MOTT MACDONALD

2020 Consulting Engineer's Annual Report

November 2020

Confidential

Mott MacDonald
Two Allegheny Center
Nova Tower 2, Suite 1301
Pittsburgh
PA 15212
United States of America

T +1 (412) 497 2900
mottmac.com

Pittsburgh Water & Sewer Authority
Penn Liberty Plaza I
1200 Penn Avenue
Pittsburgh, PA 15222

2020 Consulting Engineer's Annual Report

November 2020

Confidential

PITTSBURGH WATER AND SEWER AUTHORITY
(Allegheny County, Pennsylvania)

2020 CONSULTING ENGINEER'S ANNUAL REPORT

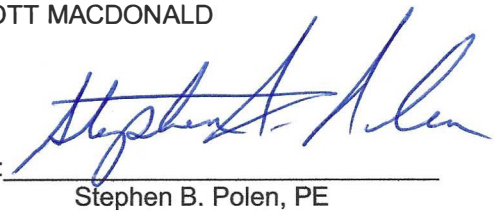
CERTIFICATE OF ENGINEER

I am a Professional Engineer registered in the Commonwealth of Pennsylvania and am employed by Mott MacDonald. I am qualified to offer the following information being familiar with the operations of The Pittsburgh Water and Sewer Authority (Authority) and having worked in similar capacities for other such entities.

I hereby report and certify that the statements of opinions, projections of efforts and schedules, and presentation of other information contained in the following report, relevant to the water and sewer systems of the Authority, are consistent with my understanding of the conditions of the systems and future plans of the Authority as provided by the Authority as of November 6, 2020.

IN WITNESS WHEREOF, I have executed this document, on behalf of Mott MacDonald on 11/9/2020

MOTT MACDONALD

By: 

Stephen B. Polen, PE

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
Draft	10-23-20	DJHealey Langley	DONusser	SBPolen	Draft version
100%	11-06-20	DJHealey Langley	KChavara	SBPolen	PWSA input and project details incorporated
Final	11-06-20	DJHealey Langley	KChavara	SBPolen	Mott MacDonald incorporated PWSA input and project details

Document reference: 507103557 | | |

Information class: Standard

Contents

Executive summary 1

1 History and Background 6

1.1 General 6
1.2 Initial Operation 6
1.3 Capital Improvement Program (CIP) Funding Sources 6
1.3.1 Revolving Line of Credit in 2016, 2018, and 2020 6
1.3.2 2017 Bond Refunding 7
1.3.3 2019 Bond Issuance and Refunding 7
1.3.4 2020 Anticipated Bond Issuance and Remarketing 8
1.3.5 PENNVEST Funding 8
1.4 Water System Background 9
1.4.1 PADEP Administrative Order, April 2016 10
1.4.2 September 6, 2019 Consent Order and Agreement 10
1.5 Wastewater System and Stormwater System Background 15
1.5.1 Administrative Consent Orders and Consent Order and Agreements 16
1.5.2 USEPA 308 Information Request 17
1.6 Staffing 17

2 Maintenance, Repair and Operation of the Water, Wastewater, and Stormwater Systems 18

2.1 Findings on Current Maintenance, Repair, and Operation of the Water and Sewer Systems 18
2.1.1 Water System Findings 21
2.1.2 Wastewater System and Stormwater System Findings 23
2.1.3 Information Management System Findings 24
2.2 Recommendations for Maintenance, Repair and Operation of the Water, Wastewater, and Stormwater Systems during the 2021 Fiscal Year 25
2.2.1 Water System Recommendations 26
2.2.2 Lead Service Line Replacement (LSLR) Program 27
2.2.3 Wastewater System and Stormwater System Recommendations 28
2.2.4 Information Management System Recommendations 29

3 Capital Improvement Program Projects 31

3.1 General 31
3.2 Funding Sources 31
3.3 Current Capital Improvement Plan 31

4 Public Utilities Commission Act 65 and Act 70 42
4.1 Public Utility Commission Regulatory Background 42
4.1.1 Overview 42
4.1.2 Long-Term Infrastructure Improvement Plan 42
4.1.3 Compliance Plan 43
4.2 Act 70 and the Cooperative Agreement 44

5 Conclusion 45

6 Acknowledgement 46

A. Duties of the Consulting Engineer 47

B. History of Bond Issues and Refunding (1984 – 2013) 50
B.1 First Bond Issue 50
B.2 1993 Bond Issue and Refunding 50
B.3 1995 Bond Issue 51
B.4 1998 Bond Issue and Refunding 51

Tables

Table 1.1: PENNVEST loans 9
Table 1.2: Subject and Location of COA Requirements 12
Table 1.3: PADEP Consent Order Related Capital Projects Schedule (9/6/19 Signed COA, Revised 5/13/20 for COVID-19 Extension) 14
Table 2.1: Limited Facility Physical Condition Assessment Locations in 2015 and Current Status 19
Table 2.2: Water Storage Tank Inspections and Renovations 22
Table 3.1: PWSA 2021-2025 Capital Improvement Plan 32
Table 3.2: Water Treatment Plant Improvements 35
Table 3.3: Water Pumping and Storage Improvements 36
Table 3.4: Water Distribution System Improvements 37
Table 3.5: Wastewater System Improvements 38
Table 3.6: Stormwater System Improvements 40
Table 3.7: Other Improvements 41

Figures

Figure 1.1: PWSA Annual Projected Capital Budgets by Project Class 5
Figure 2.1: PWSA Historical (2015 through 2019) and Forecast (2020) Operations Expenses[1] 26

Figure 3.1: PWSA Annual Projected Capital Budgets by Project Class 32
Figure 3.2: PWSA Fiscal Year 2021 Projected Capital Budgets by Project Class 33
Figure 3.3: PWSA Annual Projected Water System Capital Budgets 34
Figure 3.4: PWSA Annual Projected Wastewater System Capital Budgets 38
Figure 3.5: PWSA Annual Projected Stormwater System Capital Budgets 39

Executive summary

The Pittsburgh Water and Sewer Authority (PWSA) retained Mott MacDonald, LLC, to prepare the Annual Report of the Consulting Engineer in September of 2020. The Annual Report is required under Article VII, Section 7.11 of the 2019 Senior Indenture and Subordinate Indenture. There are several sections in the 2019 Senior Indenture and Subordinate Indenture referring to the duties of the Consulting Engineer, (see Appendix A of this report). In accordance with the 2019 Senior Indenture and Subordinate Indenture, “Consulting Engineer” shall be a qualified independent consultant having the skill and experience necessary to provide the particular certificate, report, or approval required by the provision of the Indenture or any Supplemental Indenture. The Consulting Engineer completing this report is a Professional Engineer Registered in the Commonwealth of Pennsylvania and is qualified to offer the findings and recommendations being familiar with the operations of the PWSA.

a. Article I, Section 1.01; Article V, Sections 5.01 and 5.03; and Article VII, Sections 7.07 and 7.10, discuss consulting engineer duties that are not included in the scope of service or discussions herein; however, the duties of the Consulting Engineer mentioned in Article VII, Section 7.11 of the 2019 Senior Indenture and Subordinate Indenture, including the following Consulting Engineers’ services: Provide advice and recommendations as to the proper maintenance, repair, and operation of the water and sewer systems during the next Fiscal Year and estimate the amounts of money that should be expended for such purposes.
b. Provide advice and recommendations as to the Capital Additions that should be made during the next Fiscal Year and estimate the amount of money that is recommended for such purposes.
c. Indicate whether the properties of the water and sewer systems have been maintained in good repair and sound operating condition and the Consulting Engineer’s estimate of the amount, if any, required to place such properties in such condition and the details of such expenditures and the approximate time required to do this.

In April of 2020 and throughout the preparation of this report, the Commonwealth of Pennsylvania and Allegheny County placed restrictions on travel and imposed work from home guidelines to combat the spread of COVID-19 infections. These restrictions prevented the Consulting Engineer from viewing the properties of the PWSA during 2020. As such, this 2020 Consulting Engineer’s Annual Report does not fully address the requirements of paragraph c above.

In this 2020 Consulting Engineer’s Annual Report, the Consulting Engineer describes a system that is functional but is currently subject to an Administrative Order and a Consent Order from the Pennsylvania Department of Environmental Protection to address numerous water system regulatory standards and other compliance requirements.

The water and sewer systems require upgrades to address end of useful life conditions and updates to current operational, regulatory, and safety standards. The PWSA’s water and sewer systems also include critical facilities which expose customers to the risk of loss of water if taken offline for repairs due to a lack of redundant facilities.

PWSA has been making great strides on most of the necessary upgrades and updates for these critical facilities. Highlights of PWSA’s work in 2020 include: continued progress on improvements to key components of the water treatment and distribution system, the initiation of

design work on critical water transmission system projects, and an achievement of reduction and compliance goals with required lead levels in the water distribution system.

Additionally, to sustain cost-effective operations while optimizing asset performance and life expectancy, significant structural, operational, and maintenance improvements are required and must be undertaken in the near-term to address long-standing deficiencies in both the water and sewer systems. PWSA has been making progress in addressing these deficiencies.

In the Cooperative Agreement executed on October 3, 2019, the PWSA and the City of Pittsburgh agreed upon their respective responsibilities associated with the division of services related to the system, payments, collections, cooperation by the City and PWSA in their respective capital projects that may impact each other, and the separate stormwater system within the City of Pittsburgh, and to confirm that the system will remain under public ownership.. The Cooperative Agreement states that PWSA will have responsibility for operations, maintenance, repair, and replacement of water mains and service lines, sanitary sewer and combined sewer mains and sewer laterals, and stormwater infrastructure in the 11 City parks that are 50 acres or greater. The City is treated like other commercial customers of PWSA with respect to water service lines and sewer laterals, with two exceptions: in the 11 City parks that are 50 acres or larger; and, the City's share of the cost is being phased in over five years, to become 100 percent in 2025 and thereafter. This 2020 Annual Report does not address complete City-wide stormwater management and improvements because, as described above, the PWSA does not have responsibility for all stormwater management and improvements in the City.

The Cooperative Agreement executed on October 3, 2019 constitutes a supplement to the original Cooperative Agreement within the meaning of PWSA's 2017 Amended and Restated Trust Indenture and 2019 Amended and Restated Subordinate Trust Indenture.

PWSA has stated that an agreement between the City of Pittsburgh and the PWSA will be developed that will assign responsibilities related to stormwater compliance and combined sewer system operations, maintenance, improvements, and compliance.

Water System

The PWSA's water treatment plant (drinking water) has the permitted capacity to provide 100 million gallons per day (MGD). The 2019 AWWA water audit showed that an average of 66.5 MGD was delivered to existing customers. The water system has the capacity to deliver adequate water supply to meet the demands of the customers into the foreseeable future, assuming the PWSA continues the rehabilitation and replacement program provided for in its ongoing Capital Improvement Program (CIP). The PWSA monitors water quality on a continuous basis for contaminants that may be present in source water prior to treatment, during treatment, and in finished water from the water treatment plant. This monitoring is necessary to verify that water quality meets or exceeds regulatory standards.

A major focus of the PWSA during 2020 was to reduce the number of public and private lead service lines within the water system, which would reduce the risk of lead lines leaching into the water supply. The program to reduce the presence of lead in the water supply is one of the PWSA's success stories for 2020, as it was in 2018 and 2019. Pursuant to a Consent Order and Agreement (COA) issued by the Pennsylvania Department of Environmental Protection (PADEP) on November 17, 2017, the PWSA was required to annually replace a specific number (ranging from approximately 900 to 1,600 each year) of public lead service lines. Through the PWSA's Lead Service Line Replacement (LSLR) Program, the PWSA succeeded in achieving the COA-mandated requirements for lead service line replacements in each of the past three

compliance years. The compliance year from July 1, 2019 through June 20, 2020 was the most productive year, when more than 3,200 public lead service lines were replaced, far surpassing the regulatory requirement of 900.

In 2020 to date (through October 21), PWSA has completed:

- 2,035 public service line replacements;
- 1,420 private side replacements;
- 147 public service lines replaced in the Individual LSLR (ILSLR) project;
- 196 private service lines replaced in the ILSLR project;
- 3,405 sites in the LSLR and ILSLR, and 4,342 sites including OPS and all relay projects.

Since July 1, 2016, PWSA has replaced a total of over 8,000 lead lines.

PWSA conducted two compliance water sampling rounds in December 2019 and June 2020, respectively, and the testing showed that lead concentrations were less than state and federal action levels, which indicated that the lead level in the water distribution system is back in compliance with the limit established by the United States Environmental Protection Agency (USEPA) and the PADEP. After these two consecutive testing events proved the lead levels in the system to be in compliance, PWSA is no longer required to replace 7 percent of the lead service lines in the system each year. Going forward, PWSA has stated they will continue to conduct aggressive water quality testing and work towards replacing all lead service lines by 2026. Starting in 2020, the lead service line replacement program was merged with the Small Diameter Water Main Replacement Program in order to more cost effectively replace lead lines as the small diameter mains are replaced. In most instances, the water mains that still have lead service lines are the oldest mains in the system and need to be replaced.

In addition to reducing the potential sources of lead in the distribution system by replacing lead service lines, the PWSA has been adding orthophosphate to the water supply to reduce leaching of lead into the water system from corrosion of lead lines. When orthophosphate is added to the water supply, it forms a coating on the interior of the distribution system pipes thereby reducing or controlling corrosion or leaching of lead from the pipes into the water distribution system. Chemical testing of tap water samples in PWSA's water distribution system in December 2019 and June 2020 demonstrated reduction of the presence of lead in tap water to levels below the current state and federal drinking water action level.

Wastewater and Stormwater System

An estimated 74 percent of the sewer collection system consists of combined sewers where sewage and storm water are conveyed in the same pipe. The collection system is designed so that during wet weather, a portion of the collected storm water and diluted wastewater is discharged to natural water courses through diversion chambers located throughout the sewer system including at connections to the Allegheny County Sanitary Authority (ALCOSAN) interceptors.

The combined sewer system is in satisfactory operating condition and has adequate capacity for the dry weather sewer flows. During any wet weather event, the sewer system is often taxed beyond its capacity, resulting in overflows, bypassing, and flooding. The PWSA's sewer system overflows are the subject of a 2004 Consent Order issued by the PADEP. Numerous projects have been identified to meet the terms of the 2004 Consent Order. Some of these projects have been started and some of these completed. The 2004 Consent Order has expired but a new

Consent Order and Agreement is expected to be negotiated with the USEPA in 2021 to require PWSA to continue to address these issues.

Approximately 26 percent of the sewer collection system consists of separate sanitary and storm sewers and sanitary pump stations. These systems are in satisfactory operating condition and have adequate capacity for dry weather flows. There are some localized areas in the sanitary sewer system that become overtaxed during wet weather. PWSA has made progress on their plan to rehabilitate sanitary sewers and pump stations and on meeting the regulatory requirements for operation of the storm sewers.

Several combined sewer overflow (CSO) abatement projects, basement flooding reduction projects, sewer rehabilitation, and stormwater infrastructure improvements are in various stages of design, construction, or regulatory review. These projects are expected to require significant operational and capital investments once the Consent Order and Agreement is finalized with the USEPA. The sewer system requires ongoing attention and funds from the CIP to correct existing deficiencies and repair, rehabilitate, and upgrade the system to meet regulatory requirements and reduce localized backups. If the Capital Improvement Program continues to fund the identified sewer system improvements and projects are implemented, it is anticipated that foreseeable future demands on the system can be met and progress can be made in working toward CSO compliance.

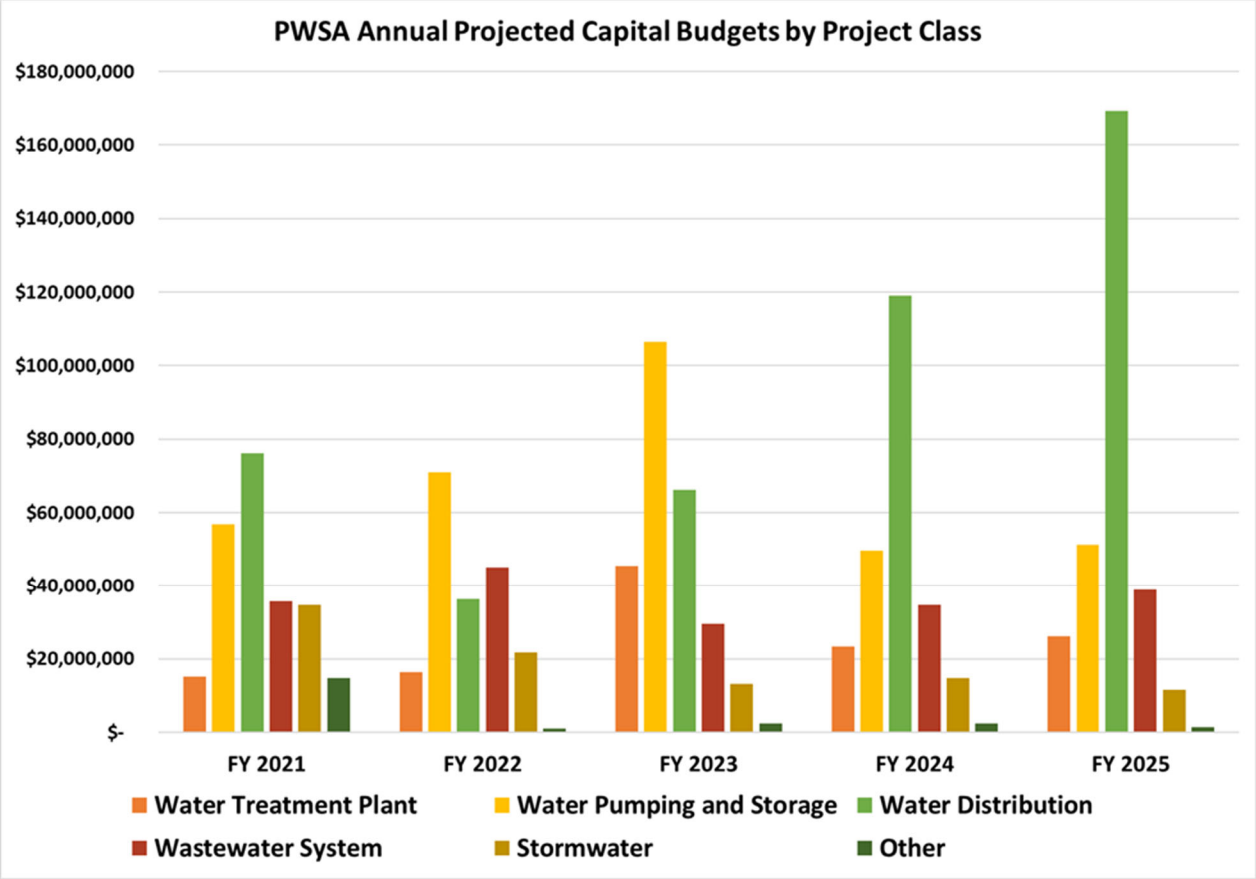
In summary, the PWSA has made progress during 2020. A few of the key progress points are:

- Advanced the CIP to address requirements of the Consent Orders and improve the water, sewer, and stormwater systems.
- Made organization changes to broaden the management team.
- Increased the number of staff.
- Made positive strides to improve maintenance and operation within the system.
- Improved compliance with regulations and Orders regarding abatement of lead, system resiliency, and overall water treatment and quality.
- Acted to improve sewer system repair and maintenance and compliance with stormwater regulations.
- Successfully developed and obtained Board approval for a robust PWSA 2021 – 2025 Capital Improvement Plan.

