

**WATER SUPPLY SYSTEM MANAGEMENT
PLAN
5-YEAR UPDATE
FOR THE
PAWTUCKET WATER SUPPLY BOARD
VOLUME 1**

**PAWTUCKET WATER SUPPLY BOARD
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EXECUTIVE SUMMARY

Introduction and Goals

This Water Supply System Management Plan (WSSMP), as revised, has been prepared as required under the Rhode Island General Laws (RIGL) 46-15.3, as amended and titled, “The Water Supply System Management Planning Act” (Act). The previous WSSMP was prepared in October 2014 and was officially accepted by the Rhode Island Water Resources Board (RIWRB) per correspondence dated January 30, 2019. The legislative authority to effectuate the goals and policies of this Act has been conferred to the Rhode Island Water Resources Board (RIWRB). To this end, the RIWRB has promulgated the Rules and Regulations for Water Supply System Management Planning, October 2002, as amended, to implement the provisions of this Act.

Under this Regulation, the Pawtucket Water Supply Board (PWSB), as a water purveyor supplying over 50 million gallons of water per year, is responsible for the preparation and adoption of a WSSMP. It also requires that the PWSB update this WSSMP periodically, as significant changes warrant but at a minimum of every five years, or as otherwise stipulated in the Regulations.

WSSMP’s are prepared in order to provide the proper framework that will facilitate the effective and efficient conservation, development, utilization, and protection of the natural water resources of the State as utilized by the water purveyor. Further, the overall goals incorporate the applicable policies and recommendations of the Rhode Island Water 2030, State Guide Plan Element 721. The purpose of this WSSMP is to outline the objectives of the Water Supply System Management Planning process for the PWSB water supply system and to serve as a guide to employ the proper decision-making processes toward meeting that goal.

This WSSMP contains a detailed description of the water system and includes the policies and procedures related to the general function, operation and management of the water system. The water quality protection component of the plan is contained separately in Volume II. The Emergency Management component as it relates to the vulnerability assessment of the water system for use in emergency planning is contained separately in Volume III. It shall be incumbent upon the PWSB to implement the recommendations and procedures outlined in this WSSMP in order to comply with the overall requirements of this Act.

Water System Description

The PWSB system supplies water to a direct service population of approximately 98,130 customers in Pawtucket, Central Falls, and the Valley Falls section of Cumberland. Water is also supplied by the PWSB through a wholesale contract to the Town of Cumberland, RI. The PWSB system's source water is derived from the Abbott Run watershed and its underlying aquifer, where the PWSB operates

4 surface water reservoirs and 8 active and 2 inactive groundwater wells. The four surface water reservoirs, (in order proceeding down the watershed) include Diamond Hill Reservoir, Arnold Mills Reservoir, Robin Hollow Pond and Happy Hollow Pond and have a combined storage capacity of 4,970 MG.

In 2008, the PWSB officially decommissioned the water treatment plant at 120 Mill Street in Cumberland, Rhode Island that had been in operational service since construction in 1938. The facility which was rated for 26.4 MGD was determined to be outdated and not economically viable for rehabilitation to meet future water quality requirements. The abandoned plant was located at the south end of Happy Hollow Pond and treated the surface water from Happy Hollow Pond and the groundwater wells utilizing conventional water treatment processes including pre-chlorination, flocculation, sedimentation, filtration, corrosion control, chlorination, and fluoridation.

With the decommissioning of the old water treatment plant in 2008, the PWSB completed construction of its new water treatment facility at 87 Branch Street approximately one mile south of the old treatment facility. Raw water is now pumped from the south end of Happy Hollow Pond to this new treatment facility. The new facility was designed to treat a maximum flow of 25.0 MGD and a sustained average flow of 13.3 MGD. Water treatment consists of a series of chemical and physical processes through which taste, odor, color, turbidity and chemical and microbiological contaminants are removed or inactivated. Treatment techniques include coagulation, flocculation, and filtration mechanisms for the removal of color, turbidity, and other impurities. Following filtration, the water is treated with UV energy to deactivate *Cryptosporidium* and *Giardia Lamblia*. The finish water is then pH adjusted, disinfected with chlorine, and fluoridated before entering the 1.4 MG clearwell structure or the onsite 5.0 MG storage reservoir.

High service finish water pumps at the treatment plant are designed to pump from the clearwell or alternatively from the onsite 5.0 MG storage tank and into the transmission and distribution system. Once pressurized, the finished water is conveyed to the distribution system via a series of water mains departing to the north and south of the treatment plant. Two water storage reservoirs are located at the western edge of the distribution system, on Stump Hill in the Town of Lincoln. These tanks have a combined storage capacity of 13.0 million gallons.

