CITY OF BORDENTOWN
WATER DEPARTMENT

ASSET MANAGEMENT PLAN

PREPARED FOR

CITY OF BORDENTOWN
MUNICIPAL COMPLEX
324 FARNSWORTH AVENUE
BORDENTOWN, NEW JERSEY 08505

PREPARED BY

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APRIL 2019

RVE PROJECT NO. 0313T017

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1 SECTION I - INTRODUCTION

1.1 BACKGROUND OF UTILITY

The City of Bordentown (City) is located in Burlington County, New Jersey. The City owns and operates their own Public Community Water System including the potable water supply wells, water treatment, and water distribution systems, through the City of Bordentown Water Department (PWSID 0303001). The water system serves approximately 16,000 residents through 5,180 connections in the City of Bordentown and Bordentown Township directly. In addition, the Borough of Fieldsboro purchases water at a bulk rate for resale to its residents through two interconnections located at or near the municipal boundary of the City and the Borough. The oldest portions of the water system date back to 1903.

The City of Bordentown Water Department (Water Utility) derives its raw water from the Potomac-Raritan-Magothy (PRM) aquifer. There are four (4) groundwater wells, all drilled after 1964 and over 100 feet deep, which supply the raw water to the Water Treatment Plant (WTP) with a total source capacity of 4 MGD. The Water Utility supplies water through a network of 80 miles of watermains, 953 valves, and to 482 fire hydrants.

In the distribution system, there is an 800,000 gallon standpipe in Gilder Park at State Route 130 and a 4 million gallon standpipe behind the City of Bordentown Public Works yard on Crosswicks Street (County Route 528).

1.2 PURPOSE OF ASSET MANAGEMENT PLAN

In 2018, the City authorized Remington & Vernick Engineers to tour their existing water utility facilities, review current records, and interview utility personnel to prepare an Asset Management Plan (AMP) for the water utility. Included in the AMP was an analysis of both above ground and below ground infrastructure. In particular, the condition of existing infrastructure was evaluated based upon known age, recent improvements/upgrades, repair/emergency response records and available operation and maintenance records.

This AMP is for the City of Bordentown Water Department as required by the Water Quality Accountability Act, PL 2017, c.133, and describes how the Water Utility will manage the water system assets. The AMP contains: an overview of the Water Utility's water system, mission statement and level of service goals; evaluation of existing assets; identification and prioritization of critical assets; descriptions of the Operations and Maintenance and Water Main Renewal programs, a 10-Year Capital Improvement Plan; and a Financial Plan.

The purpose of the AMP is to provide the basis of a water supply and treatment program to inspect, maintain, rehabilitate, and replace wells, pumps, treatment facilities, and the distribution system in accordance with all Federal and State regulations, standards established by the American Water Works Association, and as required by the WQAA. In addition, the AMP will also establish a strategy to fund the action plans and capital improvement projects required to maintain the water system at the desired level of service.

1.3 MISSION STATEMENT AND LEVEL OF SERVICE GOALS

The Water Utility's mission statement is:

We at the City of Bordentown Water Department work hard each day to provide high-quality water to every tap. We ask that all our customers help us protect and conserve our water resources, which are the heart of our community, our way of life, and our children's future.

The levels of service goals determine the amount of effort that is required to inspect, maintain, renew and upgrade the water system infrastructure to provide customers with the level of service required. The level of service goals and performance targets are summarized below on Table 1.

TABLE 1 - LEVEL OF SERVICE GOALS

GOAL	PERFORMANCE TARGET
Meet all State and Federal Water Quality Requirements.	Monthly
Reduce unaccounted water system losses by 2% per year until reducing unaccounted for water to under 15%.	Annually
Provide appropriate water system capacity to support current and future development	Annually
All customer service complaints will be investigated within 2 business days of reporting the complaint	Annually
Maintain water rates at acceptable levels to Residents/Businesses.	Annually

1.4 STAFFING

The Water Utility has staff that is responsible for the proper functioning of the Water System. Several of these individuals have served as members of the "The Asset Management Team". The Asset Management Team is responsible for preparing, implementing and updating this plan. The current team is listed in Table 2.

TABLE 2 - ASSET MANAGEMENT TEAM

NAME	TITLE	ORGANIZATION	ROLE/RESPONSIBILITY ON PROJECT
Joe Myers	Commissioner	City of Bordentown	Director
Margaret M. Peak	Chief Finance Officer	City of Bordentown	Financial
John J. Walls	Licensed Water Operator	City of Bordentown Water Department	Water Operations
Paul Kelley	Water Engineer	Remington & Vernick Engineers	Consultant
Steven Donohue	Water Engineer	Remington & Vernick Engineers	Consultant

The Water Utility presently consists of four (4) full-time staff members. In addition to operation of the water treatment plant, the utility personnel's responsibilities include repair of water mains, hydrants, and valves, utility markouts, and customer service. Outside contractors may be used when the in-house staff is overburdened.

2 SECTION 2 – SYSTEM ASSETS

2.1 WATER SUPPLY AND TREATMENT SYSTEM

2.1.1 General Description of System

In 2018, the Water Utility provided 528 million gallons of water to the residents, businesses and industries it serves through 80 miles of water mains to approximately 4,860 residential connections and 320 commercial/Industrial connections. A schematic of the Water Utility's water system is included in Appendix A.

The existing water supply, treatment, and distribution system consists of four (4) actively permitted water supply wells, one water treatment plant, two (2) water storage tanks, and the water distribution system. The Water Utility is permitted for groundwater diversion at a total of 118 million gallons per month through the four active wells (Wells 1,2A,3,5R), all located in the PRM aquifer. All four wells pump to the water treatment plant, located on the same site, for treatment and delivery to the distribution system. Treatment consists of radium removal, air strippers, sequestering agent injection, PH adjustment, and chlorination.

Over the past five (5) years, the Water Utility's peak demand is shown in the table below. It should be noted that the Water Utility also has committed peak demands that increase the Total Peak Demands as follows:

TABLE 3 - CURRENT WATER DEMANDS

	CURRENT PEAK	COMMITTED PEAK	TOTAL PEAK	CAPACITY/ ALLOCATION LIMITS	CAPACITY/ALLOCATION SURPLUS
DAILY DEMAND	2.519 MGD	0.381 MGD	2.900 MGD	3.36 MGD (Firm Capacity)	0.460 MGD
MONTHLY DEMAND	78.074 MGM	5.906 MGM	83.980 MGM	118 MGM	34.020 MGM
YEARLY DEMAND	777.542 MGY	46.355 MGY	823.897 MGY	1150 MGY	326.103 MGY

Based upon NJDEP Public Water System Deficit/Surplus Calculation – 2/13/19

As noted above, the Water Utility can currently meet its total yearly demand through the use of their wells, but is nearing its firm capacity. The Water Utility should seek ways to increase firm capacity of their system in order to maintain the water supply and as not to prevent future growth in and around the City. Ways to increase the firm capacity include increasing well capacity, increasing the capacity of the water treatment plant, and installation of interconnections with nearby water systems. Please note that the establishment of peak demand is a 5-year rolling value. Accordingly, the peak demand can vary from year to year based upon weather (i.e. drought conditions result in a higher peak demand) and the amount of unaccounted for water.

As discussed earlier, the Water Utility supplies neighboring Borough of Fieldsboro with water through two interconnections. However, Fieldsboro cannot supply water to the City of Bordentown.

2.1.2 Future System Demands

Water consumption has steadily increased over the last several years. With several development agreements in place and assuming an increase in available capacity in the next few years, demand is expected to continue to increase for several more years as follows:

TABLE 4 – FUTURE SYSTEM DEMANDS

Water Demand	Average Demand			Peak Demand	
	Daily	Monthly	Annual	Daily	Monthly
Current Demand	1.937 MG	58.92 MG	707 MG	2.519 MG	78.074 MG
5 Year Projection	2.033 MG	61.83 MG	742 MG	2.644 MG	81.978 MG
10 Year Projection	2.134 MG	64.92 MG	779 MG	2.777 MG	86.078 MG
15 Year Projection	2.241 MG	68.17 MG	818 MG	2.915 MG	90.380 MG

Assuming a reduction in unaccounted for water, water consumption is only increasing by an additional 5% over each 5 year period. The Water Utility is nearing is firm capacity and any deviations from this projection will limit development in the area. As noted above, the Water Utility should attempt to increase firm capacity of the water system.

