
Oklahoma Department of Environmental Quality

Capacity Development Program
Annual Progress Report to EPA
State Fiscal Year 2021

September 29, 2021

1. Introduction

With the Safe Drinking Water Act (SDWA) Amendments of 1996, Congress put in place a variety of initiatives designed to assist public water systems in providing safe drinking water and complying with the terms of the Act. One of these was the capacity development (CD) initiative, established with the intent of focusing on those systems most in need of assistance, primarily small systems serving populations of 3,300 or less. CD is the process by which the State of Oklahoma assures that drinking water systems acquire and maintain the *technical, managerial, and financial* (TMF) capabilities to successfully operate.

All states are currently implementing state-specific CD programs tailored to meet water systems' needs. As required in Section 1420 of the Safe Drinking Water Act Amendments of 1996, the Oklahoma Department of Environmental Quality (DEQ) must submit an annual report of CD activities to the United States Environmental Protection Agency (EPA). This report reflects the efficacy of the State's CD Strategy by detailing improvements in the TMF capabilities of the State's public water systems. The annual CD progress report is available on the DEQ's website, at <https://www.deq.ok.gov/water-quality-division/public-water-supply/capacity-development/>.

A *public water system* (PWS) is defined by the SDWA as a system that provides water via piping or other constructed conveyances for human consumption to at least 15 service connections or serves an average of at least 25 people for at least 60 days each year.

There are three types of PWSs:

1. Community Water Supplies (CWS) such as towns and rural water districts;
2. Non-transient non-community (NTNC) systems such as schools or factories; and
3. Non-community (NC) systems such as rest stops or parks.

Of the 1,346 PWSs in Oklahoma:

- 901 are community water systems;
- 80 are non-transient non-community;
- 365 are non-community water systems;
- 181 systems use surface water as their primary source;
- 728 systems use groundwater as their primary source;
- 345 systems purchase from surface water systems;
- 7 systems use groundwater under the direct influence of surface water as their primary source;
- 77 systems purchase from groundwater systems; and
- 8 systems purchase from groundwater under the direct influence of surface water systems.

DEQ has the statutory authority to ensure that all water supply systems will have adequate TMF capabilities prior to their construction in Oklahoma. For new systems, these capabilities are assessed via two DEQ regulatory directives. The first directive derives from Oklahoma Administrative Code (OAC) 252-626: Public Water Supply Construction Standards [<https://www.deq.ok.gov/asd/rules-and-regulations/attachment/626/>], which states that a PWS must receive a "Permit-to-Construct" from DEQ prior to initiating construction. The other directive requires all operators of a PWS to be licensed by DEQ, according to OAC 252:710: Waterworks and Wastewater Works Operator Certification Regulations [<https://www.deq.ok.gov/asd/rules-and-regulations/attachment/710/>]

2. Enforcement and Compliance Mechanisms

DEQ's CD program relies on the success of its enforcement and compliance programs. These two programs are partially funded through the Drinking Water State Revolving Fund (DWSRF) 10% State Program Management Set-Aside, and the 15% Local Assistance and Other State Programs Set-Aside. Funding information is detailed in DEQ's *Final Intended Use Plan, Drinking Water State Revolving Fund, State Fiscal Year 2021*. Note that State's fiscal year is from July 1st to June 30th the following calendar year.

DEQ maintains a strong enforcement program that particularly addresses systems with multiple violations of SDWA requirements. Such systems are referred to DEQ enforcement staff for analysis of the causes behind the violations. When it is determined that enforcement is needed, there are three main legal tools available to the agency to bring about compliance: a Notice of Violation, a Consent Order, and an Administrative Compliance Order. Boil Advisories, while not official enforcement actions, also play a role in addressing SDWA violations.

A **Notice of Violation** (NOV) is the first formal enforcement document issued to facilities upon failure to comply with DEQ rules or regulations. NOV's address matters such as maximum contaminant level (MCL) violations, monitoring failures, improper operating procedures, or construction deficiencies. A NOV has a short deadline for compliance, typically fifteen days from the day the water system receives the document.

If it is determined that the system is not likely to regain compliance by the NOV's deadline, DEQ's PWS District Engineer (DE) prepares a **Consent Order** (CO). The CO is a mutual agreement between DEQ and the affected system that cites the system's responsibilities, establishes a longer deadline for returning to compliance (with milestones and deadlines for major steps towards compliance), and specifies fines that may be levied against the system as a result of non-compliance.

An **Administrative Compliance Order** (ACO) is issued when time is limited and there is a significant health hazard, or when a water system refuses to agree to the terms of a CO. In an ACO, DEQ determines what tasks need to be completed and sets deadlines for the completion of these tasks. Both the CO and the ACO stipulate the penalties for failing to meet the required deadlines.

