FINAL REPORT

Water and Sewer Rate Study Update

Prepared for

City of Petersburg, VA

March 2019

JACOBS

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Acronyms and Abbreviations

ARWA	Appomattox River Water Authority
AWWA	American Water Works Association
CCF	Hundred Cubic Feet
DEQ	Department of Environmental Quality
DSCR	Debt Service Coverage Ratio
DWSD	Detroit Water and Sewerage Department
FY	Fiscal Year
Kgal	Thousands of Gallons
MGD	Million Gallons per Day
MHI	Median Household Income
PILOT	Payment in lieu of taxes
SCWWA	South Central Wastewater Authority
SCWWTP	South Central Wastewater Treatment Plant
USCM	United States Council of Mayors
US EPA	United States Environmental Protection Agency
VPDES	Virginia Pollution Discharge Elimination System
VRA	Virginia Resource Authority
WEF	Water Environment Federation

SECTION 1

Introduction and Background

1.1 Authorization and Purpose

The City of Petersburg, Virginia (the City) authorized CH2M HILL Engineers, Inc.(now Jacobs), and Davenport & Company, LLC (Davenport), the City's Financial Advisor, to update the water and sewer rate study (the Rate Study) that was prepared August 2017. The purpose of the update is to incorporate an additional years of billing data and financial results to document and support the City during the development and implementation of the City's FY 2020 budget and multi-year rate plan from FY 2020 through FY 2023. Davenport provided updates to the multi-year operating pro-forma projection that was used by Jacobs for purposes of calculating projected rates. Timmons confirmed the City's water and sewer capital expenditure needs for the FY 2020 through FY 2023 planning period which was incorporated into the multi-year operating pro forma projection.

1.2 The City's Water and Sewer Utility System

The City owns and maintains a water and wastewater distribution and collection system (the "System"). Water is purchased from the Appomattox River Water Authority ("ARWA") in accordance with a multi-jurisdictional service agreement wherein Petersburg is allocated 16.69 percent of the plant capacity (16.03 MGD) with a maximum raw water allocation of 14.05 MGD. The City's average daily use is 4.54 MGD and its peak day use is 7.95 MGD. The annual cost of water purchased from ARWA is approximately $1.5 million.

The City purchases wastewater treatment services from the South Central Wastewater Authority ("SCWWA"). SCWWA was incorporated on March 11, 1996, and currently provides wastewater treatment service to the Cities of Colonial Heights and Petersburg, and to the Counties of Chesterfield, Dinwiddie (through the Dinwiddie County Water Authority) and Prince George. The City's allocated treatment capacity is 12.08 MGD, or 52.5 percent of the total treatment capacity of 23 MGD. The annual treatment cost for the City is approximately $4.5 million.

The Petersburg Utility System consists of 260 miles of water mains, 6 water storage tanks, 2 water pump stations, and 1,378 fire hydrants. The City maintains over 195 miles of wastewater collector lines and 19 wastewater pumping stations. The City increased utility rates by 13.4 percent in Fiscal Year 2017 and City Council approved an additional rate increase of 14.3 percent as part of the FY 2018 Adopted Budget to fund infrastructure improvements.

The City serves a population of approximately 38,400. There are approximately 11,800 water customers and 11,750 sewer customers. City customers are predominantly residential (single-family and multifamily) and represents 90 percent of the customers. Commercial and industrial customers represent 10 percent of the customers.

Eight years of structurally unbalanced budgeting in both the City's General Fund and water and sewer utility funds resulted in a financial crisis in FY 2016 and early FY 2017. The fiscal crises were so severe that essential government services were at risk, including contractual payments to the SCWWA for wastewater services and ARWA for wholesale water purchases. The breakdown of the City's water and sewer metering, billing, and collection processes, as detailed in Section 1.3, created a significant additional loss of monthly recurring revenue that worsened the City's financial situation.

1.3 Key Operating Issues through June 30, 2018

Based on discussions with City staff and review of information provided to Jacobs and Davenport by the City, the bullet points below identify key issues with the System that culminated through June 30, 2018.

- The City water and sewer infrastructure has suffered from lack of capital investment due to historic underfunding of capital needs.
- The City had failed to implement recommended rate increases in FY 2015, FY 2016 and FY 2017 pursuant to a recommended rate plan from Draper Aden & Associates.
- Petersburg converted to a monthly billing process in early calendar year 2015, which caused a lag in processing payments by the Treasurer. As a result, delinquent fees were not imposed.
- Difficulty in the conversion to new water meters in late calendar year 2015 resulted in months in which no water and sewer bills were sent out and months in which incorrect bills were sent out. The cessation of billing combined with incorrect billing negatively impacted revenues in FY 2016.
- The City's water and wastewater billing process suffered from lack of data control, meter reading capabilities and lack of internal processes.
- The City continues to work on billing issues, but there are legacy issues that add confusion when analyzing customer billing data that confounds reconciling estimated billed revenues against unaudited financials for FY 2018.
- The August 2017 Rate Study Report recommended a 15 percent rate increase in FY 2019. Based on current rate schedule, a rate increase was not implemented for FY 2019.

1.4 Billing and Collection

The August 2017 Rate Study Report documented a collection rate of 70 percent. Based on data as of January 2019, the City estimates the collection rate to 80 percent. Which means 80 percent of billed water / sewer charges are collected. This collection is low compared to other water and sewer utilities, which typically exceed 90% based on surveys conducted by industry associations such as the National Association of Clean Water Agencies (NACWA).

In cases of nonpayment, delinquent fees are assessed. While the City can assess delinquent fees, due to recent issues with the billing system, assessing delinquent fees was suspended. Additionally, there is a lag time in the processing of bill payments; resulting in approximately $1.9 million in accounts receivable.

It is important to recognize that water and sewer is not a free service and there is a cost to the City. Not actively addressing accounts receivable and penalties for non-payment results in a negative feedback loop in which the customer believes it is ok not pay the water and sewer bill because the City is not going to act. Table 1-1 summarizes typical actions used by utility systems for billing and collection. These are activities that the City may use, except in response to recent circumstances activities have been suspended. To help address water / sewer bill delinquencies, the City can use these activities.

Based on recent discussion with City staff, corrective actions are being taken to rectify the low collection rate. Actions include implementation of "shut-off" policy and more aggressive pursuit of collections. To help improve the collection rate it is important for the City to continue these efforts and track progress.

Table 1-1. Typical actions used by utility systems for billing and collection

Activity	Applicability to Petersburg
Water Shut Off	The City can use the aging report to identify accounts that are 120 days or more delinquent and shut off water.
Reconnection fee	If the water is shut off due to 120 days or more delinquency, then asses reconnection fee.
Penalties for Late Payments	After converting to monthly billing in early calendar year 2015, which caused a lag in processing payments by the Treasurer, delinquent fees are not being imposed. If there continues to large number of delinquent accounts, the City should start assessing late fees.
Collection Agency	The City can use the aging report to identify accounts that are 120 days or more delinquent and
Liens	If collection agency is not successful, the City can use it authority and place lien on property. When the property is sold or transferred, the lien would help recover delinquent balance.
Financial Hardship Assistance	In cases of financial hardship, the City can help customers identify assistance for paying water / sewer bills.

Relevant examples related to billing and collection that Petersburg faces are the steps and actions that Detroit Water and Sewerage Department (DWSD) implemented to rectify their billing and collection issues. The issues that DWSD face and how they addressed them is documented in a final report entitled "City of Detroit Blue Ribbon Panel on Affordability."[1] The Blue Ribbon report identifies several activities that could be used by Petersburg to help improve billing and collection performance, including the following:

- Associate service address with financially responsible parties (i.e. property owners).
- Upgrading billing software
- Reviewing and updating City business processes regarding billing and collections
- Consistent practice for disconnection rules and penalties
- Payment plans with disconnection avoidance for customers that are delinquent in paying water and sewer bills
- Payment plans with arrearages forgiveness
- Flexibility for timing or frequency of when bills are issued to customer.
- Budget billing (use historical water usage to develop a budget payment and have a true up at end of year)
- Customer assistance programs
- Rate Structure Design (depending on State law), could develop rates specific to qualify customers where the bill is based on percent of income level.
- Water conservation programs for customer that received some type of assistance.

[1] Galardi Rothstein Group. 2016. "City of Detroit Blue Ribbon Panel on Affordability."