Capital Improvement Plan

Figure 1.1 presents an illustration of the CIP for the fiscal years 2021 through 2025 that was approved by the PWSA Board of Directors on September 25, 2020. The CIP is divided into six project classes: water treatment plant, water pumping and storage, water distribution system, wastewater system, stormwater system, and other projects.

Figure 1.1: PWSA Annual Projected Capital Budgets by Project Class



Mott MacDonald was authorized to begin preparation of the Annual Report of the Consulting Engineer on October 1, 2020. As of the date of this report, the 2021 operational budget has not yet been approved by the Board. We have attempted to compile and review as much information as available and speak to as many staff senior staff as we could, given the constraints of the COVID-19 work restrictions.

It is the Consulting Engineer's opinion, based upon our review of the financial summaries of the CIP expenditures during 2020, review of progress made on the CIP, review of the Board approved CIP for 2021 – 2025, and through interviews with key staff, that the PWSA is managing their systems, organization and finances to move the PWSA forward and provide improved water and sewer systems for their customers.

1 History and Background

1.1 General

In February 1984, the leadership of the City of Pittsburgh (City) formed The Pittsburgh Water and Sewer Authority (PWSA) under the provisions of the Pennsylvania Municipality Authorities Act, 53 Pa. C.S.A. §5601 et. seq. The PWSA's Articles of Incorporation were originally approved on February 17, 1984, by the Commonwealth of Pennsylvania. In 2008, the Commonwealth approved an Amendment to the Articles of Incorporation as adopted by the City and the PWSA to extend its term of existence to 2045 to ensure that its term covers the duration of certain bond obligations. In 2019, the Commonwealth of Pennsylvania approved an Amendment to the Articles of Incorporation as adopted by the City and the PWSA to extend its term of existence to March 19, 2070 and to include stormwater systems.

1.2 Initial Operation

Pursuant to a Lease and Management Agreement dated March 29, 1984, between the PWSA and the City (the "Lease and Management Agreement"), the water and sewer systems were leased to the PWSA and the PWSA took over operations of these systems on May 1, 1984.

Under the Lease and Management Agreement, the PWSA was authorized to operate and maintain the water and sewer systems, construct all necessary improvements, establish and collect rates and charges for its service, and finance its operations and improvements through revenue collections and sale of bonds and notes payable solely from the PWSA's revenues. The PWSA appointed and designated the City as the PWSA's agent to manage, operate, and maintain the water and sewer systems for the term of the lease, subject to the general supervision, direction, and the control of the PWSA. The City provided the services necessary to operate the water and sewer systems to the PWSA with the PWSA reimbursing the City for all expenses incurred and expended by the City.

The Capital Lease Agreement and Cooperation Agreement, each between the PWSA and the City, as authorized in Resolution No. 47 of 1995, terminated the Lease and Management Agreement. The Cooperation Agreement provided that the City render certain services to the PWSA as set forth in the agreement and provided the basis of payment for such services to be rendered by the City. As of January 1, 1995, all positions in the City Water Department and certain positions in the City Water and Sewer Division of the Department of Engineering and Construction were eliminated from the City's budget, and similar positions were created and filled by the PWSA. Under the terms of the Capital Lease Agreement, the PWSA will own the water and sewer systems on September 1, 2025 upon payment of $1.00.

1.3 Capital Improvement Program (CIP) Funding Sources

PWSA has employed various funding mechanisms since 1984 to fund their annual Capital Improvement Plans. Appendix B provides the history of the bond issuances and refunding from 1984 through 2013. Funding mechanisms from 2016 to the present are outlined as follows.

1.3.1 Revolving Line of Credit in 2016, 2018, and 2020

In July 2016 and pursuant to Resolution No. 36 of 2016, the PWSA entered a drawdown, revolving line of credit financing with JPMorgan Chase Bank NA. The maximum amount that can be drawn and outstanding at any one time is $80,000,000 and has an initial term of four

years. The PWSA is using funds borrowed under this vehicle to finance capital projects. The intention of the PWSA is to draw down this balance to near the facility's capacity and then to issue bonds to replenish the facility before using it again.

In June 2018 and pursuant to Resolution No. 63 of 2018, the PWSA amended the revolving line of credit financing agreement with JP Morgan Chase Bank NA to increase the maximum line of credit limit from $80,000,000 to $150,000,000. The JP Morgan line of credit expired in June 2020.

In June 2020, PWSA entered into a new revolving line of credit bank loan with PNC Bank National Association in an amount of $150,000,000 with a maturity date of June 23, 2023.

1.3.2 2017 Bond Refunding

In December 2017 and pursuant to Resolution No. 190 of 2017, the PWSA issued $165,390,000 Water and Sewer First Lien Revenue Refunding Bonds composed of Series A ($159,795,000) and Series B (taxable) ($5,595,000). The proceeds of the Bonds were used to fund the costs of the refunding of all or a portion of the PWSA's outstanding Series 1998B, 2008A, 2008D-1, and 2013B Water and Sewer System Revenue Bonds. The refunding was completed to reduce the PWSA's debt service payments over the next 15 years by approximately $6,275,000 and to obtain an economic gain (difference between present values of old debt and new debt service payments) of $5,311,111.

The 2017 A and B Bonds were issued at a bond premium of $23,374,000, which is being amortized as an adjustment to interest expense over the life of the Bonds.

The 2017 A and B Bonds at December 31, 2017 have carrying amounts of approximately $160 million and $5 million, respectively. The maturity value of defeased 2008-D1 Bonds outstanding at December 31, 2017 was $24,665,000.

In addition, the PWSA issued $218,805,000 Series C First Lien Revenue Refunding Bonds, the proceeds of which were used to fund the costs of refunding the PWSA's outstanding Series 2008 B-1, B-2, and D-2 Water and Sewer System Revenue Bonds. The refunding was completed to reduce the PWSA's debt service payments over the next 23 years by approximately $9,782,000 and to obtain an economic gain (difference between present values of old and new debt service payments) of $7,852,000.

The 2017 C Bonds at December 31, 2017 have a carrying amount of approximately $219 million. The 2017 C Bonds that have a mandatory tender on December 1, 2020 are being remarketed. Long-term fixed rate new money financing is intended to pay down all or a portion of the PNC capital line of credit. Anticipated debt issuance is $216,720,000 through PWSA Water and Sewer First Lien Revenue Refunding Bonds, Series C of 2017; remarketing is with a SIFMA Note Structure and a three-year term.

1.3.3 2019 Bond Issuance and Refunding

In July 2019 and pursuant to Resolution No. 62 of 2019, the PWSA issued $109,900,000 (fixed-rate) Series A First Lien Water and Sewer Revenue Bonds and $104,290,000 (fixed-rate) Series B Subordinate Water and Sewer Refunding Bonds. The proceeds from the Series A of 2019 Bonds were used to pay down the balance of the revolving line of credit. This increased the capacity on the revolving line of credit to allow the PWSA to continue funding capital projects. The proceeds from the Series B of 2019 were used to refund the PWSA's outstanding Series C-1 and C-2 of 2008 Water and Sewer System Revenue Bonds and terminating the associated swaps. The cost to terminate the swaps was $27,605,000, of which $5,700,000 was funded with

a cash contribution. The refunding was completed to reduce the PWSA's exposure from the risks associated with swaps.

1.3.4 2020 Anticipated Bond Issuance and Remarketing

Based on discussions with PWSA Directors and a review of the Board-approved actions as of September 25, 2020, on December 1, 2020, PWSA anticipates debt issuance of:

- $1,015,000 PWSA Water and Sewer System First Lien Revenue Bonds, Series A of 2020 (taxable), with one maturity on September 1, 2022. These taxable Series A Bonds will be used to pay the cost of issuance associated with remarketing Series C of 2017 Bonds.
- $109,500,000 PWSA Water and Sewer System First Lien Revenue Bonds, and Series B of 2020.
- $218,805,000 PWSA Water and Sewer System First Lien Revenue Bonds for the purpose of remarketing Series C of 2017 Bonds.

1.3.5 PENNVEST Funding

Act 16 of 1988 established the Pennsylvania Infrastructure Investment Authority (PENNVEST) to assist local governments in financing water and sewer projects. The PENNVEST Program provides loans and grants for acquisition, construction, improvement, expansion, extension, repair and/or rehabilitation of all or part of any water or sewer system. Funding under the PENNVEST Program is primarily in the form of low interest, 20-year loans.

In 2018, the PWSA applied for and received a significant funding package from PENNVEST for the ongoing Lead Service Line Replacement Program. The 2018 funding offered to the PWSA by PENNVEST consists of $13,687,173 in grants and $35,441,231 in low interest loans with a total funded amount of $49,128,404. These moneys have been used for continuing the Lead Service Line Replacement (LSLR) Program in 2019 and for a portion of 2020. The LSLR program is detailed in Section 2.2.2.

In 2019, the PWSA applied for and received a significant loan package from PENNVEST for continuing the lead service line replacements, which are transitioning to become part of the Small Diameter Water Main Replacement (SDWMR) Program. The 2020 funding offered to the PWSA by PENNVEST is $65,220,000 as a low interest loan. This loan has been used for the small diameter water main replacements in 2019 and 2020. The LSLR and the SDWMR programs are detailed in Section 2.2.2.

Table 1.1 summarizes the active and complete PENNVEST loans secured by the PWSA.

Table 1.1: PENNVEST loans

Project name	Project type	Loan approval date	Status	Loan amount[1]
Railside Street Sanitary Sewer Ext.	Wastewater	11/15/00	Complete	$158,399.23
Ollie Street & Overbrook Blvd. Storm Sewer	Storm	11/15/00	Complete	$800,963.48
Water System Improvements No. 1	Water	3/21/01	Complete	$3,940,113.91
Streets Run Interceptor	Wastewater	7/18/01	Complete	$1,928,470.44
Water System Improvements No. 2	Water	3/20/02	Complete	$5,112,263.50
Water System Improvements No. 3	Water	7/17/02	Complete	$4,821,500.00
Sewer System Improvements – Phase I	Wastewater	10/27/08	Complete	$4,672,410.00
Sewer System Improvements – Phase II	Wastewater	4/20/09	Complete	$10,264,250.00
Sewer System Improvements – Phase III	Wastewater	7/21/09	Complete	$4,865,613.00
Water System Improvements – Phase V	Water	4/20/09	Complete	$8,613,546.00
Water System Improvements – Phase VI	Water	7/21/09	Complete	$8,393,478.00
Sewer System Improvements – Phase IV	Wastewater	1/22/13	Complete	$3,275,316.00
Water System Improvements – Phase VII	Water	1/22/13	Complete	$2,713,065.00
Water System Improvements – Phase VIII	Water	4/24/13	Complete	$3,813,561.00
Lower Hill Sewer Infrastructure Project Phase 1A	Wastewater	10/23/13	Complete	$1,712,506.00
COA Storm Sewer Separation Project 2013	Storm	10/23/13	Complete	$2,361,405.00
Lead Service Line Replacements	Water	10/17/18	Active	$35,441,231.00
Small Diameter Water Main Replacement Program	Water	1/29/20	Active	$65,220,000.00
		Total PENNVEST Funding		**$102,888,091.56**

[1] Loan amount shown is final loan amount for completed project or original approved loan amount for active projects. Table 1.1 does not include grant funds.

1.4 Water System Background

The Allegheny River provides the sole source of water for the system. The Pennsylvania Department of Environmental Protection (PADEP) issued a Water Allocation Permit to the PWSA in March 1989, which allows for water withdrawal of up to 100 MGD from the river. The PADEP has advised the PWSA that the permitted allocation would be re-evaluated in the future if the PWSA's demand increases because of growth within the City or through the sale of water to surrounding municipalities.

The PWSA, through its water supply and distribution system, provides water service to more than 300,000 people and over 81,000 service line connections to residential, commercial, industrial and public customers with potable water and water for fire protection within the geographic boundaries of the City and surrounding areas. The system consists of:

- Rapid sand-type water treatment plant with a maximum capacity of 117 million gallons per day
- 20.8 MGD microfiltration water treatment plant that returned to service on September 14, 2020 after improvements and rehabilitation were completed.
- Approximately 964 miles of water mains
- Over 32,000 valves and hydrants
- Raw water pump station located along the Allegheny River
- Ten finished water pump stations
- Three finished water reservoirs

- Source water reservoir
- 13 storage tanks at 9 sites

The total storage capacity of the reservoirs and the tanks is approximately 455 million gallons. The useable storage capacity within the reservoir and tank system provides adequate volume and pressure under normal water usage for the equivalent of about two days.

The Pennsylvania-American Water Company (PAAW) supplies water to approximately 26,000 customers in the southern and western sections of the City. The PWSA provides sewer conveyance to these customers. The PWSA previously had an agreement with PAAW to subsidize the water purchased for these PWSA customers because PAAW has a higher rate for water than the PWSA. As part of the PWSA compliance filing with the PA Public Utility Commission (PUC) at Docket No. M-2018-2640802, effective January 1, 2020, the PAAW subsidy was eliminated. This filing was supported by the PUC to ensure an appropriate cost of service model was implemented across the service area.

Two additional small areas, one in the eastern part of the City and the other in the western end of the City, are served by the Wilkinsburg-Penn Joint Water Authority and the West View Water Authority, respectively. In each of these areas, the respective independent water purveyor owns and maintains the distribution system elements such as the waterlines, valves, hydrants and other equipment. In addition, the PWSA, through interconnections with other systems, provides bulk water supply to Aspinwall, Fox Chapel, and Reserve Township, and emergency use water to several adjacent municipalities.

1.4.1 PADEP Administrative Order, April 2016

In April 2016, the PWSA received an Administrative Order from PADEP for violations under the Pennsylvania Safe Drinking Water Act and regulations related to a modification of corrosion control treatment chemical in 2014. The PWSA reinstituted the original corrosion control chemical in early 2016 and is fully cooperating with PADEP and the components of the Order. The PWSA completed a corrosion control study in 2017. The recommendations included the introduction of orthophosphate into the system at strategic locations to reduce corrosion and help control lead levels. In 2019, four orthophosphate systems were placed into service. These corrosion control systems have decreased the lead concentration and the corrosion in the water distribution system over the past year. Significant progress has been made. Since June 2016, PWSA has replaced over 8,000 lead lines. Two Lead and Copper Rule (LCR) compliance sampling rounds were completed in December 2019 and June 2020, respectively, and the testing showed that lead concentrations in the water distribution system were less than state and federal action levels. The lead levels in the water distribution system indicated compliance with USEPA and PADEP regulatory standards. PWSA has stated they will continue to conduct aggressive water quality testing and work towards replacing all lead service lines by 2026. The lead line inventory, tracking, and mapping will continue through December 2020. There is one remaining requirement on the Administrative Order that PWSA is working on, and this is due in December 2022.

1.4.2 September 6, 2019 Consent Order and Agreement

On September 6, 2019, the PWSA entered into a Consent Order and Agreement (COA) with PADEP in the matter of “violations of the Pennsylvania Safe Drinking Water Act and the Rules and Regulations Promulgated Pursuant Thereto.” The COA mandates that the PWSA take action to implement a previously recommended clearwell improvement plan and eliminate “washout” cross-connections (washouts are used to drain or flush the water system).

The issues surrounding the clearwell have been studied by technical experts from four different consultants since 1998. Marion Hill Associates found that the clearwell was structurally stable but identified areas of concern including, but not limited to: build-up of sediment in the bottom of the tank prohibiting inspection; infiltrating tree roots; erosion evidence, deterioration and cracks in the concrete walls; clearwell equalization chamber leaks and rusted gates on the clearwell and gatehouse. The other three consultants provided reports in 2008 and 2017 that focused on available alternatives to address, as one of the reports stated, “PWSA’s desires to have a clearwell system with the operational flexibility of being able to remove approximately one half of the clearwell from service for cleaning and maintenance while the other half remains in service; and to have the ability to bypass the clearwell and send filtered water directly to the Bruecken Pump Station in emergency situations.”

