Maryland
Department of the Environment

Triennial Report to Governor

CAPACITY DEVELOPMENT
for
MARYLAND PUBLIC DRINKING WATER SYSTEMS
Calendar Years 2020 - 2022

Prepared by:

Water Supply Program

Prepared for:

Governor Wes Moore
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Executive Summary

One primary responsibility of the Maryland Department of the Environment (MDE or the Department) is to ensure safe and adequate drinking water supplies for Maryland's citizens. MDE oversees multiple programs and activities to make certain that public drinking water systems are constructed, operated, and maintained in a manner that ensures the drinking water produced is safe to consume and provides an adequate supply to meet current and future needs. MDE's Water Supply Program (WSP) accomplishes this goal through the implementation of the federal Safe Drinking Water Act (SDWA) and State regulations.

The SDWA requires states to develop programs to ensure that both new and existing water systems have the technical, financial, and managerial capacity to provide safe drinking water to their customers. In 1999, Maryland adopted regulations requiring owners of new water systems to demonstrate the systems are viable and have adequate capacity. In 2001, the U.S. Environmental Protection Agency (EPA) approved Maryland's capacity development strategy to improve the capability of Maryland's existing public drinking water systems. This strategy was revised in 2009, 2017, and 2022. Maryland's primary strategy to improve capacity in existing systems is to identify public water systems' greatest needs and focus technical assistance and training efforts toward these areas. In addition, WSP undertakes many other activities that help water systems remain in compliance with State and federal regulations, including routine inspections, funding assistance, onsite technical assistance, operator training, laboratory certifications, source water assessment, and consolidation of water systems when appropriate.

EPA requires states to prepare triennial reports to their Governor that focus on two main components: capacity development authority for new public water systems, and capacity development strategy for existing public water systems. EPA may withhold 20% of a state's funding if the state fails to submit a triennial report.

This triennial implementation report details Maryland's capacity development program for new and existing water systems, as well as the progress made toward improving capacity; activities for calendar years 2020 through 2022 are also summarized. Data generated from MDE's current efforts in improving water system capacity are compared with baseline data from 2001 to evaluate improvements and accomplishments. Through these efforts, Maryland has maintained one of the highest rates of compliance among all states, ensuring the safety of the drinking water for more than six million Marylanders who rely on water provided by more than 3,200 public water systems.

Introduction

This report has been prepared for the Governor's Office in accordance with Section 1420 (c)(3) of the Safe Drinking Water Act (SDWA) and follows previous triennial capacity development reports submitted to the Governor's Office since 2002. As previously, it documents challenges and progress related to capacity development and evaluates the State's effectiveness as reflected by inspection and compliance data collected through calendar year 2022 (CY22). The report will be published on MDE's website.

One of MDE's primary responsibilities is to ensure safe and adequate drinking water supplies for Maryland citizens. This is accomplished, in part, by the Department's Water Supply Program (WSP) which implements the SDWA and manages other programs and activities to make certain that public drinking water systems are constructed, operated, and maintained in a manner that ensures the drinking water produced by these systems is safe to consume, and that there is an adequate supply to meet current and future needs.

Per State and federal regulations, a public water system is any facility that serves 25 or more individuals for more than 60 days per year which has its own water source or provides treatment to purchased water. The three types of public water systems include community water systems (CWS) that serve year-round residential consumers; non-transient non-community (NTNC) water systems that serve recurring consumers and include schools, daycares, and places of employment; and transient non-community (TNC) water systems that serve different consumers each day and include campgrounds and restaurants (in rural areas). A consecutive water system receives some or all of its finished water from one or more wholesale water systems. Eighty-nine percent of Maryland's population, nearly 5.5 million people, is served by a community water system; the remaining 11% are served by individual domestic wells. Table 1 presents water system and population data from EPA's SDWIS-State database as of May 19, 2023.

Table 1

Drinking Water Statistics	2022	2019	2016	2013	2010	2007	2004	2001
Population of Maryland	6,164,660	6,045,680	6,016,447	5,928,814	5,773,552	5,618,344	5,558,058	5,296,486
Individuals served by community water systems	5,489,287	5,370,003	5,107,864	5,057,350	4,989,406	4,844,668	4,846,923	4,438,335
Percent of population served by community water systems	89%	89%	85%	85%	86%	86%	87%	84%
Percent of population served by individual wells	11%	11%	15%	15%	14%	14%	13%	16%
Number of public water systems	3,245	3,251	3,295	3,396	3,432	3,533	3,692	3,816
Number of community water systems (CWS)	464	463	464	474	473	486	502	503
Number of non-community non- transient community water systems (NTNCWS)	546	541	532	544	550	559	576	568
Number of transient non-community water systems (TNCWS)	2,235	2,247	2,299	2,378	2,409	2,488	2,614	2,745
Number of systems using surface water	89	74	65	60	59	69	66	64
Number of systems using only ground water	3,156	3,177	3,230	3,336	3,373	3,464	3,626	3,752

[1] Includes consecutive systems

The 1996 SDWA Amendments required States to develop a program to strengthen the managerial, technical and financial capacity of water systems to reliably deliver safe drinking water that meets all the national primary drinking water regulations. The State programs must have two main components: (1) legal authority to ensure that new water systems have sufficient technical, managerial, and financial capacity to meet drinking water standards; and (2) a strategy to identify and assist existing water systems in need of improving managerial, technical, or financial capacity to comply with regulations and public health standards. Maryland's legal authority for ensuring new water systems have sufficient technical, managerial, and financial capacity was established in Code of Maryland Regulations (COMAR) 26.04.01.36 and adopted in 1999. Maryland's strategy to improve the public drinking water system capacity was originally approved by the EPA in 2001. The strategy was revised several times, and most recently in 2022 to include asset management as required by the federal American Water Infrastructure Act (AWIA), established in 2018. Maryland's current strategy also incorporates new initiatives to eliminate lead in daycare drinking water and address emerging contaminants, including per- and polyfluoroalkyl substances (PFAS) and harmful algal blooms.

A sustainable and resilient water system relies upon three critical and interdependent components, similar to a three-legged stool: technical, managerial, and financial capacity. Technical capacity refers to the physical infrastructure of the public water system (the adequacy of the source water, wells, water intakes, treatment, storage, and distribution), as well as the technical knowledge of system personnel and their ability to apply technical knowledge. Managerial capacity includes ownership accountability, staffing and organization, and the effectiveness of relationships with consumers and regulatory agencies. Financial capacity refers to the financial resources of the water system, including credit worthiness, fiscal controls, and the ability to generate sufficient revenue.

WSP focuses capacity development efforts by identifying areas where training and technical assistance are most needed through water system self-assessments, compliance results, and onsite sanitary surveys (inspections) of water systems. WSP's collaborative relationships with state and regional organizations also provide targeted technical assistance. These efforts result in water systems' improved ability to supply safe drinking water to their customers.

As new issues arise that are not fully addressed by the original capacity development strategy, revisions are made. In 2002, Maryland experienced severe drought conditions that highlighted the need for comprehensive assessment and response activities related specifically to these events. More recent estimates of growth potential and water availability indicate several communities could experience water shortages unless steps are taken to better understand the hydrologic system and to carefully plan for future water needs.