SECTION 2

Assumptions

In preparing this report, the consulting team relied on information provided by the City of Petersburg and others, and information previously developed by team member to support other efforts of the City. While offering no assurances with respect to this information, which has not been independently verified, the team believes that this information and assumptions of future conditions made in conjunction with the City, are valid for purposes of this report. The following sources of information were used to prepare this report:

- Comprehensive annual financial reports for FY 2017;
- Unaudited financial data for FY 2018;
- Customer account and billing data provided by the City for October 2017 to September 2018 and annualized. Rate impact analysis assumes no growth in customer or usage
- Capital investment in accordance with the schedules and cost estimates outlined in Section 7 as prepared by the Timmons Group;
- Pro forma projections outlined in Section 10 as prepared by Davenport & Company LLC; and
- 80 percent collection rate
- O&M inflation factor of 2.5 percent
- Increases in the City's operating budget for allocated costs related the capital investments of ARWA and SCWWA (See Section 7)
- PILOT payment to General Fund projected at $750,000 in FY 2020 and thereafter
- Projected Debt Service based on the City's 5-year CIP
- Debt service coverage ratio of 125 percent
- Rate Smoothing over several years (FY 2020 to FY 2022)
- Rate increases are applied equally to water and sewer rates.

SECTION 3

Customer and Usage Information

3.1 Number of Customers

Customer and usage information was derived from the City's billing data. Most customer billing information is maintained on the City's billing system. The billing information for these customers is obtained by automated meter reading and uploaded to the system. There are approximately 50 customers (large volume users) in which meter reads and bills are prepared manually. The customer base is mostly residential followed by commercial and industrial. Table 3-1 provides a summary of the number of customers by account type and system (water and sewer). Table 3-2 provides a summary of the customers by meter size and account type.

Table 3-1. Number of Customers by System by Category

Customer Category	Water	Sewer	Percent
Residential	10,398	10,370	88.0%
Commercial	1,195	1,157	10.1%
Industrial	23	23	0.2%
Multifamily	195	194	1.7%
Total	**11,811**	**11,744**	

Source: City of Petersburg, VA billing system, October 2017 to September 2018.

Table 3-2. Number of Water Customers by Category by Meter Size

Meter Size	Residential	Commercial	Industrial	Multifamily	Total
5/8"	8,017	510	4	57	8,588
3/4"	175	31	1	3	210
1"	2,037	347	3	39	2,426
1 1/2"	79	100	4	45	228
2"	78	170	-	43	291
3"	5	15	-	2	22
4"	3	10	4	4	21
6"	3	12	3	1	19
8"	1	-	-	1	2
10"	-	-	4	-	4
Total	**10,398**	**1,195**	**23**	**195**	**11,811**

Source: City of Petersburg, VA billing system, October 2017 to September 2018.

3.2 Water and Sewer Usage

The City bills customer for water service based on the meter reads for each customer and usage is summarized in Table 3-3. Billed water service for the period October 2017 to September 2018 was annualized to estimate a total annual usage of 1.3 billion gallons.

Table 3-3. Billed Water Usage (gallons) by Tier by Category

Tier	Residential	Commercial	Industrial	Multi-Tenant	Total
0 to 2,244 gallons	220,032,129	19,443,117	371,499	4,621,710	244,468,455
>2,244 and <=91,256 gallons	321,309,240	113,606,038	5,645,078	55,166,425	495,726,780
> 91,256 gallons	197,765,373	248,642,914	91,070,241	41,301,705	578,780,233
Total	**739,106,742**	**381,692,070**	**97,086,818**	**101,089,839**	**1,318,975,469**

Source: City of Petersburg, VA billing system, October 2017 to September 2018, annualized.

Sewer service is billed based 100 percent of billed water usage. Unlike water service, not all customers receive sewer service due to septic systems. Billed sewer service for the period October 2017 to September 2018 was annualized to estimate a total annual usage of 1.3 billion gallons.

Table 3-4. Billed Sewer Usage (gallons) by Tier by Category

Tier	Residential	Commercial	Industrial	Multi-Tenant	Total
0 to 2,244 gallons	219,484,612	19,045,884	371,499	4,592,282	243,494,277
>2,244 and <=91,256 gallons	320,471,561	109,745,354	5,645,078	55,044,716	490,906,708
> 91,256 gallons	197,765,373	246,491,602	91,070,241	41,301,705	576,628,921
Total	**737,721,545**	**375,282,840**	**97,086,818**	**100,938,703**	**1,311,029,906**

Source: City of Petersburg, VA billing system, October 2017 to September 2018, annualized.

3.3 Bill Tabulations

Bill tabulations provide a snap of customer usage patterns and can be used to evaluate usage patterns and rate blocks (tiers). Bill tabulations for each account type were prepared bases on the billing data for the October 2017 to September 2018.

3.3.1 Residential

Figure 3-1 summarizes the bill distribution for residential customers. There are some bills with zero usage, which is attributed customers that don't have a water meter and are billed based on estimated water usage. Also, customers may not have water usage, but pay a minimum charge. Another possibility is a broken water meter and based on feedback from the City, the billing system is continually being improved to correct these instances. Figure 3-2 summarize the cumulative billed usage express in thousands of gallons (Kgal) for residential customers. Approximately 85 percent of residential billed usage is 100 Kgal or less. The average residential usage is approximately 4,500 gallons per month.

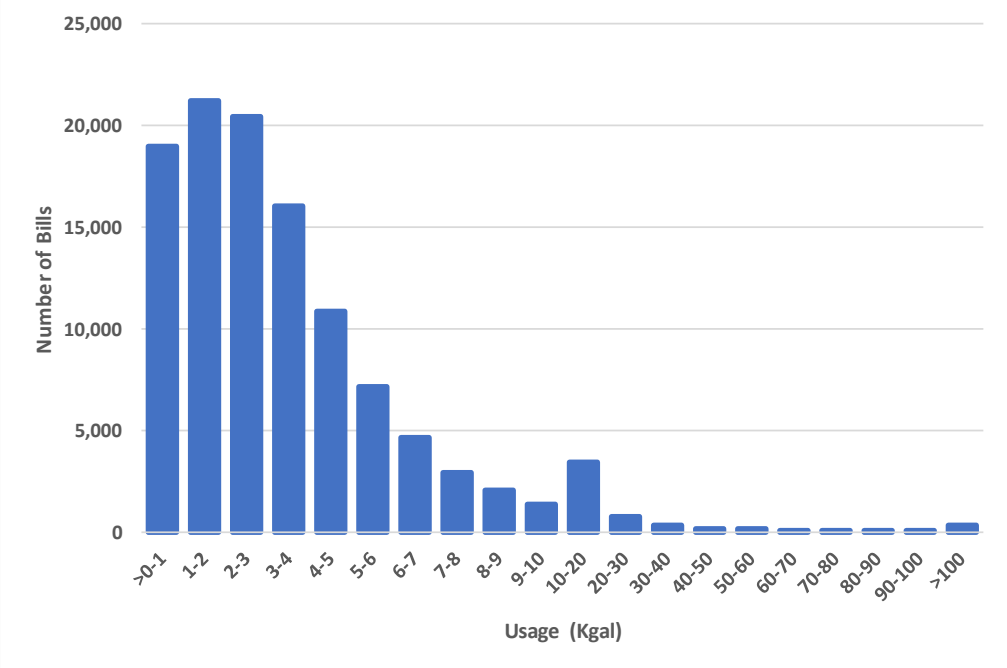


Figure 3-1. Residential Bill Distribution by Usage Block (Kgal)

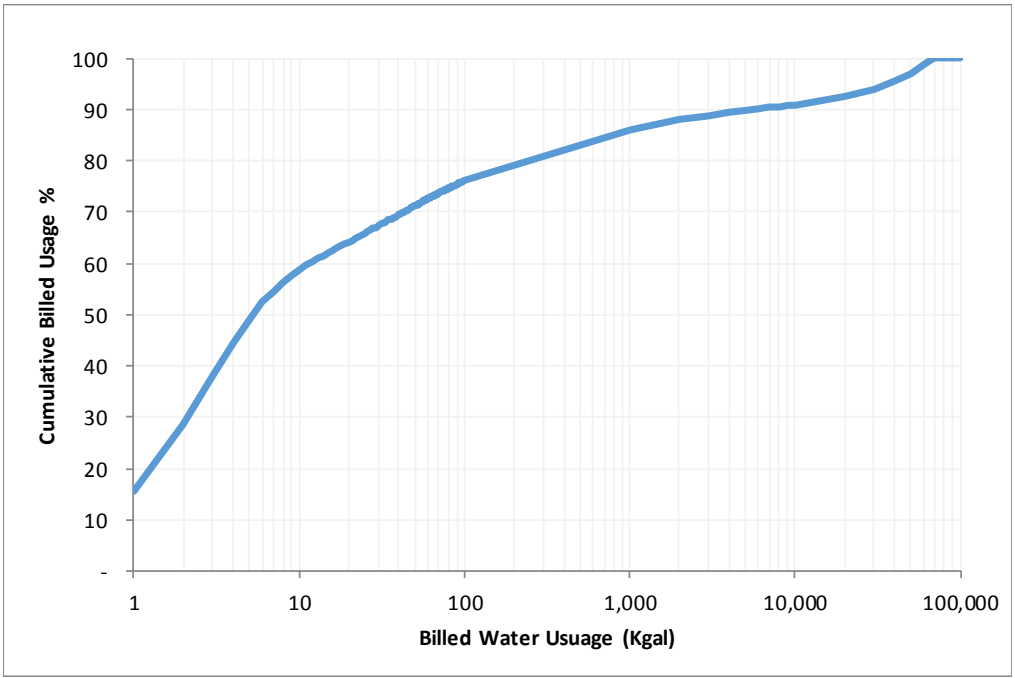


Figure 3-2. Residential Percent Total Cumulative Billed Usage (Kgal)

3.3.2 Commercial

Figure 3-3 summarizes the bill distribution for commercial customers. There are some bills with zero usage, which is attributed to customers who may not have water usage, but pay a minimum charge. Another possibility is a broken water meter and based on feedback from the City, the billing system is continually being improved to correct these instances. Figure 3-4 summarize the cumulative billed usage (Kgal) for commercial customers. Approximately 40 percent of residential billed usage is 100 Kgal or less.

