

Peaks Mill Water District Corrective Action Plan

January 6, 2020

Prepared for
Peaks Mill Water District by BlueWater Kentucky

The Kentucky Department for Environmental Protection (KDEP) issued a settlement offer letter dated November 5, 2019 to the Peaks Mill Water District (PMWD). The settlement offer proposes an Agreed Order that includes a Corrective Action Plan (CAP) to address low chlorine residuals in the distribution system reported in Notice of Violations (NOV's) dated August 28, 2019, October 7, 2019, October 25, 2019 and November 18, 2019. PMWD agrees to proceed with an Agreed Order to address the drinking water violations and proposes a Corrective Action Plan with the following elements outlined by the KDEP:

- i. An explanation of why the cited violation occurred;
- ii. A report of the completed corrective actions;
- iii. A list of proposed corrective actions to be completed to demonstrate compliance with 401 KAR 8:150 Section 1 and 401 KAR 8:020 Section 1;
- iv. A schedule of implementation for proposed corrective action items; and
- v. A final compliance date for completion of all remedial measures included in the CAP.

The Corrective Action Plan includes the following elements:

1. Why the Violations Occurred:

Peaks Mill Water District (PMWD) is supplied with water from the Frankfort Plant Board (FPB), Frankfort, Kentucky and Kentucky American Water Company (KAWC), Lexington, Kentucky. The FPB water source supplies approximately 99 percent of PMWD water, while KAWC water source currently supplies approximately 12 customers along US Highway 127 near the Franklin/Owen County line. The FPB water delivery point and master meter is located on Peaks Mill Road, east of US Highway 127 North near Cedar Cove Road (38 13' 37" North and 84 50' 59" West).

The chlorine residual at the FPB master meter ranges from 1.2 to 2.9 and varies throughout the year due to source water quality, treatment methods, water age and water temperature. The water delivery point (master meter) to PMWD is located approximately 8 pipeline miles from the FPB water treatment plant located on the East-West Connector (Highway 676) at the Kentucky River.

PMWD distributes water through approximately 85 miles of water distribution mains, that vary in size from 3-inches to 8-inches as shown in Exhibit A. Due to the elevation changes in the service area, PMWD operates three (3) primary pressure zones as follows:

Pressure Zone 1 (Shadrick Zone)

- Water supplied from FPB,
- Delivery point and master meter located on Peaks Mill Road, elevation 727 feet,
- Shadrick standpipe, 326,000 gallons, 110.9 feet tall, overflow 943 feet,
- Standby pump station on US 127 North, elevation 790 (operated when needed to boost pressure and flow),
- Hydraulic grade of 910 to 943 feet, pressure range 35 psi to 90 psi.

Pressure Zone 2 (Herman Smithers Zone)

- Water supplied from Pressure Zone 1 through flow control station,
- Flow control station located at US 127, North of Black Oak Drive,
- Herman Smithers standpipe, 184,000 gallons, 110.9 feet tall, overflow 904 feet,
- Hydraulic grade 870-904 feet, pressure range 35 psi to 160 psi,
- Some local pressure regulation valves (PRVs) for high pressure areas.

Pressure Zone 3 (Union Ridge Zone)

- Water supplied from Pressure Zone 2 through booster pump station,
- Booster pump station located on Sulphur Lick Road,
- Union Ridge standpipe, 100,000 gallons, 97.8 feet tall, overflow 1018 feet,
- Hydraulic grade 990 to 1018 feet, pressure range 30 psi to 160 psi,
- Some local pressure regulation valves (PRVs) for high pressure areas.

Current KAWC Supply – located along Highway 127 near Franklin/Owen County line to supply approximately 12 homes. System supplied by KAWC Owen County Water Treatment Plant and valved off from Pressure Zone 2 (Herman Smithers Zone).

As of December 31, 2019 PMWD serves approximately 1,175 customers (serving a population of approximately 2,900) and is considered a rural water system with low density (14 customers per mile compared to 22 customers per mile average for Kentucky) and low water demand (less than 3,800 gallons per customer per month).