Previous revisions enhanced the State's drought management program by including hydrologic study findings for the Fractured Rock and Coastal Plain regions of the State, developing / implementing capacity management plans and water resource elements for comprehensive planning purposes, and promoting conservation technologies. Water system training plans that addressed climate change resiliency, water system security, and emergency response/recovery were also incorporated.

House Bill 270, adopted in 2017, requires the development of regulations for all public and nonpublic schools in Maryland to test for the presence of lead in each drinking water outlet in all occupied school buildings. WSP has worked with schools and school districts to implement this required testing on a three-year, cyclical basis; most Maryland schools have now conducted at least one round of the testing. Revisions to the federal Lead and Copper Rule (LCR) will require similar lead testing of some outlets in all schools and childcare centers.

With funding appropriated under Section 1464(d) of the SDWA, amended by the Water Infrastructure Improvements for the Nation (WIIN) Act, Section 2107, MDE made funds available to participating public school districts for remediating drinking water outlets with elevated levels of lead in the drinking water. Schools serving students in economically disadvantaged communities and/or serving younger children (ages 6 and under) are prioritized for funding. MDE plans to use future WIIN Section 2107 funding to develop a QR code-based application for schools' use to streamline sampling and improve data quality.

The most recent revision to the strategy in 2022 incorporated asset management, as required by the 2018 federal American Water Infrastructure Act. Asset management builds capacity as it is the practice of managing critical infrastructure components for future planning and water system sustainability. The current revision promotes asset management plans during WSP routine sanitary survey process and through WSP technical assistance providers such as Southeast Rural Community Assistance Project (SERCAP) and Maryland Rural Water Association (MRWA).

Challenges

Several factors present capacity development challenges for Maryland water systems. One of the greatest challenges is related to limited resources associated with water system size. Of the 464 community water systems serving year-round residents, only thirty-one systems serve a population greater than 10,000 people. Most Maryland water systems are very small; 341 water systems serve a population of 1,000 or fewer people. These very small systems often have limited financial resources and expertise, which can lead to postponed preventive maintenance, inability to retain qualified water operators, and a lack of infrastructure improvements.

Population growth has led to several new housing and commercial developments in rural areas that can exacerbate other limited resources, especially for small and medium sized communities. For example, the population served by Maryland's community water systems increased by approximately 380,000 people since CY16, which increased the collective water demand by 32.4 million gallons per day. In some cases, water supply system sources or treatment plants may have difficulty meeting needs associated with projected population growth.

Increased regulatory requirements present challenges as well and can be especially overwhelming for the very small systems. Since CY01, ten new regulations have been promulgated at the federal level, several of which have required new infrastructure for many water systems. Four new regulations, including two related to lead and another related to per- and polyfluoroalkyl substances (PFAS) are being finalized in CY23 and are expected to be implemented within three years. According to the *2015 EPA Needs Survey*, Maryland's total capital need over the next 20 years is $9.3 billion.

Complex regulatory changes and advancing treatment technologies require water system operators to obtain and consistently increase their knowledge with additional training. However, relatively low operator salary levels and a shrinking pool of qualified workers have presented challenges for water systems to attract and retain competent certified water plant operators.

Climate change impacts and drought conditions are also expected to present challenges, particularly for the smaller water systems. Concerns range from source water availability to weather related events that require emergency response to increased incidence of harmful algal blooms that result in the presence of cyanotoxins in drinking water.

Emerging contaminants, including pharmaceuticals, personal care products, harmful algal blooms, and per- and polyfluoroalkyl substances (PFAS) present a major challenge for even the most well operated

water systems. PFAS is a set of widely used chemicals found in water, fish, and soil that break down slowly over time. Scientific studies have shown exposure to some PFAS may be linked to harmful health effects. As there are thousands of PFAS found in many different consumer, commercial, and industrial products, this set of chemicals is challenging to study to assess environmental risks and impacts to public health. EPA proposed regulatory thresholds for six PFAS chemicals in CY23, which could be promulgated as early as 2025. As of December 31, 2022, MDE sampled all community water systems for PFAS, evaluated areas of elevated detections, and began assisting water systems with remediation efforts that included applications for federal funding.

The Effectiveness of Maryland's Strategy

The effectiveness of Maryland's capacity development strategy is measured through the progress made towards improving the technical, managerial, and financial capacity of water systems in the State. Program databases, sanitary survey inspection records, and public water system surveys are used to identify improved performance and areas where additional capacity development efforts are needed.

The 2001 baseline values included a self-assessment survey, regulatory compliance data, operator certification statistics and information from sanitary survey inspections. These baseline values are compared with 2020 data in Table 2. The sources of each of the major components of the baseline are discussed below.

In 2016, MDE replaced the legacy database, Public Drinking Water Information System with a federal database, SDWIS-State. The SDWIS-State database houses water quality compliance data as well as monitoring and reporting requirements. The database's enhanced compliance tracking tools help WSP continuously monitor the progress of water systems' technical and managerial capacity.

A sanitary survey is an onsite inspection of a public water system that includes an inspection of the water source(s), the water treatment plant(s), the storage capacity and the distribution system(s); it also includes a review of water quality test results, operations and maintenance procedures. Sanitary surveys and other site visits allow field staff to identify significant sanitary defects that could adversely impact public health, non-regulatory deficiencies that may indicate problems with technical capacity, and other general infrastructure needs. WSP works with water systems to help correct all deficiencies and improve their capacity to provide safe and adequate water to their customers.

During sanitary surveys, WSP field staff review standard operating procedures, emergency plans, and other technical and managerial documentation. In addition to improving the technical capacity of the water system, the sanitary survey is often used as a tool for initiating improvements in managerial and financial capacity. The frequency of sanitary surveys ranges from approximately once per year to once every three or five years, depending on the system size, type and complexity, and the vulnerability of the source water.

Since 2001, WSP has circulated a Capacity Development self-assessment survey to all community water systems every 6 years; the most recent survey was sent in 2020. Survey questions were initially formulated by a workgroup of representatives from local, state and federal public agencies, and private industry to solicit information about the technical, managerial and financial capacity of Maryland's public water systems. While WSP attempted to improve the 2020 survey response rate, only 46% of systems responded - similar to the 2007 survey response. Efforts to increase the response rate included administering the 2020 survey electronically, using an internet-based survey application, reducing the number of questions, and making follow-up calls to offer assistance. The COVID-19 pandemic may have influenced or impacted survey responses/results. Table 2 provides a summary of the measurement

of twelve technical, financial and managerial baseline criteria since 2001. MDE is evaluating efforts to improve water system response and possibly enforce mandatory response.