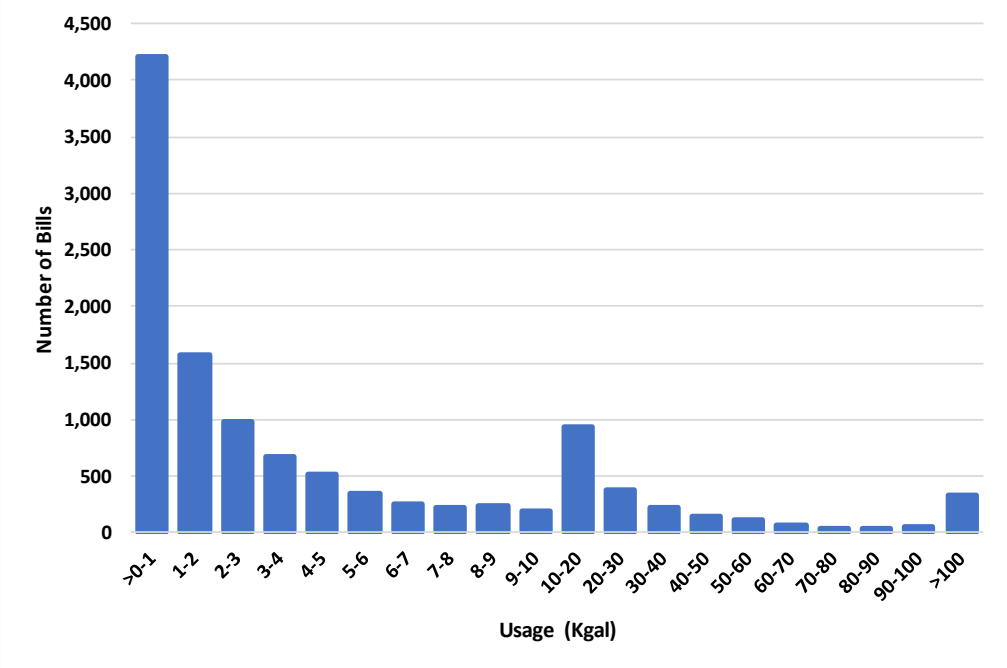


Figure 3-3. Commercial Bill Distribution by Usage Block (Kgal)

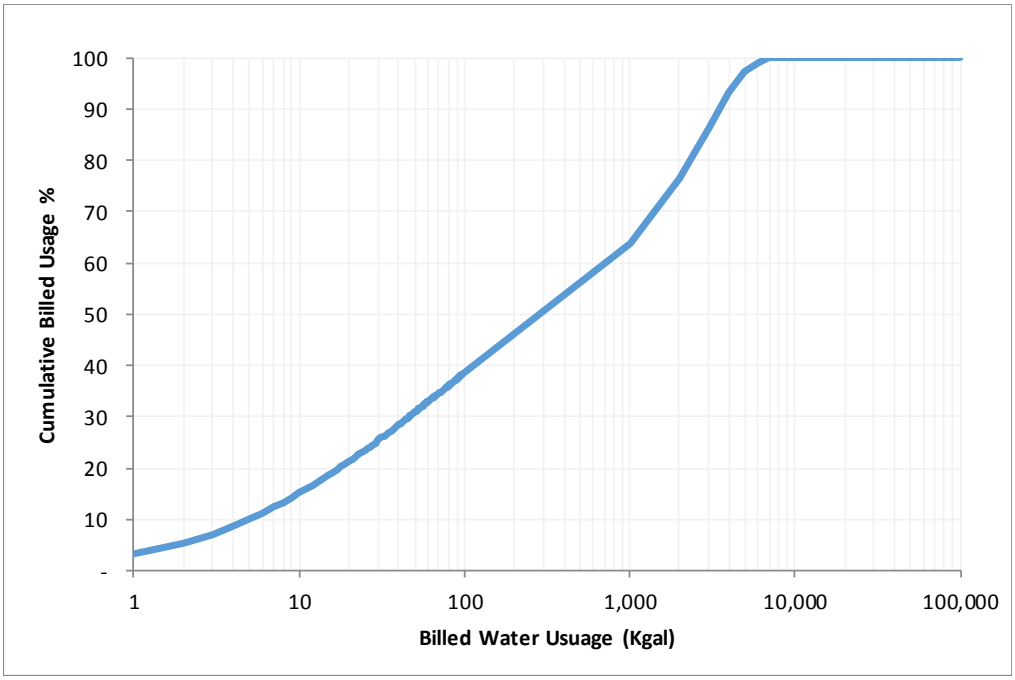


Figure 3-4. Commercial Percent Total Cumulative Billed Usage

3.3.3 Industrial

Figure 3-5 summarizes the bill distribution for industrial customers. There are some bills with zero usage, which is attributed customers may not have water usage, but pay a minimum charge. Another possibility is a broken water meter and based on feedback from the City, the billing system is continually being improved to correct these instances. Figure 3-6 summarize the cumulative billed usage (Kgal) for industrial customers. Approximately 5 percent of residential billed usage is 100 Kgal or less.

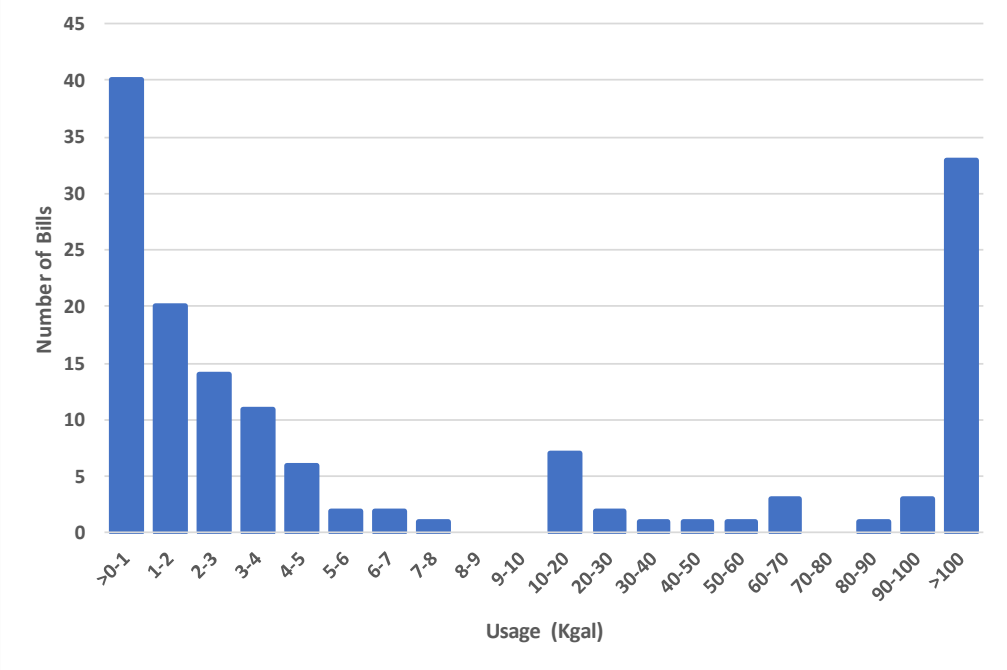


Figure 3-5. Industrial Bill Distribution by Usage Block (Kgal)