During summer months, high water temperature (above 80 degrees) and water age are the primary contributors to a degradation in chlorine residual below 0.5 milligrams/liter (mg/l or ppm). FPB disinfects with chloramines and does not conduct an annual or semi-annual burnout with free chlorine. The water supplied by FPB at the master meter is typically below 7.5 pH. Various studies indicate water with lower pH promotes nitrification in warm water and water with higher pH (above 9.0) is necessary to reduce bio-film growth and nitrification.

Low water pH, warm water, low water demand and water age are the primary contributors to nitrification in the PMWD distribution system, resulting in disinfectant levels below 0.5 ppm in portions of the distribution system. Historically, flushing water in the distribution system has improved chlorine residuals. However, in the summer and fall of 2019, flushing did not restore chlorine levels above 0.5 ppm to meet the requirements of KAR 8:150 Section 1 and 401 KAR

8:020 Section 1. Further remediation beyond flushing will be required to bring chlorine levels above 0.5 ppm, especially during warm weather periods from June to November.

In addition, two major water quality changes occurred in 2019 that are believed to have contributed to the extensive water quality issues experienced by PMWD in 2019. On July 3, a major fire occurred at the Jim Beam bourbon warehouse facility and a significant amount of bourbon was released into Glenn's Creek and the Kentucky River. This resulted in a large amount of organic loading in the Kentucky River, the water source for FPB's water supply. Total Organic Carbon (TOC) levels increased significantly in both source water and finished water delivered to customers, including PMWD. Higher TOC levels can lead to the growth of microorganisms and depletion of oxygen and an increase in chlorine demand, biofilm growth and nitrification in the distribution system. This water quality event appears to be a significant contributor to the loss of chlorine residual in the PMWD system from July to December 2019.

The FPB also experienced an equipment failure from July 27 to July 30, 2019, when ammonia feed equipment failed, and FPB treated the water with free chlorine instead of chloramines (chlorine and ammonia). During this period, the temporary change in treatment and lower chlorine residuals in the Frankfort water supply may have contributed to an acceleration of nitrification and loss of chlorine residual in the PMWD distribution system.

2. Report of Completed Corrective Actions:

In 2017, PMWD became concerned with the drop in chlorine residuals in remote portions of the distribution system. This typically occurs during warm water months from June to November. When chlorine residuals drop below 1 ppm, PMWD would initiate flushing to bring in higher chlorine residuals to the areas of concern. In 2018, PMWD began pursuing alternative methods to address the loss of chlorine residual.

Since 2018 the following actions have been initiated and are complete or currently underway:

- a. In January 2018, PMWD contacted the technical assistance staff of the Kentucky Division of Water (KyDOW) to feed ORA-CLE, a bio-penetrant, to reduce nitrification during warm water months. KyDOW approved the use of ORA-CLE at the Owenton Road pump station, 810 feet downstream from the master meter in Pressure Zone 1 (Shadrick Zone). PMWD fed ORA-CLE from May to November 2018.
- b. In January 2019, PMWD requested KyDOW approve the installation a chloramine booster system at the Union Ridge tank to address the loss of a chlorine residual in Pressure Zone 3 (Union Ridge Zone). The chloramine booster system (sodium hypochlorite and ammonium sulfate) was approved by KyDOW in August. The system is leased from Water Solutions Unlimited, Inc. and is currently operating. The BWA's advisories in Pressure Zone 3 (Union Zone) will be lifted once chlorine residuals are stabilized above 0.5 ppm.
- c. In June 2019, PMWD received approval to feed ORA-CLE at the Owenton Road Control Station feeding Pressure Zone 2 (Herman Smithers Zone). PMWD operated the ORA-CLE feed system from July to November 2019.

