b)					
a	3/4"		$193.00	$238.21	$240.00	$240.00	$240.00
b	1"		$211.00	$267.18	$270.00	$270.00	$270.00
c	1.5"		$249.00	$363.91	$350.00	$365.00	$365.00
d	2"		$286.00	$426.41	$405.00	$430.00	$430.00
	Valve Connections	6.7 (c)					
e	3" & 4"		$16,184.00	$15,702.05	$15,705.00	$15,705.00	$15,705.00
f	6" & 8"		$16,720.00	$15,941.64	$15,945.00	$15,945.00	$15,945.00
g	10" & 12"		$19,130.00	$18,600.39	$18,605.00	$18,605.00	$18,605.00

TABLE M-1 : Summary of Miscellaneous Charges (Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges	New - Calculated Charges	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
	Attachment to a Transmission Main	6.7 (d)					
	3" & 4" Sleeve						
	16" Main		$21,995.00	$23,474.81	$23,475.00	$23,475.00	$23,475.00
	20" Main		$23,075.00	$24,857.35	$24,860.00	$24,860.00	$24,860.00
	24" Main		$24,155.00	$26,470.30	$26,475.00	$26,475.00	$26,475.00
	30" Main		$36,517.00	$36,844.36	$36,845.00	$36,845.00	$36,845.00
	36" Main		$41,676.00	$42,006.36	$42,010.00	$42,010.00	$42,010.00
	6" & 8" Sleeve						
	16" Main		$22,531.00	$23,590.02	$23,595.00	$23,595.00	$23,595.00
	20" Main		$23,395.00	$24,626.92	$24,630.00	$24,630.00	$24,630.00
	24" Main		$24,583.00	$26,470.30	$26,475.00	$26,475.00	$26,475.00
	30" Main		$38,429.00	$37,449.36	$37,450.00	$37,450.00	$37,450.00
	36" Main		$45,527.00	$43,826.36	$43,830.00	$43,830.00	$43,830.00
	10" & 12" Sleeve						
	16" Main		$24,898.00	$22,441.16	$22,445.00	$22,445.00	$22,445.00
	20" Main		$25,870.00	$23,294.36	$23,295.00	$23,295.00	$23,295.00
	24" Main		$26,896.00	$24,482.36	$24,485.00	$24,485.00	$24,485.00
	30" Main		$41,217.00	$38,803.36	$38,805.00	$38,805.00	$38,805.00
	36" Main		$49,862.00	$47,448.36	$47,450.00	$47,450.00	$47,450.00
8	Discontinuance of Water	6.8	$100.00	$1,776.55	$100.00	$100.00	$100.00
9	Hydrant Permits	6.9					
a	One Week		$265.00	$890.89	$375.00	$525.00	$735.00
b	Six Month		$2,250.00	$3,366.88	$3,150.00	$3,370.00	$3,370.00
10	Flow Tests	6.10	$350.00	$911.59	$490.00	$690.00	$915.00
11	Water Service Line Investigations and/or Inspections	6.11	$100.00	$89.26	$90.00	$90.00	$90.00
	Section 7- Miscellaneous Sewer Charges						
3	Wastewater Discharge Permit	7.3	$1,000.00	$4,406.20	$1,400.00	$1,960.00	$2,745.00
4	Groundwater Discharge Permit	7.4	$1,000.00	$3,165.76	$1,400.00	$1,960.00	$2,745.00

TABLE M-1 : Summary of Miscellaneous Charges (Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges	New - Calculated Charges	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
5	Manhole Pump-out Permit	7.5	$1,000.00	$3,215.28	$1,400.00	$1,960.00	$2,745.00
6	Trucked or Hauled Wastewater Permit	7.6	$1,000.00	$2,337.18	$1,400.00	$1,960.00	$2,340.00
7	Photographic & Video Inspection	7.7	$160.00	$275.00	$225.00	$275.00	$275.00
	Section 8- Miscellaneous Stormwater Charges						
1	Stormwater Plan Review Fees	8.1					
a	Conceptual Stormwater Plan Approval		$600.00	$1,156.14	$840.00	$1,160.00	$1,160.00
b	Post Construction Stormwater Plan Submission		$600.00	$280.03	$285.00	$285.00	$285.00
c	Post Construction Stormwater Plan Approval (Additional Review Time Fee)		$90.00	$145.67	$130.00	$150.00	$150.00
2	Stormwater Management Fee in Lieu	8.2					
a	Exemption to Water Quality Requirement		$5.00	$19.42	$10.00	$15.00	$20.00
b	Exemption to both Water Quality & Channel Protection Requirement		$13.00	To be discontinued	To be discontinued	To be discontinued	To be discontinued
	Other- Not in the Miscellaneous Charges Section						
1	Sewer Credit Application Fee	3.5 (c)	$150.00	$1,640.67	$210.00	$295.00	$415.00
2	Sewer Credit Failure to Inform PWD about increase	3.5 (f)	$300.00	$271.51	$275.00	$275.00	$275.00
3	Stormwater Credit Application Fee	4.5 (f) (3)	$150.00	To be discontinued	To be discontinued	To be discontinued	To be discontinued
4	Stormwater Credit Application Fee Renewal	4.5 (f) (5)	$50.00	$1,356.54	$70.00	$100.00	$140.00

Column Notes

1	From the PWD Regulations (effective Sept 5, 2017) incl. Attachment A-Rates and Charges (FY 2018 Charges)
2	Calculated charges for work performed during Water Department's regular business hours (9:00 a.m. to 4:45 p.m.) (i.e. not including overtime)
3,4,5	Proposed FY 2019 -FY 2021 Miscellaneous charges

TABLE M-2 : Summary of Miscellaneous Charges (Non Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges (Non Business Hours)	New - Calculated Charges (Non Business Hours)	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
	Section 6- Miscellaneous Water Charges						
1	Meter Test Charges	6.1					
a	5/8"		$60 + Addl expenses incurred	$213.19	$220.00	$220.00	$220.00
b	1",1.5",2"		$125 + Addl expenses incurred	$287.84	$290.00	$290.00	$290.00
c	3",4",6",8",10",12"		$315 + Addl expenses incurred	$687.59	$690.00	$690.00	$690.00
d	Field Tests 3" and above		$350 + Addl expenses incurred	$687.59	$690.00	$690.00	$690.00
2	Charges for Furnishing and Installation of Water Meters	6.2					
a	Setting both Meter and Meter Interface Unit (MIU)						
	5/8"		No separate rate in Regs	$254.52	N/A	N/A	N/A
	3/4 RFSS		No separate rate in Regs	$432.70	N/A	N/A	N/A
	1"		No separate rate in Regs	$431.94	N/A	N/A	N/A
	1" RFSS		No separate rate in Regs	$525.89	N/A	N/A	N/A
	1 1/2		No separate rate in Regs	$810.44	N/A	N/A	N/A
	1 1/2 RFSS		No separate rate in Regs	$755.83	N/A	N/A	N/A
	2"		No separate rate in Regs	$910.80	N/A	N/A	N/A
	2" RFSS		No separate rate in Regs	$973.89	N/A	N/A	N/A
	3" Compound		No separate rate in Regs	$2,405.07	N/A	N/A	N/A
	3" Turbine		No separate rate in Regs	$1,518.79	N/A	N/A	N/A
	3" Fire Series		No separate rate in Regs	$3,406.25	N/A	N/A	N/A
	4" Compound		No separate rate in Regs	$2,819.14	N/A	N/A	N/A
	4" Turbine		No separate rate in Regs	$2,560.07	N/A	N/A	N/A
	4" Fire Series		No separate rate in Regs	$3,694.31	N/A	N/A	N/A

TABLE M-2 : Summary of Miscellaneous Charges (Non Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges (Non Business Hours)	New - Calculated Charges (Non Business Hours)	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
	4" Fire Assembly		No separate rate in Regs	$6,050.07	N/A	N/A	N/A
	6" Compound		No separate rate in Regs	$4,850.07	N/A	N/A	N/A
	6" Turbine		No separate rate in Regs	$4,100.07	N/A	N/A	N/A
	6" Fire Series		No separate rate in Regs	$5,345.10	N/A	N/A	N/A
	6" Fire Assembly		No separate rate in Regs	$7,950.07	N/A	N/A	N/A
	8" Turbine		No separate rate in Regs	$5,481.13	N/A	N/A	N/A
	8" Fire Series		No separate rate in Regs	$6,117.50	N/A	N/A	N/A
	8" Fire Assembly		No separate rate in Regs	$11,170.77	N/A	N/A	N/A
	10" Turbine		No separate rate in Regs	$7,822.24	N/A	N/A	N/A
	10" Fire Series		No separate rate in Regs	$8,550.07	N/A	N/A	N/A
	10" Fire Assembly		No separate rate in Regs	$15,334.49	N/A	N/A	N/A
	12" Turbine		No separate rate in Regs	$7,935.73	N/A	N/A	N/A
	12" Fire Series		No separate rate in Regs	$8,739.64	N/A	N/A	N/A
	12" Fire Assembly		No separate rate in Regs	$16,205.15	N/A	N/A	N/A
b	Furnishing and Setting Meter Interface Unit (MIU)						
	5/8"		No separate rate in Regs	$106.70	N/A	N/A	N/A
	3/4 RFSS		No separate rate in Regs	$106.70	N/A	N/A	N/A
	1"		No separate rate in Regs	$191.89	N/A	N/A	N/A
	1" RFSS		No separate rate in Regs	$191.89	N/A	N/A	N/A
	1 1/2		No separate rate in Regs	$191.89	N/A	N/A	N/A
	1 1/2 RFSS		No separate rate in Regs	$191.89	N/A	N/A	N/A
	2"		No separate rate in Regs	$191.89	N/A	N/A	N/A
	2" RFSS		No separate rate in Regs	$191.89	N/A	N/A	N/A

TABLE M-2 : Summary of Miscellaneous Charges (Non Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges (Non Business Hours)	New - Calculated Charges (Non Business Hours)	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
	3" Compound		No separate rate in Regs	$550.07	N/A	N/A	N/A
	3" Turbine		No separate rate in Regs	$550.07	N/A	N/A	N/A
	4" Compound		No separate rate in Regs	$550.07	N/A	N/A	N/A
	4" Turbine		No separate rate in Regs	$550.07	N/A	N/A	N/A
	6" Compound		No separate rate in Regs	$550.07	N/A	N/A	N/A
	6" Turbine		No separate rate in Regs	$550.07	N/A	N/A	N/A
	8"		No separate rate in Regs	$550.07	N/A	N/A	N/A
	10"		No separate rate in Regs	$550.07	N/A	N/A	N/A
3	Tampering of Meter	6.3					
a	5/8" or 3/4"		No separate rate in Regs	$106.70	N/A	N/A	N/A
b	1", 1.5" or 2"		No separate rate in Regs	$191.89	N/A	N/A	N/A
c	3" and larger		No separate rate in Regs	$550.07	N/A	N/A	N/A
4	Shut-Off and Restoration of Water Service	6.4					
a	Non-payment		No separate rate in Regs	$106.70	N/A	N/A	N/A
b	Non-compliance with Notice of Defect		No separate rate in Regs	$106.70	N/A	N/A	N/A
c	Operating service valve 2" and smaller service lines		No separate rate in Regs	$106.70	N/A	N/A	N/A
d	Operating service valve larger than 2" service lines		No separate rate in Regs	$426.10	N/A	N/A	N/A
e	Obstructed curb stop, missing access box, requires excavation		No separate rate in Regs	$852.21	N/A	N/A	N/A
f	Curb stop inoperable, requires installation of new curb stop		No separate rate in Regs	$898.79	N/A	N/A	N/A
g	Obstructed curb stop, missing access box, requires excavation and footway paving		No separate rate in Regs	$852.21	N/A	N/A	N/A
h	Curb stop inoperable, requires installation of new curb stop and footway paving		No separate rate in Regs	$898.79	N/A	N/A	N/A
i	Excavation and shutoff of ferrule at the water main		No separate rate in Regs	$2,033.97	N/A	N/A	N/A
5	Pumping of Properties	6.5	Actual Cost	$744.68	Actual Cost	Actual Cost	Actual Cost

TABLE M-2 : Summary of Miscellaneous Charges (Non Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges (Non Business Hours)	New - Calculated Charges (Non Business Hours)	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
6	Charges for Water Main Shutdown Service	6.6	No separate rate in Regs	$220.42	N/A	N/A	N/A
7	Water Connection Charges						
	Ferrule Connections	6.7 (b)					
a	3/4"		$370.00	$248.09	$250.00	$250.00	$250.00
b	1"		$388.00	$277.06	$280.00	$280.00	$280.00
c	1.5"		$426.00	$373.79	$375.00	$375.00	$375.00
d	2"		$464.00	$436.29	$440.00	$440.00	$440.00
	Valve Connections	6.7 (c)					
e	3" & 4"		$18,484.00	$16,446.54	$16,450.00	$16,450.00	$16,450.00
f	6" & 8"		$19,020.00	$16,686.13	$16,690.00	$16,690.00	$16,690.00
g	10" & 12"		$22,127.00	$19,437.94	$19,440.00	$19,440.00	$19,440.00
	Attachment to a Transmission Main	6.7 (d)					
	3" & 4" Sleeve						
	16" Main		$25,180.00	$24,405.43	$24,410.00	$24,410.00	$24,410.00
	20" Main		$26,260.00	$25,787.97	$25,790.00	$25,790.00	$25,790.00
	24" Main		$27,340.00	$27,400.92	$27,405.00	$27,405.00	$27,405.00
	30" Main		$39,702.00	$37,774.98	$37,775.00	$37,775.00	$37,775.00
	36" Main		$44,864.00	$42,936.98	$42,940.00	$42,940.00	$42,940.00
	6" & 8" Sleeve						
	16" Main		$25,716.00	$24,520.64	$24,525.00	$24,525.00	$24,525.00
	20" Main		$26,580.00	$25,557.54	$25,560.00	$25,560.00	$25,560.00
	24" Main		$27,768.00	$27,400.92	$27,405.00	$27,405.00	$27,405.00
	30" Main		$41,614.00	$38,379.98	$38,380.00	$38,380.00	$38,380.00

TABLE M-2 : Summary of Miscellaneous Charges (Non Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges (Non Business Hours)	New - Calculated Charges (Non Business Hours)	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
	36" Main		$48,712.00	$44,756.98	$44,760.00	$44,760.00	$44,760.00
	10" & 12" Sleeve						
	16" Main		$28,780.00	$23,371.78	$23,375.00	$23,375.00	$23,375.00
	20" Main		$29,752.00	$24,224.98	$24,225.00	$24,225.00	$24,225.00
	24" Main		$30,778.00	$25,412.98	$25,415.00	$25,415.00	$25,415.00
	30" Main		$45,099.00	$39,733.98	$39,735.00	$39,735.00	$39,735.00
	36" Main		$52,859.00	$48,378.98	$48,380.00	$48,380.00	$48,380.00
8	Discontinuance of Water	6.8	No separate rate in Regs	$1,834.93	N/A	N/A	N/A
9	Hydrant Permits	6.9					
a	One Week		No separate rate in Regs	$910.28	N/A	N/A	N/A
b	Six Month		No separate rate in Regs	$3,386.27	N/A	N/A	N/A
10	Flow Tests	6.10	No separate rate in Regs	$961.33	N/A	N/A	N/A
11	Water Service Line Investigations and/or Inspections	6.11	No separate rate in Regs	$93.36	N/A	N/A	N/A
	Section 7- Miscellaneous Sewer Charges						
3	Wastewater Discharge Permit	7.3	No separate rate in Regs	$4,664.93	N/A	N/A	N/A
4	Groundwater Discharge Permit	7.4	No separate rate in Regs	$3,351.65	N/A	N/A	N/A
5	Manhole Pump-out Permit	7.5	No separate rate in Regs	$3,404.08	N/A	N/A	N/A
6	Trucked or Hauled Wastewater Permit	7.6	No separate rate in Regs	$2,474.42	N/A	N/A	N/A
7	Photographic & Video Inspection	7.7	No separate rate in Regs	$275.00	N/A	N/A	N/A
	Section 8- Miscellaneous Stormwater Charges						
1	Stormwater Plan Review Fees	8.1					
a	Conceptual Stormwater Plan Approval		No separate rate in Regs	$1,160.16	N/A	N/A	N/A
b	Post Construction Stormwater Plan Submission		No separate rate in Regs	$281.07	N/A	N/A	N/A

TABLE M-2 : Summary of Miscellaneous Charges (Non Business Hours)

			1	2	3	4	5
#	Miscellaneous Charge Description	PWD Regulations Reference	PWD Existing Charges (Non Business Hours)	New - Calculated Charges (Non Business Hours)	PWD Miscellaneous Charges (Proposed-FY 2019)	PWD Miscellaneous Charges (Proposed-FY 2020)	PWD Miscellaneous Charges (Proposed-FY 2021)
c	Post Construction Stormwater Plan Approval (Additional Review Time Fee)		No separate rate in Regs	$146.22	N/A	N/A	N/A
2	Stormwater Management Fee in Lieu	8.2					
a	Exemption to Water Quality Requirement		No separate rate in Regs	$19.42	N/A	N/A	N/A
b	Exemption to both Water Quality & Channel Protection Requirement		No separate rate in Regs	To be discontinued	To be discontinued	To be discontinued	To be discontinued
	Other- Not in the Miscellaneous Charges Section						
1	Sewer Credit Application Fee	3.5 (c)	No separate rate in Regs	$1,737.01	N/A	N/A	N/A
2	Sewer Credit Failure to Inform PWD about increase	3.5 (f)	No separate rate in Regs	$287.45	N/A	N/A	N/A
3	Stormwater Credit Application Fee	4.5 (f) (3)	No separate rate in Regs	To be discontinued	To be discontinued	To be discontinued	To be discontinued
4	Stormwater Credit Application Fee Renewal	4.5 (f) (5)	No separate rate in Regs	$1,361.59	N/A	N/A	N/A

Column Notes

1	From the PWD Regulations (effective Sept 5, 2017) incl. Attachment A-Rates and Charges (FY 2018 Charges)
2	Calculated charges for work performed outside of Water Department's regular business hours (i.e. including overtime)
3,4,5	Proposed FY 2019 -FY 2021 Misc charges for work performed during non-business hours

In the Matter of the Philadelphia Water Department's Proposed Change in Water, Wastewater and Stormwater Rates and Related Charges

Fiscal Years 2019-2021

Philadelphia Water Department

Black & Veatch Management Consulting, LLC

Schedule BV-E5

Dated: February 9, 2018

Schedule REF #		Schedule Name
BV-E5	**Black & Veatch Schedules**	
1	**WP-1**	FINANCIAL PLAN – REVENUE AND REVENUE REQUIREMENT ASSUMPTIONS
2	**WP-2**	PUBLIC FIRE PROTECTION COSTS IN RATES AND CHARGES
3	**WP-3**	CAPITAL ACCOUNT DEPOSIT
4	**WP-4**	COST OF SERVICE ANALYSIS OVERVIEW
5	**WP-5**	WHOLESALE COST OF SERVICE ANALYSIS
6	**WP-6**	COST RECOVERY OF DISCOUNTS, CREDITS, GRANTS, AND TAP
7	**WP-7**	SENIOR CITIZEN DISCOUNT THRESHOLD ADJUSTMENT

PHILADELPHIA WATER DEPARTMENT
FINANCIAL PLAN:
REVENUE & REVENUE REQUIREMENT ASSUMPTIONS

This document summarizes the assumptions used in developing the revenue and revenue requirement projections for the Philadelphia Water Department's (PWD) Financial Plan for the Fiscal Year (FY) 2018-FY 2023 projection period in conjunction with the FY 2019 - FY 2021 Rate Proceedings.

1. Revenue Projections

a. Projected FY 2018 to FY 2023 service revenues under existing rates reflect the adopted FY 2018 rates (effective July 1, 2017).

b. Projected FY 2018 Public Fire Protection revenues of $7.9 million from the City General Fund reflect adopted rates for FY 2018. Beginning in FY 2019, no Public Fire Protection revenues from the City General Fund are projected.
   - Public Fire Protection Costs are assumed to be recovered as part of the fixed charges (i.e. meter based service charge).
   - Refer to the attached memo regarding public fire protection cost allocation for further information.

c. Total system accounts are anticipated to remain stable over the projection period.

d. Projected water usage reflects the current number of accounts and the average usage per account based on historical demands, as presented in Appendix 1.

e. The usage per account is projected as follows:
   - For 5/8" meter General Service Customers usage per account is projected to decrease 1.75% per year; this is based on Black & Veatch's review of the historical 2-Year Average change shown in Figure 1.
   - For all other General Service Customers usage per account is projected to remain flat.

Figure 1 – Historical Usage Per Account for General Service Customers (5/8" Meters)

Description	Historical (Fiscal Year) 2012	2013	2014	2015	2016
Annual Billed Volume Per Account (Mcf/Account)	7.34	7.55	7.27	7.32	7.02
Annual Change	-6.73%	2.86%	-3.71%	0.69%	-4.10%
2 Year Average Change		-2.05%	-0.48%	-1.53%	-1.73%

f. Projected impervious and gross area stormwater credits are presented as a reduction in billable square footage of gross and impervious area. The credits reflect an average additional incremental reduction of:
   - 20.83 million square feet of gross area per year; and
   - 8.82 million square feet of impervious area per year.

   This incremental reduction in square footage is due to credits resulting from development or redevelopment projects meeting stormwater regulations and completed SMIP/GARP projects within the projection period.

g. Projected revenues under existing rates reflect the anticipated cumulative receipts for the water, sanitary sewer, and stormwater services (including retail and wholesale receipts) each fiscal year. The receipts for each fiscal year are estimated based on the projected system billings and the associated projected collection factors.

   Raftelis Financial Consultants (RFC) provided the projected collection factors for retail *Non-Stormwater Only* and *Stormwater Only* Customers, as detailed in RFC Report 4. The collection factors represent the multi-year payment pattern for the following periods:
   - **Billing Year** – All payments associated with a given fiscal year's billing and received within the 12 months following the beginning of the fiscal year.
   - **Billing Year Plus 1** - All payments associated with a given fiscal year's billing and received within 13-24 months following the beginning of the fiscal year.
   - **Billing Year Plus 2 and Beyond** - All payments associated with a given fiscal year's billing and received after 24 months following the beginning of the fiscal year.

   Collection factors used in the financial plan analysis reflect the average collection factors for fiscal years provided in RFC Report 4.

   The projected collection factors utilized in the financial plan analysis for FY 2018 to FY 2023 are as follows:

	Billing Year	Billing Year Plus 1	Billing Year Plus 2 and Beyond
FY 2018 to FY 2023 Projected Collection Factors			
Non-Stormwater Only	85.90%	9.08%	1.56%
Stormwater Only	60.38%	7.69%	4.01%

h. Operating Fund and Rate Stabilization Fund interest earnings are projected based on projected fund balances and 0.4% annual interest earnings rate.

i. Miscellaneous and contra revenues are projected based on historical and budgeted levels as presented in Figure 4.