2.1.3 Well #1

Well #1 is located closest to the water treatment plant at the facility. The well was originally constructed in 1964 and is 126 feet deep. The well is permitted for 800 gpm and includes a vertical turbine pump operated with a 40 horsepower premium-efficient motor. The last redevelopment of the well and well pump rehabilitation was performed in 2015. No issues were reported with the pumping equipment. The electrical equipment was in newer condition, having been replaced in the last few years. The control equipment appears to be in fair condition, with no issues noted by the operator. Due to the age of the well as compared to others on site that have been replaced, this well should be considered for replacement in the next 10 years.

The building is in fair condition, with a few cracks visible in the CMU block walls. No condensation issues were noted during our inspection, but water from the discharge head was accumulating on the floor nearby. The water from the discharge head should be piped to a drain or outside the building to prevent high humidity levels within the building. High humidity levels can cause corrosion and damage to electrical equipment. Since our site visit, the drain piping was addressed to remove the standing water within the well house.

2.1.4 Well #2A

Well #2 is located at the rear of the site, furthest from the water treatment plant. The well was recently constructed in 2016 and is 198 feet deep. The well is permitted for 1000 gpm and contains a new vertical turbine pump with a 60 horsepower premium-efficient motor installed during the well installation project. Some turbidity issues were noted soon after installation but has since cleared upon further pumping. The well is operated in a rotation with the other two operable wells. The electrical and control equipment is new and in good condition.

The building is in good condition, having been installed following the well installation in 2016. No condensation or accumulating water issues were noticed during the inspection, however, the well was not used on a consistent basis prior to our site visit. The interior of the well house should be monitored for any condensation or accumulating water as part of the existing operations and maintenance plan.

2.1.5 Well #3 Facility

Well #3 is remotely located from the water treatment plant. The well was originally constructed in 1965 and is 140 feet deep. The well is permitted for 1100 gpm. The last redevelopment of the well and well pump rehabilitation was performed over ten years ago. The electrical and control equipment appears to be older, but in fair condition, with no issues noted by the operator.

The well has been offline for the last two years due to damage to the well building. The back of the building, containing the well, appears to be sinking into the ground. The well and well building should be replaced as part of a capital improvement plan. Replacement of the well will allow all of the Water Utility's wells to operate at full capacity.

2.1.6 Well #5R Facility

Well #5R is located between Well #3 and Well #1 on the site. The well was recently constructed in 2015 and is 200 feet deep. The well is permitted for 1000 gpm and contains a new vertical turbine pump with a 60 horsepower premium-efficient motor installed during the well installation project. The electrical and control equipment is new and in good condition. The operator indicated no issues with the well and pumping equipment.

The well building is new and in good condition. However, water was accumulating on the floor near the well during our inspection. The discharge head did not appear to be draining properly and was leaking to the floor. The drain piping should be repaired or replaced to prevent water accumulation and subsequent damage to interior components. Since our site visit, the drain piping was addressed and dehumidifiers were placed into operation to remove the standing water and high humidity within the well house.

2.1.7 Water Storage Tank – Gilder Park

The water storage tank at Gilder Park is located off of Crosswicks Street near Route 130. The welded steel tank was constructed in 1956 and has a capacity of 800,000 gallons. The tank interior and exterior was last painted approximately 14 years ago. Based on the recommended maintenance schedule of repainting every 10-15 years, the tank should be scheduled for repainting as part of a capital improvement plan.

2.1.8 Water Storage Tank – Crosswicks Street

The Crosswicks water storage tank is located on Crosswicks Street adjacent to the Public Works facility, which is approximately ¾ of a mile to the East of the Gilder Park Tank. The welded steel tank was constructed in 1984 and has a capacity of 4 million gallons. The tank interior and exterior were last painted approximately 14 years ago. Based on a tank repainting schedule of every 10 to 15 years, the tank should be re-painted in the near future as part of a capital improvement plan in order to preserve and extend the life of the tank.

2.1.9 Water Treatment Plant

The water treatment plant is located off of Route 206 near its intersection with Interstate 195. All of the wells on the site pump to the plant for treatment prior to distribution. Treatment at the facility includes radium removal, air stripping, iron sequestering, pH adjustment, and chlorination. Three (3) high service pumps are used to pump the treated water into the distribution system

Upon entering the water treatment plant, the raw water is conveyed through six (6) adsorption vessels containing radium removal media. The tanks have been in place since installation of the plant in 1973, but have been maintained and are in fair condition. The radium removal media was installed in 2016 and is maintained by Water Remediation Technology, LLC (WRT). With all filters operational, the filters can handle up 2800 GPM. As with the vessels, the vessel piping and valves appear to be in fair condition, with no issues indicated by the operator.

Following the radium removal equipment, the water is treated with lime to raise the pH of the water before being conveyed through the air stripper for treatment of volatile organic compounds (VOCs). The lime treatment equipment has recently been installed and is in good condition. The air stripper is approximately 20 years old. The blowers for the air stripper were leaking water through holes corroded through the metal casing. The air stripper should be inspected and serviced as required. The blowers should be scheduled for replacement to ensure proper operation and treatment.

After the air stripper, the water is fed into an underground clearwell for storage and detention time prior to being pumped into the distribution system. The water is sent into the distribution system by three (3) high service pumps located in the basement of the treatment plant. Two of the three pumps are original to the building, in 1973, and in fair condition for their age. However, the pumps are past their expected service

lives and should be serviced to prevent sudden failures. The third pump was replaced in 2010 and was in good condition.

The electrical and control equipment for the treatment plant are in good condition, with a new installation completed in 2018. The well pumps, high service pumps, and water tanks are monitored and controlled by a new SCADA system. A generator, located at the water treatment plant, provides backup power to the water treatment plant and wells. The generator is rated for 600 kW and was installed approximately 10 years ago. The generator appeared to be in good condition.

2.2 WATER DISTRIBUTION SYSTEM

2.2.1 Water Mains

The existing water distribution system consists of approximately 80 miles of water mains, dating back to 1903. Earliest sections of piping consisted of cast iron, followed by asbestos cement and then ductile iron pipe. Sizes of the pipes range from 4-inch to 12-inch diameter. The sizes and lengths of the water main were estimated based on preliminary GIS Mapping. These estimates will be updated when the GIS Mapping project is completed. The estimated breakdown of the existing water main infrastructure is as follows:

TABLE 5 – WATER MAIN SIZES

Pipe Diameter	Length of Pipe (ft)	% of Pipe in System
4-inch or less	26,708	6.36
6-inch Pipe	129,137	30.8
8-inch Pipe	160,072	38.1
10-inch Pipe or larger	100,761	24.0

As demonstrated above, 6” diameter or smaller water main comprises approximately 40% of the system. Based upon current standards, it is desirable to have larger diameter main (8” or larger) for both transmission and fire protection measures. No specific issues were reported with the underground water distribution system, with few water main breaks or leaks identified each year. It should be noted that the pressure of the water system is maintained at approximately 60 psi on average, which is maintained consistently across the system. This pressure is sufficient for this water system.

According to the WQAA, water mains should be scheduled for replacement on a 150-year cycle. As the water mains in the water system are already approaching their expected service lives, the Water Utility needs to begin a water main renewal program. With approximately 80 miles of water main, approximately 3000 feet of water main should be scheduled for replacement each year to meet the WQAA requirements. The oldest and smallest diameter water mains should be replaced first to reduce potential leaks and improve pressure in those areas during high usage periods.