- d. In July 2019, PMWD initiated Boil Water Advisories (BWA) to a portion of Zone 2 (Herman Smithers Zone) and all of Zone 3 (Union Ridge Zone) the distribution system that experienced chlorine residuals below 0.5 ppm. BWAs continued until chlorine residuals were restored to 0.5 ppm. Approximately 40 customers in Zone 3 (Union Ridge Zone) remain on BWA as of December 31, 2019.
- e. On August 26, 2019, KyDOW approved the temporary use of the chloramine booster system in Pressure Zone 3 (Union Ridge Zone) and PMWD initiated the booster chlorination feed downstream of the Union Ridge tank.
- f. In September 2019, PMWD met with staff of the FPB to discuss the water quality at the PMWD master meter and treatment options, including a chlorine burnout by FPB to reduce nitrification. PMWD expressed concerns over the water quality and pH of the FPB water supply, and the rapid loss of chlorine residuals in portions of the PMWD distribution system. The loss of chlorine residuals experienced in 2019 was more severe than previous years.
- g. In September 2019, PMWD purchased equipment and assembled two mobile chloramine booster systems to deploy as needed in areas of the distribution system that experience low chlorine residual. The booster systems require power to operate and safe access to the water distribution main to feed the chloramine solution. These mobile systems are available to install as needed in the distribution system in the event of low chlorine residuals and KyDOW will be contacted for approval prior to placing in service.
- h. In September 2019, PMWD contacted Louisville Water Company to conduct a review of distribution water quality, assess the distribution system and develop a hydraulic model for evaluation of system performance and water age.
- i. In October 2019, PMWD initiated discussions with Kentucky American Water to provide an alternative source of water for a portion of the distribution system in Pressure Zone 3 (Union Ridge Zone) that experiences low chlorine residuals during warm water periods.
- j. On December 17, 2019 PMWD executed an Amendment (included as Exhibit B) to the 2003 Water Purchase Agreement with KAWC (included as Exhibit C). The Amendment provides the following key provisions:
 - i. A new 3-inch metered supply from KAWC located on 6804 Peaks Mill Road (near the former Elementary School),
 - ii. Up to 300 gallons per minute water supply,
 - iii. Water service through December 19, 2023, with the ability to extend the contract for an additional 20 years, through 2043,
 - iv. The cost of the KAWC connection will not exceed \$64,839,
 - v. The cost of water purchased will be at the published water tariff rate approved by the Kentucky Public Service Commission.
- k. The plans and specifications for water supply connection to Kentucky American were prepared by Stantec Engineers and approved by the Kentucky Division of Water on

November 22, 2019. The plans include installation of a 3-inch meter supply, approximately 500 feet of 6-inch DR 18 C-900 PVC, control valves and pressure regulating valves.

- l. The KAWC water supply connection is currently under construction and will be available for service no later than March 1, 2020.
- m. In December 2019, PMWD executed a professional services contract with BlueWater Kentucky on December 16, 2019 to review the PMWD strategy to address distribution water quality and prepare a CAP to address water quality compliance in the NOV's dated August 28, 2019, October 7, 2019, October 25, 2019, November 18, 2019.

3. Proposed Corrective Actions and Schedule:

In addition to the completed actions noted in section 2, the Peaks Mill Water District will perform the following corrective action items over the next 24-month period to assure compliance with 401 KAR 8:150 Section 1 and 401 KAR 8:020 Section 1:

- a. Complete the installation of the emergency water supply connection to KAWC by March 1, 2020. This includes disinfection, pressure testing, and water quality sampling of the new water supply.
- b. Identify the area and customers to be served by the KAWC water supply. Locate the valves, adjust pressure regulation, storage, pumping and booster chloramination treatment to allow transition to the new KAWC water supply. The impacted customers will be notified by mail of the transition in water supply and provided directions for flushing to maintain water quality. This exercise will be conducted from January 1 to March 1, 2020, pending weather conditions that will allow flushing of water to assure water supply is maintained. Water sampling will be conducted and if necessary, a BWA will be issued. KAWC also plans a spring chlorine burn that will impact the customers supplied by KAWC water.
- c. Within 30 days of the execution of the Agreed Order, PMWD will submit a Sample Site Plan, including a map of the distribution system, sampling locations and monitoring frequencies. PMWD will use the expertise of Kentucky Rural Water in developing the Sample Site Plan. The Sample Site Plan, once approved by KyDOW, will include specified water sample locations where both PMWD and KyDOW agree to monitor for chlorine residuals. Sampling sites will be selected to assure a reliable sample can be collected, minimizing their risk of contamination from external sources.
- d. PMWD will meet with FPB officials before March 1, 2020 to discuss and evaluate the following alternatives to improve distribution water quality:
 - i. FPB's long-term strategy to improve distribution water quality at FPB's master meter, located at Peaks Mill Road and Cedar Cove Road, near US Highway 127;
 - ii. Evaluation of options to stabilize water quality in the distribution system through treatment, hydraulics, valving and flushing;