The PWSB system operates as a single pressure zone. There is, however, one small area in the Valley Falls section of Cumberland that is isolated from the main water system and is operated at a higher hydraulic grade due to high customer service elevations.

Water Supply Sources

Description of Watershed and Surface Water Supplies

The source of the PWSB's water supply is the Abbott Run watershed, a sub-basin of the Blackstone River Valley Drainage Basin. The watershed covers an area of 27 square miles in the Town of Cumberland, RI and Towns of Wrentham, Franklin, Plainville, North Attleboro and Attleboro, MA.

Diamond Hill Reservoir: There exist a number of ponds and impoundments within the Abbott Run watershed. The first and largest is near the origin of Abbott Run near the Diamond Hill area of Cumberland and is the Diamond Hill Reservoir. The Diamond Hill Reservoir was originally constructed in 1887 and has been enlarged twice. The usable storage capacity is 3.67 billion gallons. *Arnolds Mills Reservoir:* The Arnolds Mills Reservoir is located immediately downstream from the Diamond Hill Reservoir. Constructed in 1927, its usable storage capacity is approximately 1.163 billion gallons. *Robin Hollow Pond and Happy Hollow Pond:* There are four other smaller ponds along the seven-mile length of Abbott Run. The PWSB owns two: Robin Hollow Pond and Happy Hollow Pond. The total usable storage capacity in these ponds is approximately 142 million gallons. The two other ponds, Rawson and Howard Pond, are privately owned. The total storage capacity in these ponds totals approximately 51 million gallons.

Groundwater Sources

The Pawtucket Water Supply Board owns a series of ten wells (although only 8 are currently active) along Abbott Run that can supplement the surface water supply; wells 2A through 9 are currently available for use. Wells No 1 and 2 have been abandoned and are no longer in service. Wells 10 and 11 have no power and are not connected to the water system. These wells are exercised via the generator and discharge to an adjacent stream.

All of the PWSB's eight operating wells are fed directly into the raw water intake at Happy Hollow Pond as water quality dictates. These wells are also activated when raw water quality is very poor as may occur in the spring with high turbidity and in the summer to reduce surface water temperature. Generally, at minimum 2 - 3 wells are in operation at any time to supplement surface water supply to the treatment plant.

Water Treatment Facility

The Raw Water Pump Station (RWPS) is located at 118 Mill Street in Cumberland, RI adjacent to the old Water Treatment Facility at 120 Mill Street. This pump station draws water from Happy Hollow Pond through a submerged intake. The intake consists of two, 30-inch branches; each branch separates via a tee fitting into two sub-branches that each connects to two intake screens. The individual

groundwater wells, Well No. 2A through Well No. 9, connect to a 20-inch well water header. Water from the wells passes through a cascade aerator to strip the radon prior to connection with the raw water intake line from Happy Hollow Pond.

Raw water from Happy Hollow Pond is pumped approximately one mile through two, 36-inch raw water transmission pipelines to the treatment facility at 87 Branch Street. The single 36-inch pipeline from the RWPS separates via a tee fitting into the two, 36-inch pipelines that then rejoin via a tee fitting to one 36-inch pipeline prior to entering the plant.

The RWPS station was recently retrofit with a system designed to feed powder activated carbon (PAC) to the raw water supply to aid in the control of seasonal taste and odor problems. These taste and odor problems have been attributed to the levels of Geosmin and 2-Methylisoborneol (MBE) which are naturally occurring organic compounds in surface waters and both of which are discernable to consumers at extremely low levels. Their occurrence is commonly associated with warmer weather and algal blooms that occur in late summer.

The new water treatment plant is designed to produce up to 25 MGD of finished water. Additionally, it was designed to allow 30 MGD to flow through the facility without major piping or structural modifications. The facility design also allows implementation of chloramines for disinfection without major modification or plant shut down.

The water treatment plant uses polyaluminum chloride (PAC)/alum as a coagulant and contact clarification to remove TOC, color, and turbidity prior to deep bed Granular Activated Carbon (GAC) filters. The water then passes through UV disinfection units and is then dosed with sodium hypochlorite and sent to a channeled 1.4 MG clearwell with a contact time of 90 minutes, and either pumped directly into the distribution system or to the onsite 5 MG storage tank. The treatment plant is completely controlled by in-line process analyses and a computer based Supervisory Control and Data Acquisition (SCADA) System.