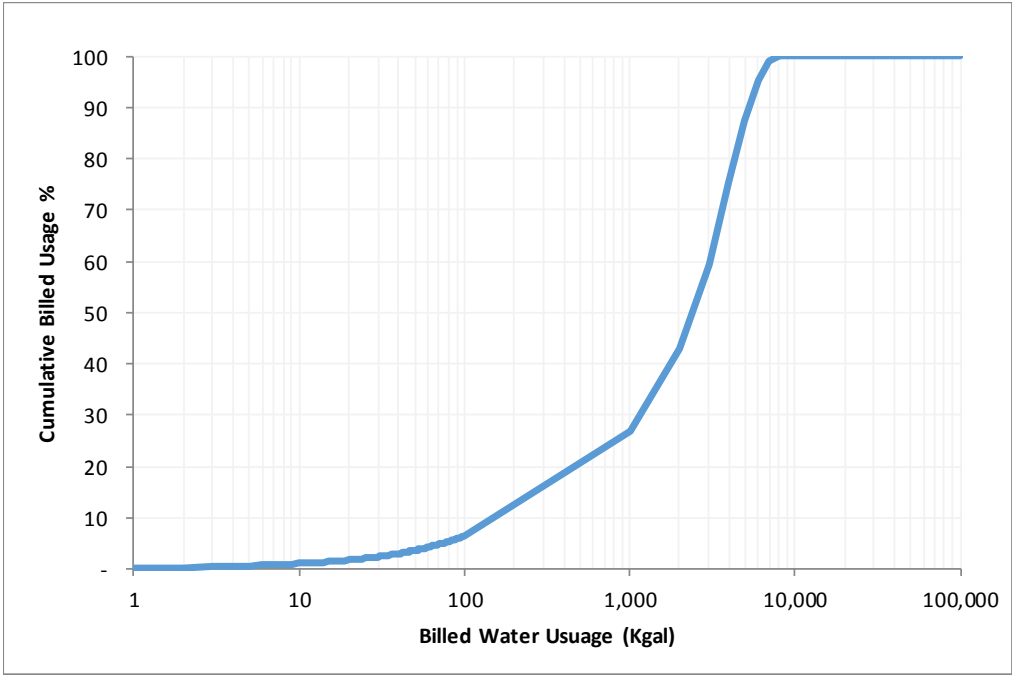


Figure 3-6. Industrial Percent Total Cumulative Billed Usage

3.3.4 Multitenant

Figure 3-7 summarizes the bill distribution for multitenant customers. There are some bills with zero usage, which is attributed customers may not have water usage, but pay a minimum charge. Another possibility is a broken water meter and based on feedback from the City, the billing system is continually being improved to correct these instances. Figure 3-8 summarize the cumulative billed usage (Kgal) for multitenant customers. Approximately 60 percent of residential billed usage is 100 Kgal or less.

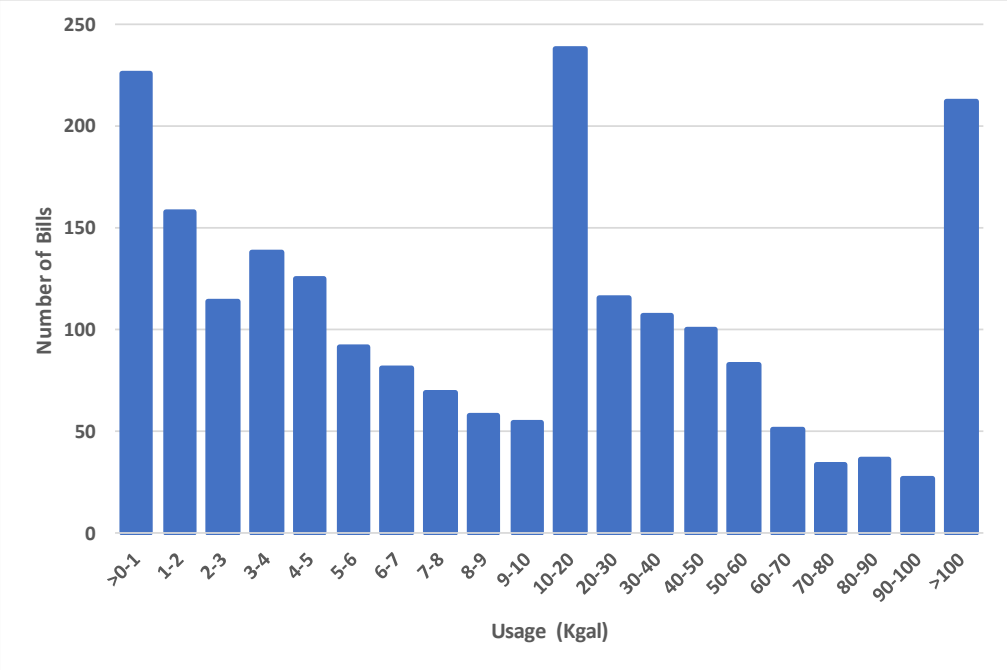


Figure 3-7. Multitenant Bill Distribution by Usage Block (Kgal)

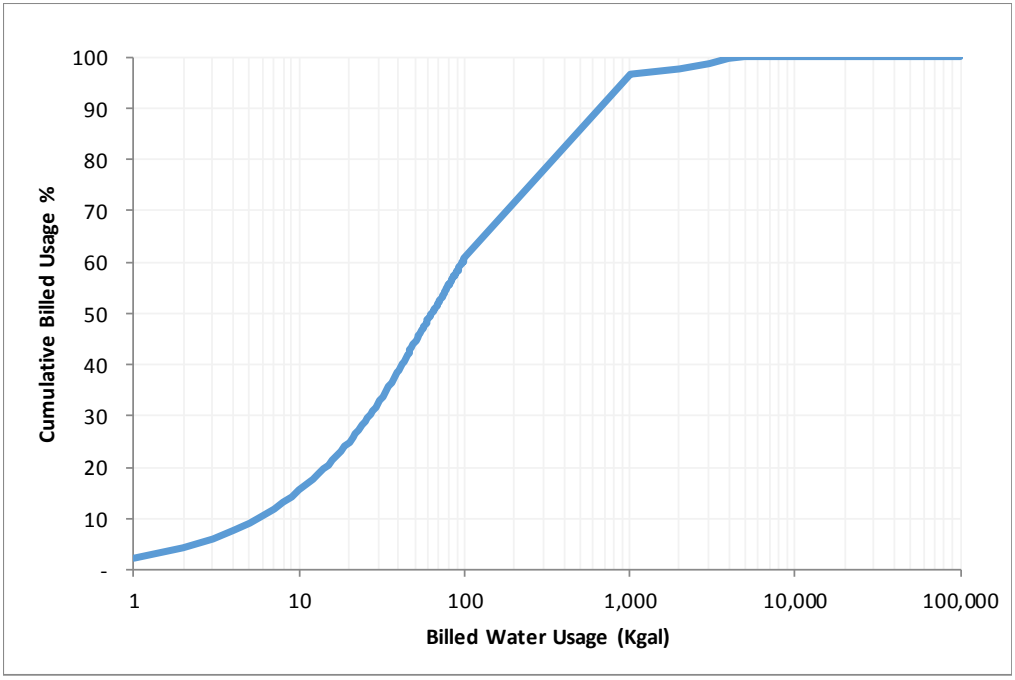


Figure 3-8. Multitenant Percent Total Cumulative Billed Usage

Water and Sewer Rate Structures

4.1 Capacity Charge

The capacity charge is a minimum charge and is based on meter size. Each customer pays the capacity charge, even when there is no water consumption. Table 4-1 summarizes the water capacity charge for FY 2017 to FY 2019. Table 4-2 summarizes the sewer capacity charge for FY 2017 to FY 2019. City did not implement a rate increase for FY 2019.

Table 4-1. Water Capacity Fee $/Bill

Meter Size	FY 2017 [a]	FY 2018[b]	FY 2019[c]
5/8"	$7.73	$8.84	$8.84
3/4"	$7.73	$8.84	$8.84
1"	$19.35	$22.12	$22.12
1 1/2"	$33.83	$38.67	$38.67
2"	$61.84	$70.68	$70.68
3"	$123.66	$141.34	$141.34
4"	$193.23	$220.86	$220.86
6"	$386.49	$441.76	$441.76
8"	$772.98	$883.52	$883.52
10"	$1,198.11	$1,369.44	$1,369.44

[a] Ordinance 17-15
[b] Ordinance 17-25
[c] There were no rate increases for FY 2019.

Table 4-2. Sewer Capacity Fee $/Bill

Meter Size	FY 2017[a]	FY 2018[b]	FY 2019[c]
5/8"	$17.54	$20.05	$20.05
3/4"	$17.54	$20.05	$20.05
1"	$43.84	$50.11	$50.11
1 1/2"	$76.76	$87.74	$87.74
2"	$140.25	$160.31	$160.31
3"	$284.65	$325.35	$325.35
4"	$438.33	$501.01	$501.01
6"	$876.65	$1,002.01	$1,002.01
8"	$1,753.31	$3,106.24	$3,106.24
10"	$2,717.62	$4,008.01	$4,008.01

[a] Ordinance 17-15
[b] Ordinance 17-25
[c] There were no rate increases for FY 2019.