- iii. Developing communications protocol for major changes in water quality impacting PMWD supply.
- e. Develop a Water Quality Operations Plan by June 1, 2020 to assure chlorine residuals are maintained above 0.5 ppm, including the following:
 - i. Document the protocol for supply of Pressure Zone 3 with KAWC water supply (Spring/Fall Cycle or permanent basis), including the free chlorine burn by KAWC in the spring and fall of each year;
 - ii. Document the flushing protocol for the warm water months of June to October;
 - iii. Document the protocol for operating the chloramine booster systems at specified locations as needed to increase chlorine levels;
 - iv. Conduct storage tank inspections and cleaning in 2020 (per 5-year cycle).
- f. In the event Corrective Action items 3(a) to 3(e) are not effective in maintaining chlorine residuals above 0.5 ppm during 2020, the following alternatives will be evaluated by March 1, 2021:
 - i. Evaluate the feasibility and cost of installing a permanent treatment system (chlorine, chloramines, sodium chlorite or other treatment system) near the FPB's master meter supply at the Owenton Road pump station or Shadrick tank to assure chlorine residuals are maintained for the entire PMWD distribution system.
 - ii. Evaluate the feasibility of purchasing additional water supply from Kentucky American Water Company and/or converting to KAWC supply on a permanent basis;
 - iii. A combination of items 3f (i) and 3f (ii);
 - iv. Note the implementation of these alternatives may require significant investment and require an implementation period of 6 to 12 months.
- g. Quarterly Progress Reports will be submitted on the 15th of the month following the compliance period for the duration of the Agreed Order. The Agreed Order is expected to run through December 31, 2021 and may be extended into 2022 if PMWD fails to maintain chlorine residuals above 0.5 ppm in the distribution system in accordance with the approved Sample Site Plan. Once four consecutive quarters of compliance with 401 KAR 8:150 Section 1 and 401 KAR 8:020 Section 1 are achieved, the Agreed Order will terminate and the stipulated penalties shall cease.

4. Final Compliance Date:

Items 3a to 3e will be complete by July 1, 2020, prior to the warm water period (Summer and Fall) when water temperature exceeds 80 degrees. The actions will improve distribution water quality and assure chlorine levels of 0.5 ppm or greater. In the event this plan of action does not fully address water quality, Corrective Action item 3(f) will be evaluated to address the issue on a permanent basis and an updated compliance schedule will be submitted to the Kentucky Division of Water.

5. Stipulated Penalties:

PMWD does not agree with the proposed \$1,500 and \$3,000 stipulated penalties and a \$15,000 civil penalty included in the KDEP letter of November 5, 2019. These penalties appear excessive, considering the following:

- a. The NOV's issued August 28, 2019, October 7, 2019, October 25, 2019 and November 18, 2019 were not health-based violations of the Safe Drinking Water Act. Federal regulation 40 CFR 141.72, which is referenced in 401 KAR 8:150 Section 2, requires a disinfectant concentration entering the distribution system not less than 0.2 mg/l (ppm) for more than 4 hours. The water entering the PMWD system at the master meter from the FPB ranges from 1.2 to 2.9 ppm, exceeding the required 0.2 ppm minimum requirement.
- b. Loss of chlorine residual below 0.5 ppm is an indicator of a potential problem and monthly compliance samples for heterotrophic bacteria were negative. Federal regulation 40 CFR 141.72 defines a detectable disinfectant as water tested with a Heterotrophic Plate Count (HPC) less than or equal to 500/ml. PMWD understands the Kentucky Administrative Requirement to be a precautionary measure of potential contamination, and as directed by KyDOW, BWA's were issued for the areas with chlorine residuals below 0.5 ppm;
- c. PMWD purchases treated water from the FPB and relies on the quality of water delivered at the master meter. Low pH and water age contribute to a degradation of chloramines levels in warm water through nitrification;
- d. FPB experienced two major water quality events in 2019 that appear to have contributed to the acceleration of nitrification in the distribution system and degradation of the chlorine residual: the Jim Beam bourbon spill and the failure of ammonia feed equipment, both in July 2019;
- e. In 2017, PMWD began to proactively investigate distribution treatment solutions beyond flushing to address nitrification and loss of chlorine residuals in portions of the distribution system;
- f. PMWD has utilized the technical staff of KyDOW to assist in solutions, including implementation of booster chloramination and the use of ORA-CLE bio-penetrant to reduce biofilm and restore chlorine residual. PMWD has installed a portable chloramine booster system to restore chlorine levels above 0.5 ppm in Pressure Zone 3;
- g. PMWD is utilizing the services of Louisville Water Company and Kentucky Rural Water to improve distribution operating and maintenance practices as well as understanding the causes of nitrification. Their knowledge and experience led to steps taken by the PMWD Board to address and improve distribution water quality;
- h. PMWD has executed a contract with KAWC for a secondary water supply to Pressure Zone 3 (Union Zone) and a portion of Pressure Zone 2 (Herman-Smithers Zone) that will