Each contact clarifier is back flushed every 4 hours of operation using a raw water/air scour flush. The GAC filters backwash with potable water and air every 24 to 48 hours. The flush and backwash wastewater flows into equalization basins located under the filters. From the equalization basins, the combined residuals waste is pumped to two dewatering lagoons via a 12-inch force main at the site of the old treatment plant lagoon. These lagoons are lined and have an underdrain system for proper dewatering of the PAC/alum sludge

Emergency generators are provided at the Raw Water Pump Station and the Water Treatment Plant to allow full production of up to 25 MGD during extended power outages. With diesel fuel deliveries at 48-hour intervals, the entire water treatment process could operate indefinitely on the auxiliary power system.

Storage Facilities

The water system maintains two distribution storage facilities located in Lincoln; a clearwell at the treatment plant and a finish water supply storage tank at the location of the treatment plant. The total distribution system storage including the finish water tank system storage is 20.9 million gallons.

Pump Stations

The PWSB system owns and operates three pump stations. The facilities are identified as Branch Street – Station 4, the Raw Water Pump Station for the treatment plant and the high lift finish water pumps at the water treatment plant.

Branch Street (Station 4) Emergency Water Treatment Plant Effluent

Located at 85 Branch Street in Pawtucket, this station was formerly the main pumping station for the PWSB when the old treatment facility was in service. This station is now utilized as a backup for the high lift service pumps at the new water treatment plant at 87 Branch Street. Five pumps were installed in 1983 at this facility (three 9 MGD pumps, one 6 MGD pump, and one 3 MGD pump).

Raw Water Pump Station

This pump station was constructed in 2007 and is located at 118 Mill Street in Cumberland adjacent to Happy Hollow Pond. It is designed to deliver raw water approximately one mile south to the water treatment facility. The station is equipped with three (3) 13.2 MGD pumps, for a total reliable pumping capacity of 26.4 MGD. The 200 HP pump motors are scheduled to be retrofit with variable frequency drives (VFD's) in 2014 in order to optimize efficiency of the facility.

Finish Water Pump Station

This pump station was constructed in 2007 and is located at 87 Branch Street at the water treatment plant. The pump station consists of four (4) 13 MGD pump, for a total reliable (one spare) pumping capacity of 39 MGD. Two of the three 900 HP pump motors were retrofit with variable frequency drives (VFD's) in order to optimize efficiency of the facility.

Transmission System

The PWSB's current system consists of approximately 272 miles of water main with approximately 24 miles of transmission mains (16-inch water main and greater). Pipe sizes range from 2-inch diameter

to 12-inch for distribution mains. Transmission mains are 16-inch diameter to 48-inch diameter. These mains transport water from the water treatment plant, the 5.0 million gallon storage tank at 87 Branch Street and the two distribution system storage tanks at Stump Hill to the entire water distribution system. The transmission and distribution system is comprised predominantly of cement lined cast iron, cement lined ductile iron and a limited amount of unlined cast iron water main.

Transmission and Distribution Main Lining and Replacement

The Rules and Regulations for WSSMP define transmission lines as the pipes that are 16 inches in diameter or greater and are the pipes required to carry potable water from a water source to or throughout an area served or to be served by a water supply system for the specific purpose of supplying water to support a general population. The PWSB owns and operates a total of approximately 24 miles of transmission water main. Less than 1% of these transmission mains are unlined pipe.

Since 1988, the PWSB has undertaken an aggressive approach to replacing or rehabilitating the entire distribution system with a goal of either cement lining or replacing all unlined cast iron water mains. PWSB has completed its goal of replacing or rehabilitating the entire distribution system in Pawtucket, Central Falls and the Valley Falls section of Cumberland.

Interconnections to Neighboring Water Systems

The PWSB can supply water to six neighboring municipal water systems including the Town of Cumberland, Town of Lincoln, City of East Providence, and Providence Water Supply Board in Rhode Island, and the Towns of Seekonk and Attleboro in Massachusetts. There is a contract to supply water to Cumberland although it is expired. However, both parties continue to honor the contract and Cumberland continues to purchase water under the terms of the original contract. The remainder of the interconnections are currently for emergency use only.

Service Area

The PWSB provides water service to approximately 98,130 customers as of 2018 within a service area that includes the cities of Pawtucket and Central Falls, and the Valley Falls section of the Town of Cumberland. Bordering cities and towns include: East Providence, Providence, North Providence and Lincoln in Rhode Island, and Attleboro and Seekonk in Massachusetts. The service area is almost fully developed and includes medium to high-density residential, commercial and industrial zoning. There is little undeveloped land in the service area.