The September 2019 COA establishes the requirements to bring the PWSA clearwell and cross-connection systems into compliance along with a timeline for the improvements.

Table 1.2 provides an overview of the requirements and due dates from the September 6, 2019 Consent Order and Agreement and the 90-day extension for some of the requirements granted on May 13, 2020 by PADEP because of COVID-19.

In order to meet the requirements of the COA, the PWSA will need to complete three additional support projects including the Aspinwall Water Treatment Plant Electrical and Backup Power Improvements, the Highland Reservoir Pump Station and Rising Main, and the booster chlorination system portion of the Lanpher Reservoir Improvements. The PWSA developed a timeline in order to accomplish these requirements as shown in Table 1.3: PADEP Consent Order Related Capital Projects Schedule. For some of the projects, schedule dates were adjusted to reflect a 90-day extension granted by PADEP on May 13, 2020 because of COVID-19.

During interviews conducted in October 2020, PWSA stated that all COA projects have been started, with the exception of the Clearwell improvements project (replacement of the Clearwell).

Table 1.2: Subject and Location of COA Requirements

	Requirement	Design/permit date and construction complete date (construction starts after permit approval)	COA Section Reference
Aspinwall WTP Clearwell bypass	Design, permit, and construct bypass system that will enable the PWSA to remove the Clearwell from service and replace it.	January 1, 2023 Construction permit issue date plus 2 years	#3a & #3b
Rehabilitate or replace Rising Main #3 to Highland 2 Reservoir	Design, permit, and construct rehabilitation or replacement of Rising Main #3.	November 30, 2020 March 1, 2021 Construction permit issue date plus 1 year	#3c(i) and (ii) & #3d
Rehabilitate or replace Rising Main #4 to Highland 2 Reservoir	Design, permit, and construct rehabilitation or replacement of Rising Main #4 to Highland 2 Reservoir to facilitate the Clearwell bypass system.	June 1, 2021 Construction permit issue date plus 2 years	#3e & #3f
Aspinwall Pump Station to Lanpher Rising Main	Design, permit, and construct second rising main from Aspinwall Pump Station to the Lanpher Reservoir.	April 1, 2021 Construction permit issue date plus 2 years	#3g
Replace the cover and liner of the Highland 2 Reservoir to facilitate the Clearwell bypass system	Design, permit, and construct replacement of the cover and liner of the Highland 2 Reservoir to facilitate the Clearwell bypass system.	June 30, 2020 Construction permit issue date plus 18 months	#3i & #3j
Replace or rehabilitate the Aspinwall and Bruecken Pump Stations	Design, permit, and construct a combined pump station to replace the existing Aspinwall and Bruecken Pump Stations OR Design, permit, and construct the rehabilitation of the existing Aspinwall and Bruecken Pump Stations.	April 1, 2021 Construction permit issue date plus 2 years	#3k (i) and (ii) & #3l
Replace the Clearwell and begin Clearwell operations	Design, permit, and construct the replacement of the Clearwell.	January 1, 2024 Construction permit issue date plus 2 years Within 30 days of operation permit issuing from PADEP	#3m & #3n
Cross Connections Investigation and Report	Complete an investigation of the locations where valves, blow-offs, meters or other such appurtenances to the distribution system are found within chambers, pits or manholes connected directly or indirectly to any storm drain or sanitary sewer and submit a report detailing the findings, including the number and locations of all such cross-connections within the PWSA system.	August 30, 2020	#3q
Cross Connection Elimination Action Plan and Schedule	Submit to the Department a plan and proposed schedule to eliminate all the identified cross-connections including whether the requested modification to eliminate each cross-connection identified in the report constitutes a major or minor change.	Within 90 days of Cross Connection Investigation Report submittal	#3r

Cross Connections Permits	For any modification the Department determines to require a permit, submit a complete and technically sufficient application to the Department for a construction permit.	Within 60 days of the issue date of the written determination.	#3s
Cross Connection Elimination	Design, permit and eliminate all identified cross connections.	Consistent with the cross-connection elimination plan and as approved or as modified and approved by the Department	#3t
Cross Connection Elimination Report	Submit a report confirming the elimination of all previously existing cross-connections. Report includes confirmatory photographs, dates and details of the corrective work performed.	Within 90 days of completion of cross-connection elimination	#3t

Table 1.3: PADEP Consent Order Related Capital Projects Schedule (9/6/19 Signed COA, Revised 5/13/20 for COVID-19 Extension)

Description	Design Start Date	Design Complete	Submit Construction Permit	Construction Permit Issued (Projected)	Construction Complete	Design (days)	Construct (days)
Projects specifically stated in COA							
Rising Main 3 – Rehabilitation	11/1/2019	10/30/2020	11/30/2020	2/28/2021	2/28/2022	364	365
Rising Main 3 – Replacement	11/1/2019	4/30/2021	3/1/2021	5/30/2021	5/30/2022	546	365
Highland No. 2 Reservoir Improvements (Liner and Cover Replacement)	9/30/2019	8/28/2020	6/30/2020	9/28/2020	3/29/2022	333	547
Rising Main 4 – Rehabilitation	6/1/2020	7/30/2021	6/1/2021	8/30/2021	8/30/2023	424	730
Rising Main 4 – Replacement	1/31/2020	7/30/2021	6/1/2021	8/30/2021	8/30/2023	546	730
Aspinwall Pump Station to Lanpher Reservoir Rising Main	1/1/2019	12/1/2020	3/31/2021	6/29/2021	6/29/2023	700	730
Aspinwall Pump Station Improvements	1/2/2020	2/26/2021	4/1/2021	6/30/2021	6/30/2023	421	730
Bruecken Pump Station Improvements	1/2/2020	2/26/2021	4/1/2021	6/30/2021	6/30/2023	421	730
Aspinwall WTP Clearwell Bypass (Emergency Response)	1/3/2022	3/3/2023	12/30/2022	3/30/2023	3/29/2025	424	730
Aspinwall WTP Clearwell Improvements (Replacement)	1/2/2023	3/1/2024	1/1/2024	3/31/2024	3/31/2026	424	730
PWSA-identified projects necessary to support COA projects (not stated in COA)							
Aspinwall Water Treatment Plant Electrical and Backup Power Improvements	1/1/2020	TBD	TBD	TBD	TBD	365	730
Highland Reservoir Pump Station and Rising Main	10/1/2018	TBD	TBD	TBD	TBD	562	730
Lanpher Reservoir Improvements - booster chlorination system		Design in progress	TBD	TBD	TBD	TBD	TBD

1.5 Wastewater System and Stormwater System Background

The PWSA sewer system conveys wastewater collected from 24 neighboring suburban municipalities and wastewater generated by 306,000 residents and businesses within the City boundaries to the Allegheny County Sanitary Authority's (ALCOSAN) interceptors. The ALCOSAN interceptors are located along the rivers and tributaries for conveyance to ALCOSAN's Wastewater Treatment Facility (WWTF) for treatment prior to discharge into the Ohio River. As a point of reference, the ALCOSAN WWTF is operating in compliance with the National Pollutant Discharge Elimination System (NPDES) under Permit No. 0025984. In total, the ALCOSAN WWTF receives wastewater flows from 83 municipalities and authorities in the region. ALCOSAN also conducts enforcement of industrial pretreatment in the PWSA's service area.

The PWSA's sewer collection system serves over 109,000 customers and includes:

- An extensive network of approximately 1,226 miles of sanitary, storm, and combined sewers
- 29,314 manholes (includes flow dividers and diversion chambers)
- 24,571 inlets (includes catch basins and storm inlets; excludes private inlets)
- 100 combined sewer overflow (CSO) diversion chambers
- 77 CSO outfalls (including 1 co-owned and 42 CSO outfalls redefined to PWSA in 2019)
- 199 storm sewer outfalls
- Four wastewater pump stations and ancillary facilities

Approximately 74 percent of the sewer system has combined sewers designed so during wet weather events, when capacity in the combined sewer pipes is exceeded, a portion of the collected storm water and diluted wastewater is discharged into natural watercourses through 100 CSO diversion chambers. PADEP issued CSO NPDES Permit PA0217611 to PWSA and the City (as co-permittees), with an effective date of May 1, 2004. PADEP has administratively extended this permit since April 30, 2009. PWSA continues to prioritize work associated with the compliance requirements in the CSO NPDES Permit.

Approximately 26 percent of the sewer system consists of separate sewers that are dedicated sanitary sewer and storm sewer pipelines; however, as redevelopment occurs in the City and portions of the combined sewer system are replaced by separate sewer systems, the percentage of separate sanitary and storm sewers is gradually increasing.

PADEP issued the most recent Municipal Separate Storm Sewer System (MS4) NPDES Permit PAI136133 to PWSA and the City (as co-permittees), with an effective date of July 1, 2020. PWSA continues to prioritize the MS4 compliance requirements in the MS4 NPDES Permit. PWSA has made great progress with MS4 compliance in the last three years. PWSA is currently working with the City on an extensive process to update ordinances and create a Unified Stormwater Code.

In 2020, 310 feet of stream restoration was completed at two sites along Saw Mill Run. The heavily eroded streambank was stabilized to improve water quality by reducing sediment loads to Saw Mill Run. As part of PWSA's MS4 permit with the City, PADEP requires implementation of stormwater management practices to reduce the amount of sediment that enters the stream from the storm sewer system.

The 24 neighboring municipalities combined and sanitary-only sewer system connections to the PWSA collection system were established pursuant to agreements with the City to convey their

wastewater to the ALCOSAN WWTF. While some agreements specify sharing of the costs associated with construction and maintenance of the trunk sewers carrying this sewage flow, most do not.

The sewer system has adequate capacity to convey dry weather wastewater flows; however, during wet weather events, the system often exceeds its capacity, which results in overflows, bypassing, and flooding.

The US Environmental Protection Agency had adopted regulations regarding overflows from combined sewer outfalls during events that result in the discharge of untreated sanitary sewage into receiving waters. These CSOs contain pollutants that are present in domestic and industrial wastewater, as well as those in urban storm water. The USEPA regulations require owners of any sewer system having CSOs to acquire NPDES discharge permits for each overflow site. PWSA's CSO permit requires the implementation of the USEPA's "Nine Minimum Control Measures" (NMCs). The NMCs define the basic steps for maintaining the combined sewer system in proper operational order and identifying potential areas requiring updates and repairs.

During dry weather conditions, the ALCOSAN interceptor system is designed to intercept wastewater flows from the City and surrounding municipalities and convey the flows to the ALCOSAN WWTF. This system includes shallow-cut pipes, deep tunnels, and diversion structures. During wet weather conditions, the flow diversion structures (which are maintained by ALCOSAN, the PWSA, and other municipalities) limit or "regulate" the amount of combined sewage that enters trunk sewers and ALCOSAN's interceptor system. In addition, there are regulator points in the sanitary sewer system that relieve or overflow untreated sewage (sanitary sewer overflows or SSOs) to the nearest water body when the systems are overtaxed. ALCOSAN's WWTF has a NPDES permitted dry weather capacity of 190 MGD and wet weather capacity of 250 MGD. Currently, the ALCOSAN WWTF is operating at capacity. The flow regulation at the plant limits peak wet weather flow to the permitted capacity. The combined sewage that exceeds the capacity of the flow regulators at the trunk sewers, interceptors, and treatment plant is discharged as CSOs to the receiving waters of the Commonwealth. ALCOSAN maintains 53 diversion structures, and an additional 153 diversion structures are maintained by the PWSA and other municipalities and authorities. In 2020, ALCOSAN signed a Consent Order, which PWSA is not a party to, and ALCOSAN will be increasing the WWTF capacity in coming years.

1.5.1 Administrative Consent Orders and Consent Order and Agreements

Administrative Consent Orders (ACOs) and Consent Order and Agreements (COAs) were issued in early 2004 to the City of Pittsburgh and the other 82 communities tributary to ALCOSAN. The Orders directed compliance with the Pennsylvania Clean Streams Law of 1937 and the Federal Clean Water Act, to eliminate SSOs, and fulfil the Pennsylvania and USEPA CSO Policy obligations. The ACOs were issued to separate sewer communities by the Allegheny County Health Department (ACHD) and the COAs were issued to combined sewer communities by the PADEP. The initial COA among the PWSA, the City of Pittsburgh, PADEP, and ACHD was entered on January 29, 2004, and later amended in July 2007. The original Orders required communities to complete the following activities:

- Assess and map the sewer collection system
- Clean and televise the sewer collection system
- Make critical repairs
- Conduct flow monitoring
- Develop a long-term wet weather control plan in conjunction with ALCOSAN

The PWSA has completed the Consent Order's compliance requirements, including the preparation and submission of a Wet Weather Feasibility Study on July 31, 2013. The submitted Feasibility Study proposes the use of green infrastructure and integrated watershed management (IWM) to assist in the control of combined sewer overflows. The integrated approach, which utilizes a combination of 'green' and 'gray' solutions to address combined sewer overflows, considers all types of pollutant sources in the watershed to holistically address water quality challenges.

On March 27, 2015, PADEP sent a letter to all ALCOSAN customer municipalities and authorities setting forth a procedure to provide additional time to explore flow reduction. The obligations of the COAs and ACOs, as amended, terminated on March 30, 2015. In mid-2015, the City of Pittsburgh and the PWSA requested to work with USEPA rather than PADEP on future orders and agreements relating to wet weather overflows. In late 2015, 82 municipalities in the ALCOSAN service area (all municipalities except Pittsburgh) received new COAs outlining Corrective Actions with a due date of December 1, 2017. The Corrective Actions included development of a Source Reduction Study that identified the types of projects that will most effectively reduce flows in the sewer system and at least one flow reduction demonstration project.

1.5.2 USEPA 308 Information Request

In January 2016, the PWSA and the City received an Information Request from the USEPA under Section 308 of the Clean Water Act. PWSA's work was completed and submitted to the USEPA and PADEP on December 1, 2017. The PWSA is advancing selected source reduction projects in situations where hydraulically they make sense and are cost effective. PWSA continues to prioritize the ongoing reporting compliance requirements required by the USEPA 308 Information Request. USEPA representatives have indicated that negotiations to develop a consent order with the PWSA and the City related to CSO compliance will begin in the near future.

1.6 Staffing

The PWSA employs 349 people (as of September 2020) and projects a total workforce of over 500 employees by the year 2025. In 2020, the PWSA is projected to hire approximately 20 new employees. A new Executive Director and Deputy Executive Director have begun their roles in 2020. PWSA's Compliance group has increased to five staff members in 2020. PWSA has posted approximately 15 open staff positions such as Senior Group Manager-Stormwater, Project Manager, and Inspectors.

2 Maintenance, Repair and Operation of the Water, Wastewater, and Stormwater Systems

Three primary sources of information were used to construct the findings and recommendations of Section 2 for the maintenance, repair, and operation of the water and sewer systems:

1. Discussions with PWSA directors and other staff in October 2020 to have a dialogue and obtain current data;
2. *Draft Consulting Engineer's 2015 Facility Conditions Assessment Report* submitted to the PWSA in May 2015; and,
3. *Consulting Engineer's 2016 Facility Conditions Assessment Report* submitted to the PWSA in October 2016.

PWSA's work to maintain and renew the water, wastewater, and stormwater infrastructure is divided into operating expenses and capital expenses. Operating expenses include routine maintenance and repair work that allows the systems to operate as designed. The operating budget funds expenses such as smaller scale water and sewer main repairs, catch basin cleaning, water treatment chemicals, vehicles, and employee salaries and benefits. Given the advanced age of much of the infrastructure, investing in maintenance is not enough. For this reason, the Capital Improvement Plan consists of prioritized projects intended to replace and upgrade key infrastructure. The 2021-2025 Capital Improvement Plan is discussed primarily in Section 3 of this report. However, the allocation of funds for future projects is relevant to the information in Section 2.

PWSA has experienced modest effects from the pandemic in 2020. There were some projects that were delayed for 2 or 3 months, but by June 2020, projects were active. There have been no layoffs because of the pandemic. PWSA stated as of September 30, 2020 that because of the pandemic in 2020, there has been a modest reduction (3 percent) in revenues from water and sewer billings. PWSA is closely tracking the revenues from billings and has taken this into account when developing the 2021 capital and operating budgets.

PWSA's Operation and Maintenance (O&M) budget for 2021 will not be available until December 18, 2020; therefore, it was unavailable when this report was prepared.

2.1 Findings on Current Maintenance, Repair, and Operation of the Water and Sewer Systems

In April 2015, Mott MacDonald conducted a Facility Physical Condition Assessment of some of the PWSA's "vertical" facilities to evaluate the condition of each of the facilities. The facilities that were evaluated, and the type of evaluation conducted, whether it was the general physical condition, operations, maintenance, or health and safety, are listed in Table 2.1. The 2015 evaluations were generally defined as follows:

- General Physical Condition: Condition of the physical building such as (but not limited to) walls, foundation, floors, ceiling, roof, doors, windows, access road, grounds, lighting, signage, parking, and overall condition of the interior and exterior of the facility.

- Operations: Condition of operational components such as (but not limited to) equipment, pumps, electrical controls, wiring, gauges, valves, controls, supports, piping, platforms, tanks, containers, lifts, cranes, special equipment, and overall operation of the facility.
- Maintenance: Condition of the facility in respect to (but not limited to) general cleanliness; condition and location of stored materials; leaks; drips; puddles; accessibility; temperature; humidity; condition and operability of fans; heaters; lighting and overall maintenance of the building and grounds.
- Health and Safety: Condition of safety considerations such as (but not limited to) railing, ramps, lights, alarms, detectors, signage, clear pathways, clearances, warning signs and labels, training, and posted procedures.

The 2015 investigation included site visits, review of previous inspection reports, and limited personnel interviews. The 2015 site visits provided an opportunity to visually inspect the equipment, interview staff on the condition of the assets, and determine a condition score for each component of the facility. Confined spaces were not entered, and equipment was not operated.