4.2 Commodity Charge

The water and sewer commodity charges are based on billed water consumption. Each customer with water usage pays the commodity charge, as well as the capacity charge. Table 4-3 summarizes the water and sewer commodity charge rates for FY 2017. In April 2017, City Council approved a 13.4 percent rate increase, which was then applied to bills for May and June 2017.

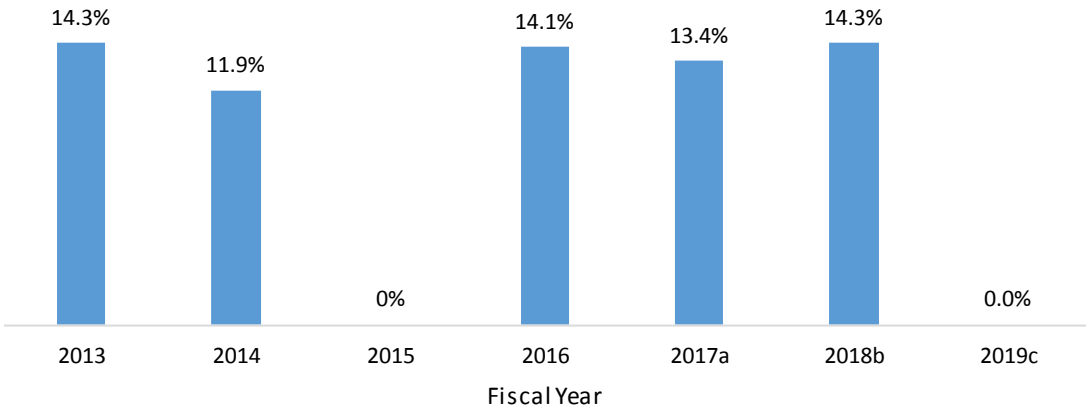
Table 4-3. Water and Sewer Commodity Charges ($/gallons)

	FY 2017[a]	FY 2018[b]	FY 2019[c]
Water Commodity ($/gallons)			
0 to 2244 gallons	$0.000698	$0.000798	$0.000798
>2,244 and <=91,256 gallons	$0.002956	$0.003378	$0.003378
> 91,256 gallons	$0.001896	$0.002167	$0.002167
Sewer Commodity ($/gallons)			
0 to 2244 gallons	$0.001561	$0.001785	$0.001785
>2,244 and <=91,256 gallons	$0.006717	$0.007676	$0.007676
> 91,256 gallons	$0.004290	$0.004904	$0.004904

[a] Ordinance 17-15
[b] Ordinance 17-25
[c] There were no rate increases for FY 2019.

4.3 Historical Rate Adjustments

Figure 4-1 summarizes the historical combined water and sewer rate increases for FY 2013 to FY 2018. As previously noted, the increase in FY 2017 was effective for only the last two months of the Fiscal Year. A 14.3 percent rate increases was implemented June 2017 for FY 2018. The cumulative historical rate increase for FY 2013 to FY 2016 was 40.3 percent; with the compounding of the rates, the rate increases during FY 2013 to FY 2016 represented an effective increase of 45.9 percent over those four years. Based on discussions with the City staff, there was a planned rate increase in 2015 but was tabled by City Council. Also, the 2017 Rate Study recommended a 15 percent increase in FY 2019, but this increase was not implemented.



[a] Ordinance 17-15. Rate increase effective May 2017.
[b] Ordinance 17-25
[c] Rates as July 1, 2017. http://www.petersburgva.gov/DocumentCenter/View/3751/FY-18-Rates?bidId=

Figure 4-1. Historical Rate Increases

SECTION 5

Historical Water and Sewer Revenues

Jacobs and Davenport reviewed the City's historical water and sewer revenues as found in the City's financial statements. The City's audit for FY 2018 was not available at the time of this study.

5.1 Water and Sewer Revenue

Table 5-1 summaries the capacity and commodity charge revenues for water and sewer service for FY 2017 to FY 2019. The FY 2018 budget compared to FY 2018 unaudited actual shows an increase in revenues. The FY 2019 adopted budget shows a decrease in revenues compared the FY 2018 unaudited actuals but increase compared to FY 2018 budget. However, based on discussions with City staff in February 2019, the FY 2019 projected estimate is at a minimum, approximately equal to the FY 2018 Unaudited Actual Results.

Table 5-1. Historical Water and Sewer Revenues
Water and Sewer Revenue by Customer Class

Customer Class	FY 2017 (actual)	FY 2018 (unaudited actual)	FY 2019 Adopted Budget	FY 2019 (Projected Estimate)[a]
Residential	$6,871,848	$10,181,778	$9,157,203	$10,181,778
Industrial	$631,848	$612,645	$536,144	$612,645
Commercial	$3,780,266	$3,338,851	$3,592,734	$3,338,851
Total Estimated Water and Sewer Revenues	**$11,283,962**	**$14,133,274**	**$13,286,081**	**$14,133,274**

[a] Based on discussions with City, February 2019.

5.2 Non-Rate Revenue

The City generated approximately $59,000 in cut-off fees, which are related to service shut off for non-payment in FY 2017. For FY 2018 (unaudited actuals), the City generated approximately $142,000. The FY 2019 estimates $125,000.

The City receives approximately $68,000 in non-rate revenue related to wholesale water supply agreements to Prince George County and Ft. Lee and wastewater conveyance agreements with the Counties of Chesterfield, Dinwiddie, Prince George, the City of Colonial Heights and Ft. Lee. The City anticipates that these contracts will be in place for the foreseeable future.

Connection and availability fees are not applied to operating expenses on a going forward basis beginning in FY 2018. In FY 2017, the City collected approximately $890,000 in connection fees. For FY 2018 (unaudited actuals), the City generated approximately $68,000.

SECTION 6

Operating Costs

Table 6-1 summarizes projected operating expenses for the period FY 2018 through FY 2023. FY 2018 figures are based on the City's FY 2018 unaudited actuals. FY 2019 is based upon the City's adopted budget. Based discussions with City Staff in February 2019, the City anticipates that financial performance in FY 2019 is on track with the budget. An inflation factor of 2.5 percent has been applied to salaries and fringe benefits, SCWWA payment, ARWA payment and other operational expenses. SCWWA and ARWA payment increases include City's share of capital investment by ARWA and SCWWA begins in FY 2021 and FY 2022, respectively.

Table 6-1. Projected Operating Expenses FY 2018 through FY 2023

Expense	FY 2018 (unaudited)	FY 2019 (budget)	FY 2020	FY 2021	FY 2022	FY 2023
Salaries/Fringe Benefits	$1,516,462	$2,385,210	$2,444,840	$2,505,961	$2,568,610	$2,632,826
SCWWA Payments	$4,710,977	$4,800,000	$4,920,000	$5,043,000	$8,574,551	$8,703,778
ARWA Payments	$1,615,966	$1,525,000	$1,563,125	$1,904,052	$1,944,107	$1,985,164
Other Operational Expense	$2,220,002	$2,122,200	$2,175,255	$2,229,636	$2,285,377	$2,342,512
PILOT	$489,000	$489,000	$750,000	$750,000	$750,000	$750,000
Total Operating Expenses	**$10,552,407**	**$11,321,410**	**$11,853,220**	**$12,432,650**	**$16,122,646**	**$16,414,279**

SECTION 7

Capital Improvement Plan

The City of Petersburg City Council recently adopted the FY 18 CIP program. The program included a summary of utility projects to be completed with FY 18 funding which is to come from a 2015 VRA bond issuance ($5,300,000) which has not been fully drawn down and a loan from the Virginia Clean Water Revolving Loan fund ($750,000). The total spending proposed for the Utility line division is $6,050,000. The breakdown between water fund and sewer fund is $2,690,000 and $3,360,000 respectively. The five-year program totals $52,500,000. Table 7-1 and Table 7-2 present the water and wastewater five-year CIPs. These tables have been replicated from the Adopted City of Petersburg Fiscal Year 2018 – 2022 Capital Improvement Plan.

In addition to the capital projects identified to improve the water and sewer system, the City is a member of the Appomattox River Water Authority and South-Central Wastewater Authority. As one of the five-member localities of these two organizations, each locality is allocated a portion of capital projects which are required to keep each utility operational and in compliance with applicable laws and regulations. Petersburg allocation for ARWA is 16.7 percent. The City's allocation for SCWWTP is 52.5 percent. These ownership proportions are based on the amount of water allocated to the locality and the corresponding amount of waste flow returned to SCWWTP. The City also wheels waste water from neighboring localities and is paid a wheeling charge from each locality proportional to the flow. Each locality is billed directly by SCWWTP for flows which are generated from each locality. The City also has an infiltration and inflow problem which results in more flow being delivered to SCWWTP than the amount of water received from ARWA.