Table 2

Data Source	Measure of Capacity		2020	2014	2007	2001
	Technical:					
Enforcement Targeting Tool (ETT) list1	Number of ETT systems (CWS & NTNC)		4	9	NA	NA
Historical Significant Noncompliance (SNC)1	Number of Historical SNC Systems (CWS & NTNC)		NA	NA	37	51
Compliance Data2	Lead and copper violations (CWS & NTNC)		8.4%	13%	<13%	13%
Sanitary Survey3	Systems with certified operators	CWS	90%	91%	86%	80%
		NTNC	67%	76%	74%	40%
Self-Assessment Survey4	Systems that can meet future 10-year water quantity demands with current sources and treatment		92%	69%	58%	72%
Sanitary Survey3	Percentage of major non-regulatory deficiencies resolved		80%	97%	90%	67%
	Financial:					
Self-Assessment Survey4	The last time water rates were changed (CWS)		Average Years:	Average Years:	Average Years: 1	Average Years: 4

			3	1		
Self-Assessment Survey4	Systems that have financial records reviewed at least annually by an independent financial auditor		75%	90%	78%	53%
	Managerial:					
Self-Assessment Survey4	CWS respondents aware of if additional treatment or equipment will be required because of upcoming SDWA regulations		24%	55%	45%	30%
Self-Assessment Survey4	Systems with service connections metered	Residential	64%	74%	60%	25%
		Commercial	71%	71%	50%	4%
Self-Assessment Survey4	Systems that can meet average daily demand with largest source out of service		83%	69%	64%	52%
Sanitary Survey3	Percentage of CWS systems with emergency plan of operation		81%	83%	75%	43%

Table 2 Notations:

[1] EPA no longer requires states to submit Historical SNC (HSNC) lists. This measure has been changed to report EPA's newest measure, the Enforcement Tracking Tool (ETT). This does not compare directly with the number of HSNC systems reported in previous years.
[2] Data from EPA's SDWIS-State database.
[3] MDE staff conduct sanitary surveys of public water systems on a regular basis. Frequency ranges from more than once a year to once every five years. The current federal requirement is a minimum of one sanitary survey per system every three years for community systems and once every five years for non-community water systems.
[4] Self-assessment surveys were conducted in 2001, 2007, 2014 and 2020. This table includes a selection of answers to questions from that survey. Surveys are conducted every six years.

Discussion of Maryland Capacity Development baseline as outlined in Table 2

Technical Measures

1. **Number of Enforcement Targeting Tool systems (CWS, NTNC & TNC).** During FY11, EPA developed and implemented a new enforcement tool known as the Enforcement Targeting Tool (ETT). WSP now maintains and reports data using this tool. Any system with 11 or more points

on the ETT is considered to be in significant noncompliance. Compliance with drinking water quality standards has the highest priority, but a water system that routinely fails to monitor or report as required by the regulation may be included on the priority list. The enforcement status is currently tracked and reported to EPA on a quarterly basis. As of December 31, 2022, four water systems had an ETT score of 11 or more. New regulations frequently result in increased violations as water systems learn about and respond to new requirements and identify funding to address infrastructure needs. WSP provides information to water suppliers of available training opportunities and gives presentations at training events around the State. WSP will continue to focus training efforts to ensure all water systems understand their responsibility for new and existing regulations.

Prior to the development and implementation of ETT, EPA produced a list of water systems with a history of SNC every three years. A system was considered to be a Significant Non-Complier (SNC) if in violation of one or more National Primary Drinking Water Regulation for any three quarters within a rolling three-year period.

2. **Lead and copper violations (CWS & NTNC).** Complex monitoring and treatment technique requirements for lead and copper can be challenging for small water systems. Water system monitoring requirements can vary widely from year-to-year and as a result, more violations occur in some years than in others. In CY22, sixty-seven lead and copper violations occurred at sixty-one water systems; most violations were related to monitoring, reporting and notification. WSP will continue to focus on reducing the number of violations by providing technical assistance and training. In addition, formal enforcement actions are being taken and penalties assessed for systems in SNC.

3. **Percentage of systems with certified operators (CWS & NTNC).** Regulations require community and non-transient non-community water systems be operated by State-certified operators. Maryland's Operator Certification Program evaluates and certifies water system employees to operate water systems according to personal experience and water treatment plant complexity; the program also requires continuing education. A knowledgeable and experienced operational staff is critical to ensuring water systems provide drinking water that meets federal and State requirements. The Board of Water and Wastewater Systems Operators (the Board) was transferred within MDE to the Water Supply Program in CY15. WSP funding supports some training classes for operators, while WSP staff advise water systems of operator certification compliance requirements and available operator training. WSP collaborates with the Board to improve operators' examination passing rates by evaluating relevant exam content and supports a contract with the Association of Board Certifications for standardized exam questions and scoring. The Board adopted several online processes, including approved continuing education and renewal form download, to improve operators' access and is developing an online portal for certification and payment. During the COVID State of Emergency, then-Governor Hogan issued an extension of licenses, permits and certifications on March 24, 2020; the extension was rescinded on August 15, 2021.

   The CY22 EPA Operator Certification Report indicated that, as of December 31, 2022, 90% of community water systems and 73% of NTNC water systems in Maryland had certified operators. Overall, 81% of all Maryland community and NTNC water systems were operated by certified individuals, which is significantly higher than the 59% baseline in CY01.

4. **Systems that can meet future 10-year water quantity demands with current sources and treatment.** In 2006, MDE developed guidance for community water systems to assess their system capacity and plan for future needs. Water system capacity can be limited by several

factors, including water (or wastewater) treatment plant design or operation; water appropriation permit limitations; and/or the water source sustainability. When customer water demands equals or exceeds 80% of the permit limitation WSP assists water systems to identify new sources, upgrade infrastructure, and/or reduce demand (i.e., conserve water) to ensure sufficient water quantity is available to meet projected demand. Of the water systems that responded to the 2020 WSP Capacity Development survey, 92% indicated adequate water source and treatment capacity to meet demand for the next 10 years, which is a substantial increase compared to 58% in 2007 and 69% in 2014. The increase is a direct attribution to the multiple MDE and WSP initiatives which encourage water systems to evaluate capacity relative to growth.

5. **Percentage of significant non-regulatory deficiencies resolved.** During sanitary surveys, WSP field staff identify sanitary defects or deficiencies that are not regulatory violations but may nevertheless have a significant public health impact. Deficiencies are characterized as significant or minor depending upon the potential to affect public health or customer comfort, and the frequency of occurrence. Significant deficiencies include routinely low water pressure events in the distribution system which makes the water system vulnerable to cross connection; a deteriorated water storage tank; inadequate or unreliable treatment; or a well that is vulnerable to flooding. WSP assists water systems to address deficiencies. The time to resolve a significant deficiency varies. While replacing a well cap can be completed in a day, connecting to another water system may take years. As of December 31, 2022, seventy-five percent of significant deficiencies were resolved, one was in formal enforcement and the remaining were on track to be resolved.

Financial Measures

1. **Last time water rates were changed (CWS).** Frequent review and adjustments of water rates allows systems to cover rising water system costs and provides adequate funds for future system improvement. The results of the most recent Capacity Development self-assessment survey indicate water systems continue to adjust rates more frequently than in the past. WSP has supported training efforts to educate water systems about the importance of establishing appropriate rate structures. The 2020 survey responses indicated water systems revised rates on average within three years; this is similar to previous survey results.

2. **Systems that have financial records reviewed at least annually by an independent financial auditor (CWS).** Independent audits of water system financial records are sound financial practice. The self-assessment survey results indicate variability in this practice. While 75% of water systems performed an annual independent financial review, 90% performed such a review in 2014, and 78% performed such a review in 2007. However, all three surveys showed a markedly higher number of independent audits than the 2001 base point of 53%.