provide water with a chlorine residual at 3.5 ppm. This alternative source of water is expected to improve chlorine residuals in this portion of the distribution system. A spring/fall free chlorine burn by KAWC will reduce biofilm growth, reduce nitrification and restore stable chlorine residuals above 0.5 ppm;

- i. PMWD has contracted with BlueWater Kentucky to develop a water quality strategy and operating plan to improve water quality and eliminate occurrences of low chlorine residual in the distribution system;
- j. The Corrective Actions will cost an estimated \$153,000 to address this issue, including the cost for temporary chemical feed system (\$42,000), the connection with KAWC (\$65,000 plus \$38,000) and the additional water flushing from July to December 2019 (\$8,000). PMWD currently has annual revenues of approximately \$1.1 million. Monthly water bills average \$57.87 for 5,000 gallons (compared to Kentucky average of \$39.75 reported in Cannon and Cannon 2018 Rate Survey). This \$153,000 cost has a significant impact on the PMWD rate base and the PMWD Board desires to keep water rates affordable for its customers. A high stipulated penalty will place an unnecessary operating cost burden on the PMWD rate payers.

Water industry experience has indicated there will be periods of time when disinfectant residuals will decay for a number of reasons, including source water quality (Kentucky River), the FPB treatment process (chloramination, pH and alkalinity); time of travel/water age, distribution system corrosion, water storage, bio-film growth and nitrification under warm water conditions. Further, a chlorine residual below 0.5 ppm does not confirm the water is contaminated. The most effective method to determine contamination is through testing for heterotrophic bacteria concentrations. The chlorine residual is an indicator of a potential problem, but not an affirmation of contamination.

For these reasons and the proactive steps already taken by PMWD, the following Stipulated Penalties are proposed:

Tier 1 – if chlorine residual falls below 0.5 ppm after 5-minute flush at specified sample locations identified in the approved Sample Site Plan, system flushing will be initiated, and water samples will be tested for heterotrophic bacteria concentrations. If the heterotrophic plate count (HPC) is less than 500/ml system, flushing will be continued until chlorine residuals are restored to above 0.5 ppm. Tier 1 will not include a stipulated penalty, since no contamination has been confirmed.

Tier 2 – if the chlorine residual remains below 0.5 ppm after 5-minute flush at specified sample locations identified in the approved Sample Site Plan, for a period exceeding 7 days, a BWA will be issued and booster chloramination will be initiated to restore chlorine residuals to 0.5 ppm. Once the chlorine residual is restored to 0.5 ppm, the BWA will be lifted. Tier 2 has a stipulated penalty of \$100 per occurrence.

Tier 3 – if chlorine residuals remain below 0.5 ppm after 5-minute flush for an extended period exceeding 30 days, a BWA and booster chloramination will continue. Tier 3 has a stipulated penalty of \$250 per month per occurrence until the chlorine residual is restored to 0.5 ppm and BWA is lifted.

In addition, PMWD believes a Civil Penalty of \$15,000 should not be assessed considering the proactive steps taken to date by the PMWD and the commitments made in the Corrective Action Plan going forward. PMWD looks forward to meeting with KyDOW staff and resolving this issue under an Agreed Order to the satisfaction of both parties.

END OF REPORT

Exhibit A – Peaks Mill Water Supply Map