Service Connections

In 2018, there were 22,944 service connections. Since 2012, there has been an overall increase of 0.3% in the total number of service connections. The number of service connections and the percent change in each category are depicted in the following table.

Number of Service Connections and % Change

CATEGORY	2012	2018	% Change
Residential	21,152*	21,161*	0.04
Commercial	1,268	1,432	12.9
Industrial	193	194	0.5
Other	262**	157**	59.9
Total	22,875	22,944	0.3

*Includes Multi-Family and Trailer Parks

**Includes Hospital, Nursing Home, and Public Facilities

Present Population Served

The PWSB serves the entire population of the City of Pawtucket, the City of Central Falls, as well as the Valley Falls region of the Town of Cumberland. The 2010 U.S. Census determined the population for Pawtucket to be 71,148 and the population of the City of Central Falls to be 19,376.

The service population in Valley Falls was calculated using the number of service accounts of 2,752 multiplied by the 2010 US Census Data of 2.76 persons per household. This equates to a total service population of 7,596 in Valley Falls. The resulting combined service population for the City of Pawtucket, the City of Central Falls, and the Valley Falls region of the Town of Cumberland is 98,120. 98,130 was used as the population number in calculation to account for fluctuation.

Future Population Estimate

The population information depicted in the table below was interpolated based on the 2018 populations utilized. The projection for the next 20 years is slightly declining overall.

Projected Population for Communities Using PWSB Water

Year	2018 Present Population	2023 5 – Year Population	2038 20 – Year Population
Pawtucket	71,148	70,408	68,576
Central Falls	19,376	19,175	18,675
Valley Falls, Cumberland	7,596	7,517	7,321
Total:	98,130	97,110	94,583

Source and Distribution Metering***Master Meters***

In 2008, the PWSB installed a 36-inch “turbine” water meter at the raw water pump station at Happy Hollow Pond to meter flows being pumped to the treatment plant. At the water treatment plant there exists a 36-inch magnetic flow meter that is used to record flow produced by the treatment plant and distributed to the transmission and distribution system.

Distribution System Meters

The PWSB meters 100 percent of its customer service base and as of 2018 included 22,944 residential, commercial, industrial and government customers service accounts. The PWSB also maintains a Meter Installation, Maintenance, and Replacement (MIMR) Plan that is funded through the Infrastructure Replacement Fund (IFR). Typically, meters are replaced on a 12-15 year basis; however this is premised on available funding of the IFR account.

The PWSB undertook an aggressive in-house meter replacement program whereby all water system meters (Neptune ARB style meters) within the distribution system were replaced and fitted with a remote read meter interface unit (MIU). This was completed over a three year period from 2005 – 2008. The MIU is a two-way radio frequency (RF) read device that is designed for use by the water utility to quickly and accurately record a customer’s meter reading.

Since 2008, the PWSB has maintained a monthly billing program for the entire customer service territory and which has been proven tremendously successful and well received by the customer base. The monthly billing permits customers to budget for water use on a regular basis, reduces water loss and accelerates leak detection and prevention.

The PWSB maintains an ongoing program of meter replacement which targets meters that have been in service for 10 years or longer. These “older” meters are routinely replaced by in-house staff on a

daily basis (average of 6 – 8 per day) and will continue through the IFR program. The PWSB averages approximately 1,600 to 1,800 meter replacements per year.

System Water Production Data

Water Production

Over the past ten years (2008 – 2018), the water withdrawn from all supply sources (water production) for the system has ranged from 3,148.6 to 3,992.3 million gallons per year. PWSB produced 3,614.0 million gallons in the year 2018 with an average day demand (ADD) of 6.76 million gallons per day (MGD). During the past ten years, 2008 – 2018, the ADD has decreased at a steady rate from 10.93 MGD in 2008 to 6.76 MGD in 2018. In 2018, the maximum day demand (MDD) was 12.53 million gallons (MG) and the peak hour (PH) demand was 17.05 MG. The MDD has ranged from 11.87 MG in 2017 to 17.49 MG in 2010 over the past ten years, 2008 – 2018. The MDD over the past five years has been in a range of 11.87 MG to 17.49 MG.

Wholesale Water Supply Contracts

Currently, there is a contract with the Town of Cumberland in Rhode Island. This contract is expired however the terms and conditions are still honored by both parties with respect to the wholesale purchase of water.