Figure 4 –Projected Miscellaneous and Contra Revenues

Description	Fiscal Years	Projection
Penalties[1]	2018 – 2023	$10.3 Million / Year to $9.9 Million / Year
Other Miscellaneous Revenue[2]	2018 – 2023	$11.4 Million / Year to $14.1 Million / Year
State and Federal Grants[3]	2018 – 2023	$1.0 Million / year
License and Inspection Permits[3]	2018 – 2023	$2.5 Million / year
UESF Grants[4]	2018 - 2023	($0.65) Million
Stormwater CAP[5]	2018 – 2023	($2.4) Million / Year to ($1.9) Million / Year
Tiered Assistance Program (TAP) Discounts[6]	2018 2019 2020 2021-2023	($3.9) Million ($9.8) Million ($13.7) Million ($17.0) Million

Notes:
1. Reflects 1.50% of billings under existing rates based on the two year historical average from FY 2015 to FY 2016.
2. FY 2018 reflects budgeted amount. FY 2019 to FY 2023 reflects an anticipated increase in miscellaneous fee revenue due to updated fees.
3. Reflects FY 2018 Budget amount.
4. FY 2018 to FY 2023 projection reflects matching UESF grant.
5. Reflects a reduction of $100,000 in CAP revenue loss each year.
6. Projections of Tiered Assistance Program Discounts were developed by Raftelis Financial Consultants (RFC).

j. A TAP Rate Rider is proposed to provide a true-up mechanism for costs related to TAP revenue losses. Details on the proposed TAP Rate Rider Adjustment are provided separately in the TAP Rate Rider Adjustment white paper.
   - As indicated in Figure 4, TAP revenue losses are expected to increase from $3.9 million in FY 2018 to $17.0 million by FY 2021 and then held constant for the remainder of the study period.
   - TAP Revenue Losses are based upon current FY 2018 rates and not adjusted for anticipated revenue increase based upon the assumption that the TAP Rate Rider Adjustment mechanism will be implemented.

- If a TAP Rate Rider is not implemented, the financial plan would need to reflect anticipated increases in TAP Revenue Loss, in association with increases in retail service rates (for water, sewer and stormwater).

k. Additional service revenues reflect projected revenue increases associated with projected rate increases in fiscal years 2019 to 2023 to meet senior debt service coverage requirements (see item #4 - Bond Covenants, Transfers, and Fund Balances).

2. Operating Expenses

a. Operating expenses are projected for FY 2018 as follows:

i. Beginning with the Water Fund's approved FY 2018 budget; and

ii. Adjusting operating expenses to reflect:

- The Water Fund actual to budget spending levels of approximately 89.7%, reflect the 2-year historical average actual to budget factors from FY 2015 and FY 2016 (See Appendix 3); and
- Actual to Budget factors by cost classification for each Water Department Division and City Department (which budget costs to be funded by the Water Fund) reflect the two year historical average of the actual to budget ratio, with the following exceptions:

Figure 5 – Actual to Budget Factor Exceptions

Department	Class / Description	Actual to Budget Factor
Philadelphia Water, Sewer and Stormwater Rate Board	100 and 200	100%
Finance	200 SMIP/GARP	100%
Public Affairs	500	100%

b. Operating Expenses for fiscal years 2019 through 2023 are projected based on the following:

i. Applying the annual escalation factors to the projected FY 2018 operating expenses by category as presented in Figure 6.

- The escalation factors for Labor costs are based on the City's Five Year Financial and Strategic Plan for Fiscal Years 2018-2022 (Five Year Plan) and prior year labor agreement.
- The escalation factors for Power and Gas are based on City Energy Office estimates (see Appendix 8).

- The escalation factors for Chemicals for FY 2019 and FY 2020 are based on PWD's recent experience. An escalation factor of 1.0% is used for Chemicals for FY 2021 through FY 2023.
- The escalation factors for Public Property class 200 costs are based on the estimates in the City's Five Year Plan.
- No escalation factor is applied for indemnities for FY 2019 through FY 2023.
- The escalation factors for all other non-Labor Costs are based on a review of historical actual O&M costs and analysis of relevant cost indices. PWD's long-term historical O&M costs are presented in Appendix 4. Relevant O&M cost industry indices are provided in Appendix 5.

Figure 6 – Annual Escalation Factors

Class	Description	Annual Escalation
100	Labor Costs	FY 2019 – 2.5% FY 2020 – 3.0% FY 2021 – FY 2023 - 3.0%
220	Power	FY 2019 - FY 2020– 0.0% FY 2021 - FY 2023 3.0%
221	Gas	FY 2019 – 4.0% FY 2020 – 0.0% FY 2021 - FY 2023 – 3.0%
200	Services	FY 2019 – FY 2023 - 3.4%
200	Public Property	FY 2019 – 1.66% FY 2020 – 1.60% FY 2021 – 1.56% FY 2022 – 3.44% FY 2023 – 2.06%
307	Chemical Costs	FY 2019 – 6.7% FY 2020 – 3.8% FY 2021 - FY 2023 – 1.0%
300	Materials and Supplies	FY 2019 - FY 2023 - 0.5%
400	Equipment	FY 2019 - FY 2023 - 1.3%

500	Indemnities	FY 2019 - FY 2023 – 0.0%
800	Transfers	FY 2019 - FY 2023 – 2.5%

ii. The pension and benefit cost escalation factors were projected based on the cost increases reflected in the City's Five Year Plan, as seen below in Figure 7.

- Per City Policy, effective in FY 2017 fringes for personnel associated with the CIP program can no longer be funded via capital financing. Therefore, the FY 2018 pension and benefit costs also reflect an approximate $12.5 million shift in costs from capital to operating.

Figure 7 – Pension and Benefit Annual Escalation Factors

Description	Fiscal Year	2019	2020	2021	2022	2023
City Five Year Plan Escalation Factors						
191	City Finance-Pension	3.22%	3.33%	1.47%	1.57%	2.39%
190	City Finance-Pension Obligations	0.00%	0.00%	0.00%	0.00%	0.00%
1xx	City Finance-Benefits	5.67%	4.50%	4.44%	4.46%	4.77%

iii. Projected Operating Expenses include additional adjustments as presented in Figure 8.

c. Liquidated encumbrances for FY 2018 are projected to be $24.0 million based on the preliminary FY 2017 results and the balance of outstanding encumbrances as of June 30, 2017. Liquidated encumbrances for FY 2019 thru FY 2023 are projected to be 14.2% of projected Services (class 200) and Materials and Supplies (class 300) expenses excluding SMIP/GARP.

i. The 14.2% projection is based on the average of the actual ratio of liquidated encumbrances to expenses for Services (class 200) and Materials and Supplies (class 300) experienced in FY 2016 and FY 2015. SMIP/GARP are excluded as the budgets are fully expended.

Figure 8 – Additional Adjustments for Projected Operating Expenses

Department	Class	Fiscal Year(s)	Additional Adjustment Amount	Purpose
Water Finance	200	2019 to 2023	$10.0 Million	Additional Stormwater Management Incentive Program (SMIP) and Green Area Retrofit Program (GARP) costs.
Operations	100	2019 to 2023	$0.5 to $1.9 Million	Additional Water Department staff costs related to regulatory compliance.
Planning & Environmental Services	100	2019 to 2023	$0.1 Million to $0.4 Million	Additional Water Department staff costs related to regulatory compliance.
City Finance	100	2019 to 2023	$0.5 to $2.0 Million	Additional pension and benefits costs associated with additional Water Department staff for regulatory compliance. Additional costs are derived using the ratio of projected Water Fund pension and benefit costs (excluding capital related costs) to projected Water Fund salary costs. The annual ratio for FY 2019 to FY 2023 averages 88.3%.
	500	2019 to 2023	$0.50 Million	Based on recent budget overages, indemnities are expected to remain at a higher level for the foreseeable future.

3. Debt Service

a. Projected debt service reflects the following anticipated bond issues and assumed interest rates:

i. FY 2017 (Series 2017A Bonds) – $313.7 Million (including original issue premium) based on actual bond issue
ii. FY 2018 (Series 2017B Bonds) – $209.4 Million (including original issue premium) based on actual bond issue
iii. FY 2019 – $285.0 Million (5.50% interest rate)
iv. FY 2020 – $295.0 Million (5.75% interest rate)
v. FY 2021 – $305.0 Million (6.00% interest rate)
vi. FY 2022 – $340.0 Million (6.00% interest rate)
vii. FY 2023 - $335.0 Million (6.00% interest rate)

b. Projected debt service for the proposed bond issues in fiscal years 2019 to 2023 reflect bond issuance in the first quarter of the fiscal year with November and May interest payments.
c. Projected debt service for the proposed bond issues in fiscal years 2019 to 2021 reflects interest only payments for the first year of the bond amortization.
d. Projected debt service reflects savings from the issuance of Series 2017B Bonds.
e. Projected debt service Pennvest amortization schedules (as of May 2017).
f. Projected debt service includes a Transfer to Escrow in FY 2018 which is funded by a release from the Debt Service Reserve Fund.
g. The existing and proposed debt service payments over the projection period are presented in Appendix 6.

4. Bond Covenants, Transfers, and Fund Balances

a. Senior Debt Coverage:
   - The General Ordinance rate covenant requires minimum senior debt service coverage of 1.20.
   - In accordance with prudent financial management industry practices, PWD management established the following debt service coverage targets for the projection period:

     - FY 2018: 1.26;
     - FY 2019: 1.28;
     - FY 2020 and beyond: 1.30.

b. Total Debt Coverage
   - The General Ordinance rate covenant requires minimum total debt coverage of 1.00.
c. Insurance Covenant

- The City has covenanted to Assured Guaranty Municipal Corporation (AGM) that for so long as the portions of the Series 2010A or the 2010C Bonds insured by AGM are outstanding, the City will establish rates and charges for use by the Water and Wastewater systems sufficient to yield Net Revenues (excluding amounts transferred from the Rate Stabilization Fund into the Revenue Fund during, or as of the end of, such fiscal year) at least equal to 90 percent of the Debt Service Requirements (excluding debt service due on any Subordinated Bonds) in such fiscal year.

d. Capital Account Deposit.
   - Projected FY 2018 to FY 2023 Capital Account Deposit is based on the following assumptions:
     1. Inflated net plant investment of 3.4% per year based on the average annual increase in net plant investment (excluding construction work in progress) during FY 2014 and FY 2016.
     2. Annual Capital Account Deposit is based on 1.0% (in FY 2018) and 1.5% (FY 2019-FY 2023) of prior year projected net plant investment (original cost less depreciation).

e. Residual Transfer to Construction.
   - Projected transfers are made as available.
   - The end-of-year Residual Fund balance is maintained at $15.0 million for the projection period.

f. Rate Stabilization Fund Transfers.
   - The Water Department has a Rate Stabilization Fund balance goal of approximately $150 million by FY 2023.
   - No deposits to the Rate Stabilization Fund are planned during the rate period (FY 2019 – FY 2021).

g. Beginning Fund Balances.
   - The FY 2017 beginning fund balances are based on the FY 2016 Financial Statements.

5. Capital Program

Total capital program for the projection period is estimated as shown in Figure 9. The projected capital program is based on the proposed FY 2018 to FY 2023 capital program. The FY 2019 to FY 2023 capital program costs reflect an annual inflation of 2.5% based on industry construction cost indices. Relevant capital cost industry indices are provided in Appendix 7.

The projected capital program total annual expenditures for the projection period were estimated as 90% of the annual inflated capital program budget. The projected total annual expenditures reflect the anticipated capital program expenditures for the projection period.

The projected capital expenditures are allocated to the water and wastewater utilities based on the distribution of the projected capital budget.

Figure 9 –Projected Capital Program Budget and Annual Expenditures

Fiscal Year	2018	2019	2020	2021	2022	2023
CIP Budget						
Water CIP	$143 M	$146 M	$148 M	$130 M	$133 M	$135 M
Wastewater CIP	$211 M	$211 M	$212 M	$233 M	$249 M	$250 M
Total CIP Budget	**$354 M**	**$357 M**	**$360 M**	**$363 M**	**$382 M**	**$385 M**
Inflated CIP Budget						
Water CIP	$143 M	$149 M	$155 M	$139 M	$145 M	$151 M
Wastewater CIP	$211 M	$216 M	$221 M	$249 M	$273 M	$280 M
Total CIP Budget	**$354 M**	**$365 M**	**$376 M**	**$388 M**	**$418 M**	**$431 M**
CIP Expenditures						
Water CIP	$129 M	$134 M	$139 M	$125 M	$130 M	$136 M
Wastewater CIP	$189 M	$194 M	$200 M	$224 M	$246 M	$252 M
Total CIP Expenditures	**$318 M**	**$328 M**	**$339 M**	**$349 M**	**$376 M**	**$388 M**

APPENDICES

Appendix 1 – Billed Volume per Account
Appendix 2 – Retail Excluding Stormwater Only Collection Factor Calculations
Appendix 3 – Actual to Budget Factors
Appendix 4 – Water Fund Historical O&M Costs
Appendix 5 – O&M Cost Industry Indices Data
Appendix 6 – Existing and Projected Debt Service
Appendix 7 – Capital Cost Industry Indices Data

APPENDIX 1

Billed Volume per Account

Annual Billed Volume Per Account (Mcf/Account)

Customer Type	USE FY 2017	Historical Averages 2 Year	Historical Averages 3 Year	Historical Usage Per Account FY 2014	Historical Usage Per Account FY 2015	Historical Usage Per Account FY 2016
Senior Citizens (Special Customer Group II)						
5/8" Meter	5.60	5.62	5.63	5.63	5.74	5.51
> 5/8" Meter	6.60	6.63	7.62	9.60	7.05	6.20
General Service (Residential)						
5/8" Meter	7.00	6.95	6.99	7.07	7.09	6.80
> 5/8" Meter	69.00	68.87	74.56	85.93	73.88	63.87
General Service (Commercial)						
5/8" Meter	11.50	11.52	11.46	11.33	11.73	11.31
> 5/8" Meter	163.00	163.93	162.30	159.05	165.22	162.64
General Service (Industrial)						
5/8" Meter	11.20	11.46	11.22	10.72	11.74	11.19
> 5/8" Meter	160.00	160.14	161.40	163.92	153.57	166.71
General Service (Public Utilities)						
5/8" Meter	10.00	9.44	10.11	11.45	8.96	9.92
> 5/8" Meter	115.00	120.53	113.22	98.59	124.31	116.76
General Service (Excluding Senior Citizens)						
5/8" Meter	NA	7.25	7.28	7.35	7.40	7.09
> 5/8" Meter	NA	126.30	128.51	132.93	130.10	122.49
General Service (Including Senior Citizens)						
5/8" Meter	NA	7.17	7.20	7.27	7.32	7.02
> 5/8" Meter	NA	126.25	128.46	132.87	130.06	122.44
PHA (Special Customer Group IV)	29.00	29.36	28.83	27.75	30.25	28.48
Charities & Schools (Special Customer Group I)	75.00	72.50	74.85	79.55	73.67	71.32
Hospital/University (Special Customer Group III)	590.00	576.80	589.35	614.46	543.35	610.24
Hand Bill	2,100.00	2,148.51	2,121.67	2,068.00	2,125.74	2,171.28
Scheduled	8.00	7.84	8.89	11.00	10.35	5.33
Fire Service	3.00	3.38	3.14	2.64	2.82	3.95

Note: The volumes presented above represent the average annual billed volume per account for all accounts within the respective customer type.

These figures differ from the typical customer consumption used to estimate the typical customer bills for residential, senior citizen and small commercial customers. Please refer to the Typical Residential Consumption Memo and Small Commercial Consumption Memo as prepared by Raftelis Financial Consultants for further information on typical monthly customer consumption and the methodology utilized to determine it. As detailed in the memo, the typical consumption represents the monthly consumption for a typical customer account and is adjusted to "exclude any zero bills or those that indicated negative consumption as these consumption levels indicate usage adjustments or inactive accounts, respectively."

Appendix 2

Retail Excluding Stormwater Only Collection Factor Calculations

Non-Stormwater only Customers	Collection Factors		
	Billing Year (Payments within 12 months)	Billing Year Plus 1 (Payments w/in 13-24 months)	Billing Year Plus 2 and Beyond (Payment after 24 months)
Historical Collection Factors	**%**	**%**	**%**
FY 2012	84.71%	9.67%	1.99%
FY 2013	84.76%	9.80%	1.69%
FY 2014	86.14%	8.61%	1.00%
FY 2015	87.02%	8.24%	
FY 2016	86.88%		
Average	**85.90%**	**9.08%**	**1.56%**

Stormwater Only Customers	Collection Factors		
	Billing Year (Payments within 12 months)	Billing Year Plus 1 (Payments w/in 13-24 months)	Billing Year Plus 2 and Beyond (Payments after 24 months)
Historical Collection Factors	**%**	**%**	**%**
FY 2012	59.32%	9.21%	5.09%
FY 2013	60.86%	7.49%	3.95%
FY 2014	59.11%	5.98%	2.98%
FY 2015	59.51%	8.08%	
FY 2016	63.08%		
Average	**60.38%**	**7.69%**	**4.01%**

Source: Raftelis Financial Consultants Report 4

Appendix 3

Actual to Budget Factors

Appendix 3
Actual to Budget Factors

		Factor Used	Historical Average 2 Year	Historical Average 3 Year	Actual to Budget Factor 2016	Actual to Budget Factor 2015	Actual to Budget Factor 2014	Actual O&M Expense 2016	Actual O&M Expense 2015	Actual O&M Expense 2014	Budgeted O&M Expense 2016	Budgeted O&M Expense 2015	Budgeted O&M Expense 2014
Human Resources and Administration													
Salaries & Wages	100	95.46%	95.46%	96.04%	92.92%	98.04%	97.33%	$ 8,190,963	$ 8,502,816	$ 7,650,763	$ 8,815,500	$ 8,673,039	$ 7,860,450
Services	200	72.00%	72.00%	74.00%	65.23%	78.04%	79.36%	$ 3,406,310	$ 4,562,319	$ 3,277,947	$ 5,222,100	$ 5,846,000	$ 4,130,600
Materials and Supplies	300	58.80%	58.80%	64.52%	57.88%	59.66%	82.01%	$ 660,930	$ 725,233	$ 632,835	$ 1,141,850	$ 1,215,550	$ 771,700
Equipment	400	57.04%	57.04%	65.31%	29.70%	98.33%	171.52%	$ 188,501	$ 413,078	$ 140,816	$ 634,600	$ 420,100	$ 82,100
Indemnities	500	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	$ -	$ -	$ -	$ 100,000	$ 100,000	$ 100,000
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Human Resources and Administration			82.84%	85.01%	78.21%	87.38%	90.40%	$ 12,446,704	$ 14,203,446	$ 11,702,361	$ 15,914,050	$ 16,254,689	$ 12,944,850
Finance													
Salaries & Wages	100	88.48%	88.48%	87.36%	89.16%	87.78%	84.77%	$ 2,273,794	$ 2,170,853	$ 1,849,144	$ 2,550,200	$ 2,472,925	$ 2,181,400
Services	200	46.33%	46.33%	50.38%	26.88%	65.70%	58.28%	$ 1,961,689	$ 4,811,153	$ 4,366,100	$ 7,297,500	$ 7,322,500	$ 7,491,000
SMIP/GARP	2xx	100.00%	122.57%	117.54%	131.00%	113.15%	96.54%	$ 15,000,000	$ 11,598,134	$ 5,020,143	$ 11,450,000	$ 10,250,000	$ 5,200,000
Materials and Supplies	300	7.48%	7.48%	12.23%	18.62%	5.28%	15.26%	$ 16,054	$ 23,023	$ 124,596	$ 86,200	$ 436,200	$ 816,400
Equipment	400	0.00%	0.00%	85.54%	0.00%	0.00%	92.95%	$ -	$ -	$ 521,252	$ 37,800	$ 10,800	$ 560,800
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	58.46%	58.46%	58.39%	76.87%	44.60%	58.25%	$ 8,100,186	$ 6,244,621	$ 7,714,419	$ 10,537,000	$ 14,000,000	$ 13,243,100
Subtotal Finance			78.55%	74.83%	85.58%	72.04%	66.44%	$ 27,351,723	$ 24,847,784	$ 19,595,654	$ 31,958,700	$ 34,492,425	$ 29,492,700
Planning and Engineering													
Salaries & Wages	100	92.60%	92.60%	89.08%	87.79%	97.38%	82.27%	$ 1,075,392	$ 1,199,514	$ 1,043,846	$ 1,225,000	$ 1,231,738	$ 1,268,860
Services	200	53.99%	53.99%	46.37%	47.74%	60.29%	31.24%	$ 237,504	$ 297,188	$ 155,719	$ 497,500	$ 492,900	$ 498,500
Materials and Supplies	300	40.62%	40.62%	46.53%	29.09%	51.55%	59.36%	$ 54,541	$ 102,067	$ 105,252	$ 187,500	$ 198,000	$ 177,300
Equipment	400	15.67%	15.67%	13.59%	6.56%	24.77%	12.48%	$ 3,873	$ 14,614	$ 27,449	$ 59,000	$ 59,000	$ 220,000
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Planning and Engineering			75.55%	70.59%	69.64%	81.42%	61.55%	$ 1,371,310	$ 1,613,383	$ 1,332,266	$ 1,969,000	$ 1,981,638	$ 2,164,660

Note: Spend factors using 2-year average highlighted yellow and exceptions are highlighted in blue.

Appendix 3
Actual to Budget Factors (Continued)

		Factor	Historical Average		Actual to Budget Factor			Actual O&M Expense			Budgeted O&M Expense		
		Used	2 Year	3 Year	2016	2015	2014	2016	2015	2014	2016	2015	2014
Operations													
Salaries & Wages	100	98.10%	98.10%	97.03%	95.71%	100.61%	94.76%	$ 71,318,230	$ 71,789,745	$ 65,710,338	$ 74,515,100	$ 71,357,193	$ 69,343,900
Services	200	88.86%	88.86%	87.73%	91.69%	86.03%	85.51%	$ 54,441,610	$ 51,086,665	$ 51,604,806	$ 59,373,700	$ 59,381,100	$ 60,348,600
Power	220	75.62%	75.62%	76.89%	72.08%	79.44%	79.42%	$ 20,071,556	$ 20,427,534	$ 21,440,579	$ 27,845,000	$ 25,714,000	$ 26,994,900
Gas	221	84.65%	84.65%	82.32%	70.51%	104.77%	77.41%	$ 4,013,404	$ 4,190,988	$ 3,561,029	$ 5,692,000	$ 4,000,000	$ 4,600,000
Materials and Supplies	300	82.35%	82.35%	83.15%	82.34%	82.35%	84.83%	$ 15,057,143	$ 14,703,881	$ 14,625,464	$ 18,286,100	$ 17,855,400	$ 17,240,200
Chemicals	307	93.85%	93.85%	97.37%	93.35%	94.32%	104.31%	$ 21,075,520	$ 22,324,969	$ 24,446,114	$ 22,575,800	$ 23,668,950	$ 23,435,500
Equipment	400	80.16%	80.16%	72.40%	82.66%	77.30%	59.18%	$ 1,486,260	$ 1,219,613	$ 1,172,215	$ 1,798,000	$ 1,577,800	$ 1,980,700
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Operations			90.23%	89.99%	89.23%	91.25%	89.52%	$ 187,463,723	$ 185,743,395	$ 182,560,545	$ 210,085,700	$ 203,554,443	$ 203,943,800
Planning & Environmental Services													
Salaries & Wages	100	98.00%	98.00%	98.97%	99.40%	96.55%	101.25%	$ 12,946,501	$ 12,135,854	$ 11,080,774	$ 13,024,700	$ 12,569,537	$ 10,944,400
Services	200	93.96%	93.96%	92.88%	88.56%	100.06%	90.22%	$ 22,364,997	$ 22,388,075	$ 17,411,374	$ 25,254,200	$ 22,374,200	$ 19,299,800
Materials and Supplies	300	75.82%	75.82%	78.91%	78.20%	73.34%	86.13%	$ 1,101,182	$ 989,788	$ 1,015,983	$ 1,408,100	$ 1,349,600	$ 1,179,600
Equipment	400	32.96%	32.96%	44.35%	33.47%	32.20%	62.82%	$ 285,682	$ 187,954	$ 556,793	$ 853,450	$ 583,650	$ 886,400
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Planning & Environmental Services			93.52%	93.38%	90.52%	96.81%	93.05%	$ 36,698,362	$ 35,701,671	$ 30,064,924	$ 40,540,450	$ 36,876,987	$ 32,310,200
Public Affairs													
Salaries & Wages	100	89.47%	89.47%	90.60%	83.15%	95.96%	93.21%	$ 2,354,115	$ 2,644,067	$ 2,260,265	$ 2,831,100	$ 2,755,277	$ 2,424,900
Services	200	90.50%	90.50%	91.34%	89.21%	91.83%	93.27%	$ 8,040,229	$ 8,001,034	$ 7,244,654	$ 9,013,200	$ 8,712,700	$ 7,767,700
Materials and Supplies	300	58.24%	58.24%	53.91%	74.39%	41.94%	45.19%	$ 279,935	$ 156,358	$ 168,011	$ 376,300	$ 372,800	$ 371,800
Equipment	400	134.15%	134.15%	91.87%	179.54%	88.75%	7.32%	$ 27,829	$ 13,757	$ 1,134	$ 15,500	$ 15,500	$ 15,500
Indemnities	500	100.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Public Affairs			89.31%	89.96%	87.46%	91.22%	91.44%	$ 10,702,108	$ 10,815,216	$ 9,674,064	$ 12,236,100	$ 11,856,277	$ 10,579,900

Note: Spend factors using 2-year average highlighted yellow and exceptions are highlighted in blue.