Table 2.1: Limited Facility Physical Condition Assessment Locations in 2015 and Current Status

Facility	Current Status
Aspinwall Pump Station (subject of COA)	Design in progress
Brashear Chlorine Booster	Design Contract Awarded
Bedford Chlorine Booster	Design Contract Awarded
Bruecken Pump Station (subject of COA)	Design in progress
Herron Hill Pump Station	In CIP FY2023-FY2025
Highland, Howard, and Lincoln Pump Station (PS)	Howard PS – In CIP FY2024-FY2025; Lincoln PS – design in progress
Highland Reservoir No. 1	Construction contract awarded
Highland Reservoir No. 1 Membrane Filtration Plant	Completed in September 2020
Highland Reservoir No. 2 Chlorine Booster Station	Design Contract Awarded
Lanpher Reservoir	Construction of liner and cover complete; design underway for sodium hypochlorite building and ancillary items
McNaugher Tank	
Mission Pump Station	In CIP FY2023-FY2025
Saline Pump Station	In CIP FY2022
Various Reservoirs (Herron Hill, Highland No. 2, Lanpher (subject of COA)	Herron Hill in construction; Highland 2 and Lanpher – construction contracts awarded
WTP – West Raw Water Intake Structure	In CIP FY2021-FY2025
WTP – East Raw Water Intake	In CIP FY2021-FY2025
WTP – Walkway from Ross to clarifiers	
WTP – Clarifier No. 2	Construction
WTP – Clarifier Flumes	

Facility	Current Status
WTP – Gas Building	
WTP – Clearwell (subject of COA)	
WTP – Emergency Access Tunnel	
WTP – Chemical Feed - Carbon	Construction
WTP – Mechanical Room	In CIP FY2021
WTP – Sedimentation Basins	
WTP – Site and Grounds	
Browns Hill Road Pump Station	In CIP FY2023-FY2025
Lincoln Place (Mifflin Road) Pump Station	In CIP FY2021-FY2025
Central Warehouse	In CIP FY2021
Various Facilities – Pump Component Deficiencies	
Various Facilities – Electrical Deficiencies	
Various Facilities – Vegetation	
Various Facilities – Defective Downspouts	
Various Facilities – Roof Deficiencies	2 roof replacements in CIP FY2021
Various Facilities – Emergency Light Fixtures	
Various Facilities – Spill Containment	

Detailed investigation findings, which can be found in the *Draft Consulting Engineer's Facility Physical Condition Assessment Report* dated May 20, 2015, and the *Consulting Engineer's 2016 Facility Conditions Assessment Report* dated October 7, 2016 are presented by facility and identify the various components of the facility, suggested corrective actions to address observed deficiencies, and condition scores.

PWSA has been inspecting facilities individually as part of the design process when a particular facility is being renovated. The Director of Health and Safety is performing safety inspections.

A full facility physical condition assessment of each of PWSA's facilities has not been conducted since the findings of the 2015 Assessment were reported. To date, significant improvements have been made to address the deficiencies outlined in the 2015 Assessment. However, these improvements have not been documented in a comprehensive document. If detailed comprehensive assessments are completed as part of design projects, the assessments should be documented. Detailed finished water pump station assessments were started in late 2016. We suggest that the PWSA conduct a comprehensive assessment on all of their facilities, including electrical, structural, and security systems, a review for compliance with the American with Disabilities Act, the presence of lead paint, and the presence of asbestos building materials.

PWSA Operations and Maintenance staff report that the organization is focused on goals for maintenance and repair rates, customer service, and the reporting measures that are required in the Compliance Plan established by the Pennsylvania PUC. Overall, there are approximately 60 performance metrics that the PWSA is required to report to the PUC. Examples include valve turning and hydrant flushing. The PWSA has created a new organizational performance

improvement dashboard called Headwaters and it is publicly available on the PWSA website. The dashboard provides a snapshot of PWSA's progress related to several metrics that are being measured and tracked: number of lead service line replacements (PWSA side); four metrics for customer communications; number of water meters repaired or replaced; average number of training hours per employee per year; and, average length of service disruption. PWSA has exceeded the expectations for the metrics shown in the Headwaters webpage. For example, as of September 2020, 19,707 water meters have been repaired or replaced, compared to the goal of 16,500.

2.1.1 Water System Findings

Condition Assessments should be updated, and the critical needs of the facilities identified, and the repairs required to the facilities determined in order to maintain the facilities in good operating condition. Many of the recommended repairs and/or replacements are identified and prioritized in the 2021-2025 CIP. Water system projects in the 2021-2025 CIP consist of:

- 13 projects at the Water Treatment Plant, with estimated capital costs of $126,558,340.
- 22 water pumping and storage projects, with estimated capital costs of $334,992,169.
- 22 water distribution projects, with estimated capital costs of $467,037,906.

Water Treatment Plant improvements will be required to meet current and upcoming water quality regulations. There are several facilities that are in use beyond their useful lives and have not had a detailed condition assessment to check for major or moderate structural defects. Detailed analyses are required to determine actual conditions and appropriate maintenance and/or rehabilitation. In 2019, the PWSA completed development of a Water Distribution Master Plan. This plan included an assessment of each system within the storage and distribution system, and a plan to address noted deficiencies or required improvements. In the interim, needed maintenance and near-term capital improvements are moving forward.

The floating covers and liners on the water reservoirs had reached their normal life expectancy. Replacement of the cover and liner at the Lanpher Reservoir was completed in 2019, and other improvements at Lanpher Reservoir are scheduled in the CIP. Improvements are scheduled for Highland No. 2 Reservoir in the CIP; however, we recommend continued frequent visual inspections of the reservoir cover until it is replaced.

Water storage tank inspections are overdue for many of the 13 tanks in the PWSA system. Water storage tanks should be inspected every five years. Table 2.2 provides storage tank inspection and renovation information. Improvements for four water storage tanks (Garfield, Herron Hill, Lincoln, and Spring Hill) are identified in the CIP.

There are several facilities that have potential major to moderate structural defects as historically documented. Detailed structural analyses are required to determine current conditions.

Heating, ventilation, electrical, security, and auxiliary equipment have experienced significant deterioration and near-term maintenance and/or replacement is strongly advised.

Information provided by PWSA Engineering staff indicated that preventative maintenance such as roof repairs and other general facility maintenance is ongoing.

Emergency backup power is not available at most facilities and should be installed as soon as possible to ensure uninterrupted water supply. PWSA has been working with Duquesne Light Company on this item.

Table 2.2: Water Storage Tank Inspections and Renovations

Name	Type	Construction material	Year constructed	Last major renovation	Last known inspection date	Year inspection required*
Allentown Tanks (2)	Standpipe	Riveted steel	1939	2015	2019	2024
Bedford Tank	Standpipe	Welded steel	1993	N/A	2006	2011
Brashear Tanks (2)	Standpipe	Welded steel	Undetermined	2010	2006	2015
Garfield Tank	Elevated	Welded steel	1959	1992	2018	2023
Herron Hill Tank	Elevated	Welded steel	1967	2012	2008	2017
Lincoln Tank	Standpipe	Welded steel	1939	1982	2020	2023
McNaugher Tanks (2)	Standpipe	Concrete	1998	N/A	Undetermined	2017
Spring Hill Tanks (2)	Standpipe	Riveted steel	1928	1982	2006	2011
Squirrel Hill Tank	Standpipe	Welded steel	1939	2012	2008	2017

*Based on AWWA standard five-year inspection cycle.

The existing water distribution system has significant portions of the system operating beyond their useful lives. Preventative maintenance and/or replacement is strongly recommended in the near-term to ensure reliable water supply and public safety. A robust water distribution system replacement program is included in the CIP.

Inspection and condition assessment of below-ground infrastructure, pipelines, and storage facilities need to be conducted on a more frequent and routine basis.

Significant portions of the PWSA facilities and infrastructure are located outside of the public right-of-way, and easements have not been obtained. The PWSA should establish easements in ownership of all property where the PWSA facilities or infrastructure are located.

To prevent premature failure and undue deterioration of valves and hydrants, routine maintenance, testing, operation, and inspection should be increased in breadth and frequency.

Known changes in future water quality standards require a plan for implementing changed operating treatment materials and procedures. The PWSA has restored its pilot plant within the laboratory at the Water Treatment Plant as well as joined Partnership For Safe Water in order to prepare for these changes.

As described in Section 1.4.1, since 2016, PWSA has made significant progress with reducing lead levels in the water distribution system, by implementing corrosion control with the addition of orthophosphate in the water lines, and by replacing lead service lines. Highlights of PWSA's additional larger water system projects initiated in 2020 included the following awarded projects:

1. contract for urgent water repair
2. design contract for bus rapid transit water distribution improvements
3. contract for water valve replacement
4. contracts for continuation of lead service line replacement program
5. contract for lead service line identification program
6. design contract for corrosion control chemical storage and feed systems

7. design contract for additional work at the Highland Reservoir Pump Station and rising main, including addition of a new sodium hypochlorite disinfection system
8. contract for water sample collection and lead testing
9. design contract for lime slurry system improvements at the WTP
10. design contract for powdered activated carbon system improvements
11. design of Lanpher Reservoir improvements
12. multiple design contracts for small diameter water main replacements
13. two design contracts for clearwell emergency response project
14. two design contracts for Aspinwall Pump Station improvements
15. two design contracts for Bruecken Pump Station improvements
16. purchase order for the replacement of 240 membrane modules at the Membrane Filtration Plant
17. contract for replacement of small water meters
18. contract for Aspinwall utility water improvements
19. contract for water relay

2.1.2 Wastewater System and Stormwater System Findings

Condition assessments should continue to prioritize repairs.

The existing sewer system has significant portions of the system operating beyond their useful lives. Preventative maintenance and/or replacement is strongly recommended in the near-term to ensure reliable water supply and public safety.

Inspection and condition assessment of below-ground infrastructure, pipelines, and storage facilities must be conducted at a more rapid pace to complete an assessment of the entire system every five years as recommended by the AWWA. This work has moved forward; however, it is behind schedule.

The sewer system contains a significant number of “junctions” serving as sewer connections in place of manholes. These sewer connections are inaccessible for maintenance and repair purposes and should be avoided wherever possible. It is recommended that manholes are constructed instead of junctions. The maximum distance between manholes should be 400 feet, as per “Recommended Standards for Wastewater Facilities,” also known as “10 State Standards.”

Paragraph 7 of the 2004 Consent Order and Agreement requires all municipal catch basins within 100 feet of a sanitary sewer to be tested to verify that they are not connected to the sanitary sewer. The PWSA completed testing of the catch basins in 2011 and continues to disconnect catch basins which failed inspection.

Flooding has continued to be an issue in several parts of the service area during heavy rain events. The PWSA should continue to collaborate with the City and Pennsylvania Department of Transportation to mitigate flooding.

Negotiations are anticipated to begin in 2021 with USEPA and PWSA to develop a consent order for implementing CSO reductions. A CSO Long Term Control Plan (LTCP) has not been accepted by the USEPA for the City of Pittsburgh and the PWSA. This plan, once finalized and accepted, will create a significant draw on the PWSA resources.

Negotiations to develop a Consent Order are anticipated in 2021 among USEPA, the City of Pittsburgh, and PWSA to address deficiencies with the City of Pittsburgh’s MS4 compliance to date, particularly requirements for three Minimum Control Measures. It is expected that most of the work will be incurred by the City of Pittsburgh and PWSA’s efforts will be modest.

Current regulatory requirements defined in PWSA's and the City's MS4 NPDES Permit include 10 percent sediment reduction to be completed by June 30, 2025 in the Saw Mill Run watershed, the Streets Run-Monongahela River watershed, and the Chartiers Creek watershed.

PWSA is continuing to prioritize sewer rehabilitation projects, repairs for wastewater pump stations, and closed-circuit televising of sewers. Highlights of PWSA's larger sanitary, combined, and storm sewer system projects initiated in 2020 has included the following projects awarded:

1. continuation of Thomas and McPherson stormwater project
2. design contract for Four Mile Run stormwater infrastructure project
3. continuation of design contract for Woodland Road green infrastructure Phase 1 project
4. continuation of design contract for Saw Mill Run streambank stabilization project
5. contract for CSO flow monitoring program
6. design contract for M-29 outfall improvements
7. design contract for bus rapid transit stormwater infrastructure improvements
8. contract for continuation of storm CCTV and investigative work
9. three design contracts to address priority sewers under structures. Sewers under structures such as buildings, railroads, or bridges, or under major utilities or steep slopes are being prioritized for relocation or rehabilitation.
10. contract for sewer reconstruction of sanitary, storm, and combined sewers
11. multiple contracts for urgent sewer repairs or rehabilitation of sanitary, storm, or combined sewers
12. two design contracts for large diameter sewer rehabilitation
13. five design contracts for small diameter sewer rehabilitation
14. three construction contracts for small diameter sewer rehabilitation (two with defined areas and one with an indefinite quantity)
15. construction contract for manhole and sewer point repairs
16. contract for catch basin cleaning
17. two applications to ALCOSAN's GROW grant program for two stormwater management projects
18. three contracts for catch basin replacement and a contract for inlet replacement

The 2021-2025 CIP includes:

- 9 wastewater system projects, with estimated capital costs of $184,076,182.
- 19 stormwater system projects, with estimated capital costs of $95,899,955.

2.1.3 Information Management System Findings

Condition assessments should be updated on a priority basis to determine any changes in condition and to prioritize work on all facilities.

Continued reliance on existing information and lack of coordination between various information systems will result in incomplete communication of critical system information, slower responses to system deficiencies, and overall increased management and capital costs. Implementation of a Computerized Maintenance Management System (CMMS) would provide the ability for operations and engineering to make effective operating decisions, rank capital investments, improve customer service, and lower operation, maintenance, and capital costs. Also, this system would provide transparent access by all management at the PWSA to monitor project work, costs, and budgets.

In 2020, the PWSA implemented a mobile work order system called SpryMobile, which is a cloud-hosted maintenance management system that is interfaced with its customer information

system. This application enables real-time digital reporting using tablets for work orders, metering deployment, and equipment testing. PWSA Operations and Maintenance staff use this application daily for field inspections, for example, meters, leaks, non-revenue water, sewer televising, catch basins, and hydrants. PWSA can query orders and evaluate trends using the data captured in SpryMobile. In addition, the PWSA is in the beginning phases of implementing a series of other information management system upgrades that include Enterprise Resource Planning (ERP) system, Document Management Services (known as DocuWare), and Geographic Information System (GIS).

The PWSA built and calibrated a hydraulic water model using WaterGems by Bentley. This model work was completed in November 2019, and PWSA uses it frequently for water system analyses.

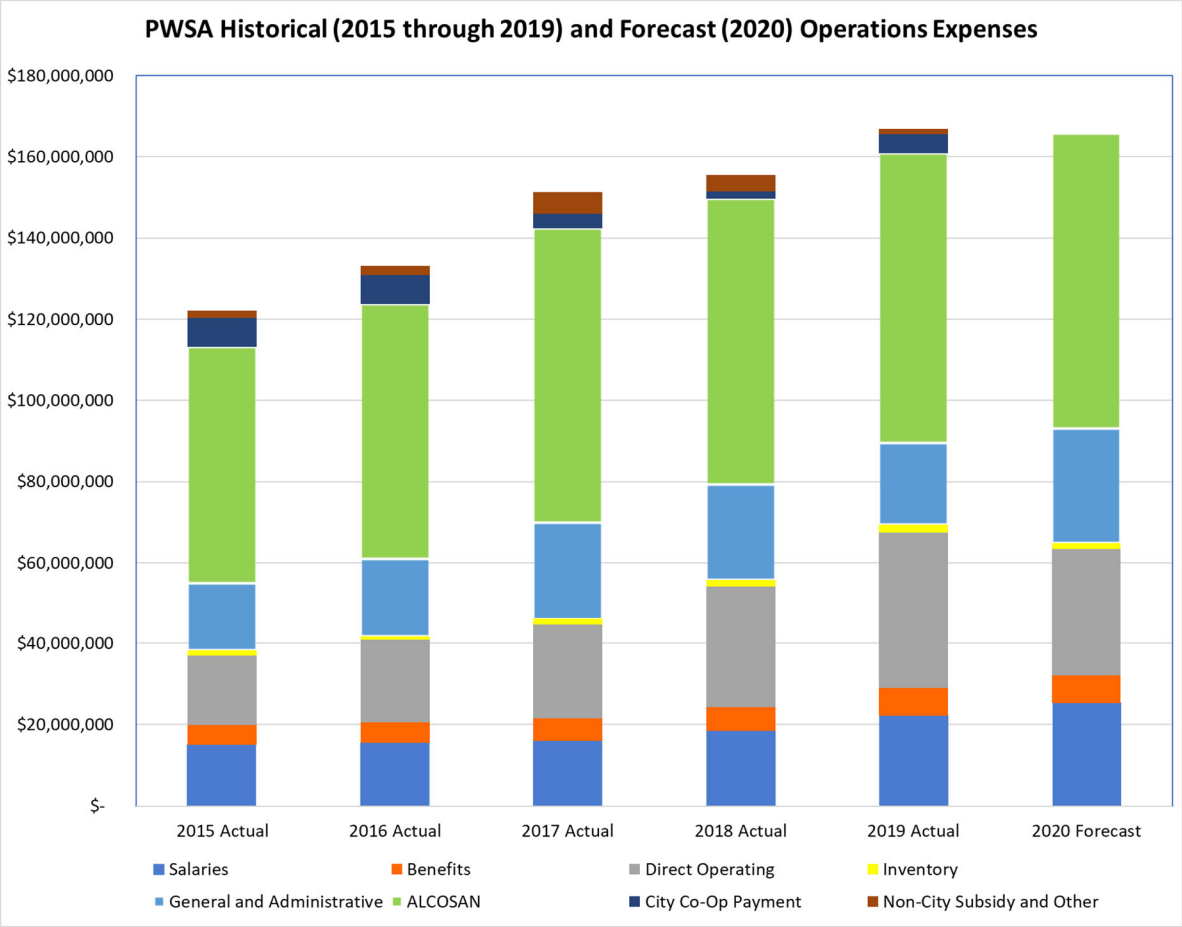
The PWSA's hydrologic and hydraulic sewer system model is a valuable tool for assessing and evaluating the sewer system and should be upgraded as necessary and maintained and updated on a regular basis. The existing sewer model is incomplete and PWSA is planning to build it out for all sewersheds and update the model to provide a calibrated tool for developing efficient CSO reduction projects compliant with the CSO LTCP. This effort will be completed in conjunction with the completion of development of the system master plan.