2.2.2 Water System Losses

The Water Utility accounted for 417 million gallons of water usage through the water meters, which resulted in unaccounted for water amount of 21%. Unaccounted for water can be attributed to several factors including unauthorized consumption, administrative errors, data handling errors, metering inaccuracies or failures, fire suppression activities, and hydrant flushing to name a few. Unaccounted for water may also be attributed to system leaks. Estimating 2% for apparent loses such as hydrant loss, meter reading error,

firefighting activities, etc., a 19% water loss may be attributable to system leaks from the water mains, fire hydrants or service laterals. This equates to approximately 111 MGY in lost water and revenue for the Water Utility. The Water Utility may want to consider acoustical leak detection to begin identification of leaks in the system that are contributing to lost water. The testing will allow the Water Utility to prioritize and bias the water main replacements that are planned as part of the water main renewal program and reduce the amount of unaccounted for water. Reduction of unaccounted for water will also reduce future peak demands and allow the Water Utility to allocate as much water as possible to future development.

2.2.3 Valves

The number of valves in the system is estimated at 953. The age and size of the valve were estimated along with the age and size of the water mains. Some of the valves were expected to date back to 1903 with the water main installation, and the average age of the water main was estimated at 60 years old. Many of these valves are approaching or have exceeded their expected service lives.

The Water Utility does not currently have a valve-exercising program and some valves have not been operated for long periods of time, resulting in the condition of the valves being unknown. With adequate maintenance, the life of the valves can be extended. As valves are a critical component of a system, the lack of ability to isolate a system when needed causes not only operational and service issues, but can be costly to rectify (i.e. wet tap, line stop installations). In addition, as part of the WQAA, valve maintenance will be required for all system valves. Proper inspection, operation and maintenance of the system valves should be performed as part of an operations and maintenance plan.

2.2.4 Water Meters

The system water meters were last replaced in 2002. The water meters are radio read devices, which eases the labor requirement of meter readers. There is no meter replacement program in place and meters were only replaced on an as-needed basis. When needed, The Water Utility performs water meter replacements for water customers, which are typically located within basements. Few service calls were reported each year due to meter accuracy concerns.

As water meters age, the accuracy tends to decrease, resulting in lost revenue and larger quantities of unaccounted for water. At an expected service life of 20 years, the water meters should be scheduled for replacement. The Water Utility has scheduled for the replacement of all water meters in 2019 in order to improve the accuracy of water meters and reduce unaccounted for water.

2.2.5 Water Services

The Water Utility provides repairs up to the curb line or at the curb stop of the customer's service line. In-house personnel perform the service repairs of the Water Utility’s portion of the service. Based upon the existing rate of development in the City and Township, approximately 50 new water service connections are expected each year.

2.2.6 Fire Hydrants

The Water Utility has an existing hydrant-flushing program that requires the flushing of all hydrants, approximately 482 in the water system, twice per year. In addition, any repairs or replacements of hydrants are performed by in-house maintenance personnel. Hydrant flushing not only reduces incidences of rusty water, but also ensures operation of the hydrants when required, similar to a valve exercising program.

According to the WQAA, hydrants are required to be flushed once per year and logged by the Water Utility for reference, including any required repairs or replacements. The Water Utility should continue the hydrant flushing program currently in place and log the activities going forward. The flushing program should continue to be performed under an operations and maintenance plan. Any hydrants found to be defective or leaking should also be replaced as part of an operations and maintenance plan.

3 SECTION 3 - BUSINESS RISK

Some assets are more important than others in making sure that drinking water of the highest quality is provided to the customers. In order to determine the assets with the highest business risk, assets were graded using a scale of 1 to 5 for both probability of failure and consequence of failure. These grades were used to both prioritize critical assets and improve practices used for routine operation and maintenance. This process includes reviewing all assets and grading their condition, criticality to the Water Utility's mission, and redundancy (the number of back-up assets to help support each asset). This information is used to ensure that the Water Utility delivers the level of service described in Section 1.3.

3.1 PROBABILITY OF FAILURE

The Probability of Failure (POF) of each asset was rated based on the age of the asset relative to its expected service life and current performance of the asset. The metrics used to determine the asset POF risk score are described in Table 6 below.

TABLE 6 - PROBABILITY OF FAILURE SCORING METRICS

RANK:	DEFINITION
Excellent:	Asset is new, or like-new. The asset meets or exceeds performance criteria. No further action needed at this time.
Above Average:	Assets in this category are relatively new. The asset has been maintained in good condition with little signs of wear/deterioration. The asset meets the required performance criteria for the application with little to no problems. This item should be included in a preventative maintenance program to maintain condition.
Fair:	Assets in this category are at or near half their expected service life. The asset has been maintained but shows some signs of wear/deterioration. Some loss of performance and/or efficiency is expected. Increased preventative maintenance is required to limit problems and extend service life.
Poor:	Assets in this category are toward the end of their expected service life. The asset has had maintenance but shows wear/deterioration. Significant loss of performance and/or efficiency is expected. The asset should be planned for rehabilitation or replacement in the near future.
Failing:	Assets in this category are nearing or have exceeded their expected service life. The asset shows significant wear/deterioration, loss of performance, and/or efficiency. The asset should be rehabilitated or replaced immediately.

3.2 CONSEQUENCE OF FAILURE

The Consequence of Failure (POF) of each asset was rated based on cost of emergency repairs, impact to water service, impact to water quality, and potential damage to the environment. The metrics used to determine the asset COF risk score are described in Table 7 below.

TABLE 7 - CONSEQUENCE OF FAILURE SCORING METRICS

RANK:	DEFINITION
Low:	Little to no impact in regard to cost of repair, customer service, water quality, or to the environment.
Minor:	Failures can be isolated and/or repaired quickly. Localized customer service interruption, water quality issues, or environmental impacts expected.
Medium:	Failures can be repaired within budget for service/maintenance. Some customer service interruption, water quality issues, or environmental impacts would be expected.
High:	Failures would result in long-term projects with high cost to repair and significant impact to current year budget; water quality issues or service outages would be moderate in size and/or duration; substantial impact to the environment.
Significant:	Cost to address failure would likely impact budget for years to come. Significant service outages in size and duration, water quality issues, or damage to environment likely to result from failure.

3.3 REGULATORY ACTION HISTORY

The following is a comprehensive list of violations incurred for the water system. The Water Utility has exceeded action levels for lead while sampling in the past year.

Group Violations							
Violation #	Violation Status	Analyte Group	Violation Type	Violation Name	Monitoring Period	Sample Point ID	Determination Date
2016-6746	V	VOCS FEDERAL	03	MONITORING, ROUTINE MAJOR	4Q2015	TP001003	01/20/2016
2016-6718	V	VOCS FEDERAL	03	MONITORING, ROUTINE MAJOR	3Q2015	TP001003	10/19/2015
2012-6150	V	TOTAL THM-HAA5	27	MONITORING, ROUTINE (DBP), MAJOR	1QT12	DS	04/30/2012
1997-13	V	VOC PHASE2&5	03	MONITORING, ROUTINE MAJOR	2QT97	TP001003	08/22/1997