Appendix 3
Actual to Budget Factors (Continued)

		Factor Used	Historical Average 2 Year	Historical Average 3 Year	Actual to Budget Factor 2016	Actual to Budget Factor 2015	Actual to Budget Factor 2014	Actual O&M Expense 2016	Actual O&M Expense 2015	Actual O&M Expense 2014	Budgeted O&M Expense 2016	Budgeted O&M Expense 2015	Budgeted O&M Expense 2014
Division of Technology													
Salaries & Wages	100	88.14%	88.14%	86.35%	86.45%	89.96%	82.50%	$ 5,416,218	$ 5,233,042	$ 4,621,214	$ 6,265,289	$ 5,816,911	$ 5,601,271
Services	200	76.87%	76.87%	80.25%	67.71%	88.54%	88.47%	$ 9,957,749	$ 10,226,939	$ 9,567,462	$ 14,706,497	$ 11,551,218	$ 10,814,511
Materials and Supplies	300	63.94%	63.94%	67.38%	41.88%	88.52%	78.33%	$ 848,074	$ 1,609,074	$ 944,117	$ 2,025,150	$ 1,817,650	$ 1,205,350
Equipment	400	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Division of Technology			78.92%	80.97%	70.54%	88.97%	85.88%	$ 16,222,041	$ 17,069,055	$ 15,132,793	$ 22,996,936	$ 19,185,779	$ 17,621,132
Mayor's Office of Transportation & Utilities and Office of Sustainability													
Salaries & Wages	100	99.20%	99.20%	97.05%	99.72%	98.74%	92.89%	$ 201,861	$ 227,983	$ 208,176	$ 202,424	$ 230,886	$ 224,100
Services	200	100.00%	100.00%	25.77%	100.00%		0.00%	$ 30,000	$ -	$ -	$ 30,000	$ -	$ 86,400
Materials and Supplies	300	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Equipment	400	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Mayor's Office of Transportation & Utilities			99.25%	86.33%	99.76%	98.74%	67.05%	$ 231,861	$ 227,983	$ 208,176	$ 232,424	$ 230,886	$ 310,500
Philadelphia Water, Sewer and Stormwater Rate Board													
Salaries & Wages	100	100.00%						$ -	$ -	$ -	$ -	$ -	$ -
Services	200	100.00%						$ -	$ -	$ -	$ -	$ -	$ -
Materials and Supplies	300	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Equipment	400	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Philadelphia Water, Sewer and Stormwater Rate Board								$ -	$ -	$ -	$ -	$ -	$ -

Note: Spend factors using 2-year average highlighted yellow and exceptions are highlighted in blue.

Appendix 3
Actual to Budget Factors (Continued)

		Factor	Historical Average		Actual to Budget Factor			Actual O&M Expense			Budgeted O&M Expense		
		Used	2 Year	3 Year	2016	2015	2014	2016	2015	2014	2016	2015	2014
Public Property													
Salaries & Wages	100	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Services	200	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	$ 4,042,633	$ 3,959,919	$ 3,786,428	$ 4,042,633	$ 3,959,919	$ 3,786,428
Materials and Supplies	300	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Equipment	400	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Public Property			100.00%	100.00%	100.00%	100.00%	100.00%	$ 4,042,633	$ 3,959,919	$ 3,786,428	$ 4,042,633	$ 3,959,919	$ 3,786,428
Fleet Management													
Salaries & Wages	100	86.38%	86.38%	88.10%	85.10%	87.65%	91.82%	$ 2,526,922	$ 2,602,612	$ 2,521,284	$ 2,969,317	$ 2,969,317	$ 2,745,986
Services	200	99.31%	99.31%	98.42%	98.67%	99.95%	96.63%	$ 1,469,209	$ 1,488,271	$ 1,438,785	$ 1,489,000	$ 1,489,000	$ 1,489,000
Materials and Supplies	300	94.83%	94.83%	96.18%	90.66%	99.01%	98.86%	$ 3,875,181	$ 4,232,497	$ 4,225,827	$ 4,274,640	$ 4,274,640	$ 4,274,640
Equipment	400	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Fleet Management			92.72%	93.86%				$ 7,871,312	$ 8,323,380	$ 8,185,896	$ 8,732,957	$ 8,732,957	$ 8,509,626
City Finance													
Salaries & Wages	100	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Benefits	1xx	89.96%	89.96%	91.34%	89.01%	90.91%	94.73%	$ 47,276,002	$ 48,293,131	$ 41,044,344	$ 53,115,262	$ 53,120,209	$ 43,330,000
Pension	191	98.85%	98.85%	91.61%	100.25%	97.29%	78.49%	$ 46,646,526	$ 40,861,335	$ 38,305,052	$ 46,529,000	$ 42,000,000	$ 48,800,000
Pension Obligations	190	100.35%	100.35%	135.48%	103.05%	97.57%	215.87%	$ 12,468,686	$ 11,415,451	$ 22,450,403	$ 12,100,000	$ 11,700,000	$ 10,400,000
Services	200	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Materials and Supplies	300	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Equipment	400	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Indemnities	500	71.39%	71.39%	78.55%	83.70%	59.09%	92.86%	$ 5,440,242	$ 3,840,767	$ 6,036,098	$ 6,500,000	$ 6,500,000	$ 6,500,000
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal City Finance			93.38%	95.15%	94.58%	92.14%	98.90%	$ 111,831,456	$ 104,410,684	$ 107,835,896	$ 118,244,262	$ 113,320,209	$ 109,030,000

Note: Spend factors using 2-year average highlighted yellow and exceptions are highlighted in blue.

Appendix 3
Actual to Budget Factors (Continued)

		Factor Used	Historical Average		Actual to Budget Factor			Actual O&M Expense			Budgeted O&M Expense		
			2 Year	3 Year	2016	2015	2014	2016	2015	2014	2016	2015	2014
Revenue													
Salaries & Wages	100	88.55%	88.55%	87.94%	89.31%	87.81%	86.71%	$ 9,948,364	$ 10,013,594	$ 9,701,251	$ 11,138,839	$ 11,404,254	$ 11,188,570
Services	200	99.88%	99.88%	100.17%	99.84%	99.92%	100.80%	$ 4,477,102	$ 4,241,117	$ 4,133,603	$ 4,484,480	$ 4,244,480	$ 4,100,780
Materials and Supplies	300	95.57%	95.57%	92.43%	92.73%	98.42%	87.32%	$ 594,307	$ 630,784	$ 688,157	$ 640,920	$ 640,920	$ 788,120
Equipment	400	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Indemnities	500	18.51%	18.51%	20.28%	11.56%	25.46%	32.07%	$ 578	$ 1,273	$ 481	$ 5,000	$ 5,000	$ 1,500
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Revenue			91.84%	91.34%	92.32%	91.36%	90.33%	$ 15,020,351	$ 14,886,768	$ 14,523,492	$ 16,269,239	$ 16,294,654	$ 16,078,970
Procurement													
Salaries & Wages	100	89.30%	89.30%	89.79%	99.94%	78.66%	90.90%	$ 77,339	$ 60,866	$ 62,746	$ 77,383	$ 77,383	$ 69,028
Services	200	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Materials and Supplies	300	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Equipment	400	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Procurement			89.30%	89.79%	99.94%	78.66%	90.90%	$ 77,339	$ 60,866	$ 62,746	$ 77,383	$ 77,383	$ 69,028
Law													
Salaries & Wages	100	84.24%	84.24%	86.17%	83.20%	85.29%	90.15%	$ 2,085,052	$ 2,137,491	$ 2,192,613	$ 2,506,206	$ 2,506,206	$ 2,432,087
Services	200	35.66%	35.66%	56.10%	26.55%	44.77%	96.99%	$ 183,651	$ 309,631	$ 670,808	$ 691,614	$ 691,614	$ 691,614
Materials and Supplies	300	30.66%	30.66%	33.36%	42.72%	18.60%	38.74%	$ 18,376	$ 8,002	$ 16,663	$ 43,010	$ 43,010	$ 43,010
Equipment	400	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Indemnities	500	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Transfers	800	0.00%						$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Law			73.16%	79.00%	70.57%	75.76%	90.95%	$ 2,287,079	$ 2,455,124	$ 2,880,084	$ 3,240,830	$ 3,240,830	$ 3,166,711
Total Water Fund			89.69%	89.97%	89.12%	90.27%	90.56%	$ 433,618,002	$ 424,318,674	$ 407,545,325	$ 486,540,664	$ 470,059,076	$ 450,008,505

Note: Spend factors using 2-year average highlighted yellow and exceptions are highlighted in blue.

APPENDIX 4

Water Fund Historical O&M Costs

Appendix 4
Water Fund Historical O&M Costs

	Description	2014	2015	2016
PWD Operating and Maintenance Expenses Summary				
100	Salaries & Wages	$ 108,902,414	$ 118,718,437	$ 118,414,751
1xx	Benefits	$ 41,044,344	$ 48,293,131	$ 47,276,002
191	Pension	$ 38,305,052	$ 40,861,335	$ 46,646,526
190	Pension Obligations[1]	$ 22,450,403	$ 11,415,451	$ 12,468,686
200	Services	$ 103,657,686	$ 111,372,311	$ 110,612,683
220	Power	$ 21,440,579	$ 20,427,534	$ 20,071,556
221	Gas	$ 3,561,029	$ 4,190,988	$ 4,013,404
2xx	SMIP/GARP	$ 5,020,143	$ 11,598,134	$ 15,000,000
300	Materials and Supplies	$ 22,546,905	$ 23,180,707	$ 22,505,723
307	Chemicals	$ 24,446,114	$ 22,324,969	$ 21,075,520
400	Equipment	$ 2,419,659	$ 1,849,016	$ 1,992,145
500	Indemnities	$ 6,036,579	$ 3,842,040	$ 5,440,820
800	Transfers	$ 7,714,419	$ 6,244,621	$ 8,100,186
Total PWD Operating and Maintenance Expenses Summary		**$ 407,545,325**	**$ 424,318,674**	**$ 433,618,002**
PWD Operating and Maintenance Expenses Summary - 2 Year Average Increase				**2014 - 2016**
100	Salaries & Wages			4.28%
1xx	Benefits			7.32%
191	Pension			10.35%
190	Pension Obligations[1]			-25.48%
200	Services			3.30%
220	Power			-3.25%
221	Gas			6.16%
2xx	SMIP/GARP			72.86%
300	Materials and Supplies			-0.09%
307	Chemicals			-7.15%
400	Equipment			-9.26%
500	Indemnities			-5.06%
800	Transfers			2.47%
Total PWD Operating and Maintenance Expenses Summary - 2 Year Average Increase				**3.15%**

Note: 1. Decrease from FY 2014 to FY 2015 reflects decrease in debt service payments per City's Series 2012 Pension Bonds.

APPENDIX 5

O&M Cost Industry Indices Data

Appendix 5
O&M Cost Industry Indices Data

Fiscal Year	Consumer Price Index All Urban Consumers Philadelphia Area		PPI Materials for Construction		PPI Construction Machinery & Equipment		PPI Industrial Chemicals		Consumer Price Index Electricity Philadelphia Area		Consumer Price Index Gas Philadelphia Area	
	Raw Number	% Change	Raw Number	% Change	Raw Number	% Change	Raw Number	% Change	Raw Number	% Change	Raw Number	% Change
2011	230.6	1.90%	208.7	2.56%	193.7	1.52%	296.2	15.39%	203.1	0.45%	191.7	-5.15%
2012	236.2	2.43%	216.1	3.55%	201.7	4.13%	321.4	8.51%	205.4	1.13%	181.2	-5.48%
2013	240.0	1.61%	220.8	2.17%	208.5	3.37%	302.0	-6.04%	197.2	-3.99%	177.3	-2.15%
2014	242.7	1.13%	224.7	1.77%	212.6	1.97%	294.5	-2.48%	196.4	-0.41%	177.0	-0.17%
2015	244.2	0.62%	228.7	1.78%	215.7	1.46%	265.2	-9.95%	193.0	-1.73%	169.7	-4.12%
2016	244.2	0.00%	228.0	-0.31%	218.1	1.11%	231.3	-12.78%	192.9	-0.05%	148.1	-12.73%
2 Yr Avg												
2014	-	1.37%	-	1.97%	-	2.67%	-	-4.28%	-	-2.22%	-	-1.17%
2015	-	0.87%	-	1.77%	-	1.71%	-	-6.29%	-	-1.07%	-	-2.17%
2016	-	0.31%	-	0.73%	-	1.29%	-	-11.38%	-	-0.90%	-	-8.53%
3 Yr Avg												
2014	-	1.72%	-	2.49%	-	3.15%	-	-0.19%	-	-1.11%	-	-2.62%
2015	-	1.12%	-	1.91%	-	2.26%	-	-6.21%	-	-2.05%	-	-2.16%
2016	-	0.58%	-	1.08%	-	1.51%	-	-8.51%	-	-0.73%	-	-5.82%

APPENDIX 6

Existing & Proposed Debt Service

APPENDIX 6 Existing & Proposed Debt Service (in $000s)

Line No.	Description	2018	2019	2020	2021	2022	2023
	Revenue Bonds						
1	Existing (a)	185,756	133,964	123,040	115,891	109,229	105,309
	Proposed						
2	Fiscal Year 2017 (b)	13,646	33,616	32,616	12,116	12,116	12,116
3	Fiscal Year 2018 (c)	9,124	8,560	8,560	14,391	11,323	14,530
4	Fiscal Year 2019 (d)		11,756	19,884	19,884	19,884	19,884
5	Fiscal Year 2020 (e)			12,722	21,141	21,141	21,141
6	Fiscal Year 2021 (f)				13,725	22,442	22,442
7	Fiscal Year 2022 (f)					17,450	24,701
8	Fiscal Year 2023 (f)						17,194
9	Total Proposed	22,770	53,933	73,782	81,257	104,356	132,006
10	Total Revenue Bonds	208,526	187,897	196,823	197,147	213,585	237,316
	Pennvest Loans						
11	Pennvest Loans - Parity Pennvest	11,500	11,682	11,636	11,636	11,636	11,636
12	Total Senior Debt Service	220,026	199,579	208,458	208,783	225,221	248,951

(a) Assumes the average interest rates of 3.0 % for the Variable Rate Series 1997B Bonds and 4.53% for the Variable Rate Series 2005B Bonds. Reflects savings from Series 2017B Refunding Bonds.

(b) Reflects actual Series 2017A Bonds debt service.

(c) Reflects actual Series 2017B Bonds debt service.

(d) Assumes interest only payments through FY 2018 based on 5.50% interest. Assumed to be issued during the first quarter of the fiscal year.

(e) Assumes 5.75% interest rate. Assumed to be issued during the first quarter of the fiscal year.

(f) Assumes 6.00% interest rate. Assumed to be issued during the first quarter of the fiscal year.

APPENDIX 7

Capital Cost Industry Indices

Appendix 7
Capital Cost Industry Indices Data

Fiscal Year	H.W. Index Cost of Construction Pump Plant - Equipment		H.W. Index Cost of Construction Treatment Plant - Equipment		H.W. Index Cost of Construction Transmission Plant - Steel Mains		H.W. Index Cost of Construction Distribution Plant - Mains		H.W. Index Cost of Construction Distribution Plant - Meters		McGraw-Hill (ENR) Construction Cost Index	
	Raw Number	% Change	Raw Number	% Change	Raw Number	% Change	Raw Number	% Change	Raw Number	% Change	Raw Number	% Change
2011	708	0.14%	642	1.74%	644	8.60%	633	2.59%	635	3.76%	8,950.3	3.48%
2012	780	10.17%	669	4.21%	711	10.40%	669	5.69%	646	1.73%	9,189.3	2.67%
2013	800	2.56%	689	2.99%	724	1.83%	698	4.33%	677	4.80%	9,424.2	2.56%
2014	856	7.00%	713	3.48%	694	-4.14%	720	3.15%	688	1.62%	9,672.1	2.63%
2015	928	8.41%	736	3.23%	712	2.59%	736	2.22%	702	2.03%	9,933.1	2.70%
2016	990	6.68%	755	2.58%	697	-2.11%	747	1.49%	709	1.00%	10,166.6	2.35%
2 Yr Avg												
2014	-	4.76%	-	3.24%	-	-1.20%	-	3.74%	-	3.20%	-	2.59%
2015	-	7.70%	-	3.35%	-	-0.83%	-	2.69%	-	1.83%	-	2.66%
2016	-	7.54%	-	2.90%	-	0.22%	-	1.86%	-	1.51%	-	2.52%
3 Yr Avg												
2014	-	6.53%	-	3.56%	-	2.52%	-	4.39%	-	2.71%	-	2.62%
2015	-	5.96%	-	3.23%	-	0.05%	-	3.23%	-	2.81%	-	2.63%
2016	-	7.36%	-	3.10%	-	-1.26%	-	2.29%	-	1.55%	-	2.56%

APPENDIX 8

Memo from the City Energy Office Re: Escalation Factors for the Philadelphia Water Department

MEMO

TO: **Melissa LaBuda, Philadelphia Water Department**
CC: **Jaclyn Rogers, Emily Hill, Paul Kohl, Mardi Ditze**
FROM: **Adam Agalloco**
DATE: **August 23rd, 2017**
SUBJECT: **Utility Escalation Factors for the Philadelphia Water Department**

Background

At the request of the Philadelphia Water Department (PWD), this memo means to serve as a reference document for utility escalation prices for FY18-FY23 for PWD's use. The Energy Office, housed in the Office of Sustainability, purchases Electricity, Natural Gas and Vehicle Fuel on behalf of City government (including PWD) and has information relative to the how the hedge purchases impact future costs.

Electricity

The City has purchases of electricity for Fiscal Year's FY18, 19 and 20 and is currently hedged in energy markets at 83%, 48% and 25% respectively. The City is next scheduled to purchase electricity hedges in October. Of the purchases already made, the executed prices are similar or slightly lower than current rates. As a result, the Energy Office feels comfortable recommending a flat escalation rate associated with electricity prices (0%) for FY18 to FY19 and FY19 to FY20. After FY20, the Energy Office recommends using a standard escalation rate of 3%, consistent with the General Fund's five year plan (see chart below).

Year Transition	Escalation Rate
FY19	0.0%
FY20	0.0%
FY21	3.0%
FY22	3.0%
FY23	3.0%

It's worth noting that the City only hedges a portion of its electricity purchases (energy and basis), while the other significant charges of transmission, capacity, renewables and ancillaries are fully passed through the PJM subaccount at cost. These prices have been relatively stable for the past several years and no major changes are anticipated.

Natural Gas

The City has purchases of natural gas for Fiscal Year's FY18, but with a contract expiring next spring, no purchases have been made for FY19 or FY20. Projections for future escalation curves are primarily based on the forward NYMEX natural gas market and Winter Basis Strips from Transco Z6 (NNY) North. Winter Basis strip prices are used as a proxy for all months as they tend to have the most volatile cost changes. The PWDs use is not driven by weather patterns as much as the General Fund use and thus is more sheltered from the basis market (and price volatility). As a result, the Energy Office feels

comfortable that commodity and basis prices will stay relatively flat escalation rate, however upon review of the proposed settlement for PGW's rate case , there are impacts into PWDs overall costs of natural gas. Following review and analysis of the tariff's the total impact to PWD of approximately $82,000, the Energy Office believes an escalation rate of 4% would be more representative for FY18 into FY19 (under the assumption that the rate increase would come into effect prior to FY19 start). Afterwards, the Energy Office would expect a no escalation into FY20, followed by the a standard escalation rate of 3% into FY21-FY23, consistent with the General Fund's five year plan (see chart below).

Year Transition	Escalation Rate
FY19	4.0%
FY20	0.0%
FY21	3.0%
FY22	3.0%
FY23	3.0%

Next Steps

The Energy Office will provide regular updates to PWD on the purchases and impacts to electricity and natural gas rates and escalation projections. Please feel free to reach out if there are any questions.

Adam Agalloco
Energy Manager
adam.agalloco@phila.gov
215.686.4460

To: Philadelphia Water Department (PWD)	From: Black & Veatch
Task Name: Cost of Service	Schedule: BV-E5
Document: Recovery of Public Fire Protection Costs	White Paper: WP-2

The purpose of this memorandum is to provide an overview of water industry considerations for recovering costs related to public fire protection via user rates and charges. Appendix A provides a brief summary of peer utility approaches to the recovery of public fire protection costs.

Industry Considerations

The American Water Works Association's (AWWA) Manual M1: *Principles of Water Rates, Fees, and Charges* (AWWA Manual M1) provides an overview of historic water system public fire protection cost recovery mechanisms. Common recovery methods include:

- Recovery from General Fund – This method includes determining the water system public fire protection costs and recovering the cost via the General Fund of the community served. This recovery method is reflective of the approach currently utilized by PWD.
- Recovery from Water System Customers – This method includes determining the water system public fire protection costs and recovering the cost from water system customers via user rates and charges. In general, the public fire protection costs could be allocated to customer classes and built into the overall rate design in several ways, including:
  - Charge per Bill – The public fire protection cost is added to the fixed portion of a customer's monthly or quarterly bill. This reflects that public fire protection costs are generally fixed.
  - Charge per Equivalent Meter - The public fire protection cost is recovered through the fixed portion of a customer's monthly or quarterly bill, but graduated to reflect the varying meter size of water system customers. Similar to the charge/bill approach, cost recovery via meter size also reflects the generally fixed cost nature of the expense, but also acknowledges that mains are oversized to address increased pumping and storage capacity requirements associated with fire flow.
  - Volumetric Rate – Cost recovery for public fire protection cost is through the volumetric rate and included in the rate on a per billed usage basis (e.g., $ per 1,000 cubic feet (Mcf)) as customers use water.

PWD Considerations

The City of Philadelphia is enacting a new policy whereby water user rates and charges will directly pay for the cost of public fire protection. As such, PWD asked Black & Veatch to evaluate an alternative approach to recover these costs from water system retail customers, instead of the General Fund. The following bullet items address several key considerations of the transition in cost recovery:

- Determining the Water System Cost of Public Fire Protection – Black & Veatch would utilize the same general approach as seen in PWD's historical rate proceedings. Direct fire protection costs (both private and public) are allocated to the functional cost components based on engineering allocation percentages and recognizing the Base-Extra-Capacity methodology outlined in AWWA Manual M1. The split of costs between public and private fire protection is based on the proportionate share on an equivalent hydrant basis. Using this approach includes all costs associated with fire protection – pumping, storage capacity, main oversizing, hydrant flushing and maintenance, and billing. The current annual revenue requirement related to public fire protection is approximately $7.9 million.
- Rate Design – PWD utilizes a single, General Service rate structure for its retail customers, irrespective of whether they are residential, commercial, or industrial in nature. This includes a fixed charge by meter size (Monthly Service Charge) for costs related to customer service, billing and collection, and meters and services. It also includes a volumetric charge applied via a declining block rate structure that utilizes four rate blocks (Quantity Charge). The following reflects how public fire protection costs could be recovered from either the fixed charge or the volumetric rate:
    - Fixed Charge Recovery – This approach involves recovering public fire protection costs via PWD's Monthly Service Charge. In this instance, retail equivalent meters and services would be used as a basis for deriving a graduated public fire protection charge by meter size. The public fire protection charge would be added to the existing Monthly Service charge to derive the revised, higher Monthly Service Charge by meter size. The use of equivalent meters and services as a basis for recovery would result in a higher public fire protection charge for larger meters compared to a base, 5/8-inch metered customer.