Managerial Measures:

1. **Awareness of whether additional treatment or equipment will be required because of SDWA regulations that will come into effect within the next few years (CWS, NTNC & TNC).** This data point has been variable. More managers (55%) were aware of upcoming regulations and the impacts to water system operations in 2014, compared to 30% in the baseline 2001 survey. However, the responses decreased to 24% in the 2020 survey; WSP believes this sharp decline in awareness is the result of water system staff turnover. Since 2020, WSP has focused on educating water systems about new or upcoming regulations and will

continue to target educational efforts to ensure water system managers and operators understand impacts of anticipated changes to federal and State laws and regulations. WSP funds training classes specifically for superintendents of small water systems through the College of Southern Maryland's Maryland Center for Environmental Training. In addition, WSP regional partners, including the Maryland Rural Water Association, the Chesapeake Section American Water Works Association, and the Water and Wastewater Operators Association of Maryland, Delaware and DC all promote regulatory updates during training classes and at annual conferences for all water system operators and superintendents.

2. **Percentage of systems with metered service connections (CWS).** Metering is a fundamental tool to manage water use and is especially useful for community water systems. Accurate meters reflect customer water usage, allow the water system to bill customers appropriately, and can encourage conservation efforts with a (tiered) rate structure. Water systems can also use meters to identify water loss occurring from distribution system leaks, theft, or other unauthorized uses. Per the 2020 self-assessment survey, 64% of systems reported 100% of their residential customers are metered, while 71% of the systems reported 100% of their commercial customers are metered. These percentages are substantially higher than the 2001 baseline survey. While many smaller systems do not have metered service connections, WSP expects these percentages to increase as demand and water conservation interest escalates.

3. **Systems that can meet average daily demand if the largest source is out of service (CWS, NTNC, TNC).** Some water systems rely upon multiple sources to supply customers and meet demand; many very small water systems utilize only a single source. The number of sources is a critical component to ensuring water system reliability in the event a source must be taken out of service due to a mechanical/electrical failure or other unforeseen reason. The percentage of systems that reported capacity to meet average daily demand with the largest source out of service has increased substantially to 83%, compared to the 2001 baseline of 52%. WSP provides guidance to water systems for improving sustainability and will continue to encourage the use of sufficient backup sources.

4. **Percentage of CWS systems with an emergency plan of operation (CWS).** A water system emergency plan of operation (or emergency response plan) outlines how a community water system will respond to possible emergencies such as a power outage, hurricane, terrorism, or water contamination. It includes contact information for key personnel, including water system managers, local emergency responders, chemical suppliers, equipment manufacturers, well drillers, alternative water suppliers, and WSP staff. WSP has focused a considerable amount of energy on providing guidance and technical assistance to water systems in developing these plans. During sanitary surveys, field staff review a system's emergency response plan and encourage system managers to update them as needed. Efforts are being made to secure federal grant funding to provide technical assistance to small systems for conducting vulnerability analyses to identify and prioritize remedial actions at which time ERPs can also be updated. Currently, 81% of community water systems have an emergency plan of operation. WSP will continue to work with systems to encourage appropriate emergency planning.

Additional State Measures:

Prior to EPA's proposed PFAS Maximum Contaminant Levels, MDE began a multi-phase sampling program in CY20 wherein all community water systems were sampled for PFAS by late CY22. MDE is working with systems whose results exceed EPA's proposed Maximum Contaminant Levels for

PFAS to provide technical assistance with determining the best course of action to mitigate high PFAS levels. MDE is also connecting these systems with federal funding opportunities that consider environmental justice and disadvantaged community designations within the award criteria. MDE began sampling all Maryland non-transient non-community (NTNC) systems, such as schools and places of employment, for PFAS in CY23.

MDE also started a project in 2020 to enhance management of harmful algae toxins in Maryland's drinking raw water reservoirs (pre-treatment). This includes a preliminary assessment to establish baseline levels for comparison with future sampling programs. Twenty priority reservoirs were selected in 2020 and sampling was done in July 2021 and late summer 2022. This is in addition to 50+ bloom samples that are routinely tested during algae bloom season. MDE began sampling early in the CY23 HAB season.

Next Steps

In addition to continuing multiple capacity development related activities, WSP is taking the following steps to further improve water system capacity:

- Work with training organizations so that training content covers areas of greatest need.
- Provide additional technical resources that are accessible to water systems. Increase internet accessibility of training tools.
- Provide training and technical assistance for water systems on newly adopted and upcoming drinking water regulations.
- Continue monitoring hydrologic conditions and routinely update MDE's drought webpages.
- Encourage water systems to anticipate and prepare for potential conditions under climate change.
- WSP requires all community water systems with more than 10,000 customers to perform annual water audits to determine the efficiency of the water system. In addition, water systems with usage exceeding 80% of the water appropriation permit must perform water audits.
- WSP continues to closely monitor lead water quality results, changes in treatment processes that could impact corrosion control, and customer complaints that could indicate serious problems like those experienced in Flint, Michigan in 2014.
- Augment efforts to protect children from lead in drinking water. Adopt measures for childcare centers following recent legislation to ensure safe levels of lead in Maryland's public and nonpublic school buildings.
- Continue to monitor for PFAS and assist water systems with communications and funding support.
- Continue to monitor for harmful algal blooms.
- In support of the Department's "One Water" initiative, MDE will foster interdisciplinary collaboration on topics such as drinking water, water quality restoration, water conservation, beneficial reuse, water-related climate change action, and other topics across programmatic boundaries.

Conclusion

WSP focuses on many activities to assist public water systems improve their technical, managerial, and financial capacity, which will ultimately protect public health. WSP efforts include financial assistance, technical and compliance support, targeted training based on need, encouraging water conservation, improving system capacity to meet drought demands, and assistance to multiple water systems seeking to consolidate.

Maryland water systems continue to maintain a very high compliance rate of 99% with drinking water regulations and health-based standards. Water system managers have generally grown more aware of new regulations and treatment needs, and 92% of water systems believe they currently have enough capacity to meet demands 10 years from now. Efforts aimed at assessing and improving water systems' capacity for potential drought periods have improved their resiliency for future climate control conditions. Water systems have identified several training topics of interest that include drinking water regulations, asset management, accounting for leaks and emergency response. MDE plans to work with training providers to ensure that these topics are covered in future training opportunities. MDE looks forward to continually improving the technical, financial and managerial capacity of Maryland water systems.

Appendix A: CAPACITY DEVELOPMENT CASE STUDIES

The case studies in Appendix A provide some insight into the ways in which WSP continually works with water systems to improve their technical, managerial, and financial capacity.

***Allegany County* – Town of Luke interconnection resolved**
CWS population = 68

The Town of Luke was a mill town founded in the late 1800s that received drinking water from the mill. Its water distribution system is a patchwork of original pipes and repairs that have been made over the last century. In 2019, the Verso paper mill announced its closure and that it would no longer produce drinking water for Luke. After studying various water source options, a project was completed in October 2020 to connect Luke's aging and failing distribution system to the nearby Town of Westernport (population 2,200). A project to replace the distribution system has been priced at $1.6 million and funding applications were submitted to MDE and federal funding agencies in January 2020. It is critically needed and MDE continues to work with funding agencies and the Town of Luke to complete the project. Luke is now purchasing water from the new Westernport connection through a master meter. The new distribution system will offer the town fire protection and an equitable and accurate way to bill customers through the metering of each individual connection.