Water Use

System Water Use Data

The current Average Day Demand (ADD) for calendar year 2018, based on the total volume of water metered at the point of sale is 6.76 MGD. The average system per capita demand for total water purchased in 2018 was calculated at 68.92 gallon per capita day (gpcd) with a high of 88.54 gpcd in August and a low of 58.24 gpcd in April.

The RIWRB has established a target of 65 gallons per capita per day (gpcd) for the residential component of the annual average water use. As indicated in the PWSB's Demand Management Strategy (Appendix N), based on the data from fiscal year 2012, the PWSB residential average water use is 54 gpcd. This number has been fairly consistent in recent years and was determined to be 59 gpcd in fiscal year 2011 and 56 gpcd in fiscal year 2010.

Major users which are defined as those customers using more than 3 million gallons per year as supplied by the PWSB total forty-one (41). The total usage of these major users represents 10.9% of the total system demand.

Non-Account Water Use

The PWSB has maintained an average of 8.2% non-account water since 2008 and 7.5% for the year 2018. This rate is below the goal of 15% set forth in *Water Supply Policies for Rhode Island*, State Guide Plan Element No. 721.

Future (Wholesale) Water System Demands

The PWSB wholesale water supply to the Town of Cumberland will continue as Cumberland requires the supplemental water supply. For the past several years, the Town of Cumberland has become more self-reliant upon its own available water resources including surface water from Sneece Pond and several groundwater supply wells. In addition, the Town has implemented a groundwater exploration and development program which is aimed at gaining further independence of water supply. They have secured permits for new wells, but it is uncertain to what degree this may impact the future wholesale water volumes to the Town of Cumberland.

Additionally, there is interest among other abutting communities for the purchase of wholesale water from the PWSB. This could be to potentially gain added “emergency” redundancy from other current wholesale purchase suppliers, to potentially purchase water at reduced rates or to maintain a new source of viable water supply. Preliminary interest has been expressed from East Providence, Bristol County Water Authority, the Town of Lincoln, Rhode Island, and most recently Attleboro, Massachusetts. This is only at the conceptual stages and would require additional efforts including possible significant infrastructure improvements should this move forward at some point in the future. The results of this would likely have a significant impact on the wholesale water currently sold by PWSB and the exact volumes cannot be quantified at this time.

Summary of Planned Capital System Improvements

The PWSB is proactive in identifying areas in which the water supply, treatment and distribution system can be maintained and improved. PWSB commitment to providing safe, reliable, and adequate water supply to its customers is demonstrated in the recent replacement of its water treatment facility.

The PWSB has also developed and maintains a Capital Improvements Plan to forecast and provide needed system improvements. The contents of this WSSMP details system improvements including dam and well rehabilitation, reports and studies, main replacement projects and cleaning and lining projects over a 20-year planning period.

A summary of the planned capital improvements, funding source, anticipated schedule and an estimated cost is presented in the following table. The implementation of these improvements is

subject to comprehensive study of policy and financial decisions that is required for the actual implementation of the improvements to the water supply distribution system.

Capital Improvement Program Projects

Project	Funding	Timing	Estimated Cost (\$)
Diamond Hill Dam and Spillway and Emergency Action Plan	IRF	Complete	800
Diamond Hill Dam and Spillway Inspection	IRF	2020	1,700
Diamond Hill Dam Improvements	IRF	2023-2025	250,000
Happy Hollow Dam and Spillway Emergency Action Plan	IRF	Complete	800
Happy Hollow Dam and Spillway Inspection	IRF	2020	1,700
Happy Hollow Dam Improvements	IRF	2021-2022	1,650,000
Arnold Mill Dam and Spillway Emergency Action Plan	IRF	Complete	800
Arnold Mill Dam and Spillway Inspection	IRF	2020	1,700
Arnold Mill Dam Improvements	IRF	2023-2025	860,000
Well Field Electric Improvements	IRF	2020	1,200,000
120 Mill Street ESA & Demo Assessment	IRF	2020	30,000
Decommission 120 Mill St WTP	IRF	2021-2022	3,000,000
Well 3 Rehabilitation (redevelopment)	IRF	2022	350,000
Well 4 Rehabilitation (redevelopment)	IRF	2022	350,000
Well 5 Rehabilitation (redevelopment)	IRF	2022	350,000
Well 8 Rehabilitation (redevelopment)	IRF	2013	350,000
Well 9 Rehabilitation (redevelopment)	IRF	2014	350,000
Well 6 Rehabilitation (redevelopment)	IRF	2021	350,000
Well 7 Rehabilitation (redevelopment)	IRF	2021	350,000
3 MG Tank Rehabilitation	IRF	2022-2023	900,000
5 MG Tank Rehabilitation	IRF	2020	300,000
Attleboro, MA Emergency Interconnection	IRF	2020	150,000
Lincoln Emergency Interconnection	SRF	2022-2023	1,200,000
East Providence Emergency Interconnection	SRF	2020-2021	3,000,000
Main Replacement Improvements 11	IRF	2020-2021	3,000,000