Individual Violations							
Violation #	Violation Status	Analyte	Violation Type	Violation Name	Monitoring Period	Sample Point ID	Determination Date
2018-9902	V	CHLORINE	27	MONITORING, ROUTINE (DBP), MINOR	APR2018	DS	07/30/2018
2018-9901	V	LEAD	PB	LEAD ACTION LEVEL EXCEEDED	6M 201801	DS	06/25/2018
2018-9898	V	LEAD	PB	LEAD ACTION LEVEL EXCEEDED	6M 201707	DS	12/07/2017
2017-9897	V	TOTAL HALOACETIC ACIDS (HAA5)	27	MONITORING, ROUTINE (DBP), MAJOR	2Q2017	DS	07/18/2017
2017-9896	V	ETHYLBENZENE	03	MONITORING, ROUTINE MAJOR	3Q2016	TP001003	10/19/2016
2016-9894	V	CONSUMER CONFIDENCE RULE	71	CCR REPORT			08/24/2016
2016-9849	V	GROSS ALPHA, EXCL. RADON & U	02	MCL, AVERAGE	3Q2015	TP001003	10/07/2015
2015-9848	V	GROSS ALPHA, EXCL. RADON & U	02	MCL, AVERAGE	2Q2015	TP001003	07/08/2015
2015-9847	V	GROSS ALPHA, EXCL. RADON & U	02	MCL, AVERAGE	3Q2014	TP001003	10/20/2014
2014-9846	V	GROSS ALPHA, EXCL. RADON & U	02	MCL, AVERAGE	2Q2014	TP001003	07/11/2014
2014-9844	V	COMBINED URANIUM	03	MONITORING, ROUTINE MAJOR	4Q2013	TP001003	01/28/2014
2012-9843	V	COLIFORM (TCR)	22	MCL (TCR), MONTHLY	AUG2012	DS	08/21/2012
2010-9810	V	E. COLI	34	MONITOR GWR TRIGGERED/ADDITONAL, MINOR	DEC2009		08/03/2010
2010-9410	V	PUBLIC NOTICE	75	PUBLIC NOTICE RULE LINKED TO VIOLATION	2Q2009	TP001003	10/27/2009
2010-9310	V	PUBLIC NOTICE	75	PUBLIC NOTICE RULE LINKED TO VIOLATION	4Q2009	TP001003	10/27/2009
2009-9109	V	GROSS ALPHA, INCL. RADON & U	02	MCL, AVERAGE	2Q2009	TP001003	09/04/2009
2009-9009	V	GROSS ALPHA, INCL. RADON & U	02	MCL, AVERAGE	4Q2008	TP001003	04/02/2009
2009-8909	V	COMBINED RADIUM (-226 & -228)	02	MCL, AVERAGE	4Q2008	TP001003	04/02/2009
2009-8809	V	COMBINED RADIUM (-226 & -228)	02	MCL, AVERAGE	3Q2008	TP001003	12/09/2008
2009-8709	V	GROSS ALPHA, INCL. RADON & U	02	MCL, AVERAGE	3Q2008	TP001003	12/09/2008
2008-8608	V	COMBINED RADIUM (-226 & -228)	02	MCL, AVERAGE	2Q2008	TP001003	07/31/2008
2008-8508	V	GROSS ALPHA, INCL. RADON & U	02	MCL, AVERAGE	2Q2008	TP001003	07/31/2008
2008-8408	V	COMBINED RADIUM (-226 & -228)	02	MCL, AVERAGE	1Q2008	TP001003	05/21/2008
2008-8308	V	GROSS ALPHA, INCL. RADON & U	02	MCL, AVERAGE	1Q2008	TP001003	05/21/2008
2007-8207	V	COLIFORM (TCR)	22	MCL (TCR), MONTHLY	JUL2007		07/31/2007
2006-7906	V	SODIUM	03	MONITORING, ROUTINE MAJOR	3Y200201	TP001003	05/30/2006
2001-1401	V	LEAD	PB	LEAD ACTION LEVEL EXCEEDED	6M200007		12/13/2000
1996-1296	V	COLIFORM (TCR)	22	MCL (TCR), MONTHLY	NOV95		12/18/1995
1993-793	V	TRICHLOROETHYLENE	01	MCL, SINGLE SAMPLE	YR199101	TP001003	11/09/1992
1992-692	V	TRICHLOROETHYLENE	02	MCL, AVERAGE	6M199110	TP001003	02/07/1992
1990-490	V	TTHM	03	MONITORING, ROUTINE MAJOR	2QT90		09/17/1990
1989-389	V	TTHM	03	MONITORING, ROUTINE MAJOR	3QT88		12/21/1988
1988-288	V	TTHM	03	MONITORING, ROUTINE MAJOR	2QT88		09/20/1988
1987-187	V	TTHM	03	MONITORING, ROUTINE MAJOR	2QT86		10/01/1986

3.4 WATER SUPPLY SYSTEM RISK SCORING SUMMARY

The overall business risk score was calculated by multiplying the probability of failure and the consequence of failure scores, with some reduction in risk provided to redundant assets. The asset inventory with risk scores is attached in Appendix B. The following chart summarizes the assets with the highest business risk, which should be prioritized for rehabilitation/replacement to maintain desired levels of service to customers.

TABLE 8 - HIGH RISK ASSETS

ASSET	RISK SCORE	SUMMARY
Well #3 Replacement	15	Well #3 is inoperable due to settlement of the well house around the well. Due to its age and the replacement of other wells on site, Well #3 should be replaced to ensure full capacity of the facility.
Crosswicks Road Tank	14	The 4MG tank has not been painted since 2000. The tank is overdue for painting on the interior and exterior and corrosion is evident on the exterior. Corrosion will continue and worsen the longer the tank is left unpainted.
Gilder Park Tank	13.5	The 800,000 tank has not been painted since 2000. The tank is overdue for painting on the interior and exterior and corrosion is evident on the exterior near the bottom. The tank should be painted to maintain its current condition.
WTP Air Strippers	13.5	The air strippers have been in place for approximately 20 years. Water was seen leaking from the blowers during our inspection. The air strippers are due for service, including replacement of the blowers, to ensure full capacity.

The above projects have been included in the capital improvement program for rehabilitation or replacement. Projects were spread out over the 10-year period to limit budget impacts in any given year.

In addition to the above high business risk assets, some additional projects were included in the 10-year Capital Improvement Plan to improve capacity, reduce system losses, and increase levels of service. Those projects are:

TABLE 9 – ADDITIONAL RECOMMENDED PROJECTS

ASSET	SUMMARY
Interconnection / Alternate Water Supply Source	The water supply to the Water Utility is limited by the capacity of the Water Treatment Plant equipment. An interconnection or alternate water supply source will allow the Water Utility to use all of its available capacity and ensure continued operation should a failure of any component occur.
Water Meters	The water meters were last replaced in 2002. With an expected service life of 20 years, the water meters are due for replacement in the near future. Older meters can become inaccurate over time and lead to higher than normal unaccounted for water. All Water meters are scheduled for replacements in 2019.
Well #5R Rehabilitation	Wells should be rehabilitated within 10 year intervals in order to prevent loss of capacity or sudden failures. Well #5R has been in operation since 2016.
Well #2A Rehabilitation	Wells should be rehabilitated within 10 year intervals in order to prevent loss of capacity or sudden failures. Well #2A has been in operation since 2017.
Well #1 Replacement	Well #1 is the oldest of the wells on site and the only one on this site which hasn't been replaced, or in an urgent need for replacement. Well #1 should be replaced before it fails in order to maintain capacity of the facility.
Lagoon Cleanup	The lagoon is required to be cleaned up over the next several years as mandated by an administrative consent order from the NJDEP. In 2019, the Water Utility will work with NJDEP to close the lagoon.

These projects have been included in the 10-year Capital Improvement Plan and should be reviewed and updated on a yearly basis, depending which projects have been completed to date.

4 SECTION 4 – ACTION PLANS

Based upon the evaluation of the water system assets, existing system management strategies, and financial strategies, various action plans have been prepared to guide the Water Utility in achieving their level of service goals. The action plans developed for the Water Utility are an Operations and Maintenance Program, Water Main Renewal Program, and a 10-year Capital Improvement Plan.

4.1 OPERATIONS AND MAINTENANCE PROGRAMS

Preventive maintenance is the day-to-day work necessary to keep assets operating properly, which includes the following:

A. Regular and ongoing annual tasks necessary to keep the assets at their required service level
B. Day-to-day and general upkeep designed to keep the assets operating at the required levels of service
C. Tasks that provide for the normal care and attention of the asset including repairs and minor replacements

Preventive maintenance is carried out because of a planned maintenance program (such as regularly scheduled asset repairs) and historically problematic operations (such as equipment malfunctions). Equipment must be maintained according to manufacturer's recommendations to achieve maximum return on investment. By simply following the manufacturer's suggested preventive maintenance, the useful life of equipment can be increased 2 to 3 times when compared to a “run-till-failure” maintenance schedule. Deferred maintenance tasks that have not historically been performed because of inadequate funding or staffing must be projected into future operating budgets to achieve life expectancy projected by the manufacturer or engineer.