***Anne Arundel County* – Tebbston on the Magothy plant and operational deficiencies**
CWS population = 52

Tebbston on the Magothy is a small community near the scenic Magothy River. When a lab was unable to take a repeat sample after a bacteriological detection in September 2020, the WSP initiated an investigation. A site visit and file review revealed the water treatment plant to be in poor condition from a lack of adequate maintenance, and no certified operator. Along with poorly maintained equipment and a softener discharging to the ground, the aged water plant was subject to flooding and may meet the definition of a confined space. A significant deficiency was issued in October 2020 to address the issues found. WSP is currently working with the system to ensure the appropriate corrective actions are taken to protect the public health of the community. The deficiency remains unresolved, and the matter has been elevated to formal enforcement by the Office of the Attorney General.

Anne Arundel County – **Patuxent Mobile Estates treatment failure resolved**
CWS population = 450

Patuxent Mobile Estates is a mobile home park in Anne Arundel County where MDE has received complaints from residents regarding the occurrence of discolored water for several years. In April 2022, the WSP conducted a site visit in response to discolored water complaints and discovered the filters installed to remove iron and manganese had failed and recent water quality results showed elevated iron levels for some time. Discolored water was observed at the complainant's home and the iron residual was nearly ten times the Secondary Maximum Contaminant Level (MCL). In response, the WSP team immediately required bottled water and hauled potable water as alternative sources of water for the residents while new filters were being sourced. A precautionary boil water advisory (BWA) was approved to stay in place while hauled water was used and the filters were out of service. Significant deficiencies were issued for treatment, operations and management, distribution, and maintenance. Due to supply shortages, new filters were not installed until July 2022.

On July 12th, a severe storm caused a power outage at the plant leaving the residents without water. The WSP team immediately worked with the operator company and the Baltimore Gas and Electric utility to restore power to the plant, which was resolved on July 14th. The BWA remained in place until negative bacteria results were received. The community presently enjoys clean drinking water and no complaints have been reported since the installation of the new filters.

Baltimore City – **City of Baltimore treatment deficiencies resolved**
CWS population = 1,600,000

During the sanitary survey at the City of Baltimore in 2017, a WSP engineer discovered that many of the filters were in poor condition. They observed that the surface of the filters was uneven and saw mudballs and other materials. Based on these observations, MDE recommended that all of the filters be inspected. As a result of the inspections, some of the filters were identified as needing underdrain repair. These repairs, in addition to new media, filter troughs, and re-lining of the concrete walls of the filters, were completed on 5 filters by March 2020.

Baltimore City – **City of Baltimore managerial deficiencies resolved**
CWS population = 1,600,000

Baltimore City detected e. coli in the distribution system over Labor Day weekend in 2022. During the ensuing investigation and level 2 assessment, several deficiencies were discovered regarding some of the sampling sites that the city was using for bacteriological sampling. The level 2 assessment listed several recommended corrective actions to address both short term and long-term concerns. One of the sampling locations showed water quality that did not match water quality in the main, despite prolonged flushing, indicating that internal building plumbing was interfering with obtaining representative samples. In addition, a review of the City's bacteriological sampling site plan showed that some primary sampling locations did not have identified upstream and downstream repeat sample locations. A revised bacteriological sampling site plan was submitted within a month. The city is pursuing the purchase and installation of sampling stations for locations where they are unable to find taps inside buildings that reflect water quality conditions in the mains.

Baltimore County – **Stevenson Village Shopping Center well contamination resolved**
NTNC population = 50

In September 2019, the sole well became contaminated with oil. MDE's WSP worked closely with the owner of the shopping center to coordinate sampling of the well and issue a Do Not Use order. Although the source of the oil contamination was never pinpointed, the general area of contamination was eventually determined after several groundwater monitoring wells were drilled. WSP was again consulted to determine where on the limited lot would be a good location for a replacement well. An existing well on an adjacent property was investigated first, but this well had a hole in the casing at ground level and significant bacteriological contamination. Upon further investigation of the private well, it was also determined that the casing had a large break and root intrusion below the surface. Only a small area of the property was not impacted by the contamination. A new well, which required treatment for iron and manganese, was drilled in that location. After the appropriate permitting, the new well was finally put into service in September 2020.

Baltimore County **- Hunt Valley Golf and Country Club copper violations resolved**
NTNC population = 60

Hunt Valley Golf and Country Club has been on the Enforcement Targeting Tool (ETT) list due to numerous lead and copper rule (LCR) violations. The system has had multiple exceedances of the federal copper action level over the past ten years, and the water system would routinely fail to perform required follow-up actions. In October 2021, WSP engineers conducted a site visit to ensure the proper corrective action was being taken. WSP engineers discussed corrosion control practices that should be used and documentation that must be completed. As a result of this intervention, copper levels from the most recent round of sampling were below the action level. The system has since dropped in ranking on the ETT list.

Calvert County**- Calvert Mobile Home Park operational issues**
CWS population = 80

Calvert Mobile Home Park (MHP) utilizes one well, several bladder tanks, and sodium hypochlorite for disinfection. In May 2021, the operator notified WSP that the well pump began operating at half capacity and eventually failed. A tanker was brought in to restore pressure and a boil water notice was issued to the residents. A well driller replaced the pump, bacteriological samples were collected, and the system was brought back online after negative bacteria results.

In July 2021, the operator left with short notice, leaving the water system to find a new class T1 certified operator. The WSP provided guidance to the park regarding operator requirements and assisted the park with obtaining a new operator. The MHP quickly found a new certified operator and was able to comply with operator requirements.

In August 2022, the county health department notified the WSP of a few residents who were out of water for 2 days and that service was restored. Plumbers determined the water supply lines were clogged due to the aged condition of the well casing, which was made of deteriorating galvanized steel that introduced rust and sediment into the distribution system. WSP continues to work with the system in CY2023 to get the well replaced.

Carroll County **– City of Westminster PFAS detection**
CWS population = 35,256

The City of Westminster provided finished water PFAS results to MDE in October 2020. The results indicated a presence of PFAS in their finished drinking water from one of their treatment plants and wells. In response to these results, MDE asked Westminster to take the source offline and prioritized sampling their system. MDE's samples confirmed elevated levels of PFAS over EPA's health advisory level of 70ppt. MDE asked the City to continue to keep the well offline, notify the impacted drinking water customers, and continue to monitor PFAS throughout the system, including storage tanks. As of mid-2023, the City is currently working with a consultant to treat the PFAS at this well and has not had any issues with meeting demand while offline.

Carroll County **- Freedom District Disinfection Byproduct (DBP) optimization exercise**
CWS population = 24,867

Freedom District is a regional water system in southeastern Carroll County that draws water from

Liberty Reservoir, and supplies water to the local area as well as the Town of Sykesville and the consecutive system of Springfield Hospital. The water system has had a challenge meeting the Disinfectant Byproduct Rule (DBPR) and went out of compliance in July 2018. WSP visited the water plant several times in 2019 to assist the new superintendent in several ways to improve capacity. Monitoring and operational requirements for the surface water were outlined, and suggestions were made to improve chemical feed and DBP sampling throughout the plant. In addition, WSP coordinated an instructional site visit to Cumberland's water plant in March 2019 that provided the new superintendent with insight into the successful Dissolved Air Flotation (DAF) operation. Although Freedom District is currently still on EPA's ETT list, the water system's violation for DBPR exceedance was returned to compliance in June 2019. WSP performed a second exercise in October 2022 and is working with the water system to implement additional optimization efforts at both the treatment plant and distribution system.