Main Replacement Improvements 12	IRF	2022-2023	1,355,000
Main Replacement Improvements 13	IRF	2023-2024	1,465,000
Main Replacement Improvements 14	IRF	2024-2025	1,585,000
Leak Detection in Distribution System	IRF	2020, 2024	60,000
Meter Replacement	IRF	2012-2027	5,318,200
Meter Propagation Path Study	IRF	2020	50,000
Smart Meter Software & Setup	IRF	2021-2022	2,000,000

Water Quality Protection

The PWSB continues its policy of working with the Town of Cumberland, the Cumberland Land Trust (CLT) and the Cumberland Open Space Commission (OSC) to acquire properties or development rights of properties in the Watershed with the prime intent of water quality protection.

The PWSB continues to actively maintain and manage the land surrounding the Watershed. By owning the property, the PWSB can set forth storm water management plans to ensure that the Reservoir is not negatively impacted by the development. All construction within the Watershed is reviewed by the PWSB, and if comments are warranted, the comments are sent to the Town or RIDEM.

The PWSB also worked with the Cumberland Zoning Committee to create a watershed overlay district. This watershed overlay district will help protect both Cumberland's and Pawtucket's watersheds by prohibiting certain types of commercial and industrial activities.

Source Water Assessment

Volume II of the WSSMP fulfills the requirements of the water quality protection component of the Plan. An update of the Source Water Assessment for the PWSB was developed in accordance with the Guide to Updating Source Water Assessments and Protection Plans, October 2007. The final risk ratings for the Happy Hollow, Abbott Run, Arnold Mills, and Diamond Hill Reservoir Protection Areas were determined to be consistent with the 2003 ratings. The final risk rating for the Pawtucket Wellhead Protection Area increased from moderate to high. The PWSB reviewed the 2007 source water assessment and made the appropriate revisions.

Updated Well Head Protection Area Mapping

Volume II addendum provides an update of the mapping of the well head protection areas for PWSB's 8 (numbered 2A, 3, 4, 5, 6, 7, 8 and 9) existing active groundwater well supply sources as well as its 3 existing "inactive" (numbered 2, 10 and 11). These redefined wellhead areas are as depicted in the

State of Rhode Island and Providence Plantations, Department of Environmental Management – Office of Water Resources “*Ground Water Quality Rules*”, June 2010. (Groundwater Rules).

The PWSB shall in accordance with 18.6.2 of the Ground Water Regulations maintain conformance to the requirements of the Rhode Island Water Resources Board “Rules and Procedures for Water Supply System Management Planning” that are determined to be in compliance with the Water Quality Protection Component of the “Rules and Procedures for Water Supply System Management Planning”.

Available Water

Most Recent Safe Yield Analysis

The PWSB’s most recent safe yield analysis was completed in 1996 by Camp, Dresser & McKee. The safe yield was determined to be between 18.6 MGD and 20.6 MGD. This safe yield was not based on the Abbott Run watershed directly but rather the analysis was based on a watershed that is hydrologically similar to Abbott Run.

The PWSB safe yield calculated by CDM in 1996 was based on the longest and most severe period of drought on record for New England, the drought of the 1960's. Watershed parameters and data were adapted from PWSB records for the Abbott Run watershed, as well as from the Nipmuc River USGS stream gage near Harrisville, RI. The full text of the 1996 CDM report is contained in the Appendix. According to the 1996 CDM Safe Yield report, the safe yield range for the surface water supply from the Abbott Run watershed is between 15 and 17 MGD. The PWSB has elected to adopt the results provided by the Abbott Run gage, which provides a yield of 16 MGD. This value is considered valid for safe yield determination and planning purposes.

The 1996 CDM Safe Yield report states that the potential yield of the groundwater reservoir under Abbott Run is significantly affected by the amount of induced recharge available from Abbott Run. For example, 12 MGD can be pumped provided that adequate stream depth is maintained, but only 5 MGD can be pumped if no recharge is available from Abbott Run. Using the results of these studies, the system reliable safe yield of 19.6 MGD is currently considered to be that used in planning studies.

It is important to note that although different methods were used to analyze the safe yield of the PWSB system, all have been completed by using data from other basins thought to be comparable; no flow gauges have ever been installed within the Abbott Run sub basin in order to complete such a study.