      In Black & Veatch's opinion, this would be the most effective way to recover public fire protection costs from water system customers. Public fire protection costs are predominately fixed costs, and using the Monthly Service Charge ensures revenue stability similar to the current method of recovery from the General Fund.
    - Quantity Charge Recovery – This approach involves recovering public fire protection costs via PWD's Quantity Charge. Under the current rate methodology, the four block, declining structure is designed by evaluating the water system costs that serve various retail customer types, e.g., residential, commercial, and industrial. Public fire protection costs would be allocated to these customer types using an estimated fire flow demand for each customer type, or on the basis of their resulting cost of service. This provides the basis for designing the Quantity Charge where each retail customer type pays for a share of public fire protection costs. The use of the Quantity Charge would be subject to fluctuations in retail customer water usage and provides less revenue stability when compared to recovery using the Monthly Service Charge.
- Other Considerations – As with any change in policy, a transition to the direct recovery of public fire protection costs from water system customers results in a higher Monthly Service Charge or Quantity Charge. Regardless of the cost recovery option selected, PWD should develop a clear explanation regarding the change in policy and the potential impact to water for all stakeholders.

Conclusion

For communities such as the City of Philadelphia whose residents receive water from a single agency, the methods for recovering public fire protection costs generally consist of recovery via the General Fund (and ultimately resident property taxes), or recovery via water system rates and charges. As the City of Philadelphia will be transitioning the recovery of public fire protection costs from the General Fund to water system customers, as directed by PWD, Black & Veatch has modified its cost of service and rate methodology to allocate public fire protection costs to retail customer types. This provides the basis for recovering public fire protection costs from either PWD's Monthly Service Charge or Quantity Charge.

In Black & Veatch's opinion, PWD should recover the public fire protection costs from retail customers using the Monthly Service Charge because this approach 1) is an industry-accepted method; and 2) provides PWD with revenue stability. This recommended approach to public fire protection cost recovery is reflected in Black & Veatch's latest financial plan and cost of service study.

APPENDIX A – PEER UTILITY PUBLIC FIRE PROTECTION COST RECOVER APPROACH

The information provided in the following Table focuses on water system public fire protection costs including:

1) Understanding how water system public fire protection costs are derived; and

2) Understanding how the public fire protection costs are recovered, e.g., through customer rates or other funds.

The information was derived from public information or from individuals with knowledge of how water system public fire protection costs are derived and recovered for water systems which are similar to PWD.

#	Utility Name	Municipal Entity/ Area	Cost Derivation Method	Cost Recovery Mechanism
1	Baltimore Bureau of Water and Wastewater	City of Baltimore, MD	A water system cost of service and rate study has been performed.	The public fire protection costs are recovered from the water system customers through the volume charge.
2	Greater Cincinnati Water Works	City of Cincinnati, OH	Water system public fire protection costs determined based on a cost of service allocation process.	Cost recovery is from water system customers. Costs related to hydrant maintenance and hydrant replacements are recovered from a customer's fixed charge. GCWW recovers public fire protection costs related to system capacity via the volume charge portion of the customer water bill.
3	City of Columbus Public Utilities	City of Columbus, OH	Water system public fire protection costs determined based on a cost of service allocation process.	These costs are recovered from the water system customers. The costs, including servicing hydrants and providing sufficient capacity for fire protection, are recovered in the volume charge portion of the customer water bill.
4	City of Chicago Water Management	City of Chicago, IL	Water system public fire protection costs are not separately delineated.	The public fire protection costs, which are inherent in the overall annual water system O&M and capital costs, are recovered via water system rates and charges.
5	District of	Washington, DC	Water system public fire	This cost (approximately $10M per year) is recovered

#	Utility Name	Municipal Entity/ Area	Cost Derivation Method	Cost Recovery Mechanism
	Columbia Water & Sewer Authority		protection costs are derived outside of the regular water cost of service analysis.	from DC Government and is related to the cost of hydrant maintenance and providing capacity for firefighting purposes.
6	New York Department of Environmental Protection (DEP)	New York City, NY	NYC DEP performs a water rate study, but public fire protection costs for the water system are not separately delineated.	Water system public fire protection costs are recovered from the water system customers. DEP does rely on the Fire Department for hydrant inspections and these costs are passed to DEP to be recovered through customer water rates.
7	Pennsylvania American Water Company (PA AWC)	Entire Service Area (Various locations throughout Pennsylvania)	PA AWC conducts a water system cost of service and demand study.	PA AWC is allowed to recover up to 25% of the public fire protection costs via hydrant fees charged to municipalities. The remaining "unrecovered" public fire protection costs are included in the fixed charges (i.e. meter based fees) of all utility customers. For PA AWC, this includes residential, commercial, industrial, and public customers.
8	Charleston Water System	Charleston, SC	A water rate study is performed and public fire protection costs are determined through the cost of service allocation process.	Costs associated with public fire protection are allocated to retail customers and recovered through the monthly service charge.
9	Board of Public Utilities	Kansas City, KS	A water rate study is performed and public fire protection costs are determined through the cost of service allocation process.	Costs associated with public fire protection are allocated to retail customers and recovered through the monthly service charge.
10	City of Kansas City	Kansas City, MO	A water rate study is performed and public fire protection costs are determined through the cost	Costs associated with public fire protection are recovered through the water volume charge.

#	Utility Name	Municipal Entity/ Area	Cost Derivation Method	Cost Recovery Mechanism
			of service allocation process.	
11	Tulsa Metropolitan Utility Authority	Tulsa, OK	A water rate study is performed and public fire protection costs are determined through the cost of service allocation process.	Costs associated with public fire protection are recovered through the water volume charge.
12	Seattle Public Utilities	Seattle, WA	A water rate study is performed and the public fire protection costs are determined through the cost of service allocation process.	Flat annual fee is charged to the Cities of Seattle and Burien based on size of the main connected to the hydrant.
13	City of San Diego	San Diego, CA	A water rate study is performed and public fire protection costs are determined through the cost of service allocation process.	Costs are recovered through the meter charge.
14	Long Beach Water Department	Long Beach, CA	A water rate study is performed and the public fire protection costs are determined through the cost of service allocation process.	Public Fire costs are re-allocated proportionately to all retail customers and then recovered through the meter charge.
15	Green Bay Water Utility	Green Bay, WI	A water rate study is performed and public fire protection costs are determined through the cost of service allocation process.	Regulated by Wisconsin Public Services Commission. Public Fire Protection charge billed to customers on a quarterly basis. Based on meter size.
16	San Antonio Water System	San Antonio, TX	A water rate study is performed and public fire protection costs are determined through the cost of service allocation process.	Public Fire costs are re-allocated proportionately to all retail customers and then recovered through the meter charge.

To: Philadelphia Water Department (PWD)	From: Black & Veatch Management Consulting, LLC
Task Name: Cost of Service	Schedule: BV-E5
Subject: Fiscal Year 2019 Capital Account Deposit	White Paper: WP-3

Introduction

Black & Veatch Management Consulting, LLC (Black & Veatch) performed a review of Philadelphia Water Department's (PWD) existing policy concerning the annual Capital Account Deposit Amount. This memorandum provides a summary of the analysis performed for Fiscal Year (FY) 2019, the impact of any potential adjustments, and a summary of the conclusions.

Terminology

The PWD Restated General Water and Wastewater Revenue Bond Ordinance of 1989 (General Ordinance) states that:

Capital Account Deposit Amount means an amount equal to one percent (1%) of the depreciated value of property, plant and equipment of the System or such greater amount as shall be annually certified to the City in writing by a Consulting Engineer as sufficient to make renewals, replacements, and improvements in order to maintain adequate water and wastewater service to the areas served by the System.

The Context

Black & Veatch has served as the Consulting Engineer for the Bond Feasibility Studies for PWD over the last two decades. Per the General Ordinance, Black & Veatch, in its financial analysis, has utilized an annual Capital Account Deposit Amount equal to one percent (1%) of the depreciated value of water and wastewater system net capital assets. The Capital Account Deposit Amount is cash financed from water and wastewater rates and charges. This amount, combined with other capital funding sources, such as the funds available in the construction fund, sufficient for providing normal renewal and replacement of the water and wastewater system assets.

Since fiscal year 2010, PWD has increased its annual capital expenditures due to the following:

1. On June 1, 2011, PWD entered into a Consent Order Agreement (COA) with the Pennsylvania Department of Environmental Protection (PADEP) to mitigate combined sewer overflows (CSOs) from the City's combined sewer system. The primary means for accomplishing this is implementing the Long-Term Control Plan Update (LTCPU). The LTCPU includes significant necessary capital improvements spread over a 25-year period to reduce CSOs and the associated pollutant loads.
2. Consistent with industry best asset management practices, PWD is accelerating its annual renewal and replacements of the water distribution and wastewater collection system assets. PWD is doing so to reduce main breaks and sewer back-ups, and to enhance the rehabilitation of its aging infrastructure.

3. To meet drinking water quality standards and comply with permit requirements, PWD is also investing in its water and wastewater treatment facilities.

To assure revenue sufficiency for this increased level of annual capital spending, it was necessary to perform a review of PWD's policy on Capital Account Deposit. Therefore, Black & Veatch performed a review of the Capital Account Deposit Amount for FY 2019.

The following sections provide an overview of the analysis and our conclusions on the level of Capital Account Deposit Amount.

Analysis

Black & Veatch evaluated the annual capital expenditure and the Capital Account Deposit Amounts for fiscal years 2004 through 2016. Black & Veatch chose this period as it allows comparison of the *annual average* capital spending for two distinct time periods as follows:

1. FY 2004 through FY 2009: Capital spending levels prior to the COA and enhanced levels of system renewal and rehabilitation; and

2. FY 2010 through FY 2016: Capital spending levels associated with the implementation of the LTCPU and enhanced levels of system renewal and rehabilitation.

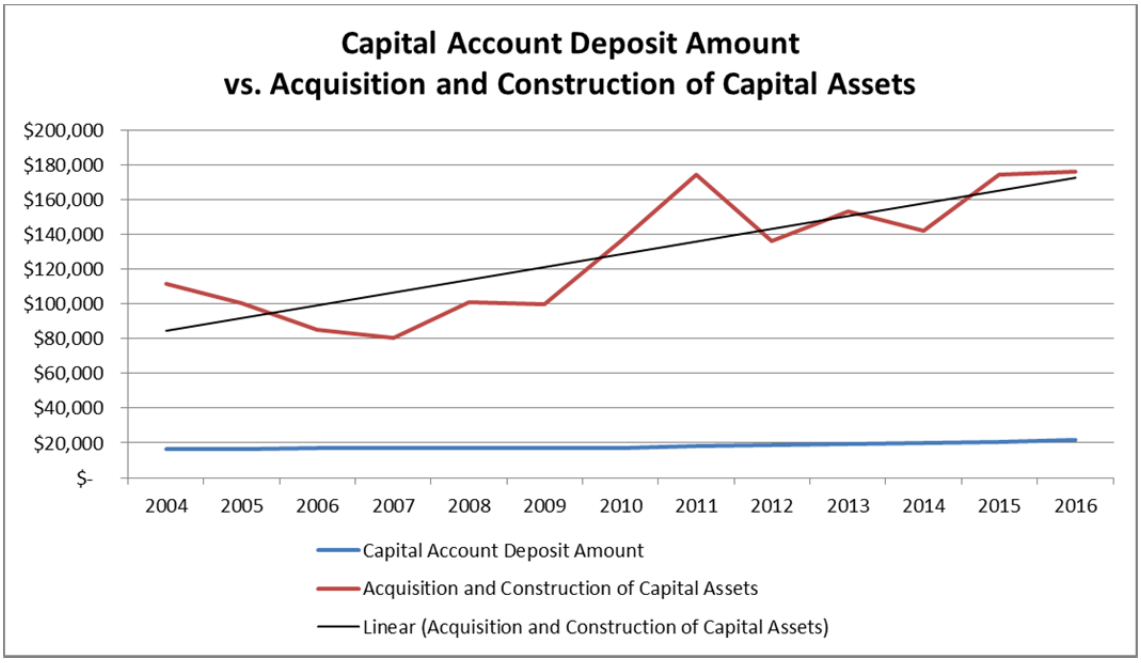


Figure 1 Capital Account Deposit Amount vs. Capital Spending Levels

Figure 1 provides a graphical illustration of the historical trends in levels of annual capital spending and annual Capital Account Deposit Amount. The annual level of capital spending has been trending higher compared with the annual Capital Account Deposit Amount. As PWD is still in the early stages of the LTCPU program and has begun to accelerate infrastructure renewal and replacements, we expect that annual capital spending levels will continue to be at or higher than the FY 2016 spending level.

PWD relies on funds from the Capital Account to support its Capital Improvement Program (CIP), and the analysis shows that while the annual level of capital spending has increased, the percentage of Capital Account Deposit Amount relative to the annual capital spending has decreased. In FY 2009 the Capital Account Deposit Amount of $17,140,000 was 17.14% of the annual capital spend amount of $100,009,000. By FY 2016, the Capital Account Deposit Amount of $21,497,000 was 12.2% of the annual capital spend amount of $175,797,000.

Exhibit 1, in Appendix A, presents the details of the Net Capital Assets, the Capital Account Deposit Amount, and the annual Capital Expenditure, for the period of FY 2004 through FY 2016.

Potential Adjustment to Capital Account Deposit Amount

Black & Veatch evaluated the Capital Account Deposit amount compared to PWD's historical rate of capital spending. Table 1 presents the analysis that adjusts the Capital Account Deposit Amount to the total annual capital spending levels historically experienced by PWD.

Table1 Adjustment of Capital Account Deposit Amount ($1,000s)

Line No.	Description	Result	Notes
1	Avg. Annual Capital Spend (2010-2016)	$ 155,994	Exhibit 1, Ln. 7 – Ln. 13
2	Avg. Annual Capital Spend (2004-2009)	$ 96,483	Exhibit 1, Ln. 1 – Ln. 6
3	Avg. Annual Capital Spend Ratio	1.62	Table 1, Ln. 1 / Ln. 2
4	FY 2016 Capital Account Deposit Amount	$ 21,497	Exhibit 1, Ln. 1 – Ln. 13
5	FY 2016 Adjusted Capital Account Deposit Amount	$ 34,825	$21,497 X 1.62
6	FY 2016 Net Capital Assets	$ 2,230,233	Exhibit 1, Ln. 1 – Ln. 13
7	FY 2016 Adjusted Capital Account Deposit Amount as a % of FY 2016 Net Capital Assets	1.56%	$34,825 / $2,230,233
8	FY 2016 Adjusted Capital Account Deposit Amount as a % of Avg. Annual Capital Spend	22.3%	Table 1, Ln. 5 / Table 1, Ln. 1

The average annual capital expenditure during the period of FY 2010 through FY 2016 is 1.62 times that of annual capital expenditure during FY 2004 through FY 2009. Commensurate with this increase in average annual capital expenditure, the adjusted level of annual Capital Account Deposit Amount would be approximately 1.56 percent of the FY 2016 depreciated value of property, plant and equipment of the water and wastewater assets.

Increasing the annual Capital Account Deposit Amount from the current levels would be consistent with the levels of Capital Account Deposit Amounts that occurred prior to FY 2010 (*See Exhibit 1 in Appendix A)*.

Impacts of Potential Adjustment

An increase in the level of Capital Account Deposit Amount is likely to have the following impacts on certain financial metrics. Based on our knowledge of PWD's financial planning and rate process these include:

- Increased Required Funding Available for CIP – An increase in the Capital Account Deposit Amount would provide additional levels of cash financing for PWD to use toward water and wastewater capital improvements.
- Debt Service Requirements – An increase in Capital Account Deposit Amount could potentially cause a commensurate decrease in bond financing and associated annual debt service.
- Increasing the requirement for a higher Capital Account Deposit Amount (under the same revenue levels) would not impact Senior Debt Service coverage, but would impact Total Debt Service Coverage[1]. Initial estimates would be a decrease in Total Debt Service coverage by FY 2023 from approximately 1.17 to 1.12.
- Less available funding for CIP from the Residual fund. The higher Capital Account Deposit Amount (under the same revenue levels) results in less net revenue transferred to the Residual Fund and available for capital projects. Shifting the amount from the elective Residual Fund Transfer to the required Capital Account Deposit is not significant in that funds in the Capital Account are still available for use. In other words, the total planned amount of funding available for CIP remains the same.

Conclusion

Based on the analysis, Black & Veatch concludes the following:

- PWD's annual capital spending has increased significantly since FY 2010.
- The annual level of the Capital Account Deposit Amount has consistently stayed set at one percent of Net Capital Assets. While the amount of Capital Account Deposit Amount has increased over the years, the percentage of Capital Account Deposit Amount, relative to the total annual capital spending levels, has decreased.
- Adjusting the recommended Capital Account Deposit Amount to approximately 1.5 percent of Net Capital Assets would better align the Capital Account Deposit Amount to the enhanced levels of capital spending that is occurring and is likely to continue during the foreseeable future. This would also enhance the level of cash financing of capital expenditures.
- Adjusting the recommended Capital Account Deposit Amount to approximately 1.5 percent of Net Capital Assets would not negatively impact PWD's financial position or result in a significant need for increased revenues from rates and charges as the revenues from current debt coverage accommodates the additional 0.5 percent deposit amount.
- PWD's overall capital spending amounts will continue to increase. Black & Veatch recommends that PWD periodically review this analysis and the recommended Capital Account Deposit Amount to maintain consistent levels.

[1] Increasing the Capital Account Deposit increases the total annual expenses included in the basis of the Total Debt Service Coverage calculation, thereby reducing coverage.

Based on the foregoing analysis, Black & Veatch recommends that the Capital Account Deposit Amount for FY 2019 increase to approximately 1.5% of the depreciated value of property, plant and equipment of water and wastewater system assets.

APPENDIX A

Exhibit 1 presents the details of the Net Capital Assets (Column 3), the Capital Account Deposit Amount (Column 4), and the Capital Expenditure (Column 5) for the period of FY 2004 through FY 2016. Column 6 presents the ratio of annual Capital Account Deposit Amount to the annual capital expenditure. Line 14 of Exhibit 1 shows the Compound Annual Growth Rate (CAGR) from 2004 to 2016.

The Net Capital Asset values are per the Balance Sheet of the City's Comprehensive Annual Financial Report (CAFR). The annual capital expenditure values are per the CAFR Statement of Cash Flows.

Exhibit 1 PWD Historical Capital Account Deposit Amount vs. Capital Spending Levels ($1,000)

(1)	(2)	(3)	(4)	(5)	(6)
Line No.	Fiscal Year (FY)	Net Capital Assets[1]	Capital Account Deposit	Acquisition and Construction of Capital Assets[1]	% Capital Account Deposit Amount to Capital Spend
			= (3) Prior Year X 0.01		= (4) / (5)
1	2004	$ 1,670,909	$ 16,348	$ 111,785	14.62%
2	2005	$ 1,695,477	$ 16,709	$ 100,477	16.63%
3	2006	$ 1,698,771	$ 16,955	$ 85,213	19.90%
4	2007	$ 1,692,583	$ 16,988	$ 80,661	21.06%
5	2008	$ 1,714,035	$ 16,926	$ 100,755	16.80%
6	2009	$ 1,726,450	$ 17,140	$ 100,009	17.14%
7	2010	$ 1,811,347	$ 17,265	$ 136,316	12.67%
8	2011	$ 1,886,726	$ 18,113	$ 174,208	10.40%
9	2012	$ 1,938,001	$ 18,867	$ 136,123	13.86%
10	2013	$ 2,019,350	$ 19,380	$ 153,338	12.64%
11	2014	$ 2,070,492	$ 20,194	$ 142,039	14.22%
12	2015	$ 2,149,680	$ 20,705	$ 174,135	11.89%
13	2016	$ 2,230,233	$ 21,497	$ 175,797	12.23%
14	**CAGR**	**2.44%**	**2.31%**	**3.85%**	

Note 1: City of Philadelphia Comprehensive Annual Financial Statements

Key Facts:

1. The annual level of capital expenditure (Column 5) is outpacing the CAGR of the Net Capital Assets (Column 3).

2. There is an increase in annual capital expenditure beginning in FY 2010, relative to expenditure levels in prior fiscal years. The increased annual expenditure levels from FY 2010 and beyond is largely due to the COA and the associated implementation of PWD's LTCPU, and enhanced system renewal and rehabilitation investments.

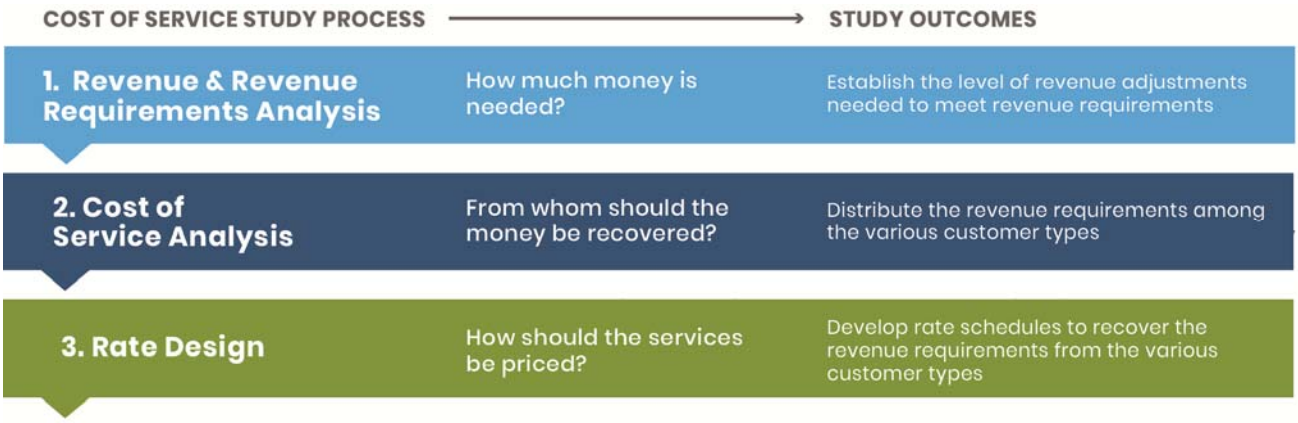
To: Philadelphia Water Department (PWD)	From: Black & Veatch Management Consulting, LLC
Task Name: Cost of Service Study	Schedule: BV-E5
Document: Cost of Service Analysis (Retail)	White Paper: WP-4

White Paper: Cost of Service Analysis Overview (Retail)

Introduction

The cost of service rate study that we perform for the Philadelphia Water Department ("Water Department") involves three key components namely, (i) Revenue Requirements Analysis; (ii) Cost of Service Analysis; and (iii) Rate Design. Figure 1 illustrates the three components of the process and the key outcome of each component.

Figure 1 – Cost of Service Rate Study Process and Key Outcomes



This paper provides an overview of the technical steps involved in the second component "Cost of Service Analysis." We first provide an overview of the purpose and benefits of a cost of service analysis, and then an overview of each key step in the multi-level cost allocation that we perform for the "Water Cost of Service Analysis" and the "Wastewater Cost of Service Analysis." The Water Department provides water and wastewater services to both retail customers and wholesale customers. This paper provides an overview of specifically the **"Retail"** cost of service analysis.