***Carroll County* – Town of Hampstead PFAS detection resolved**
CWS population = 6,600

The Town of Hampstead is a small town with a population of about 6,600 and 2,200 connections. The Town consists of 12 treatment plants and 20 wells. PFAS samples were collected in November 2020 as part of MDE's statewide assessment of PFAS in state drinking water sources. The results from one of the treatment plants contained PFAS levels over three times EPA's health advisory level. MDE recommended the Town take the plant offline immediately and develop a notification letter to the Town residents. Further sampling showed that only one of the two wells at the plant was contaminated with PFAS, however both wells were recommended to remain offline due to the wellheads' proximity to each other. The Town has not had any issues meeting demand with these wells offline. MDE recommended the Town to perform quarterly PFAS testing at these wells and yearly testing at their other treatment plants to continue monitoring the situation.

***Carroll County* – Wee Care Best Daycare chronic bacteriological problem resolved** NTNC population = 158

In response to several positive total coliform bacteria results, including raw water samples, MDE launched an investigation in November 2020. During MDE's Revised Total Coliform Rule (RTCR) assessment, the wellhead was properly sealed, however water was observed collecting near the raw water main. This indicated a possible leak in the raw water main, so the water system performed pressure tests to verify. Pressure testing confirmed there was a leak and the system opted to replace the main. After chlorinating the system, the follow up bacteria samples came back negative. Since the raw main was replaced, the system has not had any positive bacteria results.

***Cecil County* - Pleasant Hill Mobile Home Park discolored water complaints resolved**
CWS population = 64

Pleasant Hill MHP is a small community water system that serves 24 connections with a population of 64 residents. The WSP was on site in June 2022 in response to a complaint of discolored water, high chlorine, and high pH from a resident. Field tests by WSP staff at a resident's home showed elevated iron levels and pH with no chlorine residual. The water system consists of caustic soda addition for pH adjustment and two ion exchange units for iron removal. Staff also observed a chlorine tablet injection device that was installed directly on the wellhead; the park owner stated the device was installed to minimize iron buildup on the well screen. The system was instructed to remove the device as it could be a source of bacteriological contamination, to obtain a certified operator, and to conduct daily

monitoring for iron and pH. WSP staff also discovered an issue with the ion exchange units, and the system worked with the manufacturer for repairs. The system obtained an appropriately certified water operator and implemented daily monitoring. The WSP has not received any recent complaints and continues to work closely with the water system to ensure no further problems arise.

***Charles County* – Laurel Water Supply well failure resolved**
CWS population = 50

Laurel water is a privately-owned community water system with a population of 50 people and 16 connections. On December 8, 2020, their well collapsed leaving the community without drinking water, forcing them to haul water. At that moment they did not have the finances to build a new water well at a quoted cost of $86,420. In addition, their water storage tank deteriorated with corrosion, adding more economic burden to them.

In order to help the community get their new well, WSP helped identify various funding possibilities including USDA, SERCAP, and EPA. Technical assistance was also provided by MDE regarding well construction and approval, review of technical information, and developing a water testing plan for the hauled water. Multiple site visits were made to follow up on well construction and completion, and nearly continuous communication was maintained with the job contractor and labs. WSP also supported the system in various meetings including Charles County Department of Public Works, USDA, SERCAP, and a private engineering firm among others. The well is now in service and supplying the community.

***Charles County* - Independence Village water outage resolved**
CWS population = 88

Independence Village is managed by a small homeowners' association (HOA). The water system consists of one well drilled in 1973, chemical disinfection, and two 2,000-gallon hydropneumatic tanks. Funding was procured from MDE about 20 years ago for some water plant improvements. In July 2022, the WSP was informed of a water outage lasting several days due to well failure and conducted a site visit. The community brought in hauled water by tanker until a well driller was able to evaluate the issue. The WSP approved a BWA until the well was repaired, chlorinated, and negative bacteria results were obtained. The system's certified operator quit during this event and the WSP connected the water system with an operator from a nearby town. The system was also referred to Maryland's technical assistance providers to seek funding as the well and water system are both deteriorating.

***Charles County* - Matthews Manor total coliform issues resolved**
CWS population = 45

Matthews Manor is a small community water system consisting of 11 connections serving 45 people with a single well, hydropneumatic tank, and no treatment. The WSP was notified of a routine and repeated positive total coliform result. The community does not have a certified operator, but a homeowner assists with the drinking water system. The WSP provided technical assistance with a Level 1 assessment in July 2022 to investigate the issue. Corrective actions included chlorinating the well and distribution system. Recommendations were made for more appropriate sampling locations for routine, repeat, and source bacteria samples. The community was also referred to technical assistance providers for plant upgrades and to obtain a certified operator. After disinfecting the well, additional bacteria samples were collected with negative results.

***Charles County* – Waldorf Water Resource Study**
CWS population = 91,260

Waldorf withdraws water from three different aquifers; two of these aquifers have been impacted by excessive withdrawals in the past decade. MDE required Charles County to evaluate source water options and limit pumping to minimize further impact on the aquifers and nearby users. As a result of MDE's direction and technical assistance, the County's engineer recently finalized a Water Source Feasibility Study, which evaluated potential source options, including new surface water sources and wholesale purchasing, to address future demand.

Additionally, MDE technical assistance staff provided the County with resources and guidance during inspections and other meetings to assist them with implementing capacity-related improvements at 15 other community water systems owned by the County. A county-wide asset management plan with automated Preventative Maintenance Plan and hydraulic mapping of various distribution systems was developed and can be used by County plants that vary in size and condition to improve water quality issues. With enhanced capacity, the County also finalized a connection to a small deteriorated CWS with the use of the State Revolving Loan Fund. WSP continues to assist Waldorf with source water options.

***Frederick County* - City of Frederick DBP optimization exercise**
CWS population = 54,000

Frederick City has three surface water plants that supply an expanded distribution system that includes several interconnected former CWSs. In 2013, the city exceeded the MCL for Total Haloacetic Acid (HAA5) at three out of their eight sample sites. In 2018, one of the small consecutive systems that purchase water from the city also had an HAA5 MCL violation. Since the first violation, the City has been seeking solutions to their DBP issue. In 2013, the city changed the location of the pre-chlorination feed from pre-flocculation to top of filters. In 2016, the City contracted with an engineering firm to investigate ways to reduce DBPs. The engineering study investigated the age of distribution water and water quality, as well as in plant production of DBPs and Total Organic Carbon (TOC) reduction with different coagulants. The study developed a prioritized list of recommendations, with tank aeration, coagulant and pre-oxidant changes among the recommendations. In January 2019, the City met with MDE to present the findings of the study and proceeded with switching coagulants at two of its three water treatment plants. Recent water quality sample results indicated significant but short-lived improvements; WSP continues to work with the water system to evaluate additional measures.