2.2 Recommendations for Maintenance, Repair and Operation of the Water, Wastewater, and Stormwater Systems during the 2021 Fiscal Year

As Consulting Engineer for the PWSA, Mott MacDonald recommends the PWSA advance the 5-year CIP, approved on September 25, 2020. The majority of the maintenance and operational issues previously identified are being addressed as separate tasks. In addition, this section contains suggestions and recommendations to be undertaken (or continued) during 2021 to improve PWSA's ability to provide a reliable source of potable water to its customers, provide reliable sewer system operations, and achieve compliance with the current and anticipated Consent Order requirements. Most of these recommendations are included in the CIP for 2021-2025.

Capital costs associated with these actions were estimated and used to assess the budget for the PWSA's CIP for 2021. Operational costs are shown in Figure 2.1 for the years from 2015 through 2019 (actual operations expenses) and for 2020 (forecasted operations expenses). The PWSA operations budget for 2021 will not be available until December 18, 2020. Operating expense increases over the past five years are mostly attributable to increased direct operating costs and labor costs. A significant increase in the number of employees is needed to effectively address the additional operations, monitoring, maintenance, and project management skills required to implement the CIP and the maintenance and operational improvements identified herein. For example, additional operations staff seems to be needed to assist engineering staff with providing valuable input in the design stage and reviewing design plans. The costs associated with the increased staff should be closely monitored during 2021 as the many programs are put into place. PWSA seeks to reduce operating expenses, for example, it has purchased its first electric vehicle and is monitoring its performance and expecting to see a reduction in fuel consumption.

Figure 2.1: PWSA Historical (2015 through 2019) and Forecast (2020) Operations Expenses[1]



[1] City Co-Op Payment and Non-City Subsidy and Other categories were eliminated by 2020.

PWSA should implement a program for conducting a comprehensive assessment of all of their facilities, including a review for compliance with the American with Disabilities Act, the presence of lead paint, and the presence of asbestos building materials.

2.2.1 Water System Recommendations

2.2.1.1 New and Priority Recommendations for 2021

Designate a leader and team from the operations staff to coordinate with compliance staff and to focus on system flushing, testing, monitoring, and tracking trends to optimize this work.

Designate a leader and team from the operations staff to coordinate with engineering staff and to focus on system improvements such as valve isolations for future work, putting new systems into service, and coordinating with design and construction services.

2.2.1.2 On-going Recommendations

Continue the Water Quality Initiative Program and adjust the program as necessary, depending on regulatory requirements and testing results. These types of requirements include lead and copper testing program for residential customers, continued optimization at the water treatment

plants, continuing the lead service line replacement assistance, replacing the PWSA-owned lead service lines, and continuing the public education program.

Continue to track and control “lost and unaccounted for” water, for example, water loss from water main breaks, flushing, or taking reservoirs out of service, through increased leak detection efforts, large meter calibration and/or replacement, and installation of meters on unmetered uses.

Continue frequent visual inspections of the reservoir covers until they are replaced. PWSA stated that they are conducting yearly maintenance of the covers, and there will be a maintenance contract out for bid in the near future.

Exercise distribution system valves and hydrants on a routine basis and implement a plan to exercise valves and sluice gates at the water treatment plant on a routine basis. Repair or replace non-operable valves and sluice gates at the water treatment plant and non-operable valves and hydrants in the system.

Perform inspections on the water storage tanks that are overdue or due as shown in Table 2.2.

Continue the routine maintenance program (in-house or through a third-party) to remove and prevent vine and vegetation growth from the vertical facilities and perform detailed inspections of roofs and rain conductor systems.

Continue planning and design of facilities to replace the Clearwell. Monitor the condition of the existing Clearwell related to cleaning, structural, and mechanical performance, and implement the Emergency Contingency Plan as necessary.

The PWSA is conducting a comprehensive condition assessment at the Aspinwall Water Treatment Plant to identify the condition of the buildings, site, process equipment, electrical system, river intake, raw water pump station, high service pump station, clearwell, and support systems. The comprehensive condition assessment should be used to prioritize the capital improvements project for 2021-2025, which identifies 13 priority projects required to meet COA deadlines and upcoming federal regulations.

2.2.2 Lead Service Line Replacement (LSLR) Program

Pursuant to Paragraph 3.e.i of the November 17, 2017 COA issued by the PADEP, the PWSA was required to replace at least 1,341 public lead service lines in place within the system on or before June 30, 2018. To address the requirements of the COA and in support of full-service line replacements, the PWSA Board of Directors approved allocation of approximately $44 million of the 2018 CIP budget to fund both the public and private side replacement for lead service lines in the PWSA’s water service area. The public and private line replacements were performed by several contractors selected by an open public bid process.

The PWSA met the requirements of Paragraph 3.e.i of PADEP’s November 17, 2017 COA. By June 26, 2018, the PWSA had replaced 1,347 public lead service lines to meet the COA requirements. Of the 1,347 lead service line replacements, 634 replacements were conducted under the 2017 and 2018 Lead Service Line Replacement Program. All other replacements were conducted either by the PWSA’s Field Operations crews or as part of water main relay projects.

Pursuant to Paragraph 3.e.i of the November 17, 2017 COA and as subsequently amended by the PADEP, the PWSA was required to replace an additional 855 public lead service lines by December 31, 2018. The PWSA exceeded that goal and replaced 1,366 lead service lines between June 27, 2018 and December 19, 2018.

The 2020 Lead Service Line Replacement program can be categorized into two projects based on the funding source. As of late October 2020, the PENNVEST funds in 2020 were used for 3,405 public and private service line replacements, completed by PWSA and their chosen contractors.

A second component of the 2020 LSLR efforts are those counted in the Individual Lead Service Line Replacement (ILSLR) project. ILSLR includes any replacements not funded using PENNVEST money and include the following categories:

- Urgent – Emergency replacement, usually due to a leak.
- CEP – Community Environmental Program. This is $1.8 million of the fine imposed on the PWSA that the PADEP is permitting PWSA to use to replace service lines for locations that are not in a current work order and that meet low to middle income guidelines. This program is administered by the Dollar Energy Fund for PWSA. The lead team at PWSA coordinates the contractors to do the replacements.
- Backlog – PWSA may need to return and replace the private side of the lead lines if a partial replacement was done by the PWSA between February 1, 2016 and December 31, 2018.

In 2020, as of late October 2020, the PWSA has replaced 147 public service lines and 196 private service lines as part of the ILSLR program.

In all, the 2020 LSLR PENNVEST and ILSLR projects have addressed over 4,300 sites in the service area. We recommend that the PWSA continue this very important and well-received program.

2.2.3 Wastewater System and Stormwater System Recommendations

2.2.3.1 New and Priority Recommendations for 2021

Review the Intermunicipal Agreements to assess opportunities to charge fees to upstream municipalities, where appropriate.

2.2.3.2 On-going Recommendations

Increase the cleaning and inspection frequency cycle for the system to improve on O&M knowledge to allow the PWSA to be proactive in responding to potential failures before they occur.

Perform a desktop risk-based assessment of the sewer mains and sewage pump stations using industry standards and best practices to prioritize inspection and rehabilitation. Conduct regular evaluations of repairs versus replacement of aging pump stations and needed solutions to abate wet weather overflows. Inspection and condition assessment of below-ground infrastructure and sewer pipelines should be conducted more frequently to complete an assessment of the entire system every five years.

Replace junctions throughout the wastewater and stormwater systems with traditional manholes wherever possible.

Evaluate the need for additional metering in the wastewater system.

Continue Adaptive Management Approach for stormwater and CSO reduction and/or pollutant reduction in programs such as Saw Mill Run watershed and the 14 connected sewersheds for which it was found that the PWSA's existing collection system could not convey the typical year flows.

Continue to prioritize the regulatory requirements in the CSO NPDES permit, including compliance with the Nine Minimum Controls requirements.

Continue to evaluate and address the basement sewage backup issues that occur during intense wet weather events.

Continue to maintain the stormwater system for optimal operation and in compliance with the MS4 requirements, including the six Minimum Control Measures. PWSA should prioritize the regulatory obligations for the PWSA and the City in the five-year MS4 permit term, including the required reduction of sediment by 2025. In 2021, the PWSA and the City should plan and design the stormwater best management practices to address the pollutant reduction regulatory requirements.

2.2.4 Information Management System Recommendations

2.2.4.1 New and Priority Recommendations for 2021

The PWSA is in the early phases of implementing a series of information management system upgrades that include Enterprise Resource Planning (ERP) system, Document Management Services known as DocuWare, Computerized Maintenance Management System (CMMS), GIS, and Human Capital Management (HCM). The ERP implementation is expected to begin in January 2021, with full implementation by mid-2022. It is expected to have the capability to exchange data with PWSA's existing e-Builder system and existing SpryMobile system. DocuWare implementation is expected to begin in 2021**.** The HCM system will go live in December 2020. It is anticipated that the CMMS and GIS updates will be fully implemented in the coming years.

2.2.4.2 On-going Recommendations

Acquire, install, develop, and implement a Computerized Maintenance Management System (CMMS), including training staff to assist with capital investment prioritization. CMMS is a software system that can be used to house, manage, and track all the various field inspection, relays, repairs, materials, equipment and labor costs, and other associated work for the PWSA's asset management program. The CMMS can be used by field and engineering staff to record, house, track, and identify short-term and long-term asset investment needs. A properly developed CMMS can identify efficiency improvements, increase levels of asset renewal, and reduce operation, maintenance, and capital costs. The CMMS should communicate with the GIS system and be able to coordinate with e-Builder software as well as the PWSA's finance system. Successful implementation of a system-wide CMMS will require significant organizational, operational, management, and capital changes to the PWSA's status.

Add pipe material and installation date with hyperlinks to historical records and photographs to the existing GIS information. Continuous GIS improvements will reduce the costs of data management, increase the flow of technical information, decrease the costs of engineering activities, and allow more comprehensive coordination with agencies, utilities, and the PWSA operations. In addition, it will allow the PWSA to securely share and/or publish certain data to the public.

The water distribution modelling software, WaterGEMS, has been developed for the PWSA's system. WaterGEMS is the only hydraulic model that has a separate input for hydrant data. Hydrant results from field investigations can easily be compared to modelled data to pinpoint possible problems in the system. It also can perform a criticality analysis, which can be integrated into the CMMS to develop a comprehensive main replacement program and help turn engineering decisions from a reactive process to a proactive process. The model which has

been developed can be made more accurate as more accurate input data is obtained. It is our understanding that these activities were undertaken as part of the water system master planning effort during 2019. We recommend this effort continue and that this model is used to help plan each project.

We recommend that the hydrologic and hydraulic sewer system model is updated and expanded to include buildout for all sewersheds, and as new and updated data is generated, and use the model for various assessments and scenarios, such as to inform development and maintenance needs of the PWSA's collection system and to evaluate wet weather impacts in the PWSA's collection system and its tributary areas.

3 Capital Improvement Program Projects

Sections 3.1, 3.2, and 3.3 are based on information in the PWSA 2021-2025 Capital Improvement Plan, approved by the PWSA Board of Directors on September 25, 2020.

3.1 General

PWSA considered the following criteria in evaluating and prioritizing capital projects:

- Safety – Potential health and safety risks to personnel and the public if action is not taken
- Regulatory Compliance – Regulatory compliance schedule and potential fines for non-compliance
- Reliability/Operational Flexibility – Location, age, and condition of infrastructure and risk if action is not taken
- Capacity – Meets community health needs and growth, as needed
- Operations and Maintenance Efficiency – Potential for operating cost savings
- Regional Cooperation/Stewardship – Coordination with external stakeholders and local communities
- Level of Service – Improvement to customer service
- Sustainability – Energy efficiency and “green” approach to improving water quality

3.2 Funding Sources

The PWSA Capital Improvement Program is funded through several primary sources to which specific programs and projects are allocated. The CIP funding sources for each of the five years are as follows:

- FY 2021: debt (revenue bonds), debt (project fund), Distribution System Improvement Charge (DSIC) – water, DSIC – sewer, and PENNVEST.
- FY 2022: debt (revenue bonds), debt (project fund), DSIC – water, and DSIC – sewer.
- FY 2023: debt (revenue bonds), debt (project fund), DSIC – water, and DSIC – sewer.
- FY 2024: debt (revenue bonds), DSIC – water, and DSIC – sewer.
- FY 2025: debt (revenue bonds), DSIC – water, and DSIC – sewer.

3.3 Current Capital Improvement Plan

Table 3.1 presents the fiscal years 2021 through 2025 CIP that was approved by the PWSA Board of Directors on September 25, 2020.

Figure 3.1 provides an illustration of the CIP for fiscal years 2021 through 2025, and Figure 3.2 shows a chart to highlight the capital budget for fiscal year 2021. The CIP is divided into six project classes: water treatment plant, water pumping and storage, water distribution system, wastewater system, stormwater system, and other projects.

Table 3.1: PWSA 2021-2025 Capital Improvement Plan

PWSA Capital Improvement Program	Total Commitment (Budget)	FY 2021	FY 2022	FY2023+
Total Water Treatment Plant	$126,558,340	$15,112,066	$16,422,149	$95,024,126
Total Water Pumping and Storage	$334,992,169	$56,863,770	$70,939,529	$207,188,870
Total Water Distribution System	$467,037,906	$76,245,552	$36,345,826	$345,446,529
Total Wastewater System	$184,076,182	$35,741,675	$45,109,155	$103,225,352
Total Stormwater System	$95,899,955	$34,696,272	$21,721,607	$39,482,076
Total Other	$22,270,000	$14,670,000	$1,100,000	$6,500,000
Total Systemwide CIP	**$1,230,834,553**	**$233,329,335**	**$191,638,266**	**$805,866,953**