Overview of Cost of Service

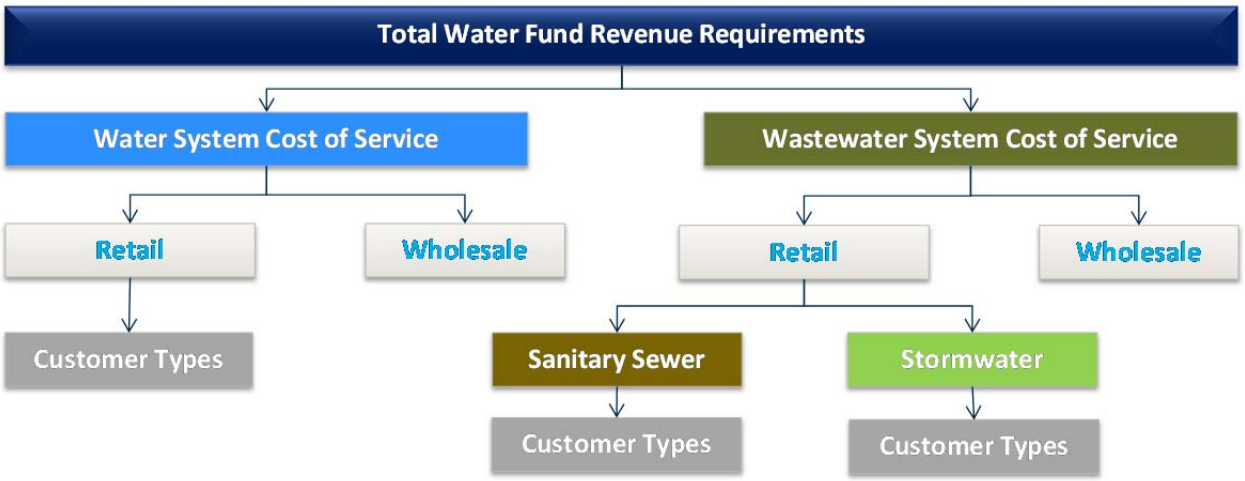
Cost of Service analysis is the process by which the net revenue requirements (O&M and Capital Costs), of the water system and wastewater system determined for a specific fiscal year (Test Year), are allocated to the users of the system in proportion to services the users receive.

The process of allocating the net water and wastewater revenue requirements helps address the following aspects:

- Delineate costs for the various services rendered
- Recognize differences in user characteristics
- Address regulations and covenants that govern the determination of user rates and charges
- Establish reasonable nexus between charges and service demands for defensible rate design

Figure 2 illustrates the overall multi-level allocation that is involved in the Water Department's cost of service analysis. First we delineate the net revenue requirements (cost of service) of the Water System and the Wastewater System. Then, we allocate the respective water and wastewater cost of service between Retail versus Wholesale customer categories, and then finally we distribute the retail cost of service among the retail customer types to determine each customer type's cost responsibility.

Figure 2 – Water Fund Cost of Service Overview

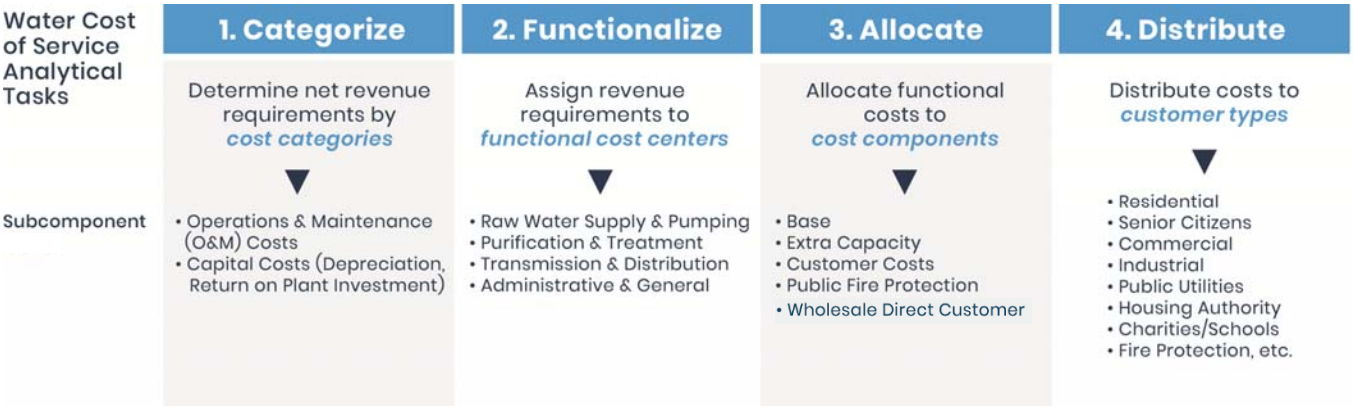


Water System Cost of Service Allocations

The major analytical steps involved in the determination of the retail **Water Cost of Service** responsibility of the customer types are illustrated in Figure 3. In Figure 3, the top row presents the key cost allocation analytical tasks and the bottom row presents the key subcomponents of each of the analytical steps.

In the discussion of the key analytical steps, we have referenced the appropriate cost allocation tables included in Schedule BV-E1.

Figure 3 – Water System Cost of Service Allocation Tasks and Subcomponents



In the following sections, we present a further discussion on the allocation of the **Water System** Capital and O&M Costs to retail customer types.

A. ALLOCATE WATER SYSTEM FUNCTIONAL COSTS TO COST COMPONENTS

1. Retail Water System Capital Cost Allocation to Cost Components

First, we restate the capital costs determined initially using a *cash-basis* approach (Table W-7), as "Depreciation" and "Return on Plant Investment", using a *utility-basis* approach.

> Note: This step is necessary as the Water Department provides water service to a wholesale customer (non-owners of the system), and hence is entitled to a higher rate of return on plant investment from the non-owner wholesale customer.

Depreciation and Return on Plant Investment Allocations to Wholesale Direct and Retail Customers

Specific steps are summarized along with appropriate Table references:

STEP 1 – Allocate System Plant Investment: To Wholesale Direct and Retail Water System Cost Components (Table W-8)

- Determine Plant Investment Costs for each "Functional Cost Center"
- *Wholesale Direct Plant Investment:* Allocate based on the customer's reserve contract capacity
- *Retail Plant Investment:* Allocate to cost components using the Base-Extra capacity cost allocation principles
    - **Note:** Retail Plant Investment = System Plant Investment LESS Wholesale Direct Plant Investment

STEP 2 – Allocate System Depreciation Expense: To Wholesale Direct and Retail Water System Cost Components (Table W-9)

- *Depreciation Expense* = [Functional Plant Depreciable Investment] x [Depreciation Rates]

- *Wholesale Direct Depreciation Expense:* Allocate based on the customer's reserve contract capacity
- *Retail Depreciation Expense:* Allocate to cost components using the Base-Extra capacity cost allocation principles
    - Note: Retail Depreciation Expense = System Depreciation Expense LESS Wholesale Direct Depreciation Expense

STEP 3 – Allocate System Return on Plant Investment: To Wholesale Direct and Retail Water System Cost Components

- *System Return on Plant Investment* = [System Capital Cost] – [System Depreciation Expense]
- *Wholesale Direct Return* = [Wholesale Direct Plant Investment] x [7.5% Rate of Return] (Table W-13A)
- Retail Return = [System Return on Plant Investment] - [Wholesale Direct Return] (Table W-14)

2. *Retail Water System O&M Cost Allocation to Cost Components*

The O&M costs determined using a *cash-basis* approach (Table W-7), is subsequently allocated between Wholesale Direct and Retail Cost Components as follows (Table W-10):

- Determine O&M Costs for each "Functional Cost Center"
- *Wholesale Direct O&M Cost:* Allocate based on Commodity-Demand cost allocation method
- *Retail O&M Cost Components:* Allocate to retail cost components using the Base-Extra capacity cost allocation method
    - **Note:** Retail O&M Costs = System O&M Costs LESS Wholesale Direct O&M Costs

B. DISTRIBUTE RETAIL CAPITAL AND O&M COSTS TO CUSTOMER TYPES

We perform the following key steps to allocate the Water System's Retail Capital and O&M Costs to the various Customer Types:

1. *Determine Water System Retail Units of Service*

The retail test year *units of service*, for each of the cost components, are determined for each customer type (Table W-11).

- Base Usage = Average daily usage
- Maximum Day & Maximum Hour Usage = Determined by applying maximum day and maximum hour peaking factors of each customer class to their respective base usage
- Maximum Day Extra Capacity = Determined by netting the Base Usage of each customer class from their respective Maximum Day Usage

- Maximum Hour Extra Capacity = Determined by netting the Maximum Day Usage of each customer class from their respective Maximum Hour Usage
- Equivalent Meters and Equivalent Bills = Determined by applying "Equivalent Meter and Equivalent Bill" factors by meter size to the respective annual number of meters and bills

2. *Determine Water System Unit Costs of Service*

The **retail** test year *unit cost*, for each of the cost components, is derived as follows (Table W-14):

- Divide the operational and capital costs allocated to each cost component by the respective total retail units of service
- Derive the total retail unit cost for each cost component as follows:
  - *Total Retail Unit Cost* = Operation Expense unit cost + Depreciation Expense unit cost + Inside City Return on Plant Investment unit cost

3. *Distribution of Costs to Customer Types*

The Water test year cost of service is distributed to each customer type by applying the total unit cost of each cost component to the corresponding units of service of each customer type (Table W-15).

4. *Distribution of Adjusted Costs to Customer Types*

A final step is to determine the "Adjusted" cost of service for each customer type. This step is necessary as the Water Department provides bill discounts to four customer types. The annual revenue reduction due to the discounts is apportioned, in a proportionate manner, to all the customer types (Table W-16).

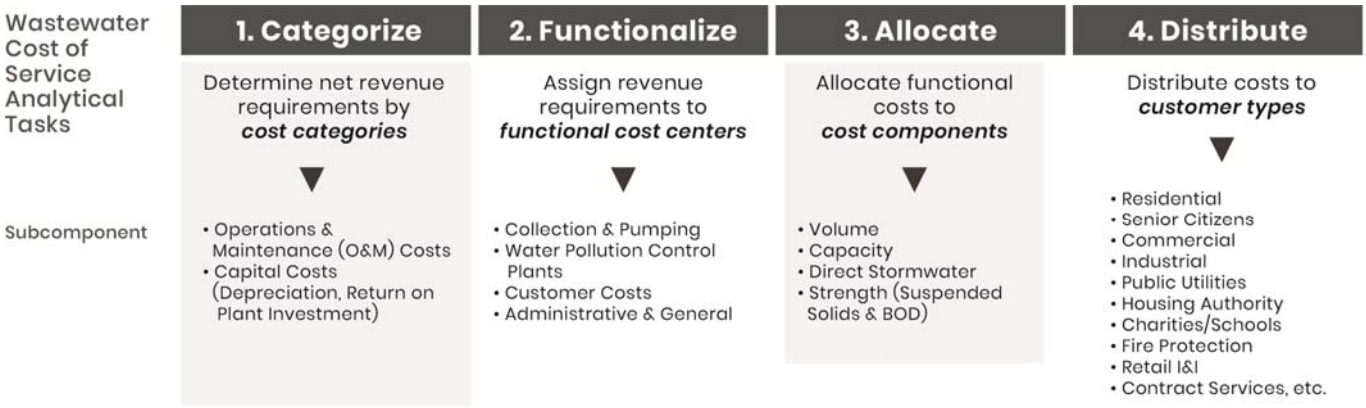
The adjusted cost of service determined for each retail customer type provides a defensible basis for the design of the Water Rates and Charges for the test year.

Wastewater System Cost of Service Allocations

The major analytical steps involved in the determination of the retail **Wastewater Cost of Service** responsibility of the customer types are illustrated in Figure 4. In Figure 4, the top row presents the key cost allocation analytical tasks and the bottom row presents the key subcomponents of each of the analytical steps.

In the discussion of the key analytical steps, we have referenced the appropriate cost allocation tables included in Schedule BV-E1 and Schedule BV-E2.

Figure 4 – Wastewater System Cost of Service Allocation Tasks and Subcomponents



A. ALLOCATE WASTEWATER SYSTEM FUNCTIONAL COSTS TO COST COMPONENTS

This section provides a very brief summary of the overall allocation steps for the **Wastewater System**, and then focuses on the Retail cost allocations.

The Water Department provides various levels of wastewater service to its multiple wholesale contract service customers. Hence, the plant investment, depreciation expense, and O&M costs are first allocated to each contract service customer in accordance with the terms of each contract and commensurate with their respective service demands. The key steps are as follows:

1. Wholesale Contract Service: Allocation of Plant Investment, Depreciation Expense, Return on Investment

The following analytical steps help determine the contract service customer capital costs:

- Determined *Total Wastewater System Plant Investment* and associated *Annual Depreciation* (Table WH-1)
- Determined each *wholesale* contract customer's *Units of Service* by cost component for each Water Pollution Control Plant (Table WH-3 and Table WW-8)
- Determined the *Plant Investment Unit Cost of Capacity* for the three Water Pollution Control Plants (Table WH-5)
- Allocated *Plant Investment Cost* to each wholesale contract service customer based on contract customers units of service and plant investment unit cost of capacity (Table WH-6 through Table WH-16; Summary Contract Service Plant Investment in Table WH-29)
- Allocated *Depreciation Expense* and *Return on Investment* to [applicable] wholesale contract service customers (Table WH-29)
    - **Note:** Depreciation and Return on Investment are not applicable to Bensalem, Lower Merion, and Upper Darby contract service customers

2. Wholesale Contract Service: Allocation of O&M

The following three categories of O&M costs are allocated to wholesale contract service customers, as applicable:

- Collection System;
- Pumping and Treatment; and
- Long Term Control Plan(LTCP)

The following analytical steps are used to allocate the [applicable] O&M costs to each wholesale contract service customer:

- Determined *O&M Unit cost* by cost component for each "Pumping Station" and each "Water Pollution Control (Treatment) Plant" (Table WH-17)
- Allocated *Pumping & Treatment O&M Cost* to each wholesale contract service customer based on contract customer's units of service and applicable O&M unit cost (Table WH-18 through Table WH-28)
- Allocated *Collection System O&M Cost* to each wholesale contract service customer based on the allocation of [applicable] capital investments in sewer collection system that serves that specific contract service customer and the ratio of the total O&M expense associated with collection system maintenance to the total plant investment of the collection system (Table WH-18 through Table WH-28)
    - Sewer Maintenance O&M costs are not applicable to DELCORA contract service customer since they pump their wastewater directly to the Southwest WPCP and do not utilize the PWD collection system
- Allocated *LTCP O&M Cost* to [applicable] wholesale contract service customers (Table WH-18 through Table WH-28)
- Allocated *Total Wholesale Contract Service O&M* to each wholesale contract service customer (Table WH-29)

3. Retail: Allocation of Capital Cost to Cost Components

The following analytical steps help determine the **Retail** capital costs by Cost Component:

- Retail Plant Investment = [Total System Plant Investment] – [Plant Investment allocated to Contract Service] (Table WW-9)
- Retail Depreciation Expense = [Total System Depreciation Expense] – [Depreciation Expense allocated to Contract Service] (Table WW-11)
- Retail Return on Plant Investment = [Total System Return on Plant Investment] – [Return on Investment allocated to Contract Service] (Table WW-11)

- **Note**: The Retail Plant Investment, Depreciation Expense, and Return on Plant Investment costs associated with *Wastewater Collection System* are further apportioned between Sanitary Sewer and Storm Costs, as appropriate (Table WW-11)

4. *Retail: Allocation of O&M Cost to Cost Components*

The following analytical steps help determine the **Retail** O&M costs by Cost Component:

- Retail O&M Functional Costs = [Total System O&M Functional Costs] – [O&M Functional Costs allocated to Contract Service] (Table WW-10)
- "Net" Retail O&M Functional Cost = [Retail O&M Functional Costs] – [Other Retail Operating Revenues] (Table WW-10)
- Allocated the "Net" Retail O&M Functional Costs to the various Component Costs of:
    - Collection System (Table WW-10A)
    - Water Pollution Control Plants (Table WW-10B through Table WW-10D)
    - Customer Costs (Table WW-12)
- **Note**:
    - Certain Retail O&M Costs such as Inlet Cleaning O&M Costs are allocated entirely to Storm Costs, as appropriate (Table WW-10A)
    - Certain Retail O&M Costs such as Collection System O&M Costs are allocated between Sanitary Sewer and Stormwater, as appropriate (Table WW-11)
    - Certain Retail O&M Costs such as Billing O&M Costs and Industrial Waste O&M costs are allocated between Sanitary Sewer and Stormwater as appropriate (Table WW-12)

B. DISTRIBUTE RETAIL SANITARY SEWER CAPITAL AND O&M COSTS TO CUSTOMER TYPES

We perform the following key steps to allocate the **Sanitary Sewer** Retail Capital and O&M Costs to the various Customer Types:

1. *Retail: Determination of Sanitary Sewer Unit Costs of Cost Components*

The **retail** test year *unit cost*, for each of the cost components, is derived as follows (Table WW-11 & Table WW-12):

- Divide the operational and capital costs allocated to each cost component by the respective retail units of service
- Derive the total Retail unit cost for each cost component as follows:
    - *Total Retail Unit Cost* = Operation Expense unit cost + Depreciation Expense unit cost + Inside City Return on Plant Investment unit cost

2. *Retail: Distribution of Sanitary Sewer Costs to Customer Types*

The Wastewater test year cost of service is distributed to each customer type as follows:

- Applying the total unit cost of each cost component to the corresponding units of service of each customer type (Table WW-13); and
- Reapportioning the *Pumping & Treatment related I&I Costs* between Sanitary Sewer and Stormwater (Table WW-14)

3. *Retail: Distribution of Adjusted Sanitary Sewer Costs to Customer Types*

A final step is to determine the Sanitary Sewer "Adjusted" cost of service for each customer type. This step is necessary as the Water Department provides bill discounts to four customer types. The annual revenue reduction due to the sanitary sewer discounts is apportioned, in a proportionate manner, to all the customer types (Table WW-14).

The adjusted *Sanitary Sewer* cost of service determined for each retail customer type provides a defensible basis for the design of the **Sewer Rates and Charges** for the test year.

C. DISTRIBUTE RETAIL STORMWATER COSTS TO CUSTOMER TYPES

We perform the following key steps to allocate the Test Year **Stormwater** Costs to the various Customer Types:

- Determine the *Units of Service* for billable Gross Area (GA) and Impervious Area (IA) by customer type (Table SW-10)
- Allocate the Test Year *Stormwater Costs* to the three rate components (Table SW-13), namely: 1) Billing & Collection; 2) GA; and 3) IA
- Determine the *Unit Costs* of GA and IA (Table SW-14)
- Distribute GA and IA costs to *Customer Types* based on billable GA and IA and the corresponding unit costs, adjusted for customer assistance cost recovery (Table SW-15)
- Determine the *Unit Costs* of Billing & Collection by Residential and Non-Residential Customer Type (Table SW-17)
- Distribute Billing & Collection costs to *Customer Types* based on billable accounts and the corresponding billing & collection unit costs
- Determine "Adjusted Stormwater Cost of Service" by Customer Type, after re-apportioning revenue reduction due to discounts, to customer types (Table SW-18)

The adjusted *Stormwater* cost of service determined for each retail customer type provides a defensible basis for the design of the **Stormwater Rates and Charges** for the test year.

Appendix A

An overview, of the Base-Extra Capacity Method and Commodity-Demand Method which are typically used in the allocation of Water System functional costs to the respective cost components, is presented. In addition, an overview of the Design Basis and/or Functional Method that is used to allocate Wastewater System functional costs to the respective cost components is also discussed in the following sections.

The costs derived in revenue requirements are incurred as a result of service demands (Cost Components) placed on the system by its customers. Many utilities are designed and sized to meet the service demands. Therefore the operational (O&M) and capital costs (Depreciation and Return on Plant Investment) are allocated to *Cost Components*.

Methods Used to Allocate Water System Functional Costs:

The principal cost drivers for water are volume of water consumed, peak water demands, number of customers, and the number of fire services.

1. *Base-Extra Capacity or Commodity Demand Methods for Water*

   The base-extra capacity method uses base, extra-capacity, customer and fire protection functional cost centers. Base represents costs incurred during average load conditions. Extra-capacity represents costs incurred with meeting peak demand rate of use in excess of base. Customer represents the costs associated with serving customers regardless of the amount of water consumed. Fire protection represents costs that apply solely to fire protection (public and private).

   The commodity demand method uses commodity, demand, customer and fire protection. Commodity represents costs incurred with the quantity produced. Demand represents costs incurred with meeting peak demand rate of use. Demand differs from extra-capacity in that all costs associated with peak demands are assigned to demand where as in extra-capacity only the peak demand in excess of base is assigned. Costs-related to customer and fire protection are similar to that described for the base-extra capacity method.

Methods Used to Allocate Wastewater System Functional Costs:

The principal cost drivers for sewer are volume of water consumed, peak flows or capacity, strengths, and number of customers. To determine the appropriate cost drivers depends on the method used.

2. *Design Basis or Functional Cost Methods for Sewer*

   The design basis method uses volume, capacity, strengths, and customer. Volume represents costs incurred for the quantity of sewerage volume treated. Capacity represents costs incurred with meeting peak flows. Strengths represents costs incurred with treating and handling specific constituents in the sewer flow such as biological oxygen demand, suspended solids, nitrogen,

ammonia, etc. Customer represents the costs associated with serving customers regardless of the amount of sewage treated.

The functional cost method uses volume, strengths, and customer. Functional cost method differs from design based in that peak flow or capacity isn't incorporated. The method is used when engineering design by system is not readily known and therefore costs are assigned based on the purpose of the cost driver.

3. *Design Basis or Functional Cost Methods for Stormwater*

At PWD, stormwater is an integral part of the wastewater program. The majority of the City is served by "combined sewerage systems" which carry both sanitary wastewater and stormwater. Consequently, PWD performs a further cost allocation between sanitary sewer and stormwater to support the development of sewer and stormwater rates.

To: Philadelphia Water Department (PWD)	From: Black & Veatch Management Consulting, LLC
Task Name: Cost of Service Study	Schedule: BV-E5
Document: Wholesale Cost of Service	WP-5

White Paper: Wholesale Cost of Service Overview

INTRODUCTION

In addition to retail water and wastewater customers, the Philadelphia Water Department (PWD) also provides wholesale water service to Aqua Pennsylvania and wholesale wastewater treatment service to 10 adjoining municipalities. To establish the rates and charges for all its customers, PWD develops a multi-year financial plan and conducts cost of service (COS) studies that take into consideration both retail and wholesale service in both the water and the wastewater utilities. This paper provides an overview of the wholesale cost of service portion of the COS studies as well as additional background information on PWD's wholesale customers and their associated contracts.

WHOLESALE COST OF SERVICE BASIS

Whether looking at the water utility or the wastewater utility, the methodology that PWD uses in conducting a COS study is the same: After developing the multi-year financial plan, PWD determines the allocable net operating expenses and capital expenses associated with serving retail and wholesale customers. With respect to the wholesale customers, PWD allocates the net operating expenses and capital costs following the industry accepted guidelines set forth in the manuals of practice of both the American Water Works Association (AWWA) and the Water Environment Federation (WEF). Due to the existence of wholesale service, and recognizing the ownership of the utilities by the City of Philadelphia, the wholesale cost of service and service charges for each wholesale customer are developed based on the *utility basis cost approach.* In addition, the wholesale service charges also recognize specific contractual capacities and other relevant considerations included in each customer's contract.

In general, under the utility basis, all users (retail and wholesale) share the system net operation and maintenance (O&M) expense proportionately based on annual service requirements. For wholesale water service, the COS determinants for annual service requirements are annual flow as well as peak daily and hourly flow requirements. On the wastewater side, the wholesale wastewater service annual service requirements use annual wastewater flow, strength (Biochemical Oxygen Demand [BOD] and Suspended Solids [SS]), and peak capacity flow requirements. Under the *utility basis,* the COS analyses allocate capital costs to wholesale customers in terms of depreciation and return on plant investment. Depreciation expense provides for the recovery of the capital investment used up over the life of the facility. Return on plant investment recognizes a return to the City for its investment in the facilities required to provide service to the wholesale customers and may be used to cover, in part, interest on debt and cash funded capital.