***Frederick County* - Mount Saint Mary's University PFAS Detection**
CWS population = 1,900

Mount Saint Mary's University is a private university with a population of 1,900 people. The University has two treatment plants with two primary production wells and one backup well; the water system is also interconnected with the Town of Emmitsburg. PFAS samples were collected in August 2020 as part of MDE's statewide assessment of PFAS in drinking water sources. The results from #3 exceeded EPA's 2016 health advisory level (HAL) for PFAS of 70 parts per billion (ppb). The WSP discussed options with the University to decrease the PFAS concentration and protect consumers while a long term solution is developed. The University is not able to fully meet peak demand without well #3 and now operates it only as a supplemental (lag) source. The University is also sampling PFAS quarterly and maintains PFAS concentration at about half of the EPA HAL. The University unsuccessfully attempted to drill a new well and is currently working with the Town of Emmitsburg to develop a

solution. The Town has two large production wells currently not in use and each would require construction of a new treatment plant.

***Frederick County* – Town of Walkersville treatment plant failure resolved**
CWS population = 8,440

Walkersville is a small town whose water sources are 3 wells that are under the direct influence of surface water (GWUDI). Twice before, in 1999 and in 2008, there has been severe contamination of the wells, to the point where the existing water treatment plant (pressure sand filtration) was unable to treat the source water. Temporary water lines were laid along roadsides from a neighboring city, and water was supplied to Walkersville for months while the contamination made its way through the ground and the wells finally returned to a normal state that could be treated by the water treatment plant. In 2018, MDE funded the town's project to replace their water treatment plant with a membrane plant that is designed to be able to treat even catastrophic contamination events. The new plant came online in 2020 and consists of two sets of membranes - microfiltration for normal conditions, followed by reverse osmosis to soften and treat for nitrates. Even during extreme contamination events, the reverse osmosis system will be able to treat the water from the wells.

***Garrett County* – Bloomington water treatment plant failure resolved**
CWS population = 350

A Comprehensive Performance Evaluation (CPE) completed in 2012 by the WSP identified the Garrett County-owned water treatment plant as barely functioning and in need of replacement. Major components in the treatment process were aging and in imminent danger of failure, which would have resulted in the town being out of water. After several years of negotiations and studies, the County decided to replace the plant with membrane filtration. The plant's design was submitted in 2019 and the plant went online in July 2020. The plant and new water storage tower ensure that the town will have a safe and reliable source of drinking water for many years to come.

***Harford County*- Maryland American Water Company LT2 compliance plan**
CWS population = 13,200

Maryland American Water Company (Bel Air) is on a compliance plan due to elevated levels of cryptosporidium under the federal Long Term 2 Surface Water Treatment Rule (LT2) at the Winters Run treatment plant. Source water monitoring conducted in October 2018 classified the Winters Run surface water source as Bin 2, which requires an additional 1-log removal of cryptosporidium at the associated treatment plant. To address this, a membrane filtration plant is currently under construction. There are anticipated construction delays due to supply chain issues and the completion date has been pushed back from 2024 to 2028. In May 2022, WSP met with Maryland American to discuss design challenges for the new plant and short-term alternatives to meet LT2 requirements with the current conventional treatment plant. Options included obtaining representative turbidity level readings by changing the combined filter effluent (CFE) monitoring location and adding ultraviolet (UV) treatment if plant performance does not meet cryptosporidium removal requirements. In June 2022, WSP conducted a site visit for a routine sanitary survey and further investigated the proposal to change the CFE monitoring location. As the plant is also pursuing automation improvements, WSP approved changing the CFE monitoring location and using the readings to meet the log removal compliance requirement. The system will also be installing a temporary build UV system in 2024 to ensure they have enough disinfection credits until the membrane treatment is installed.

***Harford County* - City of Aberdeen asbestos complaint**
CWS population = 16,200

WSP received a complaint from residents of black sediment in the water following a water main break in the Swan Meadows neighborhood in June 2022 and conducted a site visit to investigate the complaint. As the distribution system in the Swan Meadows neighborhood mainly consists of transit pipes that contain asbestos cement (AC), the residents had concerns with possible exposure to asbestos fibers during the water main break and when the distribution crew replaced the broken line. The city followed protocol by flushing and disinfecting the lines and collected a bacteriological sample before restoring service. MDE conducted special sampling and analyzed the water for bacteria, iron, and manganese; all three contaminants were absent in the samples. When service was restored, the residents experienced discolored water due to stirred up sediment in the distribution system caused by line flushing. Although there are no significant health risks associated with asbestos cement that is in contact with drinking water, the residents wanted assurance that the drinking water was safe and to be informed of main breaks and repairs through an effective method of communication.

The WSP met with the City of Aberdeen to determine options and evaluate steps taken by the City; WSP staff determined the City has evaluated distribution system needs and is in the early design phase of the water system improvements. The WSP recommended asbestos samples to be collected in the Swan Meadows area that was impacted by the water main break in August. These sample results indicated no asbestos fibers were detected. The residents were encouraged to work with the City to determine if the notification procedures can be improved. WSP continues to work with the City in CY2023 to provide guidance on future improvements.

***Kent County* – Rock Hall discolored water complaint**
CWS population = 1,750

Rock Hall is a historic waterfront town that was without a properly certified operator for years and deferred much of the maintenance of its water plant. During a 2019 inspection, WSP discovered that the town's iron removal filter system had been performing poorly, with some components deteriorating to the point of failure. WSP staff issued significant deficiencies in August 2019 for critical treatment failure, improper ventilation that created a corrosive environment, which led to filter failure, and insufficient operational staffing. After WSP met with the new Mayor and new Town Manager several times, the ventilation and staffing issues were resolved. From June to July 2020, the town experienced discolored water issues as a result of several events. First, an inoperable chemical feed pump and changes in chemical treatment impacted finished water that may have impacted distribution system water quality. In addition, a contractor used a substantial amount of water from a hydrant without the Town's knowledge; this action impacted distribution pressure and stirred up iron sediment. WSP made a site visit in July 2020 in response to a resident's complaint of ongoing discolored water and the Town flushed the distribution properly to improve water quality.

The Town contracted an engineering firm to upgrade the treatment plant and identify funding sources. Since the construction projects were expected to take several years for completion, WSP suggested short-term solutions, such as chemical feed and flushing, to minimize iron complaints. The Town implemented a SOP for a flushing program developed by the MRWA in August 2020, and WSP continues to work with the Town in CY2023.

***Kent County*- Town of Betterton**

CWS population = 481

In October 2022, MDE attended a Town Hall Meeting with the Mayor and Council, Maryland Rural Water (MRWA), Maryland Rural Development Corp (MRDC) and residents to discuss the Lead and Copper Rule Revisions' Service Line Inventory (LCRR SLI) requirement. This pending regulation requires all CWS and NTNC water systems to inventory the water service lines, determine if any contain lead, submit the inventory to MDE by October 16, 2024, and replace any water service lines that contain lead.

MRWA has provided excellent technical assistance in helping the Town address the LCRR requirements by answering questions and disseminating information, assisting with mapping needs, and developing a handout for residents to identify and document their own service line material using a scratch test and submitting photos. MRWA considers the Town of Betterton to be a pilot study to assist other small water systems in completing their Service Line Inventories. MDE also discussed funding opportunities for the Town to develop this Inventory and replace lead service lines.