Overall, the Water Utility does a good job of maintaining its mechanical equipment. Little to no sudden failures have occurred to their equipment and should be continued as per operations and maintenance schedules for the facilities. However, additional operations and maintenance activities are recommended to comply with current regulations, extend service lives of all assets, and prevent sudden failures. These additional operation and maintenance activities include a building maintenance program, a valve exercising program, and a hydrant flushing program.

4.1.1 Building Maintenance Program

A building maintenance program is necessary to not only extend the life of the buildings, but also to protect the contents inside. For the most part, the well buildings and water treatment plant are in good condition, with the exception of the well house at Well #3. However, some water accumulation within the well buildings was of concern. Standing water can cause high levels of humidity, resulting in corrosion of piping and damage to electrical equipment. Additional maintenance activities identified during the inspection included either replacing drain piping or upgrading dehumidifiers to remove excess water in the buildings. These projects can be performed by in-house personnel as part of their operations and maintenance activities. Following our on-site inspection, the drains and dehumidifiers were addressed to remove the excess water. The Water Utility should continue to monitor the buildings for standing water and address as necessary.

4.1.2 Valve Exercising Program

According to the WQAA, all valves greater than or equal to 12-inch require inspection every 2 years and all other valves require inspection every 4 years. Inspection of the valves includes clearing the area to access the valve, cleaning out the valve box, and dynamic testing of the valves. The intent of this program is to maintain the valves, extend their service lives, and be able to isolate parts of the system when needed, so that valves do not require replacement under emergency conditions, driving up replacement costs. In order to implement this valve maintenance program, additional maintenance personnel time will be required, especially during the first two years. Valve maintenance trailers containing cleaning, operating, and locating devices are often used to reduce the labor effort to facilitate this program and should be considered to reduce the labor effort. It should be noted that operation of a large number of valves that have been inactive for years may result in some valves being damaged and requiring replacement. Due to the increased labor and materials required for valve exercising and replacement of defective valves, increased operations and maintenance costs will be included in the financial plan to perform this service. All valve exercising, maintenance, and repair activities should be logged in the GIS database for tracking purposes.

4.1.3 Hydrant Flushing Program

The Water Utility has an existing hydrant-flushing program that requires the flushing of all 482 hydrants twice per year. Hydrant flushing not only reduces incidences of rusty water and extends their service life, but also ensure operation of the hydrants when required, similar to a valve exercising program. According to the WQAA, hydrants are required to be flushed once per year and logged by the Water Utility for reference, including any required repairs or replacements. The Water Utility should continue the hydrant flushing program currently in place and log the activities going forward in the GIS database for future reference. The flushing program and any hydrant repair activities should continue to be performed under an operations and maintenance plan. In addition, hydrants are required to be numbered and labeled for reference as part of the WQAA. The Water Utility has performed the numbering and labeling of all of the hydrants during the most recent hydrant flushing.

4.2 WATER MAIN RENEWAL PROGRAM

There has been much discussion on how to plan for the systematic upgrade of utility piping to prevent the leaks, loss of water pressure, reduced water quality, and even collapse of a distribution system. This “underground” portion of a water system typically goes unimproved and improvements are typically reactive rather than proactive. However, this reactive approach may not only create more costly repairs, but may also negatively impact budgets and capital improvement schedules to re-allocate funds. These types of situations not only create an impact to the customer but result in a loss of water, unplanned re-allocation of limited staffing to handle the emergency conditions and elevated costs for emergency repair.

Therefore, proper planning and allocation of resources for the distribution system infrastructure improvements need to be implemented into any long-term Capital Improvement Plan. However, a balance must also be incorporated so as not to create an undo financial burden to the customer; particularly with the variability in piping lifespans due to their localized site specific conditions. In addition, it should be noted that this is a planning mechanism to allow the Water Utility to begin the budgetary allocation for the strategic improvements to the water distribution system. The planning of water distribution improvements must be an on-going evolutionary process. The utility policy and replacement criteria may change from year-to-year but the basic process will remain the same.

Due to aging infrastructure piping throughout the country, there has been much discussion in recent years regarding the anticipated lifespan of our underground utility piping. As a result, lifespan years have been assigned to certain types of pipe material as follows:

- Cast Iron Pipe – 110 year lifespan[(1)]
- Asbestos Cement Pipe – 100 year lifespan [(1)]
- Ductile Iron Pipe – 110 year lifespan [(1)]

[(1)]– American Water Works Association

It should be noted that the above reference is clear to state that prediction of the lifespan of a below grade utility is estimated. Site specific factors such as installation methodologies, local soil characteristics, local water characteristics, water hammer, electrolysis outside of the buried pipe, etc. can all have an impact on the anticipated lifespan of a pipe. In addition, it should be noted that much of the pipe throughout the Country has already surpassed its theoretical life expectancy but is still in the ground and functioning.

As discussed earlier, according to the WQAA, water mains should be scheduled for replacement on a 150-year cycle. As the Water Utility's piping dates back 115 years, there is a need to begin water main renewal at the current time. In order to comply with WQAA requirements, approximately 3,000 feet of water main should be scheduled for replacement each year. The piping that we've included in the water main renewal program mostly consists of 4" pipe in the City and sections of 6" pipe in residential areas of the Township. Table 10 shows the recommended sections of piping to be installed to begin the Water Main Renewal Program. Costs for the replacement of these sections of pipe will be included in the Capital Improvement Program discussed in Section 4.3.

TABLE 10 - WATER MAIN RENEWAL PROJECTS

RECOMMENDED PIPING REPLACEMENT PROJECTS (BEGINNING IN YEAR 2 – 2020)		MAIN LENGTH
1	Replacement of 4" Watermain with 8" in East Union Street, West Street, and Brooks Avenue	3100 ft.
2	Replacement of 4" Watermain with 8" in Borden Street, Carpenter Street, Myrtle Avenue, Lafayette Street, and Federal Street (Farnsworth to Prince Street)	2775 ft.
3	Replacement of 6" Watermain with 8" in Leyden Avenue, Gilder Park Road, Federal Street (Prince Street to Oliver Street), McKnights Avenue, and cap off both Lime Kiln Alley and Water Street	2450 ft.
4	Replacement of 6" Watermain with 8" in Crosswicks and Hopkinson Streets	3300 ft.
5	Replacement of 6" Watermain with 8" in Farnsworth, Poplar, Linden, And Redwood Avenues (The Farnsworth Avenue project should be coordinated with the NJDOT for their orphan bridge replacement project in the same area)	5550 ft.
6	Replacement of 6" Watermain with 8" in Maple, Laurel, and Cedar Avenues	3000 ft.
7	Replacement of 6" Watermain with 8" in Elm, Pine, and Spruce Avenues	3000 ft.
8	Replacement of 6" Watermain with 8" in Oak, Grand, and Liberty Avenues	3200 ft.
9	Replacement of 6" Watermain with 8" in Roosevelt, Homestead, and Carmen Avenues	2900 ft.

As you can see from Table 10 above, 29,275 feet, or 6.9% of water main is proposed for replacement over the next 10 years. The water utility is not scheduled for water main replacement in 2019, so additional water main replacements were included over the course of the 10-year period in order to meet the NJDEP's

requirements. In accordance with NJDEP regulations, a water system with an average daily demand of 1 million gallons per day or greater is required to install a minimum 8" diameter pipe for new water main construction or for water main replacement projects; the exception being short dead end sections of the water main. The Water Utility's water system falls into this regulatory category. This requirement is to ensure adequate system flow is available not only to supply customer demands but also for sufficient firefighting capabilities. Therefore, 6" diameter water mains will be replaced with 8" mains as required.

In addition, use of acoustical leak detection, and other operations and maintenance activities, will provide the Water Utility with additional information to prioritize and modify the water main renewal projects as scheduled in the 10-Year Capital Improvement Plan.