Comparison of Available Water and Water Demand

The current reliable safe yield of the PWSB system is greater than the demand and wholesale water demand projected in both the five and twenty year projections. The comparison is summarized in the

following table. Note that safe yield is only comparable with average daily demand, and not maximum daily demand, as the reliable safe yield represents the sustainable yield from a water source over an extended period of time.

Projected Average Annual System Yield and Demand for PWSB

	2018 (MGD)	2023 Year Projections (MGD)	2038 Year Projection (MGD)
System Safe Yield	18.6 - 20.6	18.6 - 20.6	18.6 - 20.6
System Demand	(6.76)	(6.32)	(5.49)
Wholesale Water Sales (Cumberland)	(1.09)	(1.09)	(1.09)
Total Demand	(7.85)	(7.41)	(6.58)
System Surplus (Deficit)	10.75 – 12.75	11.19 – 13.19	12.02 – 14.02

Drought of record reservoir safe yield equal to 15 – 17 MGD; Groundwater well safe yield equal to 3.6 MGD. Reference *PWSB Safe Yield Report for the Pawtucket Water Supply System, November 1996 as prepared by Camp Dresser & McKee*.

Demand Management

Residential Retrofit Program (RRP)

The PWSB has previously participated in the Statewide RRP Program that was jointly developed by the RIDEM and the Rhode Island Water Works Association (RIWWA). The purpose of the program was to allow Rhode Island water suppliers to take advantage of economies of scale for purchasing retrofit kits and to minimize duplication of efforts in establishing individual programs. While the program was active around 2004 – 2007, the demand for the kits was limited and active program was stopped due to the limited community demand and funding from the PUC. The PWSB customer service department continues to maintain the retrofit kits at the main office and they are available to any customer free of charge upon request.

Major Users Technical Assistance Program (MUTAP)

The PWSB does not currently have an active major user technical assistance program. The PWSB does have a Backflow Prevention Program and employs a Cross Connection Control Technician. The Backflow Prevention Program consists of review of existing and new service connections for backflow

prevention and recommending and implementing necessary corrective measures. The responsibilities of the Cross Connection Control Technician include the following:

- Responsible for all cross connection control surveys and recommended devices to be installed as to type and location for all customers of the PWSB,
- Maintains all records for cross control surveys, backflow prevention devices installed and for all periodic testing, notification, and inspection reports,
- Assists in the development, implementation, and evaluation of a water conservation program,
- Assists in the review of application for all types of existing, new, and temporary water services,
- Assists in the review of plans, specifications and construction methods to be used on installation to ensure compliance with the approved project and as-built record for all customer side service installations.

System Management

Meter Installation, Maintenance, and Replacement (MIMR) Plan

The PWSB is a 100% metered system with cold-water meters for all homes, stores, small businesses, etc. Master meters are used at the raw water pump station, the water treatment plant and at the sites for wholesale delivery. When water is used from fire hydrants for temporary construction purposes, special meters with backflow preventers are required. The PWSB coordinates with all fire departments to review all fires, hydrant use, and other miscellaneous fire flows.

All commercial and small industrial accounts are 100% metered. The PWSB has ownership of all meters on accounts up to 2" meters. The PWSB system currently consists of Neptune MIU style meters and has purchased radio read capabilities for all their meters. The PWSB has upgraded all existing meters to radio read capabilities within the last five years using in-house staff.

The PWSB has been replacing, cleaning, and lining mains as part of its Capital Improvements Plan since 1988. Through this program the PWSB has had the ability to review and evaluate water mains within its system and has resulted in over 93% of the PWSB water mains in good or new condition. The implementation of this aggressive improvement plan has ultimately achieved the objective of a leak detection and repair plan; the identification and correction of water main defects. PWSB is in the process of developing a Request for Proposals for a leak detection project.

Preventative Maintenance (PM) Plan

The primary (preventive) maintenance is related to the mechanical and process equipment at the water treatment plant, pump and well stations. The PWSB maintains a long-term Contract for Operations

and Maintenance for these facilities with Suez. Suez in order to effectively manage these assets utilizes a computerized maintenance management system (CMMS) software provided by MVP Plant.

This program maintains information about the water treatment plant, raw water pump station and well station assets. This includes when the asset was purchased, its expected lifetime, warranty information, the upkeep history, costs, depreciation and more. The program allows maintenance staff to tracks parts, tools and other materials required to perform routine upkeep. The software also aids in managing the work order process. This includes scheduling repairs, assigning personnel to the job, reserving materials, recording costs, tracking the cause of the problem, tracking downtime and making recommendations for future action.