Both authorities have 5-year capital programs and each locality is responsible for paying the applicable percentage of these capital programs. SCWWTP has a need to improve the wastewater treatment plant ability to treat the waste stream and reduce nutrients to comply with the VPDES permit issued by DEQ. Over the next 5 years, the City's allocation of these improvements is projected to be $44,000,000, or 52.5 percent of an estimated $78 million. The ARWA project to raise the Lake Chesdin Dam is projected at $23.5 million. Therefore, the City's allocation of these improvements is projected to be $3.9 million. It is assumed that ARWA and SCWWA will independently undertake financing for these improvements and will pass along the City's allocated costs of related debt service to the City. The City's allocated costs have been incorporated into the City's operating budget projections.

When looking at the anticipated capital needs for the City and the City's share of ARWA and SCWWTP, the total five-year infrastructure needs for the water and waste water utility total 97,200,000. Table 7-3 presents the summary of major infrastructure needs. This budget was used as the basis to determine the water and sewer rate structure needed to support a program of this magnitude. Details of these rates are presented in other sections of this rate study.

Table 7-1. City of Petersburg Five Year Water Utility CIP

Project Name	Total FY 2019 - 2023	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Water Utility						
Equipment	$1,108,097		$108,097	$500,000		$500,000
SCADA Control System Replacement	$119,000	$119,000				
Halifax Tank Rehabilitation (Tank)	$550,000			$550,000		
Implement City Works	$725,000	$150,000	$75,000	$500,000		
Jamestown Tank Rehabilitation	$550,000			$550,000		
Locks Booster Station Rehab & Upgrade (New Pump)	$400,000				$400,000	
Locks Water Line Replacement	$2,160,000	$2,160,000				
Mercury Sreet Tank Rehabilitation	$400,000				$400,000	
Mount Vernon Pump Station Rehab and Upgrade	$1,100,000	$400,000		$700,000		
Mount Vernon Tank Painting (Tank)	$580,000		$580,000			
Replace Distribution Mains	$4,500,000	$250,000	$1,250,000	$1,000,000	$1,000,000	$1,000,000
Replace Water Transmission Mains (Sycamore & NW St.)	$6,000,000	$500,000	$1,000,000	$1,000,000	$1,500,000	$2,000,000
Wagner Road Water Line	$1,300,000				$1,300,000	
Walnut Hill Tank Rehabilitation	$400,000			$400,000		
Water & Sewer Master Plan, Engineering and Modeling	$100,000	$100,000				
Large Water & Sewer Meter Replacement	$500,000	$500,000				
WATER SUBTOTAL	**$20,492,097**	**$4,179,000**	**$3,013,097**	**$5,200,000**	**$4,600,000**	**$3,500,000**

Table 7-2. City of Petersburg Five Year Wastewater Utility CIP

Project Name	Total FY 2019 - 2023	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Equipment	$1,250,000		$250,000	$500,000		$500,000
Poor Creek - Force Main	$1,750,000	$1,750,000				
SCADA Control System Replacement	$119,000	$119,000				
Blackwater Creek	$800,000		$800,000			
Flow Monitoring	$150,000	$150,000				
Infiltration and Reduction Projects	$10,500,000		$3,000,000	$2,500,000	$3,000,000	$2,000,000
Infiltration and Inflow Study	$350,000	$200,000			$150,000	
Poor Creek Force Main Phase 2	$1,225,000		$1,225,000			
Poor Creek Force Main Phase 3	$795,000		$795,000			
Poor Creek Force Main Phase 4	$435,000			$435,000		
Poor Creek Force Main Replacement Design	$250,000			$250,000		
Pump Station Rehabilitation (New meters, etc.)	$3,000,000	$500,000	$500,000	$500,000	$500,000	$1,000,000
Rehabilitate Rohoic Creek Pump Station	$300,000				$300,000	
South Crater Interceptor Upgrade	$1,300,000		$500,000	$800,000		
Water & Sewer Master Plan Phase 3-Engineering & Modeling	$100,000	$100,000				
Manhole Inserts	$400,000	$100,000	$100,000	$100,000	$100,000	
WASTEWATER SUBTOTAL	**$22,724,000**	**$2,919,000**	**$7,170,000**	**$5,085,000**	**$4,050,000**	**$3,500,000**

Table 7-3. Summary of Major Infrastructure Needs (Millions of Dollars)

Type of Infrastructure	Total Cost	Petersburg Share
ARWA – Lake Chesdin Dam Raise	$23.5	$3.9
SCWWA	$78.0	$42.0
- Aging Infrastructure	- $20.3	- $10.9
- Wet Weather Improvement	- $ 17.3	- $9.3
- Denitrification	- $ 40.4	- $21.8
Petersburg Infrastructure	$52.5	$52.5
Total	$154	$98.4

SECTION 8

Debt Service

Table 8-1 provides summary of existing debt service the period FY 2018 through FY 2023, which is based on the City's existing general obligation debt that is allocable to the water and sewer utility system. Additionally, the table below summarizes projected debt service for the period FY 2020 through FY 2023. Projected debt service in FY 2020 and thereafter is based on bond funding of the CIP needs as provided by Timmons in Section 7. Approximately $5.3 million of existing bond funds from debt, which was issued in 2015, will be applied to the remainder of FY 2019 CIP needs. As a result, no new debt for FY 2019 will be issued. New municipal bond market financing issued by the City is assumed for CIP needs beginning in FY 2020 and debt service is assumed to begin in the year of the assumed bond financing.

Table 8-1. Projected Debt Service FY 2018 through FY 2023

Expense	FY 2018 (unaudited)	FY 2019 (budget)	FY 2020	FY 2021	FY 2022	FY 2023
Existing Debt Service[1]	$705,506	$917,850	$936,081	$1,037,645	$1,039,344	$1,037,810
Projected Debt Service						
City CIP[2]	$0	$0	$794,718	$1,597,438	$2,155,479	$2,584,742
Existing and Projected Debt Services	**$705,506**	**$917,850**	**$1,730,799**	**$2,635,083**	**$3,194,823**	**$3,622,552**

[1] Based on City's adopted FY 2018 Budget.

[2] Debt service for City infrastructure capital only and based on capital needs as provided by Timmons Group. Assumes financing of CIP cost plus 10 percent factor for reserve and cost of issuance; 25-year amortization and 5 percent interest rate.

SECTION 9

Pro forma

Table 9-1 shows the pro forma developed by Davenport, based on assumptions provided by the City, and which incorporates revenues with rate increases as calculated by Jacobs.

The Pro forma incorporates operating costs and assumptions as described in Section 6 and existing/projected debt service as described in Section 8. A debt service coverage of 125 percent has been assumed due to the City's current fiscal situation and credit rating having a negative impact on coverage requirements of debt service.

Revenue increases have been incorporated to reflect rate smoothing over the FY 2020 to FY 2023 planning period. In addition, the revenues assume a 80 percent collection rate for FY 2020 for FY 2023.

No connection fees have been assumed for operating purposes in FY 2019 and thereafter.

Table 9-1. City of Petersburg Water & Sewer Fund Pro forma FY 2018 through FY 2023

	FY 2018(a)	FY 2019(b)	FY 2020	FY 2021	FY 2022	FY 2023
Recoveries & Rebates	$83,557	$67,614	$67,614	$67,614	$67,614	$67,614
Cut Off Fees	$142,082	$125,000	$125,000	$125,000	$125,000	$125,000
Delinquent Charges	($1,116)	$0	$0	$0	$0	$0
Sale of Water & Sewer – Residential	$10,181,778	$10,181,778	$11,423,955	$12,817,677	$14,381,434	$14,949,500
Sale of Water & Sewer – Industrial	$612,645	$612,645	$687,387	$771,248	$865,341	$899,522
Sale of Water & Sewer – Commercial	$3,338,851	$3,338,851	$3,746,191	$4,203,227	$4,716,020	$4,902,303
Miscellaneous Revenue	$104,604	$0	$0	$0	$0	$0
Interest Earned	$5,097	$0	$0	$0	$0	$0
Connection Fees(c)	$91,688	$0	$0	$0	$0	$0
Total Revenues	$14,559,186	$14,325,888	$16,050,147	$17,984,766	$20,155,409	$20,943,939
Total Expenses	$10,552,407	$11,321,410	$11,853,220	$12,432,650	$16,122,646	$16,414,279
Revenues Available for Debt Service	$4,006,778	$3,004,478	$4,196,927	$5,552,116	$4,032,763	$4,529,660
Existing and Projected Debt Service	$705,506	$917,850	$1,730,799	$2,635,083	$3,194,823	$3,622,552
Surplus (Deficit)	$3,301,272	$2,086,627	$2,466,128	$2,917,033	$837,940	$907,109
Debt Service Coverage Ratio	5.68	3.27	2.42	2.11	1.26	1.25

[a] Based on City's unaudited actuals FY 2018 Budget.