Montgomery County **- Monocacy Elementary School E. Coli contamination resolved**
NTNC population = 351

Monocacy Elementary School is located in Dickerson, MD. The water system consists of one well, a raw water tank and pump located in a pit, a storage tank, sodium hypochlorite for disinfection, and caustic soda addition for pH control. The WSP was notified of repeat bacteria samples that were positive for E. coli in October 2022. A BWA was issued, portable handwashing stations were brought in, and the WSP performed a Level 2 assessment with the contract operator and school representative. Inadequate sealing was identified with the wellhead, the raw water tank, and the line from the raw water tank to the treatment plant, indicating several pathways for contaminants to enter the system. Chlorine was also observed to be back-flowing into the raw water tap. The school addressed these issues, and a state sampler resampled the distribution and well source water; bacteriological samples indicate the event is resolved.

Queen Anne's County **– Town of Centreville discolored water complaint resolved**
CWS population = 3,322

In November 2019, the superintendent contacted WSP regarding a complaint from a resident with discolored water who collected a water sample from their private residence with arsenic and iron results substantially exceeding Drinking Water Standards. MDE responded by collecting special samples throughout town. Five of eight arsenic sample results were approximately half of the Maximum Contaminant Level (MCL) and higher than historical results. WSP engineers performed a site visit in December 2019 and provided the Town with a performance evaluation that suggested optimizing the treatment and recommended an engineer address the discolored water and arsenic concerns. While the contract engineer's evaluation was delayed until May 2020 due to COVID-19 concerns, the town quickly implemented their recommendations that included replacement of filter media, improvements to water quality monitoring and performing an operational study. To date, the water quality seems to have improved, and the Town has not identified any additional issues with the water treatment.

St. Mary's County **- St. Mary's County Metropolitan Commission SOPs provided**
CWS combined population = 59,340

St. Mary's County Metropolitan Commission (MetCom) is a quasi-governmental agency that operates 28 community water systems in St. Mary's County. The organization has undergone administrative and operational changes within the last year, including the appointment of a new water superintendent. Through evaluations during sanitary surveys, WSP identified that new and updated standard operating procedures (SOPs) needed to be prepared and posted for each of the water systems. WSP has worked closely with the new superintendent on preparing SOPs and provided guidance on operator site visit frequency and process control monitoring. All water systems now have updated SOPs posted inside each plant, and operators are following the protocols successfully. In addition to preparing and posting updated SOPs, WSP also worked with the new superintendent to have short descriptions of each system written up that include information on how the system operates. This has helped all operations staff to have a better understanding of individual systems and operations overall. Both endeavors have resulted in more consistent operations of individual systems and built a relationship between WSP and the new administrative and operations staff at MetCom.

***Washington County* - Boonsboro-Keedysville water loss issues**
CWS population = 4,250

Boonsboro-Keedysville water system serves a population of approximately 4,200 residents and has been experiencing water loss. The WSP has been working closely with the Town of Boonsboro to determine the causes of water loss that account for more than 30% of their water produced. Several recommendations were made by WSP staff, including performing a water leak study of the Town's distribution system and an inspection of the 1.3 million gallon finished water reservoir.

A water leak detection study conducted in 2019 discovered thirteen leaks in their drinking water distribution system. Even after all the leaks have been repaired, the water system continued to lose about 30% of water produced. The Town hired a private contractor to inspect Boonsboro's finished water reservoir in 2020 and discovered the reservoir had structural issues on both its east and west sides that resulted in water loss estimated to be ten gallons per minute. Divers inspected the reservoir internally in 2021 and confirmed these findings that contribute to the massive water loss. While the Town's FY23 budget included replacing the reservoir, construction has not begun.

***Washington County* – Cascade Town Center (Fort Ritchie) interconnection resolved**
Inactive NTNC

Cascade Town Center is a private development on the site of the former Fort Ritchie, in Highfield Cascade. Fort Ritchie was originally established as a training site for the Maryland National Guard, it was acquired as a US Army installation during World War II. The post was closed in September 1998, and Washington County took over the property, and oversaw redevelopment plans of approximately 528 acres. The population in Cascade Town Center has been declining consistently. Records from the 2000 census show a population of 276, while the estimated population was 73 in 2015. The population change resulted in reduced water demand that in turn produced water quality issues with a spring-fed drinking water source. The County discontinued using the spring and relied only on two aging wells in need of repair. Likewise, the aged water distribution system experiences frequent water main breaks. These problems, coupled with water plant operational costs, caused an economic burden on the County. As a result, Washington County consolidated the Cascade Town Center water system with the nearby

Highfield water system (population = 1,141) in 2020 and plans to replace Cascade Town Center's aging distribution system.

***Wicomico County* – City of Fruitland groundwater contamination resolved**
CWS population = 5,907

The City of Fruitland is a small town on the Eastern Shore adjacent to Salisbury. Around 2014, a large plume of TCE was detected in the Morris Mill community, which is adjacent to the Town of Fruitland. Forty-nine homes with individual wells were in the area affected by the contamination. Fruitland agreed to extend the service area to the community if MDE funded the project.

A preliminary engineering report revealed that additional capacity would be needed for Fruitland's drinking water system. During the engineering study it was discovered that Fruitland's treatment plant had leaks and some inoperable valves, so with MDE funding, plant upgrades were designed. In 2017 the Morris Mill distribution system and new storage tank were completed and put into operation, giving the residents potable water.

In 2021, with MDE SRF funding, the needed upgrades at the water treatment plant were completed. Improvements included a new well, a fourth Greensand Plus filter for iron and manganese removal, an upgraded chemical room, continuous inline analyzers, and most notably a backwash recycling system. After the filters are backwashed, the water is directed into a reclaim recovery tank where the water settles for a period of time until it reaches a certain turbidity before being redirected back to the head of the plant. This process encourages water conservation by recovering some of the backwash water rather than dispensing it all. In addition to the plant upgrades, the city also completed their solar panel project this year which can sustainably provide power to the drinking water plant. These upgrades helped the entire Town and supplied Morris Mill with a reliable water supply.

***Wicomico County* – Hebron Woods Mobile Home Park operational problems resolved**
CWS population = 250

Hebron Woods Mobile Home Park's normal operations include a dedicated chemical feed system for disinfection with chlorine and a separate chemical feed system for pH adjustment with caustic soda. In January 2020, WSP responded to a resident's complaint of a strong chemical smell in the drinking water, which burned their eyes and has reoccurred over the last few years. It was discovered during the site visit that the operator mistakenly had both chemical pumps injecting chlorine, which resulted in chemical overfeeding. When the operator was asked to perform tests with the color wheel, he uses to monitor the chlorine and pH daily, field staff found that the test was not being performed correctly in accordance with the manual found online. WSP staff performed field tests and determined the free chlorine residual exceeded the regulatory Maximum Contaminant Level (MCL) of 4 ppm. The system was instructed to turn off the chemical pumps, flush the storage tanks, and notify the residents of a chemical overfeed of chlorine and to flush their taps.

WSP issued a significant deficiency for operations and management and included the corrective actions of using a digital meter for daily free chlorine and pH monitoring, weekly distribution sampling, and Standard Operating Procedures on how to perform the field tests during a period of ownership, and operator change. The significant deficiency was resolved in December of 2020. Neither the water system nor MDE received any drinking water complaints since.