4.3 10-YEAR CAPITAL IMPROVEMENT PLAN

A capital improvement plan is necessary to increase levels of service and decrease costs associated with emergency repairs. The highest business risk items are outlined in Table 8 above. These items are expected to be replaced/rehabilitated within the next 10 years as part of the capital improvement plan. In addition, Table 9 outlines other projects that increase levels of service over the next 10 years. More expensive maintenance items have been included in the capital improvement plan in order to lessen the operations and maintenance budget in the near term, while also helping to keep a schedule for items to be completed. The recommended capital improvement projects with budgetary estimates are attached in Appendix C. The capital improvement plan is a living document to be adjusted each year depending the resources available and projects able to completed each year. It is possible that additional emergency projects will come up, which will need to be incorporated into the plan and other projects adjusted accordingly. The yearly capital improvement estimates have been included in the financial plan discussed in Section 5.

5 SECTION 5 – FINANCIAL PLAN

5.1 EXISTING BUDGET REVIEW

Budget details for years 2015 through 2017 for the water utility were obtained from financial audit reports on the City of Bordentown's website. Approximate revenues generated during those years were approximately $2,800,000, with rents generating the vast majority of that amount.

The Water Utility currently budgets $2,115,000 annually for water system expenses and debt service. In addition, the water utility also has salaries and other statutory expenditures totaling approximately $785,000. Therefore, on average the water utility has generated a surplus over the last few years. According to research of other similar sized water utilities in the state, it is recommended that a healthy reserve be around $500,000 for this water system. Reserves should be maintained to fund unplanned and/or emergency events that disrupt water services.

5.2 FUTURE OPERATIONS AND MAINTENANCE COSTS

In order to maintain the service life of existing equipment and reach the level of service goals, additional maintenance activities are required in the form of a Building Maintenance Program, a Valve Exercising Program, and a Hydrant Flushing Program. As discussed earlier, due to age and a lack of recent activity, some valves will require replacement following the exercising program. Due to the increased labor and materials requirements, an additional $100,000 will be included in the budget starting in 2019 to account for these additional maintenance and repairs.

5.3 10-YEAR CAPITAL IMPROVEMENT PLAN COSTS

While it is desired to maintain the current rate structure, preventative maintenance, repairs, and capital improvements are needed to protect the infrastructure and maximize its useful life. Since public health, safety, and environmental protection are at stake, continuous operation of the public water supply system is essential. The projects included in the 10-Year Capital Improvement Plan should be performed to upgrade and maintain the current water supply system. A list of projects that are recommended to be performed over the next 10 years are included in Appendix C.

A long-term capital improvement plan consisting of multiple system upgrades each year is recommended to maintain the system and achieve the level of service goals. Based upon the 10 Year Capital Improvement Plan, it is estimated that the cost of the capital improvements over the next 10 years will cost an average of $3,188,894 per year. The replacement of the oldest sections of water main account for almost one-half of the annual project costs over the next 10 years.

5.4 FUNDING STRATEGY

Future capital improvement projects and the associated debt service have a significant impact on the rate structure. Ideally, projects are scheduled in conjunction with retirement of existing debt. Looking at the Water Utility's current remaining debt service, some reduction in debt service will be realized over the course of the 10-year period while the projected debt service phases in. For the purpose of this funding strategy, the additional debt service resulting from the 10 Year Capital Improvement Plan was projected through 2028 with the assumption that funding would be procured through either bonds or the New Jersey Environmental Infrastructure Trust at an average interest rate of 3% and a loan period of 20 years. Based upon this assumption, the projected debt service for the proposed capital improvements would increase each year over the next 10 years and reach a cost of approximately $2,104,670 in year 10. A schedule of the proposed debt service is included in Appendix D.

Annual projected revenues and expenditures through 2028 are shown in Appendix E. This budget projection considers the existing debt service, in addition to the recommended capital improvement projects needed to address aging infrastructure. Based on the current rate schedule, a deficit of $1,471,071 is projected by 2028, resulting in a fund balance of -$4,758,866. Based on the existing budget, sufficient funds are not available for the additional maintenance, upgrades and long-term planning of the water infrastructure.

Given the condition of the utility infrastructure and the current rate structure, increased rates will be required. In 2019, the water utility has increased rates by 10% in anticipation of upcoming projects. Based upon the 10-Year Capital Improvement Plan, it is recommended that the water utility continue with an annual 4% increase in rates over the next nine years (2020-2028). This will result in the standard residential quarterly service charge to increase from $33.70 to $52.76 and the usage rate to go from $3.38 to $5.29 per 1000 gallons over the 10-year period. For the average residential customer using 15,000 gallons per quarter, the quarterly service charges will increase from $84.40 to $132.14 over the same time frame. As a comparison, East Brunswick currently charges customers approximately $90 per quarter for 15,000 gallons of water usage. In addition, New Jersey American Water Company charges residential customers approximately $10 per 1000 gallons, including fixed meter and service charges, or approximately $150 per quarter for 15,000 gallons. Both water utilities rates are expected to rise over the course of the next 10 years.

The proposed rate adjustment is necessary to increase revenue to complete the needed capital improvement projects and ensure future revenues balance anticipated expenditures. The current water service user fees were adjusted based upon the recommended rate increases. Please note, connection fees were not considered as part of this study since they are not a significant revenue source at this time. Nevertheless, these fees should also be adjusted and should be increased to correspond to the proposed rate structure. The projected revenues and expenditures with the rate increase, beginning in 2019, is attached in Appendix F. With the increased rate, a small surplus of $116,237 is achieved in 2028 with slight increase in the fund balance. This projected surplus and fund balance will provide a cushion if and when emergency repairs are required.

As previously shown, the water main replacement program accounts for one-third of the annual utility fees over the next 10 years. It is important to recognize the importance implementing a replacement plan and the advantages of taking a pro-active approach. Not only is this approach cost effective, but it enhances the condition, performance, and reliability of the water system. Initiating the water renewal program will also limit future water main replacement requirements and impacts to the budget. This allows the Water Utility to begin the budgetary allocation for the strategic improvements to the water infrastructure and make the necessary rate structure adjustments.

The 10-Year Capital Improvement Plan and the associated debt service have a significant impact on the proposed rate structure. It should be noted that the water main renewal program schedule is not aggressive. The proposed budgeting schedule will still result in 93.1% of the Water Utility's water main being from original construction, at an estimated age of 60 years, at the end of the 10-year plan. With proper budgeting, the Water Utility will have the opportunity to be active in replacement of older and troublesome water mains over the next 10 years and allocate resources for additional replacements following the completion of this 10-Year Capital Improvement Plan. The proposed rate structure should be re-evaluated in future years as deviations are made from the 10-Year Capital Improvement Plan.