[b] Projected Estimate based on discussions with City Staff.

[c] Assumes that connection fees in FY 2018 and thereafter are not applied to recurring operating budget expenses.

SECTION 10

Rate Impact Analysis

Based on the revenue needs determined by the Pro forma analysis prepared by Davenport, the rate impact analysis prepared by Jacobs identified the rate increases needed to achieve a DSCR of 125 percent. With the needed CIP spending identified by Timmons to improve the water and sewer system (see Section 7) and the projected debt service to fund the capital projects (see Section 8), and resulting annual rate increases were identified. Due to the timing of capital projects and debt funding, the preliminary analyses resulted in substantial rate spikes in some of the out years. After discussions with City staff, a rate smoothing approach was recommended because it helps avoid rate shocks from one year to the next, which represents industry best practice in rate-making. Since rate increases are being smoothed out over a three-year period, there are some years in which there could be a surplus in water and sewer revenues. It is assumed that any surplus will be used to defray the cost of capital costs and help reduce borrowing costs in succeeding years. Table 10-1 summarizes the estimated water and sewer rate revenues, including the effect of the collection rate assumptions documented earlier in this study. Table 10-1 focuses on water and sewer rate revenues to determine the projected rate increases that generate rate revenues to achieve the target annual DSCR of 125 percent. Based on the identified rate increases, Table 10-2 summarizes the projected rates for the capacity and commodity charges.

To identify the rate impact on residential customers, a typical residential bill was evaluated assuming 5/8-inch meter and 5,000 gallons per month. Based on these parameters, Table 10-3 summarizes the projected monthly typical residential bill in FY 2018 is $61 and increases to $90 in FY 2023. On an annual basis, typical residential bill for water and sewer service is $733 and $1,076, respectively.

Based on American Community Survey data maintained by the US Census, the MHI for the City is estimated to be $31,798. The annual water bill as a percent of MHI is estimated to be 0.7 percent in FY 2018 and 1 percent in FY 2023, based on the current MHI for the City. The affordability threshold for water bills that is used by the US EPA is 2.5 percent of MHI. The annual sewer bill as percent of MHI is estimated to be 1.66 percent in FY 2018 and 2.44 percent in FY 2023, based on the current MHI for the City. The affordability threshold for sewer bills that is used by the US EPA is 2 percent of MHI.

It is important to recognize that affordability metrics that have been used historically by US EPA based on MHI have recognized limitations because of such issues as distribution of household incomes around the median levels. US EPA, industry associations, and utilities have recognized that more robust means are needed to identify when utility bills pose affordability challenges for low-income residential customers. For example, 50 percent of the City's households earn less $31,798. When lower household income levels are considered, the water and sewer bills as a percent MHI increases. Note that some level of increases in median household incomes would be anticipated to occur based on historical trends in incomes, and so the projected percentages may somewhat overstate the percent of MHI paid for water and sewer service in future years, since inflation has been incorporated into the O&M cost projections in this rate study.

The issue of affordability has received considerable attention in the water and wastewater industries during the past ten years, with substantial progress in identifying customer assistance programs, such as bill discounts, water audits and home appliance repairs. There are several options to assist low-income residential customers, which are documented in industry guidance such as *the Low-Income Affordability Programs* chapter of the of 2017 update (7th edition) of Principles of Water Rates, Fees, and Charges by the American Water Works Association, and the *Compendium of Drinking Water and Wastewater Customer Assistance Programs* released by US EPA in April, 2016. While beyond the scope of this rate study report, the City could consider implementing a customer assistance program for low-income customers if implementation of a such a program is found to be consistent with City values and goals as the rate increases identified in the recommended five-year rate program are implemented.

Table 10-1. Rate Impact Analysis for Projected Revenues to Achieve 1.25 DSCR, 80% Collection Rate

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Rate Increase (%)	14.30%	0.00%	12.20%	12.20%	12.20%	3.95%
Estimated Water and Sewer Revenues at 80% collection rate and current rates						
Residential (8060)	$10,181,778	$10,181,778	$10,181,778	$10,181,778	$10,181,778	$10,181,778
Industrial (8061)	$612,645	$612,645	$612,645	$612,645	$612,645	$612,645
Commercial (8062)	$3,338,851	$3,338,851	$3,338,851	$3,338,851	$3,338,851	$3,338,851
Total Estimated Water and Sewer Revenues	**$14,133,274**	**$14,133,274**	**$14,133,274**	**$14,133,274**	**$14,133,274**	**$14,133,274**
Pro forma Rate Revenue**	$14,133,274	$14,133,274	$14,133,274	$14,133,274	$14,133,274	$14,133,274
Additional Revenue Increases Needed for Coverage**		$0	$0	$1,400,616	$5,790,287	$6,616,581
Target Rate Revenues to achieve 1.25 DSCR	**$14,133,274**	**$14,133,274**	**$14,133,274**	**$15,533,890**	**$19,923,561**	**$20,749,854**
Estimated Water and Sewer Revenues at 80% collection rate with rate revenue increases						
Residential (8060)	$10,181,778	$10,181,778	$11,423,955	$12,817,677	$14,381,434	$14,949,500
Industrial (8061)	$612,645	$612,645	$687,387	$771,248	$865,341	$899,522
Commercial (8062)	$3,338,851	$3,338,851	$3,746,191	$4,203,227	$4,716,020	$4,902,303
Total Estimated Water and Sewer Revenues	**$14,133,274**	**$14,133,274**	**$15,857,533**	**$17,792,152**	**$19,962,795**	**$20,751,325**
Water and Sewer Rate Revenue Surplus (Deficit)	$0	$0	$1,724,259	$2,258,262	$39,234	$1,471

*from City of Petersburg, see Petersburg_Ut Sys Rev and Exp_With Proforma_3.4.2019.xlsx

**from Davenport and Company, see Petersburg_Ut Sys Rev and Exp_With Proforma_3.4.2019.xlsx

Table 10-2. Projected Water and Sewer Rates to Achieve 1.25 DSCR, 80% Collection Factor

Water and Sewer Rates	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**
Rate Increases	14.30%	0.00%	12.20%	12.20%	12.20%	3.95%
Number of Months	12	12	12	12	12	12
Water Commodity ($/gallons)						
0 to 2244 gallons	$0.000615	$0.000615	$0.000690	$0.000774	$0.000868	$0.000902
>2,244 and <=91,256 gallons	$0.002607	$0.002607	$0.002925	$0.003282	$0.003682	$0.003827
> 91,256 gallons	$0.001671	$0.001671	$0.001875	$0.002104	$0.002361	$0.002454
Sewer Commodity ($/gallons)						
0 to 2244 gallons	$0.001785	$0.001785	$0.002003	$0.002247	$0.002521	$0.002621
>2,244 and <=91,256 gallons	$0.007676	$0.007676	$0.008612	$0.009663	$0.010842	$0.011270
> 91,256 gallons	$0.004903	$0.004903	$0.005501	$0.006172	$0.006925	$0.007199
Water Capacity Fee $/Bill						
5/8"	$8.84	$8.84	$9.92	$11.13	$12.49	$12.98
3/4"	$8.84	$8.84	$9.92	$11.13	$12.49	$12.98
1"	$22.12	$22.12	$24.82	$27.85	$31.25	$32.48
1 1/2"	$38.67	$38.67	$43.39	$48.69	$54.64	$56.78
2"	$70.68	$70.68	$79.32	$88.99	$99.86	$103.78
3"	$141.34	$141.34	$158.61	$177.95	$199.70	$207.53
4"	$220.86	$220.86	$247.84	$278.07	$312.05	$324.29
6"	$441.76	$441.76	$495.73	$556.20	$624.16	$648.65
8"	$883.52	$883.52	$991.46	$1,112.40	$1,248.32	$1,297.30
10"	$1,369.44	$1,369.44	$1,536.75	$1,724.19	$1,934.88	$2,010.78
Sewer Capacity Fee $/Bill						
5/8"	$20.05	$20.05	$22.50	$25.25	$28.33	$29.45
3/4"	$20.05	$20.05	$22.50	$25.25	$28.33	$29.45
1"	$50.11	$50.11	$56.23	$63.11	$70.80	$73.60
1 1/2"	$87.74	$87.74	$98.46	$110.50	$123.97	$128.87
2"	$160.31	$160.31	$179.90	$201.89	$226.51	$235.47
3"	$325.35	$325.35	$365.11	$409.73	$459.71	$477.88
4"	$501.01	$501.01	$562.23	$630.95	$707.91	$735.90
6"	$1,002.01	$1,002.01	$1,124.45	$1,261.88	$1,415.81	$1,471.78
8"	$3,106.24	$3,106.24	$3,485.81	$3,911.85	$4,389.02	$4,562.53
10"	$4,008.01	$4,008.01	$4,497.77	$5,047.49	$5,663.19	$5,887.08