Figure 3.1: PWSA Annual Projected Capital Budgets by Project Class

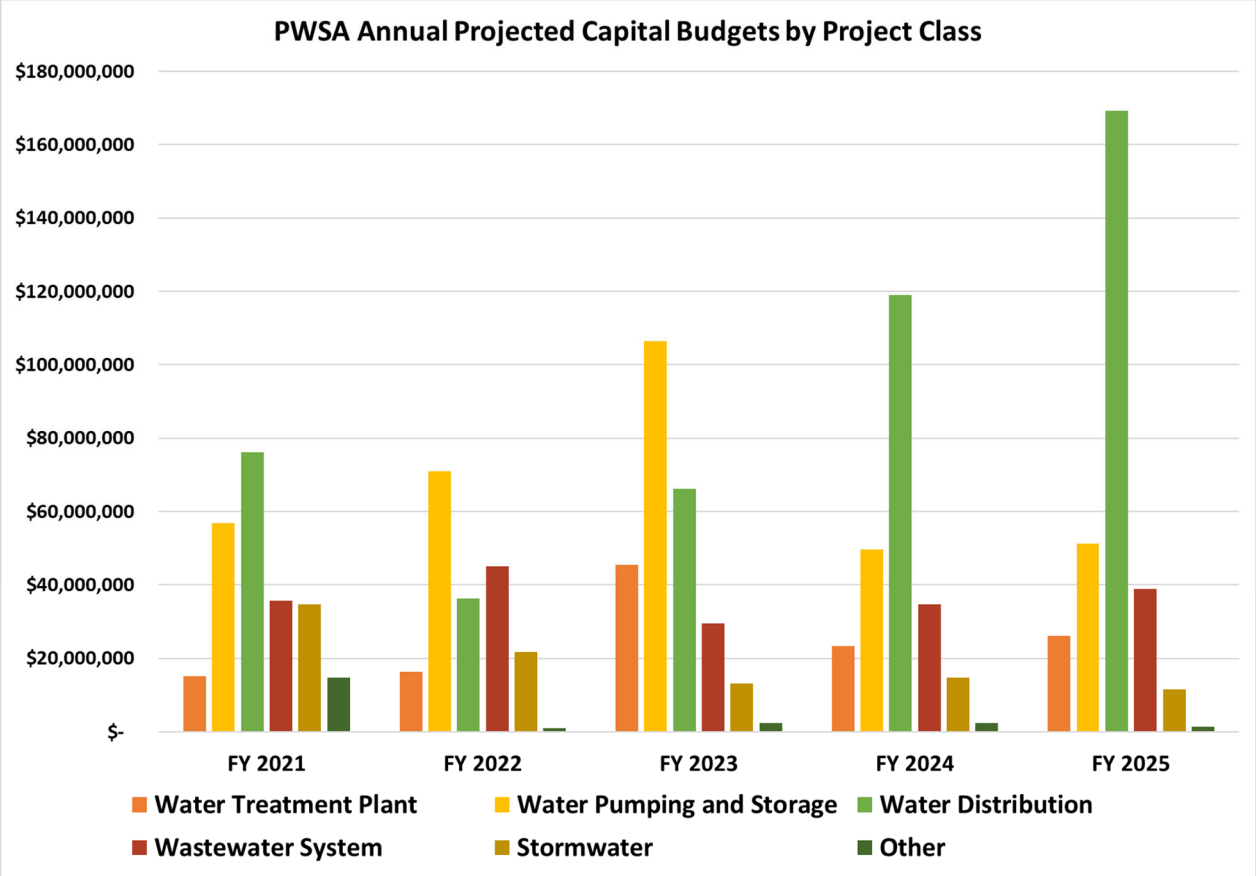


Figure 3.2: PWSA Fiscal Year 2021 Projected Capital Budgets by Project Class

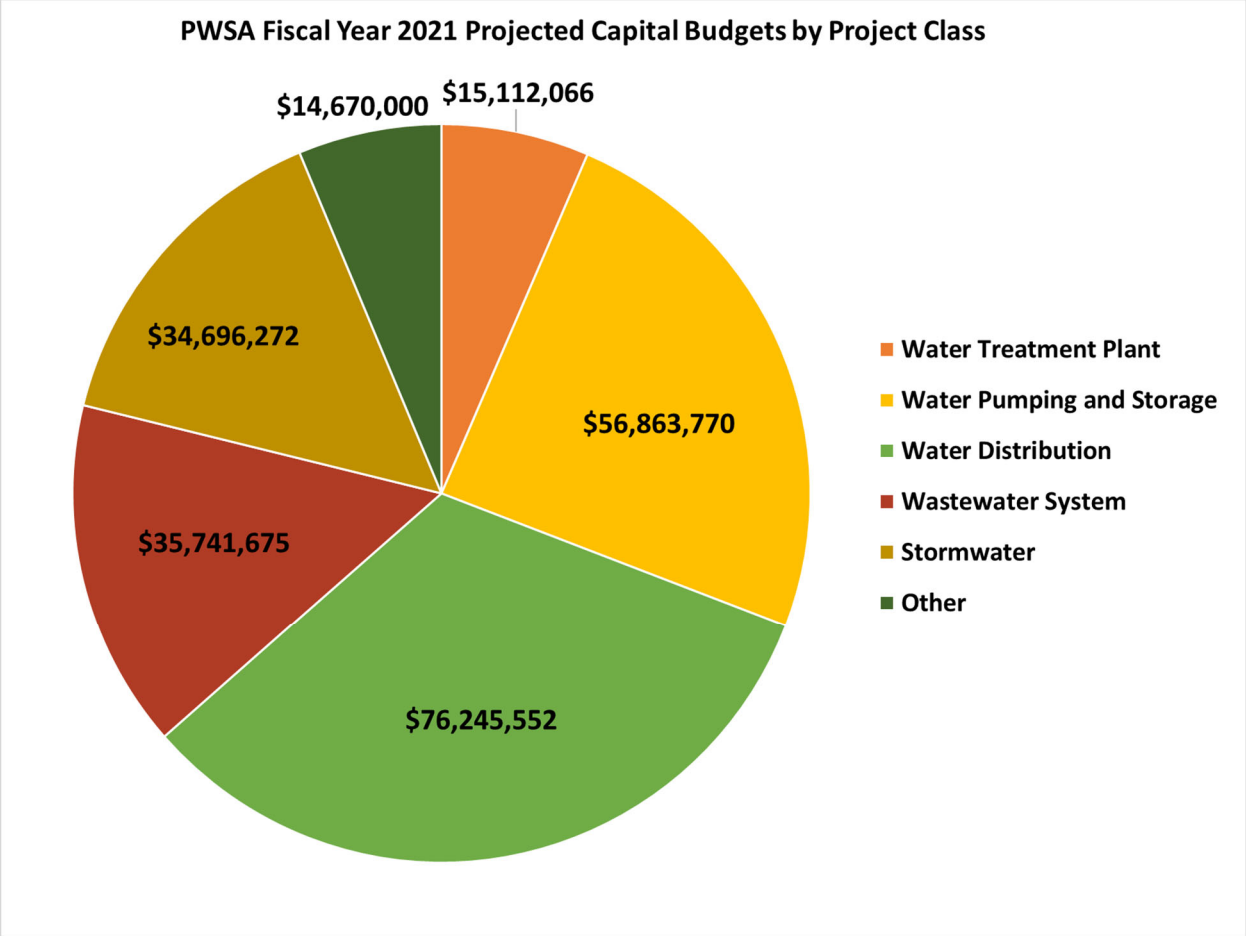


Figure 3.3 illustrates the annual water system capital budgets. Table 3.2,

Table 3.3, and Table 3.4 outline the water system capital budgets and the planned projects for fiscal years 2021 through 2025, for the water treatment plant, water pumping and storage, and water distribution system improvements, respectively.

Figure 3.3: PWSA Annual Projected Water System Capital Budgets

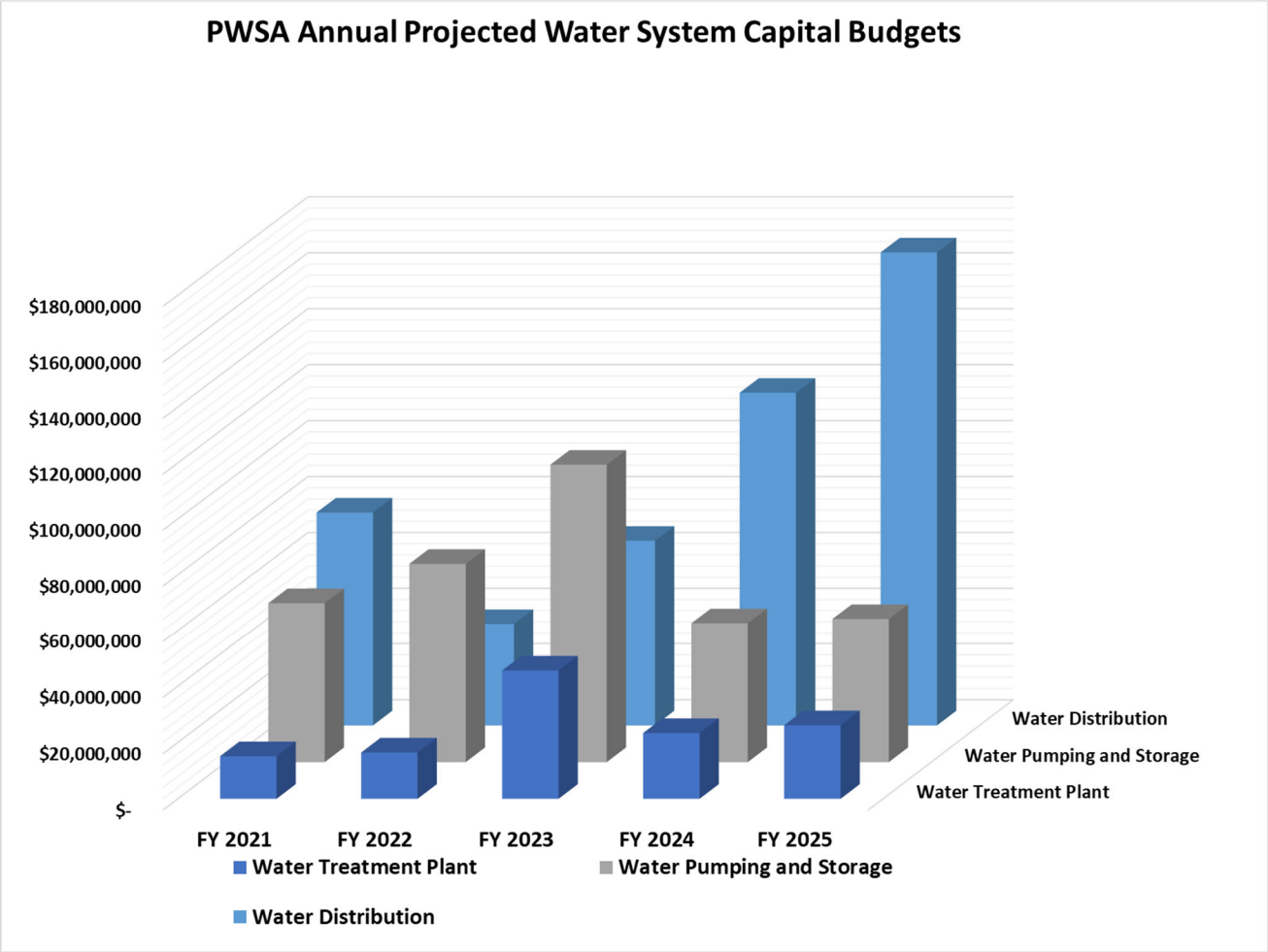


Table 3.2: Water Treatment Plant Improvements

PWSA 2021-2025 Capital Improvement Program	Total commitment (budget)	FY 2021	FY 2022	FY 2023+
Aspinwall Treatment Plant Pretreatment Chemical System and Clarification Improvements	$16,057,427	$3,343,250	$1,655,000	$11,059,177
Aspinwall Utility Water Improvements – Electrical	$210,000	$210,000	---	---
Aspinwall Utility Water Improvements – General/Mechanical	$1,068,750	$1,068,750	---	---
Aspinwall Water Treatment Plant Electrical and Backup Power Improvements	$25,802,500	$2,337,500	$4,250,000	$19,215,000
Aspinwall Water Treatment Plant Raw Water Intakes	$24,615,000	$1,228,500	$1,228,500	$22,158,000
Aspinwall Water Treatment Plant Security Fence, Lighting, and Surveillance	$308,659	$308,659	---	---
Clearwell Emergency Response Project	$26,998,948	$1,986,316	$8,406,316	$16,606,316
Corrosion Control Chemical Storage & Feed Systems	$600,404	$600,404	---	---
Emergency Clarifier Repairs – Clarifiers No. 1, 2, and 4	$258,662	$258,662	---	---
Hydraulic Valve Replacement Program	$3,250,000	---	---	$3,250,000
Instrumentation Upgrade	$1,040,000	$1,040,000	---	---
Lime Slurry System Improvements	$2,294,350	$1,412,017	$882,333	---
Ross Pump Station	$24,053,641	$1,318,008	---	$22,735,633
Total Water Treatment Plant	**$126,558,340**	**$15,112,066**	**$16,422,149**	**$95,024,126**

Table 3.3: Water Pumping and Storage Improvements

PWSA 2021-2025 Capital Improvement Program	Total commitment (budget)	FY 2021	FY 2022	FY 2023+
2019 Large Diameter Water Main Improvements - Rising Mains 3 & 4	$28,578,000	$11,000,000	$11,552,785	$6,025,215
Aspinwall Pump Station Improvements	$28,716,578	$2,135,526	$8,490,526	$18,090,526
Aspinwall Pump Station to Lanpher Reservoir Rising Main	$56,000,000	$5,000,000	$16,661,613	$34,338,387
Bruecken Pump Station Improvements	$24,450,659	$1,668,553	$6,182,033	$16,600,073
Chlorine Booster Station Improvements	$9,484,180	$2,698,491	$3,523,793	$3,261,896
Clearwell Improvements	$57,009,491	$200,000	$200,000	$56,609,491
Disinfection By-Products Mitigation	$2,610,000	$1,455,000	---	$1,155,000
Garfield Tank Improvements	$4,049,999	---	---	$4,049,999
Herron Hill Pump Station Improvements	$10,960,000	---	---	$10,960,000
Herron Hill Reservoir Improvements	$2,751,211	$2,751,211	---	---
Herron Hill Tank Pump Station Improvements	$1,110,000	---	---	$1,110,000
Highland No. 2 Reservoir Improvements	$26,840,100	$17,893,400	$8,946,700	---
Highland Reservoir Pump Station and Rising Main	$33,597,414	$10,000,000	$10,670,664	$12,926,750
Howard Pump Station Improvements	$10,396,839	---	---	$10,396,839
Inline Pump Station (Coral and Pacific) Improvements	$600,000	---	---	$600,000
Lanpher Reservoir Improvements	$12,759,386	$1,000,000	$3,879,693	$7,879,693
Lincoln Pump Station Improvements	$831,722	$171,489	$660,233	---
Lincoln Pump Station: Bypass Pump Station Project	$890,100	$890,100	---	---
Lincoln Tank Improvements	$4,195,000	---	---	$4,195,000
Mission Pump Station Improvements	$16,865,000	---	---	$16,865,000
Saline Pump Station Improvements	$171,489	---	$171,489	---
Spring Hill Tank Improvements	$2,125,001	---	---	$2,125,001
Total Water Pumping and Storage	**$334,992,169**	**$56,863,770**	**$70,939,529**	**$207,188,870**

Table 3.4: Water Distribution System Improvements

PWSA 2021-2025 Capital Improvement Program	Total commitment (budget)	FY 2021	FY 2022	FY 2023+
Bus Rapid Transit (BRT) Water Distribution	$11,500,000	$9,200,000	$2,300,000	---
District Metering	$9,850,000	---	---	$9,850,000
District Water and Pressure Meters	$1,940,539	$485,135	---	$1,455,404
Duck Hollow	$3,000,270	---	---	$3,000,270
Herron Hill – Squirrel Hill Boundary Adjustments	$830,000	---	---	$830,000
Highland Park MFP Improvements Project	$1,957,500	$225,000	$1,732,500	---
Intermediate Main Replacement Program	$38,581,034	---	---	$38,581,034
Intermediate Meters	$409,000	$75,000	$80,000	$254,000
Large Diameter Water Main Replacement	$41,081,035	$5,500,000	---	$35,581,035
Large Meter Replacement	6,940,364	$1,512,919	$1,709,414	$3,718,031
Lead Service Line Identification Program	$5,558,667	$1,500,000	$1,500,000	$2,558,667
Lead Service Line Replacement	$3,111,200	$3,111,200	---	---
Low Pressure Area Remediation	$2,293,358	$1,029,259	$1,093,445	$170,654
North Side Boundary Adjustments	$1,200,000	---	---	$1,200,000
Private Lead Service Line Reimbursement Program	$1,760,287	$500,000	$375,000	$885,287
Regulator Valve and Vault Replacement	$13,500,000	$2,000,000	$1,000,000	$10,500,000
Small Diameter Water Main Replacement	$283,563,628	$45,838,708	$19,950,643	$217,774,277
Small Meter Replacement	$7,025,175	$1,357,684	$1,796,385	$3,871,106
South Side Slopes Boundary Adjustments	$1,200,000	---	---	$1,200,000
Unmetered and Flat Rate Properties	$3,821,200	$1,548,564	$1,744,689	$527,947
Valve Replacement	$19,687,149	$1,498,333	$1,300,000	$16,888,816
Water Relay	$8,227,500	$863,750	$1,763,750	$5,600,000
Total Water Distribution System	**$467,037,906**	**$76,245,552**	**$36,345,826**	**$354,446,528**

Figure 3.4 illustrates the annual wastewater system capital budgets. Table 3.5 outlines the wastewater system capital budgets and the planned projects for fiscal years 2021 through 2025.

Figure 3.4: PWSA Annual Projected Wastewater System Capital Budgets

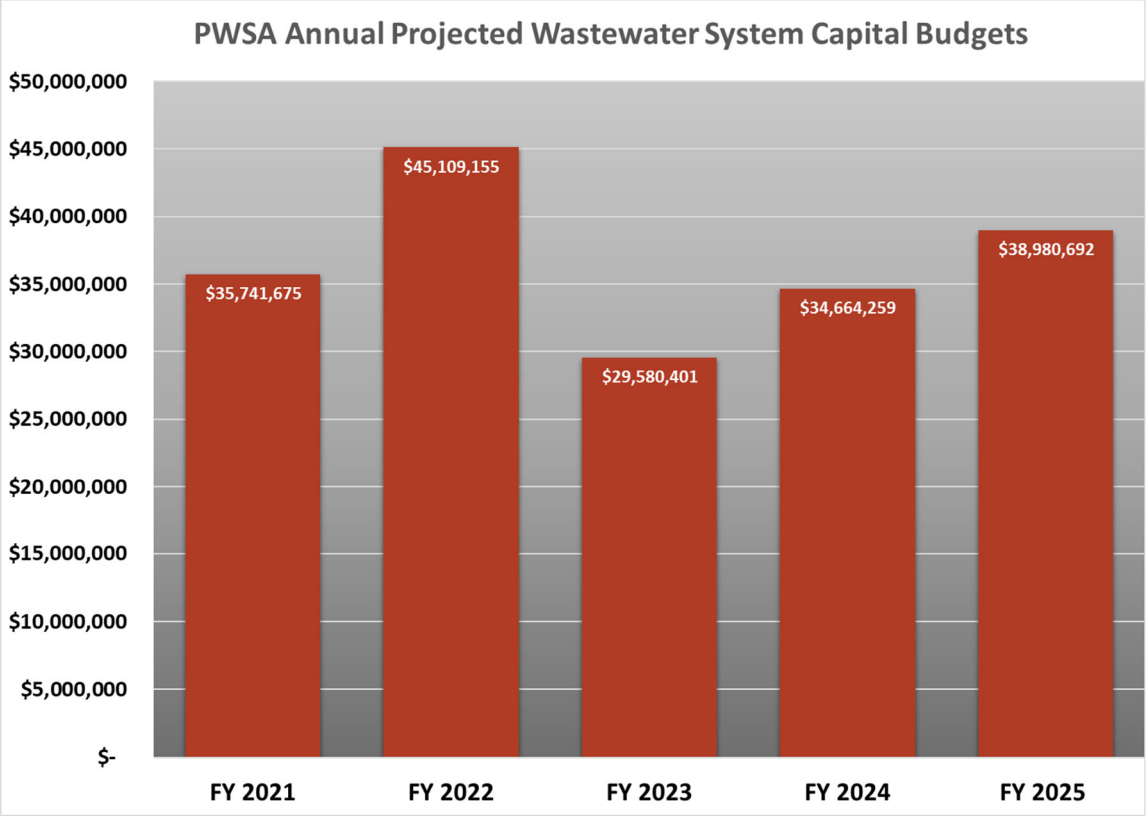


Table 3.5: Wastewater System Improvements

PWSA 2021-2025 Capital Improvement Program	Total commitment (budget)	FY 2021	FY 2022	FY2023+
31st Ward Sewer System	$6,214,039	$2,904,302	$348,961	$2,960,776
Browns Hill Road Sewer Pump Station Replacement	$1,500,000	---	---	$1,500,000
Large Diameter Sewer Rehabilitation	$21,249,489	$2,211,492	$6,391,140	$12,646,857
M-29 Outfall Improvements	$3,473,539	$3,473,539	---	---
Maytide Storm and Sanitary Sewer System Improvements	$4,596,798	$2,000,000	$1,500,000	$1,096,798
Queenston Sewer Improvements	$1,787,050	$1,601,450	$185,600	---
Sewer Reconstruction	$7,571,297	$970,175	$999,979	$5,601,143
Sewers Under Structures	$33,958,372	$3,081,151	$11,080,611	$19,796,610
Small Diameter Sewer Rehabilitation	$103,725,599	$19,499,567	$24,602,865	$59,623,167
Total Wastewater System	**$184,076,182**	**$35,741,675**	**$45,109,155**	**$103,225,351**

Figure 3.5 illustrates the annual stormwater system capital budgets. Table 3.6 outlines the stormwater system capital budgets and the planned projects for fiscal years 2021 through 2025.