Emergency and Drought Management

The Emergency Management section, Volume III, of the WSSMP establishes the responsibilities and authority within the PWSB for responding to emergencies, and outlines specific tasks for carrying out functional and constructive solutions based on a review of the potential emergencies and risks. This includes but is not limited to both natural and manmade emergencies including mechanical and equipment failure; infrastructure system failure; electrical and energy supply interruption; water system supply contamination; drought conditions; environmental factors including acts of God (hurricanes, earthquakes, etc.) It is also intended that this document provide guidance to ensure that the primary aspects of recovery from an emergency are addressed in an organized manner to aid in an efficient response and in maintaining drinking water quality and quantity.

The procedures outlined in the Emergency Management section are consistent with the goals of the State Emergency Water Supply Management Plan. It is the intent that this document provides guidance to ensure that the primary aspects of recovery from an emergency are addressed in an organized manner to aid in an efficient response and in maintaining drinking water of a high quality and quantity. In addition, the PWSB has also prepared a document titled “Drought Management Plan” that is contained in the appendix of the WSSMP. This Plan details the protocols including triggers, actions and responsible parties for the various phases of a drought which include normal, advisory, watch, warning and emergency phases of a drought condition.

Water Efficiency and Demand Management Strategy

The RIWRB adopted the Rules and Procedures Governing the Water Use and Efficiency Act for Major Public Water Suppliers, Adopted May 16, 2011 (Rule), Section 5.2. Pursuant to meeting this requirement, the PWSB prepared a Demand Management Strategy in August, 2012. RIWRB subsequently provided comment on the DMS and PWSB issued follow up correspondence to address

these issues. A copy of the DMS and follow up documentation / response is provided in the Appendix of the WSSMP.

Implementation, Financial Management, and Coordination

Implementation

The purpose of the WSSMP is to outline goals relative to water supply management planning for the PWSB water supply system and to serve as a general guide for decision-making procedures. The WSSMP details an implementation schedule developed from the Capital Improvements Plan. The implementation schedule includes projects, funding sources, timing and estimated costs for impoundments, well rehabilitation, reports and studies, main replacement and cleaning and lining projects.

Financial Management

The PWSB is a semi-autonomous extension of The City of Pawtucket. It is operated as an enterprise fund agency and is self sufficient, funding its operations through water rates and charges to its users. No subsidization exists between the City and the PWSB. The financial management of PWSB is vested in its Board of Directors. The Board establishes all rules and regulations and determines the rates to be charged for water and all miscellaneous related services. The rules and regulations and rates and charges are subject to the approval of the PUC. The Chief Engineer and Chief Financial Officer report the financial position of PWSB to the Board at its scheduled meetings.

Rate Structure

The existing Tariff schedules for PWSB were approved by the Rhode Island Public Utilities Commission in Docket No. 4550 and the effective date of the tariff is July 9, 2017. The complete tariff schedule is included as Appendix K. The metered sales rate varies by meter size. The rate is a uniform rate by class and does not vary by consumption.

Bills for metered sales are rendered monthly to all customers, in arrears and are due and payable in full when rendered. In addition to the metered sales tariff, customers are charged a Customer Service Charge which varies with meter size. All customers are billed on a monthly basis. Payment in full is required within 24 days of the billing date.

Coordination

The PWSB coordinates with the City of Pawtucket, City of Central Falls, and the Town of Cumberland on a routine basis. The PWSB is an agency of the City of Pawtucket and therefore has regular coordination and contact with all city departments including the Planning Department. This

WSSMP Update once again details and gives examples (Cumberland Land Trust, Cumberland Zoning Committee, protection efforts, etc.) of the coordination efforts made with the Town of Cumberland.

The majority of the watershed of the PWSB is within the Town of Cumberland. In addition, the PWSB is responsible for supplying more than half of the Town of Cumberland's water supply. Therefore both the PWSB and the Town of Cumberland recognize the need for coordination on the protection of their main water supply sources.

PWSB's commitment to coordinate with neighboring systems and fostering strong working relationships is further reflected in the recent development of the Mutual Aid Agreement with Cumberland Water Department and the Lincoln Water Commission. Additionally, the PWSB is a participating member in the RIWARN mutual aid and assistance program. RIWARN is a Water / Wastewater Agency Response Network that allows water and wastewater systems in Rhode Island to receive rapid mutual aid and assistance from other systems in RI to restore facilities damaged by natural or manmade incidents.