APPENDIX A
WATER SYSTEM SCHEMATIC

APPENDIX A. WATER SYSTEM SCHEMATIC

APPENDIX B
WATER SYSTEM ASSET INVENTORY AND SCORING SUMMARY

APPENDIX B. WATER SYSTEM ASSET INVENTORY AND SCORING SUMMARY

CITY OF BORDENTOWN WATER DEPARTMENT
WATER SYSTEM ASSET INVENTORY
UPDATED APRIL 2019

WATER SYSTEM FACILITIES

						Probability of Failure (POF)			Consequence of Failure (COF)							
Year of Construction	Asset	Capacity	Location	AGE (YEARS)	SERVICE LIFE	Physical Condition	Performance	POF Score	Cost	Customer Service	Water Quality	Environmental	COF Score	Redundancy	Adjusted COF	Risk Score
	Well #1 Site		Route 206													
1973	Well #1	800 GPM	Route 206	45	40	5	3	4	3	3	3	3	3	0	3	12
2015	Well Pump	800 GPM	Route 206	3	10	2	3	2.5	3	3	3	3	3	0	3	7.5
2004	Well House Piping	800 GPM	Route 206	14	50	2	3	2.5	3	3	3	3	3	0	3	7.5
2016	Electrical and Controls		Route 206	2	40	1	3	2	3	3	3	3	3	0	3	6
1973	Well House		Route 206	45	100	3	3	3	3	3	3	3	3	0	3	9
	Well #2A Site		Route 206													
2016	Well #2A	1000 GPM	Route 206	2	40	1	3	2	3	3	3	3	3	0	3	6
2017	Well Pump	1000 GPM	Route 206	1	10	1	3	2	3	3	3	3	3	0	3	6
2017	Well House Piping	1000 GPM	Route 206	1	10	1	3	2	3	3	3	3	3	1	1.5	3
2017	Electrical and Controls		Route 206	1	40	1	3	2	3	3	3	3	3	0	3	6
2017	Well House		Route 206	1	100	1	4	2.5	3	3	3	3	3	0	3	7.5
	Well #3 Site		Route 206													
1973	Well #3	1100 GPM	Route 206	45	40	5	5	5	3	3	3	3	3	0	3	15
2008	Well Pump	1100 GPM	Route 206	10	10	5	4	4.5	3	3	3	3	3	0	3	13.5
1973	Well House Piping	1100 GPM	Route 206	45	10	5	4	4.5	3	3	3	3	3	1	1.5	6.75
1973	Electrical and Controls		Route 206	45	40	5	4	4.5	3	3	3	3	3	0	3	13.5
1973	Well House		Route 206	45	100	3	5	4	3	3	3	3	3	0	3	12
	Well #5A Site		Route 206													
2015	Well #5R	1000 GPM	Route 206	3	40	1	3	2	3	3	3	3	3	0	3	6
2016	Well Pump	1000 GPM	Route 206	2	10	2	3	2.5	3	3	3	3	3	0	3	7.5
2016	Well House Piping	1000 GPM	Route 206	2	10	2	3	2.5	3	3	3	3	3	1	1.5	3.75
2016	Electrical and Controls		Route 206	2	40	1	3	2	3	3	3	3	3	0	3	6
2016	Well House		Route 206	2	100	1	4	2.5	3	3	3	3	3	0	3	7.5
	Water Treatment Plant		Route 206													
2017	Electrical and Controls		Route 206	1	40	1	3	2	3	3	3	3	3	0	3	6
2008	Generator		Route 206	10	25	3	2	2.5	3	3	3	3	3	0	3	7.5
2018	Lime Softening		Route 206	0	25	1	5	3	3	3	4	3	3.25	0	3.25	9.75
1997	Air Strippers	2800 GPM	Route 206	21	25	5	4	4.5	3	3	3	3	3	0	3	13.5
1973	Radium Removal Equip	2800 GPM	Route 206	45	50	5	3	4	3	3	4	3	3.25	0	3.25	13
1973	Treatment Building		Route 206	45	100	3	3	3	3	3	3	3	3	0	3	9
1973	High Service Pumps	2300 GPM	Route 206	45	25	5	4	4.5	3	3	3	3	3	1	1.5	6.75
2010	High Service Pump	2300 GPM	Route 206	8	25	2	3	2.5	3	3	3	3	3	1	1.5	3.75
	Water Storage Tanks															
1984	Crosswicks Road Tank	4 MG	Crosswicks Road	34	50	4	4	4	4	4	3	3	3.5	0	3.5	14
1956	Gilder Park Tank	0.8 MG	Crosswicks Road	62	50	5	4	4.5	3	3	3	3	3	0	3	13.5

APPENDIX C
10-YEAR CAPITAL IMPROVEMENT PLAN

APPENDIX C. 10-YEAR CAPITAL IMPROVEMENT PLAN

PROPOSED 10-YEAR CAPITAL IMPROVEMENT PLAN (2019 - 2028)

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 1 - 2019	
WELL #3 REPLACEMENT	$731,250.00
WATER METER REPLACEMENTS	$2,899,285.00
LAGOON CLEANUP	$1,000,000.00
CONTINGENCY / INFLATION COSTS - 10%	$463,053.50
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$916,845.93
TOTAL CAPITAL IMPROVEMENT COSTS - 2019	**$6,010,434.43**

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 2 - 2020	
REPLACEMENT OF 4" WATERMAIN WITH 8" IN EAST UNION STREET, WEST STREET, AND BROOKS AVENUE	$1,069,500.00
CROSSWICKS TANK PAINTING - INTERIOR/EXTERIOR	$2,500,000.00
CONTINGENCY / INFLATION COSTS - 13%	$464,035.00
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$726,036.30
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2020	**$4,759,571.30**

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 3 - 2021	
REPLACEMENT OF 4" WATERMAIN WITH 8" IN BORDEN STREET, CARPENTER STREET, MYRTLE AVENUE, LAFAYETTE STREET, AND FEDERAL STREET (FARNSWORTH TO PRINCE STREET)	$957,375.00
INTERCONNECTION/ALTERNATE WATER SUPPLY SOURCE	$3,500,000.00
CONTINGENCY / INFLATION COSTS - 16%	$713,180.00
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$930,699.90
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2021	**$6,101,254.90**

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 4 - 2022	
REPLACEMENT OF 4" WATERMAIN WITH 8" IN LEYDEN AVENUE, GILDER PARK ROAD, FEDERAL STREET (PRINCE STREET TO OLIVER STREET), MCKNIGHTS AVENUE, AND CAP OFF LIME KILN ALLEY AND WATER STREET	$855,250.00
AIR STRIPPER BLOWER REPLACEMENTS	$100,000.00
GILDER TANK PAINTING - INTERIOR/EXTERIOR	$1,000,000.00
CONTINGENCY / INFLATION COSTS - 19%	$371,497.50
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$418,814.55
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2022	**$2,745,562.05**

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 5 - 2023	
REPLACEMENT OF 6" WATERMAIN WITH 8" IN CROSSWICKS STREET AND HOPKINSON STREET	$1,138,500.00
CONTINGENCY / INFLATION COSTS - 22%	$250,470.00
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$250,014.60
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2023	**$1,638,984.60**

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 6 - 2024	
REPLACEMENT OF 6" WATERMAIN WITH 8" ON FARNSWORTH, POPLAR, LINDEN, AND REDWOOD AVENUES	$1,914,750.00
CONTINGENCY / INFLATION COSTS - 25%	$478,687.50
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$430,818.75
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2024	**$2,824,256.25**

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 7 - 2025	
REPLACEMENT OF 6" WATERMAIN WITH 8" IN MAPLE, LAUREL, AND CEDAR AVENUES	$1,035,000.00
CONTINGENCY / INFLATION COSTS - 28%	$289,800.00
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$238,464.00
TOTAL ESTIMATED CAPITAL IMPROVEMENT COSTS - 2025	**$1,563,264.00**

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 8- 2026	
REPLACEMENT OF 6" WATERMAIN WITH 8" IN ELM, PINE, AND SPRUCE AVENUES	$1,035,000.00
WELL #5R REHAB AND PUMP REPLACEMENT	$100,000.00
CONTINGENCY / INFLATION COSTS - 31%	$351,850.00
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$267,633.00
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2026	**$1,754,483.00**

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 9- 2027	
REPLACEMENT OF 6" WATERMAIN WITH 8" IN OAK, GRAND, AND LIBERTY AVENUES	$1,104,000.00
WELL #2A REHAB AND PUMP REPLACEMENT	$100,000.00
CONTINGENCY / INFLATION COSTS - 34%	$409,360.00
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$290,404.80
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2027	**$1,903,764.80**

MAJOR CAPITAL IMPROVEMENTS & WATER DISTRIBUTION PROJECTS	ESTIMATED COSTS
YEAR 10- 2028	
REPLACEMENT OF 6" WATERMAIN WITH 8" IN ROOSEVELT, HOMESTEAD, AND CARMEN AVENUES	$1,000,500.00
WELL #1 REPLACEMENT	$600,000.00
CONTINGENCY / INFLATION COSTS - 37%	$592,185.00
ESTIMATED ENGINEERING, PERMITTING, INSPECTION & CONTRACT ADMINISTRATION	$394,683.30
TOTAL ESTIMATED UTILITY IMPROVEMENT COSTS - 2028	**$2,587,368.30**