OVERVIEW OF WHOLESALE WATER COST OF SERVICE CHARGES

The cost of service allocable to Aqua Pennsylvania and the rates developed to recover the allocated costs, reflect consideration of the contract demands for service as set forth in the contract between Aqua Pennsylvania and the City, as well as the projected annual water consumption, and the maximum day and hour demands for Aqua Pennsylvania. PWD allocates net O&M expenses to Aqua Pennsylvania based on the ratio of the Aqua Pennsylvania projected annual consumption, maximum day demand, and the maximum hour demand relative to the projected total system annual usage or production and maximum day and hour demands. The annual capital costs allocable to Aqua Pennsylvania recognize annual depreciation expense and return on plant investment, with the allocable plant investment based upon the contract maximum day demands versus the design capacity of the various facilities used in the provision of service to Aqua Pennsylvania. PWD uses original cost to allocate plant investment for determining the applicable rate base. This approach is consistent with the methodology applied in previous rate filings and is consistent with the derivation of Aqua Pennsylvania's existing rates. The rate of return for service to the City's wholesale water and wastewater customers used in the cost of service study is 7.5 percent, which is consistent with the rate of return used in the development of Aqua Pennsylvania's existing rates. The specific contract maximum day demands for Aqua Pennsylvania used in the cost of service analysis amount to 9.5 million gallons per day (mgd) for the study period.

SUMMARY OF WATER RATES AND CHARGES

As established under the contract, the rates applicable to Aqua Pennsylvania include a commodity or usage charge, a fixed charge, and a management fee.

- **Commodity Charge.** The commodity charge is a usage unit cost rate applied to metered consumption which recovers the wholesale customer allocated O&M costs associated with power and chemicals. As agreed to by both the City and Aqua Pennsylvania, the COS analysis limits water loss percentage applied to Aqua Pennsylvania to 20 percent.

- **Fixed Charge.** The fixed charge recovers the wholesale customers share of operation and maintenance expense excluding power and chemicals, and depreciation and return on plant investment related to raw water pumping, purification and treatment, treated water pumping, treated water storage, transmission, and general and administrative.

- **Management Fee.** The management fee amounts to 10 percent and is applied to the sum of the commodity charge and fixed charge.

These charges are based on cost of service analyses prepared by Black & Veatch.

OVERVIEW OF WHOLESALE WASTEWATER COST OF SERVICE CHARGES

Similar to the COS process followed for the water wholesale customer, the cost of service allocable to the 10 wholesale wastewater customers and the rates developed to recover these allocated costs, reflect consideration of the contract demands for service as set forth in each customer's contract with the City.

PWD allocates treatment related O&M expenses to its wastewater wholesale customers based on the ratio of the contract customers' volume, peak flow and strength service requirements, including an allowance for infiltration and inflow (I&I) in the collection system as appropriate, and the projected total volume, peak flow, and loading for the wastewater pumping and treatment facilities used in the provision of service to each wholesale customer. The annual capital costs allocable to wholesale customers recognize annual depreciation expense and return on plant investment, with the allocation of plant investment based upon the contract wastewater volumes, peak flow rates, BOD/SS loadings, including an allowance for I&I in the collection system as appropriate, versus the volume, peak flow rate, and BOD/SS loading design capacity of the facilities used in the provision of service to each wholesale customer. The following table identifies the wholesale customer served by each wastewater treatment plant.

Northeast WPCP	Southwest WPCP	Southeast WPCP
Abington	DELCORA[1]	Springfield (Wyndmoor)
Bensalem	Lower Merion	
Bucks County	Springfield (Excluding Wyndmoor)	
Cheltenham	Upper Darby	
Lower Moreland		
Lower Southampton		

Notes:

1. DELCORA's wastewater is delivered directly to the Southwest WPCP and does not use PWD's pumping or collection system facilities, therefore an allowance for I&I is not required.

WPCP = Water Pollution Control Plant

Bucks County, Cheltenham, Lower Southampton, Springfield, Abington, and Lower Moreland Townships, and DELCORA cost of service allocations include a share of the system-wide O&M expense and capital costs associated with the Consent Order & Agreement (COA), also referred to as the Long Term Control Plan (LTCP), in accordance with their contract terms.

PWD allocates plant investment using the original cost basis to establish the applicable rate base for rate of return calculations. This approach is consistent with the methodology applied in previous rate proceedings and is consistent with the derivation of the existing wholesale customer rates. The rate of return for service to the City's wholesale wastewater customers used in the COS study is 7.5 percent, which is consistent with the existing wastewater wholesale customer rates and the rate or return used in the development of the water wholesale rates.

PWD allocates collection system related O&M expenses to its wastewater wholesale customers based on each's wholesale customers' allocation of collections system plant investment and ratio of collection system related O&M and the total system collection system investment.

PWD allocates a share of wastewater customer related costs to wastewater wholesale customers based on the number of meter sites for each customer and the estimated number of samples conducted in evaluating each customer's wastewater loading.

SUMMARY OF WASTEWATER RATES AND CHARGES

Wholesale wastewater customer rates and charges consist of annual lump sum charges and unit rates.

- **Annual Lump Sum Charges.** The annual lump sum charges recover the wholesale customers' share of O&M expense related to conveyance (trunk sewers), customer, and LTCP expenses, and capital costs (depreciation expense and return) related to sewage conveyance, treatment, and LTCP facilities as appropriate for each customer.

Customer	Conveyance & Customer O&M Costs	Conveyance and Treatment Capital Costs	LTCP O&M and Capital Costs
Abington	✓	✓	✓
Bensalem	✓	N/A[1]	
Bucks County	✓	✓[2]	✓
Cheltenham	✓	✓	✓
DELCORA	✓[3]	✓[2]	✓
Lower Merion	✓	N/A[1]	
Lower Moreland	✓	✓	✓
Lower Southampton	✓	✓[2]	✓
Upper Darby	✓	N/A[1]	
Springfield (Excluding Wyndmoor)	✓	✓	✓
Springfield (Wyndmoor)	✓	✓	

Notes:
1. For customers who continue to make capital contributions, the lump sum charge excludes conveyance and treatment capital costs (depreciation and return on plant investment). Rather, PWD bills these customers for any additional capital costs on future investment, beyond their previous capital contributions, for which they are responsible.
2. Customers who previously made capital contributions, but currently pay annual depreciation expense and return on plant investment under their amended contracts, are allocated system investment for each functional cost center (treatment, collection, customer, LCTP, etc.) recognizing the terms of their respective contract.
3. DELCORA's wastewater is delivered directly to the Southwest WPCP and does not use PWD's pumping or collection system facilities, therefore the fixed charge excludes conveyance related O&M and capital costs.

- **Unit Rates.** Unit cost rates for volume, capacity, and BOD and SS strength components recover the wholesale customer allocated costs associated with treatment and pumping O&M expenses.

- **Management Fee.** The management fee amounts to 10 or 12 percent, in accordance with contract terms, applied to the sum of the fixed and unit rate charges.

OVERVIEW OF WHOLESALE CUSTOMERS

A description of the various wholesale customers and their respective contracts are provided in the following sections

WATER WHOLESALE CUSTOMER

The City currently provides service to one wholesale water customer:

Aqua Pennsylvania. The Water Department's sole wholesale water customer is Aqua Pennsylvania (formerly the Philadelphia Suburban Water Company). The charges to Aqua Pennsylvania, which commenced taking service from Philadelphia in fiscal year 2002, include a commodity charge applicable to metered water usage for the recovery of power and chemical costs, and a fixed charge to recover all

other allocable O&M expenses and capital related costs. In addition, PWD charges Aqua Pennsylvania a 10 percent management fee. The contract with Aqua Pennsylvania is for up to 9.5 mgd of maximum day capacity and covers a term of 25 years, ending in 2026.

WASTEWATER WHOLESALE CUSTOMERS

Wholesale wastewater service is provided to 10 suburban customers on a contractual basis with multi-year terms. Three wholesale customers (Bucks County, Bensalem, and Upper Darby) make capital contributions to PWD for their allocated share of investment in treatment and collection system facilities used in providing wastewater service to the particular customer. Contract rates for wastewater service apply on a monthly basis and generally consist of charges for O&M expense, applicable capital costs associated with the collection and treatment facilities used in providing the service, customer related costs, and a management fee. Bucks County, Cheltenham, Lower Southampton, Springfield, Abington, and Lower Moreland Townships, and DELCORA contract rates consist of charges for O&M expense and capital costs associated with the LTCP and COA in accordance with their contract terms. PWD actively manages the wholesale service agreements to recover the costs associated with the wholesale service. The following is a brief description of each of the wholesale customers and reflects the most recent wholesale contract negotiations:

- ***Abington Township.*** The Water Department negotiated a 10-year agreement with Abington Township effective October 9, 2014. This agreement requires that Abington pay depreciation and return on plant investment on all capital facilities serving them, including their proportional share of the Water Department's LTCP expenditures. The contract also includes a management fee of 12 percent of wastewater treatment charges.

- ***Bensalem Township.*** The Water Department negotiated a 35-year agreement with Bensalem Township effective April 1, 1988. This agreement requires that Bensalem to pay a capital contribution on all improvements to facilities serving them. The contract also includes a management fee of 10 percent of wastewater treatment charges.

- ***Bucks County.*** The Water Department negotiated a wastewater services contract with Bucks County which went into effective on January 1, 1988 and the parties last amended the contract in 2005. This agreement requires that Bucks County pay depreciation and return on plant investment on all new capital facilities serving them, including their proportional share of the Water Department's LTCP expenditures. The contract also includes a management fee of 10 percent of wastewater treatment charges.

- ***Cheltenham Township.*** Cheltenham and the Water Department entered into a five year agreement effective March 19, 2014. The new contract acknowledged Cheltenham's periodic exceedance of its peak contractual flow limits and required the Township to commence Act 537 sewage facilities planning and initiated a 12 percent management fee on its total billings. On March 19, 2014 the Water Department and Cheltenham executed Amendment No. 1 to its 2010 contract. The amendment extended the contract through Fiscal Year 2025 and requires that Cheltenham pay depreciation and return on plant investment on all capital facilities serving them, including a proportional share of the Water Department's LTCP expenditures. The amendment further requires Cheltenham to undertake significant improvements to its sewer

system including intensive efforts to reduce its I&I in an effort to control its flows above the contractual limit. The Water Department has temporarily agreed to accept flows in excess of the 18 cubic feet per second (cfs) limit at the Township's Adams Avenue connection while it evaluates Cheltenham's progress in reducing its flow exceedances.

- ***Delaware County Regional Water Quality Control Authority (DELCORA).*** A 15-year contract was executed on April 1, 2013 as the previous contract expired in FY 2013. The contract includes a 12 percent management fee, maintains contractual flow limits at prior levels, and extends the exceedance charges for any exceedances in flows or pollutant loadings from the previous contract. The contract also provides for the recovery of a portion of the Water Department's LTCP costs.

- ***Lower Merion.*** The Water Department negotiated a wastewater services contract with Lower Moreland Township on May 22, 1992. This agreement requires Lower Merion to pay a capital contribution on all improvements to facilities serving them. The contract includes a 10 percent management fee.

- ***Lower Moreland Township.*** The Water Department negotiated a new wastewater services contract with Lower Moreland Township on May 18, 2015. The agreement provides modest increases to the Township's annual average daily flow limits, as well as the loadings limits and implements a significant reduction in peak flows limits. Notably, the contract provides that Lower Moreland pay its proportional share of the Water Department's LTCP costs and includes a 12 percent management fee. The new contract provides for services through Fiscal Year 2025.

- ***Lower Southhampton.*** The Water Department negotiated the most recent wastewater services contract with Lower Southampton Township on May 18, 2015. The agreement provides modest increases to the Township's annual average daily flow limits, as well as the loadings limits and implements a significant reduction in peak flows limits. Notably, the contract provides that Lower Southhampton Township pay its proportional share of the Water Department's LTCP costs and includes a 12 percent management fee. The new contract provides for services until Fiscal Year 2025.

- ***Springfield Township.*** The Water Department and Springfield Township executed a 10-year agreement on February 24, 2014. The agreement requires that Springfield pay depreciation and return on plant investment on all capital facilities serving them, including their proportional share of the Water Department's LTCP expenditures. Additionally, the contract provides for a management fee of 12 percent of the wastewater treatment charges.

- ***Upper Darby.*** The Water Department and Upper Darby executed an agreement on December 1, 1995, which expires on August 8, 2023. The agreement requires that Upper Darby to pay a capital contribution on improvements to all facilities serving them. Additionally, the contract provides for a management fee of 10 percent of the wastewater treatment charges.

WHOLESALE CUSTOMER REVENUES

In FY 2017, wholesale revenues represented 5 percent of the Water Department's total water and wastewater revenues. The following table presents the revenues from Wholesale Customers as of June

30, 2017. The table also includes information regarding the contract expiration dates as well as the percentage contribution toward PWD's LTCP costs as presented under the COA percentage column.

Wholesale Water and Wastewater Customer Revenues and Contract Terms
Fiscal Year Ending June 30, 2017

	Total	% Total Revenue	Contract End Date	COA %
Wastewater				
Delcora [1]	$ 8,274,572	1.14%	4/1/2028	9.44%
Bucks County Water & Sewer Authority	7,940,300	1.09%	3/31/2038	N/A
Cheltenham Township	3,712,261	0.51%	6/30/2025	2.43%
Lower Southampton Township	3,540,324	0.49%	6/30/2024	0.96%
Upper Darby Township	2,442,757	0.34%	8/8/2023	NA
Lower Merion Township	2,225,241	0.31%	N/A	N/A
Springfield Township				
Erdenheim [2]	1,864,095	0.26%	6/30/2023	0.79%
Wyndmoor [2] [3]	326,765	0.05%	6/30/2023	N/A
Bucks (for Bensalem) [2]	1,925,423	0.27%	6/30/2023	N/A
Abington Township	1,614,469	0.22%	6/30/2023	0.58%
Lower Moreland Township [4]	785,757	0.11%	6/30/2025	0.36%
Other Municipal Revenue	60	0.00%	N/A	N/A
Sub-total	**$ 34,652,023**	**4.78%**		**14.57%**
Water				
Aqua Pennsylvania	$ 3,276,834	0.45%	3/1/2026	N/A
Sub-total	**$ 3,276,834**	0.45%		
Total Wholesale Revenues	**$ 37,928,857**	**5.23%**		

Note: The Water Department includes capital charges within operation and maintenance charges for all customers except Bensalem, Lower Merion, and Upper Darby.

(1) Delcora allocated capital is based on assets placed in service on or after July 4, 2011.

(2) Bucks County Water and Sewer Authority maintains and operates the Bensalem Township Sewer System and the Springfield Township System.

(3) The total amount of the COA for Springfield Township – Wyndmoor is contained in the Springfield Township – Erdenheim amount.

(4) During Fiscal Year 2016, Lower Moreland renewed its wholesale wastewater contract, which now includes its proportional share of the Water Department's COA Expenditures and will expire in Fiscal Year 2025.

APPENDIX A - RECOVERY OF CUSTOMER ASSISTANCE PROGRAM COSTS FROM WHOLESALE CUSTOMERS

The following table provides a summary of customer assistance program administered by PWD and the Water Revenue Bureau and whether or not portions of those costs are allocated to wholesale customers.

Program Name	Recovered from Wholesale Customer	
	YES	NO
Discounts (Seniors, Charitable Organizations and Institutions, Hospital and Universities, Philadelphia Housing Authority)		✓
Homeowners Emergency Loan Program (HELP)[1]	✓	
Low Income Conservation Program (LiCAP)		✓
UESF Grants		✓
Cross Connection Abatement Program[1]	✓	
Basement Protection Program (BBP)[1]	✓	
Tiered Assistance Program (TAP)		✓
Stormwater Management Incentives Program (SMIP) & Greened Acre Retrofit Program (GARP) Grants[2]	✓	
Stormwater Credits		✓
Stormwater Customer Assistance Program (CAP)		✓
Stormwater Design Assistance	✓	
Residential Stormwater Programs Various[3]	✓	

1. HELP, Cross Connection Abatement Program and Basement Protection Program are included in overall Operation and Maintenance costs as part of the Administration and General cost functions. A portion of this function is allocated to wholesale customers; therefore, wholesale customers are receiving a portion of these costs with their O&M allocation.
2. SMIP/GARP is recovered from wastewater wholesale customers in accordance with their contact terms.
3. Includes, Rain Barrels, Green Practices, Design Innovation, Stream and Backyard Buffer Programs.

To: Philadelphia Water Department (PWD)	From: Black & Veatch Management Consulting, LLC
Task Name: Cost of Service Study	Schedule: BV-E5
Document: Cost Recovery of Discounts, Credits, Grants, and TAP	White Paper: WP-6

The purpose of this memorandum is to outline the cost recovery approach used for billing discounts, stormwater credits, incentives, grants and the Tiered Assistance Program (TAP). These approaches were used in development of the Fiscal Year (FY) 2018-FY 2023 financial plan in conjunction with the FY 2019 - FY 2021 Rate Proceedings.

Program Name	Cost Recovery Approach
Discounts	• Proportionate recovery from all retail service types. • Includes discounts provided to senior citizens, the Philadelphia Housing Authority (PHA), charities and schools, hospitals and universities.
UESF Grants	• Proportionate recovery from all retail service types.
Tiered Assistance Program (TAP)	• Proportionate recovery from all retail service types. • TAP Rate Rider adjustment recovered through water/sewer quantity charge.
Stormwater Management Incentives Program (SMIP) & Greened Acre Retrofit Program (GARP) Grants	• Recovered by Wastewater (*Sanitary & Storm*) revenues. • Proportionate recovery from applicable wastewater wholesale customers[1] and all retail service types.
Stormwater Credits	• Recovered by Wastewater System Stormwater Revenues. • Proportionate recovery from all retail service types. • Includes Community Gardens.
Stormwater Customer Assistance Program (CAP)	• Recovered from Stormwater Non-residential service type only.

Notes:

1. SMIP/GARP is recovered from wastewater wholesale customer in accordance with their contract terms.

To: Philadelphia Water Department	From: Black & Veatch Management Consulting, LLC
Task Name : Cost of Service	Schedule: BV-E5
Document : Senior Citizen Income Threshold Adjustment	White Paper: WP-7

This document provides the approach for the determination of income threshold for the senior citizens discount as per City of Philadelphia code of ordinances also reflected in the Water Department's regulations.

Background

The senior citizen discount is codified in City of Philadelphia's municipal code in Chapter 19-1900. Section 19-1901 of the code defines an "Eligible Senior Citizen" as follows:

"A residential customer of record of the Water Department age sixty-five (65) or older residing in the City of Philadelphia whose gross annual household income does not exceed as set forth below;

An amount not to exceed fourteen thousand ($14,000) dollars, except as adjusted to reflect the net change in the Consumer Price Index (All Urban Consumers (CPI-U) for Philadelphia (All Items)), such adjustment to occur from time to time at the discretion of the Water Commissioner, but no less often than at each general residential customer rate determination."

Methodology

The senior citizen income threshold is evaluated in accordance with City Code. The calculation methodology followed to determine the senior citizen discount threshold is described below.

Baseline Income Threshold

The baseline income threshold for senior citizen discount utilized was $14,000 in fiscal year 1987, the year the ordinance went into effect. Each year thereafter, this amount was escalated as described in the paragraph below. The current senior citizen income threshold is $31,500.

Escalation Factor

The escalation factor is determined using the Consumer Price Index data obtained from the Bureau of Labor Statistics (BLS) website. The report generated from the BLS website is for item and regional indices as specified in the ordinance above. The report specifications are:

- CPI-All Urban Consumers (Current Series)
- Original Data Value
- Not Seasonally Adjusted
- Area: Philadelphia-Wilmington-Atlantic City, PA-NJ
- All Items
- Base Period: 1982-84=100
- Years: 1982 to 2017

The index for the month of April is utilized for determination of the escalation factor to be applied to the baseline income threshold. This is because the BLS indices beginning 1998 are available for every other month. The next available index would be for the month of June, which is not available in time to update the threshold before the start of the next fiscal year for which rates are being determined.

Calculation of New Income Threshold

The new income threshold for senior citizen discount is calculated by escalating the baseline income threshold with the escalation factor determined above. The amount calculated above is rounded up to the nearest $100.

For purposes of projection of income threshold in future years, Black & Veatch recommends that the escalation factor be projected as the average annual change in the CPI over the most recent 5 years. The most recent CPI Escalation Factor is multiplied by the average change in CPI to arrive at the projected escalation factors. The new threshold for senior citizen discount is calculated by escalating the baseline threshold with the escalation factors determined. The amount calculated is rounded up to the nearest $100.

Results

The results of the senior citizen discount income threshold calculations are presented in the tables below.

Table 1 presents the escalation factors and the calculated income thresholds, and the annual change in CPI from FY 1987 through FY 2017.

TABLE 1: SENIOR CITIZEN DISCOUNT - INCOME THRESHOLD CALCULATION					
Fiscal Year	CPI Reference Date	CPI Value	CPI Escalation Factor	CPI Adjusted Income	Annual Change in CPI Adjusted Income
1986	Apr 1985	108.100			
1987	Apr 1986	110.000	1.00	$ 14,000.00	
1988	Apr 1987	115.500	1.05	$ 14,700.00	5.00%
1989	Apr 1988	120.000	1.09	$ 15,272.73	3.90%
1990	Apr 1989	126.700	1.15	$ 16,125.45	5.58%
1991	Apr 1990	134.300	1.22	$ 17,092.73	6.00%
1992	Apr 1991	140.800	1.28	$ 17,920.00	4.84%
1993	Apr 1992	145.400	1.32	$ 18,505.45	3.27%
1994	Apr 1993	149.600	1.36	$ 19,040.00	2.89%
1995	Apr 1994	153.100	1.39	$ 19,485.45	2.34%
1996	Apr 1995	157.800	1.43	$ 20,083.64	3.07%
1997	Apr 1996	162.100	1.47	$ 20,630.91	2.72%
1998	Apr 1997	166.000	1.51	$ 21,127.27	2.41%
1999	Apr 1998	167.100	1.52	$ 21,267.27	0.66%
2000	Apr 1999	171.100	1.56	$ 21,776.36	2.39%
2001	Apr 2000	175.800	1.60	$ 22,374.55	2.75%
2002	Apr 2001	181.200	1.65	$ 23,061.82	3.07%
2003	Apr 2002	183.100	1.66	$ 23,303.64	1.05%
2004	Apr 2003	187.200	1.70	$ 23,825.45	2.24%
2005	Apr 2004	194.800	1.77	$ 24,792.73	4.06%
2006	Apr 2005	203.300	1.85	$ 25,874.55	4.36%
2007	Apr 2006	211.600	1.92	$ 26,930.91	4.08%
2008	Apr 2007	215.270	1.96	$ 27,398.00	1.73%
2009	Apr 2008	223.622	2.03	$ 28,460.98	3.88%
2010	Apr 2009	221.686	2.02	$ 28,214.58	-0.87%
2011	Apr 2010	227.432	2.07	$ 28,945.89	2.59%
2012	Apr 2011	233.143	2.12	$ 29,672.75	2.51%
2013	Apr 2012	237.782	2.16	$ 30,263.16	1.99%
2014	Apr 2013	240.345	2.18	$ 30,589.36	1.08%
2015	Apr 2014	243.694	2.22	$ 31,015.60	1.39%
2016	Apr 2015	243.717	2.22	$ 31,018.53	0.01%
2017	Apr 2016	245.300	2.23	$ 31,220.00	0.65%
2018	Apr 2017	248.411	2.26	$ 31,615.95	1.27%

Notes: CPI Adjusted Income for FY 1987 and CPI Indices as per ordinance

Table 2 presents the average change in CPI over the most recent 10 year, 15 year and 20 year timeframe.