Figure 3.5: PWSA Annual Projected Stormwater System Capital Budgets

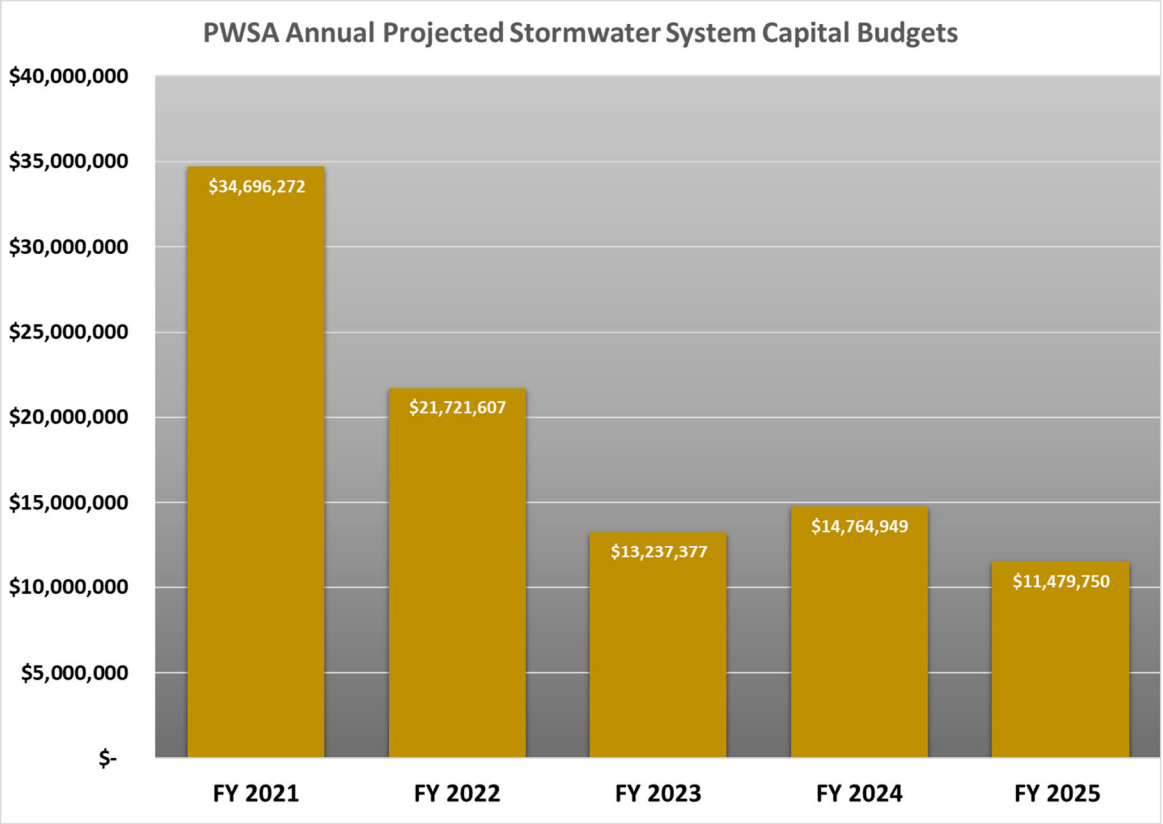


Table 3.6: Stormwater System Improvements

PWSA 2021-2025 Capital Improvement Program	Total commitment (budget)	FY 2021	FY 2022	FY 2023+
Bus Rapid Transit (BRT) Stormwater Infrastructure Improvements	$2,035,000	$685,000	$1,000,000	$350,000
Catch Basin and Inlet Replacement	$38,887,540	$8,137,621	$1,987,720	$28,762,199
Fleury Way Stormwater Infrastructure Improvements	$730,141	$730,141	---	---
Four Mile Run Stormwater Infrastructure Improvements	$19,800,000	$7,000,000	$12,800,000	---
Lawn and Ophelia	$600,000	$600,000	---	---
Martin Luther King Field Stormwater Infrastructure Improvements	$3,348,276	$2,008,966	$1,339,310	---
Maryland Avenue Stormwater Infrastructure Improvements	$2,940,000	$2,610,000	$330,000	---
Nobles Lane Storm Systems Improvements	$343,322	$343,322	---	---
Saw Mill Run MS4 Compliance Projects	$3,500,000	---	---	$3,500,000
Saw Mill Run PWSA & PennDOT Watershed Improvements	$1,000,000	---	$200,000	$800,000
Southside Flats Sewer Separation	$3,405,242	---	$335,365	$3,069,877
Southside Stormwater Infrastructure Improvements	$4,313,492	$2,156,746	$2,156,746	---
Thomas and McPherson Stormwater Infrastructure Improvements	$5,707,365	$4,319,899	$1,387,466	---
Tide Gate Installations	$3,000,000	---	---	$3,000,000
Volunteer's Field Stormwater Infrastructure Improvements	$1,000,000	$1,000,000	---	---
Wightman Park Stormwater Infrastructure Improvements	$1,750,000	$1,750,000	---	---
Winchester Drive at Grovemount Storm System Improvements	$554,577	$554,577	---	---
Woodland Road Stormwater Infrastructure Improvements	$1,735,000	$1,550,000	$185,000	---
Woods Run Stream Removal Stormwater Infrastructure Improvements	$1,250,000	$1,250,000	---	---
Total Stormwater	**$95,899,955**	**$34,696,272**	**$21,721,607**	**$39,482,076**

Table 3.7 outlines the capital budgets for planned projects in the Other Improvements category for fiscal years 2021 through 2025.

Table 3.7: Other Improvements

PWSA 2021-2025 Capital Improvement Program	Total commitment (budget)	FY 2021	FY 2022	FY 2023+
Park Maintenance/Upgrades	$4,700,000	$700,000	$1,000,000	$3,000,000
Property Acquisition/Facility Upgrades	$2,700,000	$700,000	---	$2,000,000
Reconstruction of the Façade at the Central Warehouse	$70,000	$70,000	---	---
Roof Replacement Brilliant Yard Warehouse	$160,000	$160,000	---	---
Roof Replacement Herron Hill Pump Station	$90,000	$90,000	---	---
Surface Restoration (Capital Only)	$12,500,000	$12,500,500	---	---
Utility Cost Shares	$2,050,000	$450,000	$100,000	$1,500,000
Total Other Improvements	**$22,270,000**	**$14,670,000**	**$1,100,000**	**$6,500,000**

4 Public Utilities Commission Act 65 and Act 70

4.1 Public Utility Commission Regulatory Background

4.1.1 Overview

On December 21, 2017, Pennsylvania Governor Wolf signed Act 65 of 2017 (Act) into law amending the Pennsylvania Public Utility Code which, among other things, added a new Chapter 32 (Sections 3201 – 3209) addressing the Pennsylvania Public Utility Commission's (Commission or PUC) jurisdiction over the provision of utility water, wastewater, and stormwater service by entities created by Pennsylvania cities of the second class under the Municipality Authorities Act. As the City of Pittsburgh is the only city of the second class in the Commonwealth, the Commission now has jurisdiction over the PWSA. The PWSA is the first municipal water authority to be regulated by the Commission.

Effective April 1, 2018, pursuant to 66 Pa.C.S. §§ 3201-3209, Act 65 of 2017, the PUC was granted jurisdiction over the PWSA. The Commission approved the initial water and wastewater tariffs of the PWSA effective March 1, 2019 as part of the PWSA's first base rate filing at Docket Numbers R-2018-3002645 and R-2018-3002647. On September 30, 2020, the Authority filed a proposed settlement with the PUC regarding its 2021 water and wastewater rate proposal. The proposed settlement is still to be reviewed by the presiding PUC administrative law judges as well as the full Commission with a final decision expected on or before January 14, 2021. The proposed settlement includes a 5.7 percent total increase in base water and wastewater charges, and a 5 percent distribution system improvement charge (DSIC) for both water and wastewater. The rate increase related to the proposed settlement is expected to result in an annual $14,150,000 increase in water revenue and a $4,850,000 increase in wastewater revenue.

PWSA is planning to submit materials to the Commission in March 2021 to support a request for a rate increase, and a proposed stormwater fee will be included in this request.

4.1.2 Long-Term Infrastructure Improvement Plan

Under Act 65, the PWSA was requested to file a Long-Term Infrastructure Improvement Plan (LTIIP) (66 Pa C.S. §3202 (6)) on or before September 28, 2018. The Commission normally requires that a LTIIP be submitted to support a Distribution System Improvement Charge (DSIC). A DSIC is a separate charge from the tariff and supports the accelerated replacement of aging infrastructure. The PWSA is requesting a 5 percent DSIC for both water and wastewater as per the recent proposed 2021 rate settlement.

The requirements for the development and submission of an LTIIP are outlined in PA code Chapter 121 §121.3 as follows:

- Identification of the types and age of eligible property owned and operated by the utility
- An initial schedule for planned repair and replacement of eligible property
- A general description of the location of eligible property
- A reasonable estimate of the quantity of eligible property to be improved or repaired
- Projected annual expenditures and means to finance the expenditures

- A description of the way infrastructure replacements will be accelerated and how repair, improvement or replacement will ensure and maintain adequate, efficient, safe, reliable and reasonable service to customers
- A workforce management and training program designed to ensure that the utility will have access to a qualified workforce to perform work in a cost-effective, safe and reliable manner
- A description of the utility's outreach and coordination activities with other utilities, Department of Transportation and local governments regarding the planned maintenance/construction projects and roadways that may be impacted by the LTIIP

The PWSA submitted their LTIIP to the Commission on September 28, 2018. An update to the LTIIP was finalized in August and September 2019 after consideration of input from interested parties and stakeholders. The Authority's LTIIP for water and wastewater was approved by the PUC on August 27, 2020.

4.1.3 Compliance Plan

On December 21, 2017, the Pennsylvania legislature enacted Act 65 of 2017 (Act 65), placing the Authority under the jurisdiction of the PUC pursuant to the Pennsylvania Public Utility Code. Act 65 applies most of the provisions of the Public Utility Code to the Authority in the same manner as a "public utility," resulting in regulation of the Authority's rate making, its operating effectiveness, debt issuances and other aspects of conducting its business similar to the way the PUC regulates investor-owned utilities. Act 65 includes provisions that allow the Authority to impose, charge or collect rates or charges as necessary to permit the Authority to comply with its covenants with the holders of any bonds or other financial obligations of the Authority, and prohibits the PUC from requiring the Authority to take any action that would cause the interest on the Authority's financial obligations to be includible in gross income of the holders of such obligations for federal income tax purposes.

On January 18, 2018, the PUC issued a Tentative Implementation Order (TIO) which included methods by which the PUC and affected entities may carry out the tariff approval, ratemaking, compliance plan and assessment provision of Act 65. The PUC issued a Final Implementation Order (FIO) on March 15, 2018 which, *inter alia*, directed (1) the filing of water and wastewater tariff filings no later than July 2, 2018; and, (2) a compliance plan to the PUC no later than September 28, 2018 to address how it will achieve full regulatory compliance including provisions to bring the Authority's existing information technology, accounting, billing, collections, and other operating systems and procedures into compliance with the requirements applicable to jurisdictional water and wastewater utilities. The Authority complied with both of these requirements and received approval of its Initial PUC Tariffs effective March 1, 2019. PWSA's Compliance Plan was filed on September 28, 2018 and supplemented on February 1, 2019. The PUC elected to stage its review of the Authority's Compliance Plan and Stage 1 was directed to urgent infrastructure remediation and improvement and the revenue and forecasting requirements of maintaining service that support public health and safety. The PUC issued Orders regarding Stage 1 on March 26, 2020 and June 18, 2020. The Orders resolved a significant number of issues in the proceeding by approving a partial settlement. Some issues related to lead service line remediation, however, remain outstanding and two subsequent appeals of the Stage 1 Orders are pending. Compliance Plan Stage 2 will address stormwater and customer service issues and is to begin upon entry of a final unappealable order regarding Stage 1.

4.2 Act 70 and the Cooperative Agreement

On July 23, 2020, the General Assembly of Pennsylvania enacted Act 70, which is now state law. It indicates that the Cooperative Agreement executed in October 2019 supersedes portions of PWSA's requirements that have been controlled by the Public Utility Commission regulations since April 1, 2018 when the Public Utility Commission began jurisdiction over the PWSA. The change in requirements are with respect to issues involved with PWSA and the City of Pittsburgh. Act 70's Article XXVIII-G, Water and Sewer Authorities in Cities of the Second Class (Pittsburgh is the only second-class city in the state), refers to the Cooperation Agreement entered into between the City and the Authority on October 3, 2019. It states the Cooperation Agreement shall have the force and effect of law until January 1, 2025, or an earlier termination date to which the City and Authority mutually agree, and the Cooperation Agreement shall govern:

1. Changes in the City and Authority's rights and obligations resulting from the enactment of the Act of December 21, 2017 (P.L. 1208, No.65), entitled "An Act amending Title 66 (Public Utilities) of the Pennsylvania Consolidated Statutes, in rates and distribution systems, further providing for rates to be just and reasonable; and providing for water and sewer authorities in cities of the second class," including rates paid by the City to the Authority for public utility service.
2. The division of services related to the system.
3. Payments by the City and Authority to the other based on actual, verifiable, direct expenses and in accordance with customary utility practices under 66 PA.C.S Pt. 1 (relating to public utility code).
4. Payments by the Authority to the City that shall be subordinate to each debt obligation of the Authority.
5. Cooperation by the City and Authority in their respective capital projects which may impact each other.
6. Responsibilities of the Authority with respect to City parks and other City properties. (City parks are defined as 50 acres or larger.)
7. Ownership of the system.
8. Roles and responsibilities of the City and Authority with respect to the system.

Therefore, since July 23, 2020, the PWSA is abiding by both the Act 70 requirements and the Public Utility Commission regulations, metrics, and reporting.

5 Conclusion

During 2020, the PWSA made significant progress on improvements to their water, sewer, stormwater, and operational systems for which they are responsible. Highlights of PWSA's work in 2020 include:

- Continued progress on improvements to key components of the water treatment and distribution system,
- Initiated design work on critical water transmission system projects,
- Achieved reduction and compliance with required lead levels in the water distribution system,
- Improved their project controls, financial controls, operational abilities,
- Added key staff,
- Worked to engage key customers and stakeholders on the work at hand.

In summary, it is the opinion of the Consulting Engineer, based on our understanding of the many infrastructure needs of the PWSA and the progress made during 2020; our discussions with key management staff; review of the Board approved 2021-2025 Capital Improvement Plan; and, positive oversight of the Commission, there will be sufficient funding to advance the goals and obligations of the PWSA.

6 Acknowledgement

Mott MacDonald would like to take this opportunity to express sincere thanks to the staff of the Pittsburgh Water and Sewer Authority for their valuable contributions to this report. Specifically, we want to acknowledge Will Pickering, Jennifer Presutti, Barry King, Ed Barca, Kate Mechler, Sarah Bolenbaugh, Faith Wydra, John Potanko, Rick Obermeier, B.J. McFaddin, and Alex Sciulli for their time and informed insights shared during the preparation of this 2020 Consulting Engineer’s Annual Report.

A. Duties of the Consulting Engineer

The duties of the Consulting Engineer are many and vary depending on the needs of the Authority and the provisions of the Trust Indenture. Those duties beyond the provisions of the Trust Indenture are addressed elsewhere. Per the Amended and Restated Trust Indenture between the Pittsburgh Water and Sewer Authority and the Bank of New York Mellon Trust Company, NA originally dated October 15, 1993 and restated in the 2019 Senior Indenture and Subordinate Indenture, the Pittsburgh Water and Sewer Authority must engage a Consulting Engineer to perform such duties as are imposed by the provisions of the Trust Indenture. Those provisions from the Trust Indenture pertinent to the activities of the Consulting Engineer are provided below for reference.

Per ARTICLE I – DEFINITIONS AND GENERAL INDENTURE MATTERS

Section 1.01 – Definitions: Qualified Independent Consultant

“The term “Qualified Independent Consultant” shall mean an independent professional consultant having the skill and experience necessary to provide the particular certificate, report, or approval required by the provision of this Indenture or any Supplemental Indenture in which such requirement appears, including without limitation a Consulting Engineer and an Independent Auditor.”