Table 10-3. Typical Residential Bill

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Monthly bill 5/8 inch meter 5,000 gallons consumption						
Water						
Capacity Charge	$8.84	$8.84	$9.92	$11.13	$12.49	$12.98
Commodity Charge	$8.17	$8.17	$9.17	$10.29	$11.54	$12.00
Total Water	**$17.01**	**$17.01**	**$19.09**	**$21.42**	**$24.03**	**$24.98**
Sewer						
Capacity Charge	$20.05	$20.05	$22.50	$25.25	$28.33	$29.45
Commodity Charge	$24.01	$24.01	$26.93	$30.22	$33.91	$35.25
Total Sewer	**$44.06**	**$44.06**	**$49.43**	**$55.47**	**$62.24**	**$64.70**
Total Water and Sewer (Monthly)	**$61.07**	**$61.07**	**$68.53**	**$76.89**	**$86.27**	**$89.67**
Total Water and Sewer (Annual)						
Water	$204	$204	$229	$257	$288	$300
Sewer	$529	$529	$593	$666	$747	$776
Total Water and Sewer (Annual)	**$733**	**$733**	**$822**	**$923**	**$1,035**	**$1,076**
Median Household Income (MHI) [1]	$31,798	$31,798	$31,798	$31,798	$31,798	$31,798
Percent of Annual Water Bill to MHI	0.64%	0.64%	0.72%	0.81%	0.91%	0.94%
EPA Affordability Threshold for Water Bill [2]	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Percent of Annual Sewer Bill to MHI	1.66%	1.66%	1.87%	2.09%	2.35%	2.44%
EPA Affordability Threshold for Sewer Bill [2]	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%

[1] US Census. S1901 INCOME IN THE PAST 12 MONTHS (IN 2015 INFLATION-ADJUSTED DOLLARS) 2011-2015 American Community Survey 5-Year Estimates. Available from https://factfinder.census.gov, visited March 22, 2017.
[2] USCM, AWWA, & WEF. 2013. "Affordability Assessment Tool for Federal Water Mandates"

SECTION 11

Water and Sewer Rate Comparison

Based on water and sewer rate comparison of neighboring localities, the City is trending higher compared to neighboring localities. Figure 11-1 compares the water and sewer rates based on a typical residential bill based on 5/8-inch meter and 5,000 gallons (6.68 ccf) per month. Among the group, the highest combined bill is for Prince George and the lowest is Colonial Heights. The typical residential bill for the City is shown for FY 2019 (rates effective July 2017) and FY 2020. The Typical residential bill for other localities is based on most recent rate information available online.

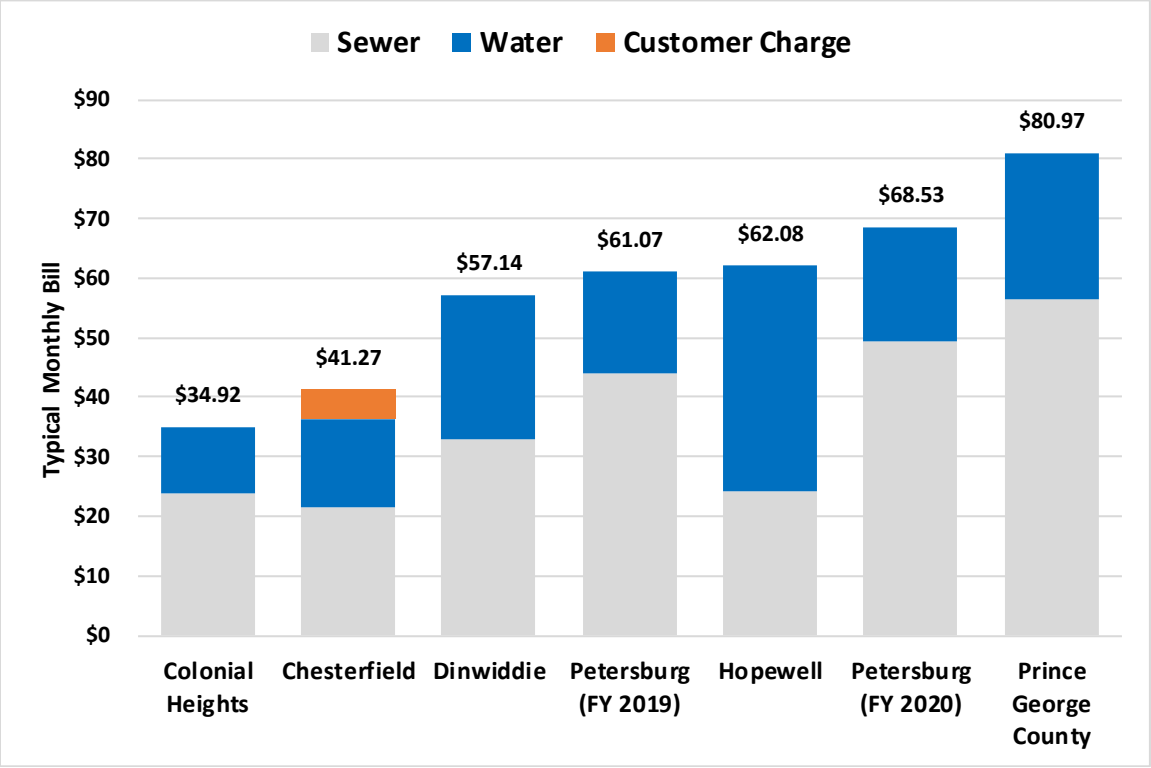


Figure 11-1. Comparison of Typical Monthly Residential Bill (5/8" meter and 5,000 gallons)

SECTION 12

Conclusion and Recommendations

Based on the results of the Rate Study, concluding remarks are as follows:

- Over next five years, water and sewer capital spending needs are $91.1 million, including the City's share for SCWWA and ARWA. City's share for SCWWA ($44 Million) and ARWA ($3.9 Million) are part of monthly payments for service per separate agreements. This means the City's share of capital costs associated with SCWWA and ARWA are not treated as outstanding debt and hence is not part of debt service coverage calculations.
- To fund City capital improvements, an additional $43.2 million is needed in debt funding, which results in projected annual additional debt service of $2.6 million by FY 2023, which would be incremental to the City's existing debt service of $1.1 million. Total existing and additional debt service is approximately $3.7 million in FY 2023.
- A debt service coverage of 125 percent has been assumed based on the issuance of double-barrel Revenue Bonds with the City's General Obligation pledge.
- The previous rate study (August 2017) identified a series of 15 percent rate increases to meet DSCR of 150 percent. The rate increases identified in this rate study update have decreased slightly because the target DSCR was lowered to 125 percent and the City's FY 2018 Unaudited Actuals Results demonstrate improved performance. To generate water and sewer rate revenues sufficient to achieve DSCR of 125 percent, a 11.89 percent increase is projected for FY 2020 to FY 2022 and 5 percent for FY 2023.
- A typical residential bill was evaluated assuming 5/8-inch meter and 5,000 gallons per month. Based on these parameters, the projected monthly typical residential bill in FY 2018 is $61 and increases to $90 in FY 2023. On an annual basis, typical residential bill for water and sewer service is $733 and $1,078, respectively. The typical monthly residential for City is relatively similar compared to neighboring localities.
- The annual water bill as a percent of MHI ($31,798) is estimated to be 0.7 percent in FY 2018 and 1 percent in FY 2023.
- The annual sewer bill as percent of MHI ($31,798) is estimated to be 1.66 percent in FY 2018 and 2.44 percent in FY 2023.

Based on the rate study presented herein, recommendations to the City are as follow:

- Implement the recommended rate increases identified in this Rate Study report.
- Continue billing system improvements, improvements in procedures and processes for addressing unpaid bills, and meter monitoring. Identification and replacement of broken and under registering meters can help realize lost revenues.
- Continue to monitor collection rate for water and sewer rates. Improvement in the collection rate can help improve revenue recognition and improve financial performance. Continue corrective actions, including implementation of "shut-off" policy and more aggressive pursuit of collections.
- Consider implementing some form of customer assistance program, such as bill discounts, assistance with water audits and in-home appliance repairs, if providing such assistance is deemed consistent with City values and goals for the utility system. As water and sewer charges increase to meet the City's financial needs to operate the water and sewer systems, this will result in higher charges for the City's low-income customers.