TABLE 2 : AVERAGE ANNUAL CHANGE IN CPI

Description	Average Annual Change
5 Year Average	1.06%
10 Year Average	1.45%
15 Year Average	2.07%
20 Year Average	2.05%

Tables 3 presents the projected senior citizen income thresholds using the 5-year average escalation factor.

TABLE 3: PROJECTIONS FOR SENIOR CITIZEN INCOME THRESHOLD

Fiscal Year	Annual CPI Income Change	CPI Escalation Factor Used	Projected CPI Adjusted Income	Projected Income Threshold for PWD Use
			Current Threshold	**$ 31,500.00**
2019	1.06%	2.28	$ 31,952.56	$ 32,000.00
2020	1.06%	2.31	$ 32,292.77	$ 32,300.00
2021	1.06%	2.33	$ 32,636.59	$ 32,700.00

Notes: CPI Escalation Factor used is based on 5-year average change in CPI

Based upon the senior citizen income threshold of $14,000 established by City Code for FY 1987 and the projected adjustments per CPI, Black & Veatch recommends that the senior income threshold be adjusted to $32,300 in FY 2019 in conjunction with the upcoming rate proceeding for the requested rate period of FY 2019 to FY 2021.

In the Matter of the Philadelphia Water Department's Proposed Change in Water, Wastewater and Stormwater Rates and Related Charges

Fiscal Years 2019-2021

Philadelphia Water Department

Black & Veatch Management Consulting, LLC

Schedule BV-E6

Dated: February 9, 2018

Ann T. Bui

Ms. Bui is a Managing Director of Business and Advisory Services for Black & Veatch Management Consulting's Water Industry. She has more than 25 years of experience working with utilities on more than 300 engagements, and has provided financial and business services for public and investor-owned utilities across the US of all different sizes ranging from those with only 5,000 service connections to those that serve populations over three million. She has also provided financial and project financing services to agencies and project located internationally in the United Arab Emirates, Chile, Hong Kong, and Singapore.

Her recent assignments have focused on drought, water scarcity and value of water issues; addressing affordability and assistance program needs; promoting operational excellence through effectiveness studies; quantifying the financial impact of deferred asset maintenance; developing innovative approaches for structuring alternative delivery projects using private and public financing instruments and preparing financial feasibility reports supporting more than $5 billion of revenue bond sales.

An active proponent of advancing the water industry, Ms. Bui is a long-standing member of several industry associations. She is the immediate past Chair of the American Water Works Association (AWWA) Finance, Accounting, and Management Controls (FAMC) Committee and is involved with AWWA's Strategic Practices Committee, AWWA's Rates and Charges Committee, and the National Association of Clean Water Agency's (NACWA's) Utility Management Committee.

Under her six-year tenure as FAMC Vice-Chair and Chair, she was a lead author and editor for AWWA's book Financial Management for Water Utilities: Principles of Finance, Accounting and Management Controls. Additionally, she has been a contributing author or key reviewer for the last version of AWWA's M1 – *Principles of Water Rates, Fees and Charges*, the current update to M1, the current and updated versions of Water Environment Federation (WEF)'s Manual of Practice 27, *Financing and Charges for Wastewater Systems*, and WEF's *User-Fee Funded Stormwater Program*. Ms. Bui has organized numerous AWWA-sponsored webinars related to capital financing and made presentations on financing topics throughout the country.

Currently, Ms. Bui is serving as the Chair for AWWA's update to M29 – *Water Utility Capital Financing*, leads the Reuse subcommittee of AWWA's Rates & Charges committee, and is the coordinating editor for Journal AWWA's *Money Matters* column.

Over the past decade, Ms. Bui has provided expert witness testimony in front of the California Public Utilities Commission, the Indiana Utilities Regulatory Commission, and the Kentucky Public Service Commission.

MANAGING DIRECTOR

Specialization:
Financial & Management Consulting Services; Debt Issuance Support; Elasticity Studies; Cost of Service & Rate Design; Institutional & Organizational Studies; Alternative Financing; Valuations/M&A

Education
- B.S., Chemical Engineering, University of British Columbia
- Masters work, Chemical Engineering, University of California -- Los Angeles
- M.B.A., Finance & Engineering Management, University of California -- Davis

Professional Registration
- Engineer-in-Training: California

Professional Associations
- AWWA
- Past Chair - AWWA's Finance, Accounting & Management Controls Committee
- Member – AWWA's Rates & Charges Committee
- Member - AWWA's Strategic Management Practices Committee
- WEF
- NACWA's Utility Management Committee

Year Career Started
1989

Year Started with B&V
1989

Books and Manuals
- Editor, *Financial Management for Water Utilities: Principles of Finance, Accounting and Management Controls*, 2012
- Contributing Reviewer, AWWA M1 Manual, *Principals of Water Rates, Fees and Charges, 5th, 6th, and 7th Editions*
- Contributing Reviewer, WEF *User-Fee Funded Stormwater Program*, Special Publication, 2014
- Contributing Author, WEF MoP 27, *Financing and Charges for Wastewater Systems, 2018*

REPRESENTATIVE PROJECT EXPERIENCE

- **City of San Diego Public Utilities Department | Water Storage Investment Program (WSIP) Grant Application | San Diego, CA | 2017 | Role: Financial Lead.** Developed $1.3 billion grant application to the State's newly developed WSIP intended to provide Bay-Delta benefits.
- **Great Lakes Water Authority | Un-Metered Customers and Water Audit | Detroit, MI | 2017 – In Progress | Role: Technical Advisor.** Developing peaking factors for un-metered customers and a review of all peaking elements for customers served by GLWA. Analyzing over 3 years of AMI data and developing new cost allocations for water loss and units of service for the 87 wholesale communities.
- **Washington Suburban Sanitary Commission | Cost of Service and Alternative Rate Structure Study | Baltimore, MD | 2016 - Ongoing | Role: Project Director.** Conducting first COS study for WSSC. Alternative rate structures being developed to address PSC directive for rate equity.
- **Philadelphia Water Department | Comprehensive Cost of Service Studies and Rate Case Support | Philadelphia, PA | 2004 - 2017 | Role: Financial Lead, Technical Advisor, and Client Director.** Comprehensive cost-of-service water, wastewater, and stormwater studies for PWD. Support for the City's revenue bond issuances and expert witness testimony at rate case hearings.
- **City of San Diego | Cost of Service Study | San Diego, CA | 2012 - 2016 | Role: Project Director.** Comprehensive cost of service studies for water and wastewater.
- **City of San Diego | Recycled Water Study and Pure Water Program Cost Allocations | San Diego, CA | 2012 - 2017 | Role: Financial Lead.** Business case development and cost allocations for the Pure Water program. Cost allocations being used to delineate cost responsibilities between Participating Agencies and the City's water and wastewater funds.
- **City of Long Beach | Cost of Service Studies, Annual Rate Surveys, and Budget-Based Irrigation Rates | Long Beach, CA | 2007 - 2012 | Role: Project Director.** Annual typical bill surveys to support City's rate increases. Conducted comprehensive water and wastewater cost of service study. Developed budget-based irrigation rates for City's irrigation customers.

- **Water Supplies Department | Water Conservation and Loss Analysis, Hong Kong, China | 2016 | Role: Subject Matter Expert. T**he lead reviewer and subject matter expert for the regulatory and infrastructure governance aspect of the Total Water Management program. Reviewed recommendations made to improvement the organization's governance and structure to meet current and future regulatory needs.
- **City of Los Angeles Bureau of Sanitation | Enhanced Watershed Management Permit; California | 2015 | Role: Financial Lead.** Provided funding strategies to support the City of Los Angeles's Bureau of Sanitation's submittal of three Enhanced Watershed Management Permits (EWMPs). The EWMP outlines a strategy to address watershed activities to comply with MS4 requirements.

PUBLICATIONS / PRESENTATIONS

Bui, Ann T., Author, *Manual of Practice 27, Financing and Charges for Wastewater Systems, Chapter3 – Financial Management and Accounting for Wastewater Systems* and *Chapter 13 – Rates for Reuse or Reclaimed Water,* 2018, published by WEF, Alexandria, VA.

"What is a World-Class Utility and How Does Yours Become One? Water Online, July 25, 2017

"Where are We Heading Next? Strategic Directions in the Water Industry", presented at the Conference of Infrastructure Financing Agencies, Federal Policy Meeting in Washington, D.C., April 2017.

"What's in Your Wallet? Ways to Address Aging Infrastructure and Lack of Money." Annual Utility Management Conference. June 2016

"No More Sacred Cows", published in Journal AWWA, January 2016.

"Business Risks to the Capital Financing Process", published in AWWA's Opflow magazine, September 2015.

"Securing Solid Revenues Streams for Water Utilities is Crucial for Financial Resilience", published in Breaking Energy, September 10, 2015.

"Revenues and Expenses and Ratios, Oh My! A Finance Primer for Non-Finance Professionals", presented at the Annual Utility Management Conference in Glendale, Ariz., March 2013.

Bui, Ann T., Editor, *Financial Management for Water Utilities: Principles of Finance, Accounting and Management Controls,* 2012, published by AWWA, Denver, Colo.

"Checks and Balances: An Overview of the New Financial Management for Water Utilities Handbook", presented at the Annual AWWA Conference in Dallas, Tex., June 2012.

"Introduction to Financial Planning" presented at the Pacific Northwest Section of the Clean Water Association Winter Short Course University, Portland, Oreg., February 2010.

"Money Makes the World Go 'Round: An Overview of the New Financial Management for Water Utilities Handbook," presented at the Annual AWWA Conference in San Diego, Calif., June 2009.

"Key Performance Indicators" presented at the Annual AWWA Conference in San Diego, Calif., June 2009.

"Everything You Ever Wanted to Know About Finance Management but were Afraid to Ask: An Overview of the New Financial Management for Water Utilities Manual", presented at the Annual AWWA Conference in Atlanta, Ga., June 2008.

"Alternative Funding Sources" presented at the Regional Water Authority Conference in Rancho Cordova, Calif., April 2007.

"Financial Benchmarks" presented at the Annual AWWA Conference in San Francisco, Calif., June 2005.

"Maximize Debt Market Options – Minimize Revenue Adjustments" presented at the Kentucky/Tennessee AWWA/WEF Conference in Nashville, Tenn., August 2004.

"Quantification and Reduction of Risk from Hazardous Air Emissions - Key note address," presented at the AIChE Annual Conference in San Francisco, Calif., November 1994.

Prabha N. Kumar, M.B.A

Ms. Kumar is a Director in the Advisory & Planning group within Black & Veatch's Management Consulting, LLC. Her areas of specialization include the following:

(i) Stormwater Utility Consulting; (ii) Non-revenue Water Management Initiatives; (iii) Business Transformation/Performance Management Services; (iv) Program Management and Strategic Planning; and (v) Stakeholder Engagement.

Ms. Kumar's comprehensive utility consulting expertise also includes financial planning, cost of service, and rate design studies, and providing expert witness and litigation support services in municipal utility rate cases and utility litigation matters.

She has also directed benchmarking studies, and technology projects that involve business needs assessment, system requirements specification, database applications design, and training.

Within the stormwater utility consulting practice area, Ms. Kumar is a "concept to launch" subject matter expert. Her expertise includes stormwater utility feasibility studies, utility development, and all aspects of user fee implementation. In addition, she has directed both internal stakeholder education and engagement, and external public education and outreach.

PROJECT EXPERIENCE

DC Water; Business Maturity Cost Allocation; Washington DC, District of Columbia, United States; 2017-In-Progress

Business Maturity Cost Allocation - Black & Veatch. Proj. Director: This ongoing study involves developing a cost allocation model to develop functional cost allocation for the IT and Distribution/conveyance; and Treatment departments to support enhanced cost and performance tracking.

City of Philadelphia; Philadelphia Water Department; Philadelphia, Pennsylvania, United States; 2015-2016

Technical Director - Black & Veatch. Ms. Kumar recently directed the water, sewer, stormwater cost of service analysis, and rate study update and bond feasibility services for the Philadelphia Water Department. The study involved a six-year financial planning, bond issuance support, cost of service analysis, wholesale and retail rates update, rate case testimony and expert witness services. Ms. Kumar served as the expert witness in the recently concluded 2016 rate case proceedings. In March 2015, bond engineering and feasibility report was provided to support the issuance of Series 2015 bonds of $417.0 Million.

DIRECTOR

Expertise:
Benchmarking; Billing Systems Needs Assessment; Business Operations Review & Optimization; Database Applications Development & Implementation; Financial Planning; Rate Studies; Storm Water Utility Development

Education

- Masters, Masters in Business Administration, MIS & Marketing, University of California Riverside, 1998, United States
- Masters, Master of Philosophy, English Language & Literature, Madras Christian College, University of Madras, 1990, India
- Master of Arts, English Language and Literature, Madras Christian College, University of Madras, 1986, India
- Bachelor of Arts, English Language and Literature, Madurai Kamaraj University, 1984, India

Total Years of Experience
20

Black & Veatch Years of Experience
19

Professional Associations
American Water Works Association (AWWA) - Member - Strategic Management Practices Committee
National Association of Clean Water Agencies (NACWA) - Stormwater Committee Member

Language Capabilities
English
Indian (Others)

Office Location
Wilmington, Delaware, USA: United States

City of Wilmington; Water, Wastewater, Storm Water Utility Annual Financial Planning and Rate Study; Wilmington, Delaware, United States; 2015-2016

Project Director - Black & Veatch. As Project Director, Ms. Kumar directed the latest financial planning and cost of service rate study. The study included the development of a financial plan for Fiscal year 2017 through 2022, projection of revenues and revenues requirements; CIP review and financing; cash flow analysis; cost of service analysis; water, sewer, and stormwater rates update; wholesale wastewater treatment fee true-up, and benchmarking. The study also included briefings and presentations to the Utility Citizen's Advisory Board (UCAB) and to the City Council. Ms. Kumar has continually managed the water, wastewater and storm water annual financial planning and cost of service study services for the City of Wilmington since 2006.

City of Wilmington; Storm Water Utility Billing Support and Advisory Services; Wilmington, Delaware, United States; 2015-2016

Project Director - Black & Veatch. The City launched the stormwater utility in 2007. Since the launch, Ms. Kumar has been providing monthly storm water parcel data processing and exceptions handling, storm water account-parcel ID mapping audits, bill processing support, and storm water credits and appeals program management support.

Pittsburgh Water and Sewer Authority; Storm Water Management and Rate Structure Project; Pittsburgh, Pennsylvania, United States; 2015-2016

Technical Advisor - Black & Veatch. Currently, Ms. Kumar is providing technical guidance for the Phase 2 – Stormwater User Fee Development and Implementation. This phase involves storm water program assessment, updates to the storm water cost allocation and revenue requirements, policy development, development of a five-year financial plan, storm water rate structure development and Citizens Advisory Group and PWSA Board education and engagement. In 2012, Ms. Kumar assisted in the Phase-1 Storm Water Feasibility Study. During this phase, she directed the tasks pertaining to the development of combined sewer cost allocation analysis, storm water revenue requirements analysis, user fee funding options evaluation and Equivalent Residential Unit (ERU) rate development.

City of Wilmington; Stakeholder Education and Engagement Services; Wilmington, Delaware, United States; 2015-2016

Project Manager - Black & Veatch. Ms. Kumar directed and facilitated nine stakeholder engagement meetings on water, sewer, storm water utility issues for the City of Wilmington's Utilities Citizens Advisory Board (UCAB). As part of this task, Ms. Kumar conducted monthly stakeholder meetings with the UCAB members and the City's

Executive Management to educate, engage, and solicit feedback on a variety of utility related issues including financial planning, rate setting, capital program planning and financing, asset management, business optimization, and water loss management. Ms. Kumar was responsible for the preparation of presentation materials and whitepapers, and facilitates the discussions.

Harford County; Comprehensive Utility Revenue Rate Study; Harford County, Maryland, United States; 2014-2016

Project Director - Black & Veatch. Ms. Kumar led a comprehensive water/sewer utility revenue study for Harford County. This comprehensive study included eight distinct work items - Operating and Capital Funding Analysis; Infrastructure Reinvestment Forecasting; Billing Period Modification Analysis; Labor Resource Analysis; Connection Fee Study; Electronic Bill Payment Investigation; Rate Benchmarking; and Rate Seminar. The financial results from the diverse tasks were integrated in to a comprehensive six-year financial plan, and cost of service analysis. A new "Asset Reinvestment Charge" was developed as part of the rate structure to generate a stable and dedicated funding for water and sewer infrastructure renewal and rehabilitation. A significant component of this study was the successful education of the City Administration and City Council on utility financial planning and rate setting, through a series of workshops and comprehensive presentations. The Council approved a series of five annual increases (FY 2016 through FY 2020).

Philadelphia Water Department; Utility Billing Appeals and Informal Hearings Mediation Support; Philadelphia, Pennsylvania, United States; 2014-2016

Project Director - Black & Veatch. Ms. Kumar assisted the Water Department and the Water Revenue Bureau during the mediation of utility billing appeals and informal hearings issues with the City's Public Advocate namely the Community Legal Services. This task involved educating the mediator and the participating entities on the facts pertaining to business process, policies, regulations, and technical issues. Ms. Kumar is currently directing the implementation of the business process, policies, and technical recommendations that resulted from the mediation efforts.

Philadelphia Water Department; Storm Water Utility Operations Knowledge Management; Philadelphia, Pennsylvania, United States; 2014-2015

Technical Director - Black & Veatch. Ms. Kumar recently assisted the Water Department's storm water utility management team with a comprehensive knowledge capture of the storm water utility billing, credits, incentives and retrofits programs. The initiative involved facilitating a series of 12 workshops with the Water Department staff to document workflows, enhance business processes, define policies, and determine key issues that need to be resolved.

Philadelphia Water Department; Water Revenue Assistance Programs and Appeals Process Review; Philadelphia, Pennsylvania, United States; 2013-2015

Project Director - Black & Veatch. Ms. Kumar directed a comprehensive program review of the Water Revenue Bureau's (WRB) existing Water Revenue Assistance Program (WRAP) and Deferred Payment Agreements program and a review of the utility billing appeals and hearing processes. The study included a holistic review of policies, process, staffing, technology, and documentation management, root cause analysis, and evaluation of improvement alternatives. In addition, the study involved a review of sample customer cases, staffing analysis, workflow mapping, decision mapping, database review, and a series of workshops with the supervisors and management of the WRB.

City of Providence; Upper Narragansett Bay Regional Storm Water Authority Feasibility Study – Phase 1; Providence, Rhode Island, United States; 2013-2014

Technical Lead - Black & Veatch. Ms. Kumar provided subject matter expertise in defining alternative frameworks for the regional stormwater authority feasibility study that included six municipalities. She assisted with presentations and discussions with the steering and stakeholder committees to evaluate the alternatives. Ms. Kumar contributed to both the organization and the content of the feasibility report and also assisted with developing the three phased "feasibility to implementation" framework that was incorporated in to the hurricane sandy coastal resiliency grant application.

City of Olathe; Storm Water Rate Restructure Study; Olathe, Kansas, United States; 2013-2014

Technical Director - Black & Veatch. Ms. Kumar provided technical guidance for the storm water rate restructure implementation project for the City of Olathe. Black & Veatch team assisted the City in transitioning from gross area based rates to impervious area based rates and charges for the City's storm water utility. Ms. Kumar led the issues and policies meeting with the City at the beginning of the project to review and refine policies pertaining to user fee methodology and billing.

City of Wilmington; Automated Meter Reading (AMR) Meter Read Analytics; Delaware, United States; 2013

Project Manager - Black & Veatch. Ms. Kumar directed the design and development of a database application to programmatically analyze the data integrity of monthly AMR meter read data. The tool has the robust functionality with a user friendly interface to initiate AMR Read data importation, execute AMR data validation, determine read exceptions water account, compute usage, and provide detailed and summary usage Trend Reports based on user specified Date Range, Pressure Zone, Customer Class, or for any account.

City of Wilmington; Indirect Cost Allocation Study; Wilmington, Delaware, United States; 2012-2013

Project Manager - Black & Veatch. Ms. Kumar managed the citywide Comprehensive Indirect Cost Allocation Study to determine the cost of providing centralized support services (indirect costs) to the various departments that provide direct services to the citizens and rate payers. The fast-track study was completed with three months using industry standard cost allocation methodology and with input from every one of the city's departments. The study resulted in shifting an additional $1.78 million of indirect costs from the General Fund to the Water/Sewer Fund. The study recommendations were implemented and the indirect costs have been included in the City's FY 2014 Water/Sewer Fund Budget.

In conjunction with the study, a user-friendly Cost Allocation Model and a detailed report was delivered to the city such that the city staff can periodically update the model to reflect changes to the Indirect Cost budget.

City of Wilmington; Monthly Billing Feasibility Study; Wilmington, Delaware, United States; 2012

Project Manager - Black & Veatch. Ms. Kumar conducted a monthly billing feasibility study to transition the city's water/sewer/storm water utility from a quarterly billing to a monthly billing process. Ms. Kumar used a six-step process to conduct the feasibility study. The analysis involved an allocation of existing personnel time across 11 cost centers, determination of current and proposed activity volumes for these cost centers, a determination of required Full-Time Equivalent (FTE) levels and non-personnel costs, and finally a cost/benefit analysis. The management is currently considering transitioning to monthly billing in FY 2015.

Miami-Dade County Water and Sewer Department (WASD); Review of Meter Reading and Billing Practices; Miami, Florida, United States; 2012

Technical Advisor - Black & Veatch. Ms. Kumar directed a management review of the meter reading, meter services, and billing operations for WASD. The study included a comprehensive and objective review of business processes and workflows, policies, technology and resource issues; an identification of improvement opportunities; and the development of improvement strategies.

Philadelphia Water Department; Citizens Advisory Committee (CAC) Engagement; Philadelphia, Pennsylvania, United States; 2011-2012

Technical Director - Black & Veatch. Ms. Kumar assisted with a series of 10 CAC meetings that were held to review several storm water policy and technical issues. The diverse issues included storm water cost allocation, user fee method, direct dischargers, residential

rate structure, a credit program and an incentives program. The series of presentations involved assistance with meeting facilitation, the preparation of presentation materials and handouts, and financial analysis.

PRESENTATIONS & PUBLICATIONS

Joell Caudill. "Harford County's Integrated Management and Innovation Drives the Transition from Financial Crisis to Financial Resilience." 2017 Utility Management Conference. February 2017

Kumar, Prabha. "Tools to Improve Utility Performance – Financial Resilience through Integrated Financial Management." Maine Water Utilities Association Conference. June 2016

Kumar, Prabha. "Agile Stormwater Programs and Incentives Drive Cost Effective Long Term Control Plan Compliance." New England Water Environment Association Specialty Conference. October 2015

Kumar, Prabha. "Developing Stormwater Program Requirements and Rate Structures." WEFTEC Conference. September 2015

Kumar, Prabha. "Sustainable Wet Weather Funding Can be Achieved by Designing and Managing Multi-objective Stormwater Utility Programs." WEFTEC Conference. September 2014

Kumar, Prabha. "Building Financial Resiliency in Challenging Times: Can Be Done With Proactive Stakeholder Engagement." Utility Management Conference. February 2014

Kumar, Prabha. "Trends in Stormwater Utilities Across the Nation." 24th Annual Environment Virginia Symposium. April 2013

Kumar, Prabha. "User Fee Funded Stormwater Utilities Manual, 2nd Edition, Chapter 3 – Stormwater Feasibility Study." Water Environment Federation. January 2013

Kumar, Prabha. "Managing Non-Revenue Water: Balanced Focus through Holistic Management Approach." Utility Management Conference. February 2012

Kumar, Prabha. "Stormwater User Fees Come Up Short." PUBLIC WORKS News Service . November 2010

Kumar, Prabha. "Regional Collaboration: A 2009 Survey Findings." Utility Management Conference. February 2010

Kumar, Prabha. "Plug the Revenue Leak: A Case Study of Utility Billing Operations Optimization." Utility Management Conference. February 2010

Kumar, Prabha. “Promoting Sustainable Stormwater Management: The Role of a Stormwater Credit Program.” Stormcon Conference. August 2008

Kumar, Prabha. “Look Before you Leap: Developing Policies for Stormwater User Fee Implementation.” Stormcon Conference. August 2008

Kumar, Prabha and Anna White. “Know Your Way – Policy Development in Stormwater User Fee Implementation.” Stormwater, Vol 9. No.3. May 2008

Kumar, Prabha. “Stormwater Billing: Navigating the Integration Challenges.” Utility Management Conference. February 2008

Kumar, Prabha. “Storm Water User Fee Financing: Charge the Runoff, not the Usage.” AWWA-WEF Joint Management Conference. July 2007

Kumar, Prabha. “Fundamentals of a Stormwater Utility Feasibility Study.” Presented at the Section AWWA Tri-Association Conference. August 2006

David Jagt

Mr. Jagt, a Manager with Black & Veatch Management Consulting, LLC., has over 30 years of experience, spanning a variety of projects, including utility revenue forecasting, estimation and projection of revenue requirements, financial planning and rate design, capital improvement program review and financing, computer rate modeling, fixed-asset record keeping and present worth analyses. Dave also has experience with civil engineering projects, such as hydraulic design, computer hydraulic modeling, structural design, building plan review, and preparation of specifications and bid documents.