APPENDIX D
PROPOSED DEBT SERVICE

APPENDIX D. PROPOSED DEBT SERVICE

Proposed Annual Debt Service - Based on Capital Improvement Plan*

Imrpovement Year	Improvement Construction Cost	2019 Debt Service	2020 Debt Service	2021 Debt Service	2022 Debt Service	2023 Debt Service	2024 Debt Service	2025 Debt Service	2026 Debt Service	2027 Debt Service	2028 Debt Service
Year 1 (2019)	$6,010,434	$396,689	$396,689	$396,689	$396,689	$396,689	$396,689	$396,689	$396,689	$396,689	$396,689
Year 2 (2020)	$4,759,571		$314,132	$314,132	$314,132	$314,132	$314,132	$314,132	$314,132	$314,132	$314,132
Year 3 (2021)	$6,101,255			$402,683	$402,683	$402,683	$402,683	$402,683	$402,683	$402,683	$402,683
Year 4 (2022)	$2,745,562				$181,207	$181,207	$181,207	$181,207	$181,207	$181,207	$181,207
Year 5 (2023)	$1,638,985					$108,173	$108,173	$108,173	$108,173	$108,173	$108,173
Year 6 (2024)	$2,824,256						$186,401	$186,401	$186,401	$186,401	$186,401
Year 7 (2025)	$1,563,264							$103,175	$103,175	$103,175	$103,175
Year 8 (2026)	$1,754,483								$115,796	$115,796	$115,796
Year 9 (2027)	$1,903,765									$125,648	$125,648
Year 10 (2028)	$2,587,368										$170,766
Total Imrovement Plan Cost	**$31,888,944**	**$396,689**	**$710,820**	**$1,113,503**	**$1,294,710**	**$1,402,883**	**$1,589,284**	**$1,692,460**	**$1,808,255**	**$1,933,904**	**$2,104,670**

** Table reflects the anticipated annual debt service resulting from additional system upgrades based on Capital Improvements Plan; Assume 3% interest rate with balance paid over 20 years*

APPENDIX E
PROJECTED REVENUES AND EXPENDITURES WITH CURRENT RATES

APPENDIX E. PROJECTED REVENUES AND EXPENDITURES WITH CURRENT RATES

PROJECTIONS BASED ON CURRENT RATES - NO INCREASE BEYOND 2019

				Projected										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Expenses														
Operating Expenses														
Salaries & Wages	580,000	608,230	530,000	556,500	567,630	578,983	590,562	602,373	614,421	626,709	639,244	652,028	665,069	678,370
Other Expenses	1,110,511	1,115,000	1,062,500	1,154,000	1,177,080	1,200,622	1,224,634	1,249,127	1,274,109	1,299,591	1,325,583	1,352,095	1,379,137	1,406,720
Current Debt Service	716,208	712,043	791,471	886,500	806,162	696,822	687,307	693,087	701,877	699,467	693,182	683,367	541,617	544,135
Capital Outlay	50,000	177,000	50,000	75,000	76,500	78,030	79,591	81,182	82,806	84,462	86,151	87,874	89,632	91,425
Proposed Capital Improvement Plan		-	-		396,689	710,820	1,113,503	1,294,710	1,402,883	1,589,284	1,692,460	1,808,255	1,933,904	2,104,670
Additional Maintenance & Repairs					100,000	102,000	104,040	106,121	108,243	110,408	112,616	114,869	117,166	119,509
Statutory Expenditures	210,481	220,228	225,256	226,400	230,928	235,547	240,257	245,063	249,964	254,963	260,062	265,264	270,569	275,980
Total Expenses	2,667,200	2,832,501	2,659,227	2,898,400	3,354,989	3,602,823	4,039,895	4,271,663	4,434,304	4,664,885	4,809,299	4,963,753	4,997,094	5,220,809
Total Revenues	2,685,734	2,732,336	3,098,957	3,408,853	3,749,738	3,749,738	3,749,738	3,749,738	3,749,738	3,749,738	3,749,738	3,749,738	3,749,738	3,749,738
Annual Surplus (Deficit)	18,534	-100,165	439,730	510,453	394,749	146,915	-290,157	-521,925	-684,566	-915,147	-1,059,561	-1,214,015	-1,247,356	-1,471,071
Beginning Water Utility Fund Balance	1,533,076	1,551,610	1,451,445	1,592,815	2,103,268	2,498,017	2,644,932	2,354,775	1,832,850	1,148,284	233,137	-826,424	-2,040,439	-3,287,794
End Fund Balance	1,551,610	1,451,445	1,891,175	2,103,268	2,498,017	2,644,932	2,354,775	1,832,850	1,148,284	233,137	-826,424	-2,040,439	-3,287,794	-4,758,866

Notes & Assumptions:

Salaries and Wages - Assume 2% increase per year

Other Expenses - Assume 2% increase per year

Statutory Expenditures - Assume 2% increase per year

Maintenance and Repairs - Assume 2% increase per year

Proposed Capital Imrovement Plan - Anticipated debt service resulting from additional system upgrades based on Capital Improvements Plan; Assume using NJEIT Funds with at an interest rate of 3% paid off over 20 years

Summary: With the current rate structure, the fund balance is projected to be -$4,758,866 in 2028

APPENDIX F
PROJECTED REVENUES AND EXPENDITURES WITH INCREASE IN RATES

APPENDIX F. PROJECTED REVENUES AND EXPENDITURES WITH INCREASE IN RATES

PROJECTIONS BASED ON PROPOSED RATES - 10% INCREASE IN 2019 WITH 4% ANNUAL INCREASE FROM 2020 THROUGH 2028

				Projected										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Expenses														
Operating Expenses														
Salaries & Wages	580,000	608,230	530,000	556,500	567,630	578,983	590,562	602,373	614,421	626,709	639,244	652,028	665,069	678,370
Other Expenses	1,110,511	1,115,000	1,062,500	1,154,000	1,177,080	1,200,622	1,224,634	1,249,127	1,274,109	1,299,591	1,325,583	1,352,095	1,379,137	1,406,720
Current Debt Service	716,208	712,043	791,471	886,500	806,162	696,822	687,307	693,087	701,877	699,467	693,182	683,367	541,617	544,135
Capital Outlay	50,000	177,000	50,000	75,000	76,500	78,030	79,591	81,182	82,806	84,462	86,151	87,874	89,632	91,425
Proposed Capital Improvement Plan		-	-		396,689	710,820	1,113,503	1,294,710	1,402,883	1,589,284	1,692,460	1,808,255	1,933,904	2,104,670
Additional Maintenance & Repairs					100,000	102,000	104,040	106,121	108,243	110,408	112,616	114,869	117,166	119,509
Statutory Expenditures	210,481	220,228	225,256	226,400	230,928	235,547	240,257	245,063	249,964	254,963	260,062	265,264	270,569	275,980
Total Expenses	2,667,200	2,832,501	2,659,227	2,898,400	3,354,989	3,602,823	4,039,895	4,271,663	4,434,304	4,664,885	4,809,299	4,963,753	4,997,094	5,220,809
Total Revenues	2,685,734	2,732,336	3,098,957	3,408,853	3,749,738	3,899,727	4,055,717	4,217,945	4,386,663	4,562,130	4,744,615	4,934,399	5,131,775	5,337,046
Annual Surplus (Deficit)	18,534	-100,165	439,730	510,453	394,749	296,904	15,822	-53,718	-47,641	-102,756	-64,684	-29,353	134,682	116,237
Beginning Water Utility Fund Balance	1,533,076	1,551,610	1,451,445	1,592,815	2,103,268	2,498,017	2,794,921	2,810,743	2,757,025	2,709,385	2,606,629	2,541,945	2,512,592	2,647,273
End Fund Balance	1,551,610	1,451,445	1,891,175	2,103,268	2,498,017	2,794,921	2,810,743	2,757,025	2,709,385	2,606,629	2,541,945	2,512,592	2,647,273	2,763,510

Notes & Assumptions:

Salaries and Wages - Assume 2% increase per year

Other Expenses - Assume 2% increase per year

Statutory Expenditures - Assume 2% increase per year

Maintenance and Repairs - Assume 2% increase per year

Proposed Capital Imrovement Plan - Anticipated debt service resulting from additional system upgrades based on Capital Improvements Plan; Assume using Bond or NJEIT Funds with at an interest rate of 3% paid off over 20 years

Summary: With the proposed rate structure, the fund balance is projected to be $2,763,510 in 2028