Per ARTICLE V – CONSTRUCTION FUND

Section 5.01 Construction Fund

“There is hereby created a special fund known as the “Construction Fund,” which shall be held in trust by the Trustee. Money shall be deposited to the Construction Fund pursuant to the provisions of Article II and from any other sources identified by the Authority. To the extent Costs of a Construction Project are paid for from Bonds, the Authority must deposit the construction proceeds of the Bonds in the Construction Fund and must follow the provisions of this Article V. To the extent the Authority is self-funding Costs from other than proceeds of Bonds, the Authority may use moneys in the Revenue Fund and the Operating Fund to pay such costs, and the Authority need not use the Construction Fund or follow the provisions of the Article V...”

“(b) Except to the extent to which a requisition relates to financing costs, a certificate signed by the Consulting Engineer approving such requisition and certifying that each item to be paid as set forth in such requisition constitutes an obligation which has been properly incurred as part of the Cost of the Construction Project and is then due and unpaid.

Upon receipt of each such requisition and the accompanying certificate, the Trustee shall pay to the persons named in such requisition, the respective amounts stated therein to be due to such persons ...”

Section 5.02 Amendment of Construction Project

“The Authority may from time to time amend or revise a construction project with the approval of the Consulting Engineer, but only if the Authority shall have first delivered to the Trustee:

(i) a written statement describing the proposed amendments and revisions.

(ii) a Resolution of the Board approving the proposed amendments and revisions.

(iii) a certificate signed by the Consulting Engineer setting forth the general effect of such proposed amendments and revisions and certifying in his opinion that such proposed amendments and revisions are in the best interests of the Authority.

(iv) an opinion of Bond Counsel that such amendment or revision in and of itself will not adversely affect the exclusion from gross incoming of interest on the Series of Bonds issued to fund such construction project."

Section 5.03 Contract Security

"All contracts which provide for the furnishing of material or the doing of work with regard to a Construction Project shall be in compliance with all federal and state statutes, rules, and regulations and shall be subject to the approval of the Consulting Engineer. The Authority will require each person with whom it may contract for construction to furnish a performance security and a labor and materialmen's security each for not less than 100 percent of the full amount of the contract entered into with such person or such greater or lesser amount as may be required by applicable law, and to carry such insurance as may be required by law and as may be recommended by the Consulting Engineer. The proceeds of any such performance security shall forthwith, upon the receipt thereof by the Authority, be deposited to the credit of the applicable Construction Fund or account therein and applied toward the completion of the construction covered by the contract in connection with which such performance security shall have been furnished except that any such proceeds as shall constitute liquidated damages for delay shall be deposited to the credit of the Revenue Fund."

Per ARTICLE VII – RATE COVENANT AND PARTICULAR COVENANTS

Section 7.07 Liens; Sale of Assets

"So long as any of the Bonds secured hereby are Outstanding, none of the Revenues shall be used for any purpose other than as provided in this Indenture, and no contract or contracts will be entered into or any action taken by which the rights of the Trustee or of the Bondholders might be impaired or diminished."

"The Authority will not voluntarily create or permit to be created any debit, lien, or charge on a parity with (except pursuant to Section 3.03 hereof) or having priority over the lien of this Indenture upon any of the Revenues pledged hereby or any other revenues or other amounts at any time pledged for the payment of the Bonds. The Authority will not sell or otherwise dispose of or encumber the System or any part thereof except as herein otherwise having provided. No sale or other disposition of fixed properties having a fair market value in excess of One Million Dollars ($1,000,000) shall be made unless the Consulting Engineer shall first have filed his certificate with the Authority and the trustee recommending such sale or other disposition of said fixed properties and shall have stated in such certificate that the sale or other disposition of said properties is in the best interests of the Authority and will not impair the security of the Bonds and the retention of said properties is not necessary for the efficient operation of the system. If, after receiving the certificate of the Consulting Engineer, the Authority determines to sell or otherwise dispose of said fixed properties, it shall by Resolution of the Authority adopted by a majority vote of a quorum of the Board, authorize such sale or other disposition and shall file a certified copy of such Resolution of the Authority with the Trustee..."

Section 7.10 Damage, Destruction or Condemnation of System: Application of Proceeds

"In the event of any damage to the System covered by insurance or condemnation or taking by eminent domain of any part of the System for which the cost of repair or replacement shall exceed $5,000,000, the proceed shall be deposited in the Revenue Fund and the Authority shall promptly notify the Trustee and file with the Trustee a Consulting Engineer's certificate stating whether, in the signer's opinion, it is practicable and advantageous to repair the damaged or condemned property, If the certificate states that the repair or replacement is practicable and advantageous, the Consulting Engineer shall, if appropriate, prepare and file with the Trustee plans and specifications therefor with an estimate of the cost thereof, and the insurance of condemnation proceeds, if any, shall be transferred to the Operating Fund and allied thereto. If the certificate states that the repair or replacement is not practical and advantageous, the proceeds shall be remain deposited in the Revenue Fund or, at the option of the Authority be transferred to the Redemption Fund for the extraordinary redemption of Bonds as hereinafter provided."

“The Bonds are subject to redemption without premium at any time, in whole or in part, within a maturity by lot, by the Authority upon the occurrence of any condemnation of taking or damage or injury of the nature set forth in the Article, from the proceeds collected as the result of such damage, injury or taking. In all cases of redemption of equipment, the Authority shall cause to be filed with the Trustee the certificate of the Consulting Engineer referred to above, determining that repair, reconstruction or replacement is not practicable, desirable or financially feasible. In the event that less than all of the Bonds outstanding are to be redeemed, the Authority shall furnish to the Trustee a Consulting Engineer’s Certificate stating (i) that the property forming a part of the System that was damaged or injured or taken by such condemnation proceedings is not essential to the operation of the System and that the continued operation of the remaining System will not, in the signer’s opinion, adversely affect the security of the Bonds remaining outstanding after such redemption, or (ii) that the System has been restored to a condition substantially equivalent to its condition prior to the occurrence of such damage, injury, or condemnation, and that continued operation of the System will not, in the signer’s opinion, adversely affect the security of the Bonds remaining outstanding after such redemption. For purposes of this Section 7.10, the term Consulting Engineer shall also include an employee of the City or the Authority who is otherwise qualified to act as Consulting Engineer under this Indenture.”

Section 7.11 Employment of Consulting Engineer; Reports

“The Authority will employ a Consulting Engineer to perform such duties as are imposed on the Consulting Engineer by the provisions of the Indentures.

It shall be the duty of the Consulting Engineer, in addition to the other duties prescribed elsewhere in this in this Indenture, to prepare and file with the PWSA and with the Trustee on or before 30 days prior to the beginning of each fiscal year thereafter, a report setting forth the following:

(a) Advice and recommendations as to the proper maintenance, repair, and operation of the system during the next fiscal year and an estimate of the amounts of money that should be expended for such purposes.

(b) Advice and recommendations as to the Capital Additions that should be made during the next fiscal year, and an estimate of the amount of money that is recommended for such purposes.

(c) Whether the properties of the System have been maintained in good repair and sound operating condition of the Consulting Engineer’s estimate of the amount, if any, required to place such properties in such condition and the details of such expenditures and the approximate time required therefor.”

B. History of Bond Issues and Refunding (1984 – 2013)

PWSA has employed various funding mechanisms since 1984 to fund their annual Capital Improvement Plans. Appendix B provides the history of the bond issuances and refunding from 1984 through 2013. Funding mechanisms from 2016 to the present are outlined in Section 1.3 of this report.

B.1 First Bond Issue

On April 19, 1984, the PWSA Board adopted a major CIP by Resolution No. 19 of 1984. The Program was designed to maintain a satisfactory level of service to the water and sewer systems current users, to improve operating efficiency, and to address future user requirements. In July 1984, the PWSA issued $93,600,000 Daily Adjustable Demand Water and Sewer Systems Revenue Bonds, Series of 1984, to implement the initial phase of the Program. From proceeds of this Bond Issue, $78,777,000 was deposited into the Construction Fund for the initial phase of the CIP. In June 1986, the PWSA issued an additional $134,700,000 Adjustable Rate Tender Revenue Bonds, Series of 1986. From the 1986 Bond Issue, $115,000,000 was available to continue the Program.

Additionally, the initial Bond Issue of the PWSA created the “Renewal and Replacement Fund” to be held in trust by the Trustee to be used by the PWSA for extraordinary maintenance and repair of the water and sewer systems or to pay the cost of capital additions. The Trust Indenture provides, so long as the aggregate amount of funds on deposit in the Construction Fund(s) is not less than $7,000,000, the PWSA is not required to make any deposits into the Renewal and Replacement Fund. It is further required that if this aggregate amount is less than $7,000,000, the PWSA shall transfer, on or before the first day of each month, a sum of $100,000 from the Revenue Fund to the Renewal and Replacement Fund until the aggregate amount equals $7,000,000. In addition, if the aggregate amount on deposit in these two funds is less than $5,000,000, the PWSA shall, on each September 1st, transfer to the Renewal and Replacement Fund all surplus moneys remaining in the Revenue Fund after all payments required to be made on such September 1st have been made until such time as the aggregate amount on deposit in these funds are equal to not less than $5,000,000.

B.2 1993 Bond Issue and Refunding

In November 1993, the PWSA issued two series of Water and Sewer System Bonds to advance refund all the outstanding previously issued bonds, provide additional funds for capital improvements to the water and sewer systems, and pay all fees and expenses incurred in connection with issuance of the 1993 Bonds. Series A of the 1993 Bonds, in the aggregate principal amount of $278,970,000, was for the advanced refunding of outstanding bonds. Series B of the 1993 Bonds, in the aggregate principal amount of $10,785,000, was to finance additional capital improvements.

The new Trust Indenture, dated October 15, 1993 and applicable to the Series A and B of the 1993 Bond Issues, eliminated the requirements for a fund balance, as described in the previous Section, to be maintained in the “Renewal and Replacement Fund” unless determined necessary annually by the Consulting Engineer. Therefore, the $2,009,523 which was being maintained in the Fund under the previous Trust Indenture was transferred to the “Prior Bonds

Construction Fund" for use for capital improvements. From the Series B of the 1993 Bond Issue, $9,990,477 was deposited into the 1993 Bond Construction Fund for additional capital improvements.

B.3 1995 Bond Issue

In 1995, the PWSA recognized that the funding for the CIP implemented in 1984 was almost depleted. To ensure a continued supply of safe drinking water and proper sewer service to the PWSA's current and future users and to address future demands on the water and sewer systems, a new CIP was developed and adopted in 1995.

The PWSA also negotiated a Capital Lease Agreement with the City, which terminated the Lease and Management Agreement and provided for the PWSA to acquire the water and sewer systems from the City in 2025.

The PWSA issued additional bonds in 1995 to fund the 1995 CIP and to pay certain obligations of the PWSA to the City under the Capital Lease Agreement. On July 15, 1995, the PWSA issued Water and Sewer System First Lien Revenue Bonds, Series A of 1995, to pay for the capital improvements identified in the new CIP and Water and Sewer System Subordinate Revenue Bonds, Series B of 1995, to pay the obligation of the PWSA to the City under the Capital Lease Agreement in the aggregate principal amounts of $89,850,000 and $103,020,000, respectively. From the Series A of 1995 Bonds, $80,000,000 was deposited into the Series A of 1995 Capital Project Fund to fund the 1995 CIP of the PWSA.

B.4 1998 Bond Issue and Refunding

Early in 1998, additions to the CIP were proposed that addressed future needs of the PWSA, which included covering Highland Reservoir No. 1, City and Urban Redevelopment Authority Projects, and improvements to the water distribution and sewerage systems.

On March 2, 1998, the PWSA issued Water and Sewer System First Lien Revenue Bonds, Series A of 1998, to provide for the refunding of the PWSA's outstanding Series A of 1995 Bonds; Water and Sewer System First Lien Revenue Bonds, Series B of 1998, to fund additions to the CIP; and Water and Sewer System Subordinate Revenue Bonds, Series C of 1998, and to refund the PWSA's outstanding Series B of 1995 Bonds. The Series B of 1998 Bonds enabled $36,001,908 to be deposited into the 1998 Capital Projects Fund, funding the CIP into the year 2000.

B.5 2002 Bond Issue

At the end of 2000, the Capital Project Funds of the PWSA were largely spent with approximately $345,000 in reserve for construction and capital projects. The PWSA had anticipated this drawdown of funds and had begun work to issue additional bonds in early 2002. The Capital Projects Fund, through this issue, provided $90,494,400 for the construction of capital projects and to meet the needs of emergencies that may require the use of capital funds.

B.6 2003 Bond Refunding

On September 23, 2003, the PWSA issued $167,390,000 of Water and Sewer System Revenue Refunding Bonds, 2003 Bonds, to partially refund the 1993 Bond Series. The 2003 Bonds, with an average yield of 3.8 percent, generated a reduction in annual debt service payments of approximately $4,000,000 for 2004. The 2003 Bonds were refunded by a portion of the 2013 Series A Bonds discussed below.

B.7 2005 Bond Issue

In June of 2005, the PWSA issued First Lien Revenue Bonds, 2005 Bonds, in the amount of $50,385,000 to provide for continuation of the CIP and to meet the needs of emergencies that may require the use of capital funds. The 2005 Bonds, with an average yield of 4.23 percent, created an increase in annual debt service payments of approximately $32 million for the first 12 years. The Capital Projects Fund, through this issue, provided $49,799,037 for capital projects.

B.8 2007 Bond Advance Refunding

In March of 2007 and pursuant to Resolution No. 23 of 2007, adopted on February 9, 2007, the PWSA issued $158,895,000 of First Lien Water and Sewer System Revenue Refunding Bonds: $43,720,000 Series A of 2007 (fixed rate), $57,585,000 Series B-1 of 2007 (variable rate demand), and $57,590,000 Series B-2 of 2007 (variable rate demand). The 2007 Bond Issue refunded the 2002 and 2005 Bonds. The 2007 Bond Advance Refunding also resulted in the deposit of $6,319,014 into the 2007 Depository Agreement Fund. These funds were available for capital projects and were exhausted in 2009. The final amount deposited was $7,503,881. Series B of 2007 Bonds are being refunded by the Series A of 2013 Bonds discussed below.

Pursuant to Resolution No. 23 of 2007, adopted on February 9, 2007, an additional $7,000,000 was made available for capital improvements. These additional funds were provided through a transfer from the Debt Service Reserve Fund in accordance with Section 6.04 of the Trust Indenture, which provided for the required funds for Debt Service Reserve Fund to be in the form of cash, a letter of credit or other credit instrument, a surety bond, or a combination thereof. The PWSA Board elected to replace the monies in the fund with a surety bond. As a result, $7,000,000 was transferred to the Construction Fund for capital improvements, and the balance of the monies were transferred to the Debt Service Fund.

B.9 2008 Bond Advance Refunded

In June 2008 and pursuant to Resolution No. 54 of 2008, adopted on April 11, 2008, the PWSA issued the following bonds:

- $145,495,000 (variable rate demand) Water and Sewer System First Lien Revenue Bonds, Series B of 2008
- $71,225,0000 (variable rate demand) Water and Sewer System First Lien Revenue Bonds, Series D-2 of 2008
- $51,910,000 (variable rate demand) Water and Sewer System Subordinate Revenue Refunding Bonds, Series C-1 of 2008
- $51,885,000 (variable rate demand) Water and Sewer System Subordinate Revenue Refunding Bonds, Series C-2 of 2008
- $68,970,000 (fixed rate) Water and Sewer System First Lien Revenue Refunding Bonds, Series A of 2008 Taxable
- $24,665,000 (fixed rate) Water and Sewer System First Lien Revenue Refunding Bonds, Series D-1 of 2008 Taxable

Proceeds of the 2008 Bonds refunded the PWSA's Series A of 1998 Bonds, Series C of 1998 Bonds, certain maturities of the Series B-1 and B-2 of 2007 Bonds, advance refunded certain maturities of the Series B of 1998 Bonds, and provided $98,442,194 for the continuation of the CIP and to meet the needs of emergencies that may require the use of capital funds.

The issuance of the 2008 Bonds resulted in no rate increase and initially levelled the PWSA's debt service requirements at approximately $42,000,000 until 2040. Due to the crisis that hit the

financial sector in the last quarter of 2008, the debt service for 2009 increased to $51,716,888. The debt service was $49,803,245 in 2010 and $46,507,900 in 2011.

In 2011, Resolution No. 59 of 2011 extended liquidity facilities for $71,225,000 (variable rate demand) Water and Sewer System First Lien Revenue Bonds, Series D-2 of 2008. Also, Resolution No. 77 of 2011 and Resolution No. 78 of 2011 extended credit facilities for $72,750,000 (variable rate demand) Water and Sewer System First Lien Revenue Bonds, Series B-2 of 2008 and $72,745,000 (variable rate demand) Water and Sewer System First Lien Revenue Bonds, Series B-2 of 2008, respectively.

In 2012, Resolution No. 64 of 2012 and Resolution No. 65 of 2012 extended liquidity facilities for the 2008 Series C-1-A, B, and C Bonds and the 2008 Series C-1D Bonds, respectively.

B.10 2013 Bond Issue

In December of 2013 and pursuant to Resolution No. 101 of 2013, the PWSA issued $86,695,000 (fixed rate) of Water and Sewer System First Lien Revenue Bonds, Series B of 2013, to provide for continuation of the CIP and to meet the needs of emergencies that may require the use of capital funds. Additionally, $8,941,131 of the Series B of 2013 Bonds was utilized to reimburse the PWSA's Operations Fund for funds that were used by the PWSA to construct CIP projects in 2013. The Capital Projects Fund, through this issue, provided $75,000,000 for capital projects. These Bonds are expected to carry interest at approximately 5.16 percent maturing in 2043. The PWSA also issued $130,215 (fixed rate) of Water and Sewer System First Lien Revenue Refunding Bonds, Series A of 2013, to refund the Series 2003 and Series 2007 B-1 and B-2 Bonds.

mottmac.com