MANAGER

Specialization:
Financial Planning, Bond Feasibility, Rate Design, Fixed Asset Recordkeeping, Computer Modeling

- Education
- B B.S., Civil Engineering, Virginia Tech, 1987

Professional Registration
P.E. 1997, Virginia, #027868

Professional Associations
- American Water Works Association

Year Career Started
1987

Year Started with B&V
1987

Office Location
Gaithersburg, MD

PROJECT EXPERIENCE

Philadelphia Water Department | Water and Wastewater Financial Rate Study | 2007–2016

Project Manager. Mr. Jagt has performed comprehensive studies of revenue requirements, costs of service and rates for water and wastewater utilities. The cost of service studies involved allocation of costs of service and determination of charges for 10 municipal wholesale wastewater customers and two wholesale water customers in accordance with the terms of wholesale service contractual agreements with these customers. He assisted with contract negotiations with municipal wholesale customers, including the development of exceedance charges. He assisted with issuance of revenue bonds, including preparation of required engineering and financial feasibility studies, presentations before bond rating agencies and preparation of official statements.

Mr. Jagt has participated in enhancements to stormwater cost allocation and rate methodologies and the impacts of the alternative rates on various representative customers. The City's evolving geographic information system network and new billing system facilitated the establishment of stormwater charges based upon the customer's impervious and gross property area.

City of Norfolk Department of Utilities, Norfolk, Virginia | Water Utility Wholesale Contract True-up Calculations | 1995–2003 and 2010–2016

Project Manager/Project Advisor. Mr. Jagt managed and assisted with the preparation of annual true-up calculations during the period of 1995 to 2003 and 2010 to 2016 for Norfolk's wholesale water contracts with the City of Virginia Beach and the U.S. Navy. A Black & Veatch-developed computer model facilitated the comparisons of adopted rates (using budget projections) with recalculated rates (using actual costs) to determine amounts of revenue to be reserved for use by the annual audit and to meet the contract-specified two-year, or biennial true-up, periods.

As stipulated by the contracts, adopted wholesale rates were based on budget projections and specified formulas recognizing the utility basis of cost allocations. The true-up comparisons revealed actual costs of wholesale service based on audited financial results.

City of Columbia, South Carolina – Department of Utilities & Engineering | Water, Sewer and Stormwater Rate Study |2017

Water and Sewer Study Task Lead. Mr. Jagt assisted with the comprehensive study of water and sewer utility rates for FY 2018. The study covered multi-year projections of revenue and revenue requirements, cost of service by customer class, design rate schedules of rates for the sale of water to retail and wholesale service customers, and sewer service. Additionally, Mr. Jagt provided support to the City during public sessions related to educating and informing existing stakeholders about the City's water and sewer financial plan and rates.

Department of Utilities, Norfolk, Va. | Water Revenue Bond Feasibility Studies | 1993–2015

Project Manager/Project Advisor. Mr. Jagt managed and assisted with Black & Veatch's evaluations of the Norfolk Department of Utilities' ability to issue water revenue bonds (Series 1993, 1995, 1998, 2001, 2010, 2012, 2013, 2014, and 2015). The studies included a formal review of system facilities for sound operating conditions, current regulatory compliance, sufficient treated and raw water capacity, and adequate staffing. A detailed review and projection of all revenue requirements including operation and maintenance expense, recurring capital, existing debt service, cost of new debt, maintenance of required reserve funds, Payment in Lieu of Taxes (PILOT), transfers to General Fund, and anticipated major capital improvements was also performed.

Key West, Florida | Wholesale Wastewater Rates Assessment and Contract Review | 2016

Task Leader. Mr. Jagt was a task leader for a cost of service analysis for wholesale wastewater service and assisted with a review of the existing wholesale wastewater services agreement and drafting an updated wholesale wastewater agreement. This study included an assessment and analysis of the existing wholesale wastewater rate furnished to the US Navy, the development of a proposed wholesale wastewater rate for Key Haven, a new service territory that was acquired and operated by the Florida Key Aqueduct Authority (FKAA), and an update of the existing Navy Wholesale Wastewater Agreement.

City of Wilmington, Delaware | Water, Wastewater, Stormwater Utility Annual Financial Planning and Rate Study | 2016

Technical Advisor. As Technical Advisor, Mr. Jagt assisted with the rate support efforts for the wholesale wastewater treatment rates. The study involved assisting with the development of a presentation of the wholesale wastewater treatment cost of service analysis methodology and results and assisting with providing responses to the wholesale customer queries regarding the proposed cost of service rates.

Harford County, Maryland | Comprehensive Utility Revenue Rate Study | 2015

Task Leader. Mr. Jagt was a task leader for a comprehensive water/sewer utility revenue study for Harford County. This comprehensive study included eight (8) interrelated work items comprising of 13 tasks. The work items included Operating and Capital Funding Analysis; Infrastructure Reinvestment Forecasting; Billing Period Modification Analysis; Labor Resource Analysis; Connection Fee Study; Electronic Bill Payment Investigation; Rate Benchmarking; and Rate Seminar. The objective of this comprehensive revenue study is to prepare a six-year financial plan incorporating the financial results from all of the other work items, to determine the magnitude of annual revenue adjustments required during the six-year study period, and its impact on rates. Mr. Jagt was the task lead for the Operating and Capital Funding Analysis and Connection Fee Study work items.

Pittsburgh Water and Sewer Authority, Pittsburgh| Stormwater Management and Rate Structure Project | 2012

Consultant. Mr. Jagt assisted with the development of stormwater cost allocation analysis, financial planning, user fee funding options evaluation and Equivalent Residential Unit (ERU) rate development as part of the stormwater utility feasibility evaluation. The study included concept development, development of combined sewer cost allocation methodology for debt service and O&M costs, analysis of annual stormwater revenue requirements and funding options and the development of stormwater Equivalent Residential Unit (ERU) rates.

Philadelphia Water Department | Stormwater Implementation Services, City of Philadelphia, Pennsylvania | 2009–2011

Consultant. Mr. Jagt has provided assistance with the implementation of Philadelphia Water Department's parcel area based stormwater charges. The implementation assistance included reviewing the Credit and Appeals manual, frequently asked questions documents, and parcel fact sheets, which were provided to non-residential customers as part of the public outreach program. The parcel area based stormwater charge bill is to go live on July 1, 2010.

Henrico County, Richmond, VA| Stormwater Utility Study | 2011

Consultant. Mr. Jagt performed the stormwater financial planning, and funding options evaluation. The study included program review and level of service alternatives evaluation, financial planning and funding options analysis, impervious area analysis and rate structure evaluation. The study also included a preliminary review of credits program, appeals process and billing options evaluation.

Public Utilities Department, Chesapeake, Va. | Water Revenue Bond Feasibility Study | 2010

Project Manager. Mr. Jagt managed Black & Veatch's evaluation of the ability of the City of Chesapeake to issue $36.4 million in water and sewer revenue bonds, Series 2010. The project included conducting site inspections of water and sewer system facilities to evaluate their adequacy to provide utility service, projection of revenue requirements and revenues; cash flow financial planning analyses; evaluation of adequate working capital balances; and debt service coverage analyses, including system maximum and annual debt ratios.

Mr. Jagt also participated in the bond working group for official statement and agreement of trust reviews and in developing presentations to bond rating agencies. He prepared a final engineering report included in the bond issue's official statement.

City of Dallas, Texas | Stormwater Fee Study | 2009–2010

Task Leader. Mr. Jagt assisted with the effort to update the stormwater user fee program for the City of Dallas. He led the financial planning and cost of service analyses. The study involved the following key tasks:

- *Financial Planning:* Developed stormwater revenue requirements for a multi-year financial plan utilizing an Excel based model. Revenue requirements developed served as the basis for the Utility's FY 2009 budget.
- *Parcel Data Analysis:* Involved an extensive parcel data analysis of the City's parcel data received from Dallas County along with billing data received from the new billing system (SAP Pay1) and the previous billing system (CIABS). Analysis also provided an estimation of the runoff coefficient for parcels. A review of the billing mechanism and procedures for ongoing maintenance were reviewed as well as an update of parcel impervious data.
- *User Fee Methodology:* Reviewed various stormwater user fee billing methodologies and alternative rate structures. Defined a methodology based on impervious area for residential, and runoff coefficient based impervious area for the non-residential parcels.
- *Rate Schedule:* Defined a rate schedule with a five-tiered rate structure for the residential parcels and an individually computed fee for commercial parcels. Unimproved (vacant) land parcels saw an increase applicable to the level of uncapped/capped gross area square footage.

Water Revenue Bureau, City of Philadelphia, Pennsylvania | Utility Billing Appeals Process Optimization | 2009

Consultant. Mr. Jagt assisted in conducting a Utility Billing Appeals Process Optimization study for the Water Revenue Bureau (WRB). The purpose of the study was to do a comprehensive review of the existing billing dispute/appeals and hearing process to facilitate better alignment of business processes with Philadelphia Water Department (PWD) regulations; and to streamline policies,

staffing, and workflow to enhance the overall operations for meeting desired service levels. The key elements of the study included the following:

- Formation of a WRB Advisory Group;
- Review of existing business processes and workflow, and policies and regulations;
- Gap analysis on processes, technology, policy, and staffing issues/constraints;
- Optimization of business workflow and technology utilization;
- Staffing and workload analysis to determine staffing needs;
- Development of recommendations for requisite policy changes; and
- Development of procedures to integrate the stormwater utility billing appeals with the water/sewer appeals processes.

Department of Utilities, Lynchburg, Va. | Water and Wastewater Financial Planning Model, Water Wholesale Cost-of-Service Study, and CSO Compliance Report Certification | 2006–2007

Project Manager. Mr. Jagt managed Black & Veatch's effort to develop financial planning models that would allow the City to conduct water and wastewater utility financial planning and rate analyses. The models allowed the City staff to analyze historical customer account and billed volumes, revenues and revenue requirements; develop projections of customer accounts and billed volumes, revenue under existing rates and revenue requirements; prepare cash-based flow of funds statements for each utility; develop financial plans for each utility; and calculate test year rates necessary to provide the net revenue requirements of each utility as established by the financial plans.

In addition, Black & Veatch assisted the City in conducting a cost-of-service water rate study for purposes of developing the cost of service and rates for the City's wholesale water service to the Counties of Amherst, Bedford and Campbell. Black & Veatch determined revenue requirements and units of service; evaluated revenue requirement basis and cost allocation methodologies; allocated revenue requirements to functional cost components; distributed functional cost component costs to customer classes; determined proposed rates for wholesale service; and assisted with the development of a wholesale service water rate agreement.

Black & Veatch also reviewed and certified the City-prepared Annual CSO Compliance Report. Black & Veatch checked the accuracy of the current year data on each of the provided schedules. The City's Annual CSO Compliance Report also includes verification that the annual residential wastewater bill based on 700 cubic feet per month is greater than or equal to 1.25 percent of median household income to ensure that enough funds are being spent on wastewater projects.

Department of Utilities, Chesapeake, Va. | Comprehensive Water and Wastewater Rate Study | 2005–2006

Project Manager. Mr. Jagt managed Black & Veatch's comprehensive analysis of the City's water and wastewater rates. The study includes the development of a 10-year financial plan for water and wastewater separately and combined, cost of service for the identified test year and cost-of-service rate design to equitably recover costs from customers based on their identified service requirements. Black & Veatch also developed a sophisticated financial planning and rate model for the City.

SELECTED PUBLICATIONS

Co-presented paper entitled, *"Sustainable Wet Weather Funding Can Be Achieved By Developing Multi-Objective Stormwater Utility Programs,"* at WEFTEC 2014 in New Orleans, La., September 2014.

Presented technical presentation entitled, *"Building Financial Resiliency: The Critical Role of Establishing and Adhering to Financial Performance Metrics,"* at the 2014 Tri-Association Conference in Ocean City, MD., August 2014.

Coauthored paper on "*Fairfax County, Virginia OWM's Approach to Sewer Utility Financial and Operational Planning,"* Presented at Chesapeake Water Environment Association and The Water and Waste Operations Association of Maryland, Delaware and District of Columbia 30th Joint Annual Conference, Ocean City, Md., July 1999.

Coauthored paper on "A Combined Water and Wastewater Utility Approach to Meeting Increasing Costs While Operating Efficiently" presented to WEF/AWWA Joint Conference in March 1999.

Coauthored paper on "*Useful Marketing Strategies Necessary for Bond Issue Preparedness,*" Presented to Chesapeake AWWA in September, 1998. and 1998 Annual VA Section AWWA Conference, Roanoke, Va., October, 1998.

Coauthored paper entitled, *"Fairfax County, Virginia OWM's Approach to Sewer Utility Financial & Operational Planning,"* presented at Annual WEFTEC "96", in Dallas, Texas, October, 1996.

Co-presented paper entitled, *"Norfolk's Use of Computer Models During Water Sales Contract Negotiations,"* at AWWA's 1995 Computer Conference in Norfolk, Va., April 1995.

Coauthored article entitled, "Long Range and Short Range Planning: Fairfax County OWM's Approach to Today's Decision Making," published in Virginia Review, September/October 1994.

Brian Merritt

Civil/water resources project management professional with 15 years of experience in the engineering and consulting industry. Extensive experience in project management, stormwater fee implementation and development, cost of service, financial planning and rate design, engineering design, permitting, public outreach, program evaluations and planning, and funding strategy implementation.

PROJECT EXPERIENCE

City of Newark, Delaware | Stormwater Utility Implementation |2016-2018

Project Support. Mr. Merritt has been assisting in the development and implementation of a stormwater utility for the City of Newark, De. This involves the evaluation of policies related to stormwater revenue requirements, impervious area development, customer classification, rate structure development, billing and enforcement as well as credit and appeals. Work also includes establishing stormwater units of service and analyzing the operations, capital and other costs to determine the revenue requirements. During 2017, Mr. Merritt assisted with the implementation phase of the project helping the City with the finalization of customer service processes including credit and appeals, billing integration and parcel account mapping. The City began billing for stormwater in January 2018.

City of Cincinnati, Ohio – Stormwater Management Utility | Stormwater Rate Study |2016-2018

Project Manager. Mr. Merritt has been working with the City of Cincinnati Ohio's Stormwater Management Utility (SMU) to complete a comprehensive review of their stormwater rates. Current work includes the evaluation of projected revenue requirements and anticipated system-wide revenue increases due to the anticipated need for a large capital program to rehabilitate and/or replace components of the City's Barrier Dam as well as other critical stormwater infrastructure. Additional costs associated with NPDES MS4 Phase II permit requirements, increased operation and maintenance costs, were also evaluated. A financial plan report was delivered to staff in the fall of 2017 and is currently under consideration by City Council.

Philadelphia Water Department, City of Philadelphia, Pennsylvania | Financial Planning and Cost of Service Study | 2017-2018

Project Manager. Mr. Merritt is supporting the financial planning, stormwater cost of service analysis, and rate study update for the Philadelphia Water Department (PWD). The study involves a six-year financial planning, cost of service analysis, cost allocation analysis, policy issues review, rate design, and rate case support. Mr. Merritt is aiding in the development of the financial plan, cost of service analysis including: sewer cost of service, system-wide billing units estimates, stormwater cost allocation, user fee methodology, credit,

MANAGER

Specialization:
Stormwater Fee and Utility Implementation; Stormwater Management; Strategic Planning; Hydraulics; Hydrology; Green Infrastructure Planning and Design; Credit Program Development; Rate Structure Analysis and Design; Stormwater Financial Planning; Public Outreach and Stakeholder Engagement; Stormwater Needs Assessment.

Education
- M.S., Civil & Environmental Engineering, Lehigh University, 2007
- B.S., Civil & Environmental Engineering, Lehigh University, 2000

Professional Registrations & Certifications
Leadership in Energy & Environmental Design (LEED) Accredited Person Certified Carbon Strategy Practitioner

Year Career Started
2002

Year Started with B&V
2015

incentive and customer assistance program cost recovery. Mr. Merritt is working with the project team to develop a rate rider concept to recover costs related to the PWD's Tiered Customer Assistance Program (TAP). Mr. Merritt is leading the stakeholder engagement support services provided under this contract. Mr. Merritt is also helping with drafting testimony for the rate proceedings.

City of Columbia, South Carolina – Department of Utilities & Engineering | Water, Sewer and Stormwater Rate Study |2017

Stormwater Task Lead. Mr. Merritt assisted with a water, sewer and stormwater rate study for the City of Columbia, South Carolina's Department of Utilities & Engineering. Mr. Merritt led the stormwater portion of the study. Project worked included: development of a multi-year financial plan, revenue and revenue requirements review, stormwater rate structure alternatives analysis, development of financial metrics, review of capital program needs and financing. The project included the development of a Stormwater Rate Study report and presentation of the Rate Study findings and recommendations to City Council. Based upon the study's findings, the City adopted a series (i.e. multi-year) stormwater rate increases.

City of Havre de Grace, Maryland | Water and Sewer Rate Study |2016-2017

Project Manager. Mr. Merritt served as project manager for the City of Havre de Grace, Maryland's comprehensive review of their current water and sewer rates. The project integrated an asset renewal forecast with the rate study and development of alternative funding mechanisms (such as an asset reinvestment charge) in order to alleviate the current deficit fiscal position and adequately fund water and sewer operations and capital program obligations. Work also included: Preparation of a reasonable estimate of repair and renewal forecast for all of the water system treatment, storage, transmission, and distribution assets; Development a five-year financial plan for the water/sewer enterprise fund to assure financial self-sufficiency; Review of the existing rate structure and design rate schedules to enable a defensible recovery of fixed and variable costs of the water and sewer utilities; and presentation of the Rate Study findings and recommendations to the Water and Sewer Rate Commission and to the City Administration and Council.

Philadelphia Water Department, City of Philadelphia, Pennsylvania | Stormwater Cost of Service and Rate Study | 2015-2016

Project Support. Mr. Merritt supported the stormwater cost of service analysis, and rate study update for the Philadelphia Water Department. The study involves a six-year financial planning, cost allocation analysis, stormwater fee policy issues review, rate design, and rate case support. Mr. Merritt aided in the development of stormwater related analysis including: sewer cost of service, system-wide billing units estimates, stormwater cost allocation, user fee methodology, credit, incentive and customer assistance program cost recovery. Mr. Merritt helped with drafting testimony for the rate proceedings.

Pittsburgh Water and Sewer Authority, Pittsburgh| Stormwater Management and Rate Structure Project | 2015-2018

Project Manager. Mr. Merritt is currently serving as Project Manager for Black & Veatch's portions of the Pittsburgh Water and Sewer Authority's (PWSA) Stormwater User Fee Development and Implementation project. Phase 2 builds off of work previously conducted in 2012, and is intended to take the decisions and recommendations developed during Phase I- Feasibility Study up to the development of a draft ordinance for consideration by Pittsburgh City Council. Project work includes updates to the stormwater cost allocation analysis, financial planning, user fee funding and rate structure finalization. Mr. Merritt is providing technical advice and input into PWSA's public outreach efforts.

South Fayette Township, Allegheny County, Pennsylvania|Stormwater Program Needs Assessment | 2015

Project Manager, while with a former employer, assisting South Fayette Township in a comprehensive needs assessment of their existing stormwater program. The goal of the project is to define an enhanced program that meets the future needs and priorities of the community while addressing operation and maintenance, infrastructure replacement, and MS4 compliance responsibilities. All of the main streams, which run through the Township, are impaired. Impairments include acid mine drainage, nutrients, PCBs, and sediments. Actions to address these pollutants must be considered as part of the next MS4 permit cycle. A stormwater needs assessment committee was conveyed to gain public input into which program areas needed the most attention and to develop a five-year plan on which to evaluate funding options.

White Township, Indiana County, Pennsylvania |Stormwater Assessment Feasibility Study|2014-2015

Project Manager, while with a former employer, assisting White Township in a program evaluation process that could result in the implementation of a stormwater user fee in the Township. This fee would be used to support enhancements to the Township's stormwater management program with resources directed to meet community-wide goals and needs. The project is intended to provide the Township with sufficient information on the viability of implementing a stormwater user fee, prior to investing in full implementation. Responsible for program evaluation and planning, billing system and data evaluation, impervious area data analysis, parcel and account review, rate structure development, initial rate estimates, public/Board of Commissioners presentations as well as overall project and client management. White Township implemented their stormwater fee in early 2016.

Radnor Township, Montgomery County, Pennsylvania | Stormwater Program and Fee Implementation | 2012-2013

Project Manager, while with a former employer, for the evaluation and development of an updated stormwater management program and funding mechanism for Radnor Township, PA. Led project team working with the

Township personnel to develop a dedicated funding source to help meet the community's goals for infrastructure maintenance, flood mitigation, and green infrastructure. Services included stormwater program assessment and level of services analysis, financial analysis, data and master account file development, stakeholder meeting facilitation, rate evaluation, rate structure and ordinance development. Radnor convened a stormwater advisory committee to provide input into key policy issues such as the stormwater program needs, level of service considerations, the overall program plan, rate structure, credit and incentive program options and public education requirements. Assisted the Township with appeals policy development, billing system implementation support, customer service training, draft credit program development, and public education efforts. The stormwater user fee was approved by the Radnor Board of Commissioners in September 2013.

City of Meadville, Crawford County, Pennsylvania | Stormwater Program and Fee Implementation Project | 2012-2013

Project Manager, while with a former employer, for the evaluation and development of an updated stormwater management program for the City of Meadville, PA. Assessed the current stormwater program with the goal of establishing a functioning stormwater funding mechanism that fully accounts for the City's stormwater program costs. Tasks included a review of the City's current level of service, evaluation of the stormwater program's organizational structure, future needs assessment, current cost estimation, facilitation of Citizen's Advisory Groups, ordinance development, credit and appeals policy and program development, customer service training, management of public outreach and education activities as well as GIS and billing database development. Two separate Citizen's Advisory Groups were convened, one to provide input on the initial stormwater fee policies and the second to help develop a detailed stormwater credit and appeals program to enhance the equity of the fee and provide incentivizes to private property owners to better manage stormwater on-site. The Meadville stormwater fee was approved by their City Council in November 2012 and the first bills were processed in 2013.

SELECTED PUBLICATIONS & PRESENTATIONS

Presentations – Stormwater Utility Implementation

- Government Finance Officers Association of Pennsylvania, April 2015
- Villanova University Guest Lecturer – Sustainability & Science, 2014
- St Joseph's University Stormwater Workshop, 2014
- Villanova University Stormwater Symposium, 2013
- 3 Rivers Wet Weather, 2013
- Erie County GIS Workshop, 2013
- PA Northwest City Manager's Meeting, 2012

Publications

"Sustainable Stormwater Programs and Financing", Pennsylvania Borough News, October 2014