Boil Advisories, while not enforcement actions themselves, are an additional tool used by DEQ to achieve compliance. These notices are issued to systems that have "acute" or "*E. Coli*" bacteriological violations. Boil Advisories require immediate notice to all consumers in order to inform the public of how to produce water that is safe for human consumption.

In calendar year 2019, DEQ issued 2,417 enforcement actions, which consisted of:

- 2,234 informal enforcement letters;
- 270 NOV's and CO's;
- 0 Administrative Compliance Order; and
- 5 Boil Advisories.

A total of 905 systems were returned to compliance during calendar year 2020 (some systems returned to compliance more than once).

3. Capacity Development Program Section

The Capacity Development Section (CDS) implements the CD strategy in Oklahoma. The CDS is responsible for fostering the relationship among the various DEQ drinking water programs, and between DEQ and other state agencies and organizations that are involved with supporting and assisting public water supplies. The CDS coordinates with the Oklahoma Water Resources Board (OWRB), Oklahoma Rural Water Association (ORWA), Communities Unlimited (CU), Southwest Environmental Finance Center (SWEFC), Oklahoma Municipal League (OML) and other agencies and organizations that provide TMF training and assistance to water systems. This ensures that open lines of communication exists between the entities and promotes cooperative and complementary efforts towards achieving water system sustainability. The overall goal of this effort is maintaining coordinated efforts towards increasing PWS TMF capabilities.

Table 1 lists the tools currently in use in Oklahoma to assess and enhance TMF capabilities.

Tool	<i>Technical</i>	<i>Managerial</i>	<i>Financial</i>
Construction Permitting	X		
PWS Enforcement	X	X	
Operator Certification	X	X	
SWAP	X	X	
AWOP	X	X	X
DWSRF	X	X	X
CD TMF Assessments	X	X	X
Sanitary Surveys	X		
Asset Management Training	X	X	X
Regionalization	X	X	X
FACT		X	X
Rate Studies			X
Water Loss Auditing	X	X	X

Table 1: Oklahoma’s Capacity Development Tools.

4. Water Quality Efforts and Participation

Regionalization and Consolidation

DEQ continued efforts to identify new and existing water systems that may benefit from ***regionalization and/or consolidation*** into larger water systems in SFY 2021. Systems were considered for regionalization/consolidation that:

- Have source water capacity limitations (drought);

- Are undergoing DEQ enforcement proceedings;
- Are considering giving away, selling, or abandoning the system; or
- Have expressed interest in regionalization or consolidation.

In SFY 2021, 4 water systems consolidated into neighboring water systems. Incorporating water supplies into CWSs enhances public health by providing the former systems with water that is more thoroughly tested and often more plentiful and reliable than they were able to produce on their own. DEQ will continue to seek out small water supplies that are struggling with compliance and will help them consider regionalization and/or consolidation, if appropriate for their situations.

Funding Agency Coordinating Team

The ***Funding Agency Coordinating Team (FACT)***, hosted by ORWA, is comprised of the following state and federal agencies and organizations:

- DEQ;
- Oklahoma Department of Commerce;
- Oklahoma Water Resources Board;
- Indian Health Service;
- U.S. Department of Agriculture – Rural Development;
- Oklahoma Association of Regional Councils;
- Communities Unlimited;
- EPA;
- Cherokee Nation; and
- Chickasaw Nation.

FACT meets quarterly to discuss the status of Oklahoma community water supplies identified in DEQ's enforcement list and to coordinate water and wastewater project funding. Before each meeting, invitations are extended to a few water and/or wastewater systems from across the state that are contending with severe problems and have the greatest *financial* need. Guests are invited for the purpose of helping them identify the best source of project funding as efficiently and effectively as possible.

With every public financing agency present at FACT, communication barriers are reduced and application processes are streamlined, resulting in rapid assistance. FACT provides a single uniform method for requesting funding and regulatory approvals, and it offers guides, checklists, and forms that are accepted by all FACT-participating agencies. DEQ has been a member of FACT since its inception in the early 1990s and has been instrumental in crafting an organization that helps to correct some of Oklahoma's most difficult to solve public water supply issues. The CDS is an important member of FACT and serves by offering TMF assistance to invited systems.

The assistance provided by FACT has been universally praised by invited water systems, which provide feedback by voluntarily completing a brief survey immediately following the FACT meeting and a follow-up survey a few months later. Survey responses are used to fine-tune the assistance provided by FACT and help plan the direction of subsequent FACT meetings.

5. Water Quality Programs

The **Construction Permitting Program** assures *technical* adequacy by reviewing water system construction plans and specifications. This *technical* review helps determine the sufficiency of the source water and the water system infrastructure.

The **PWS Enforcement Program** also assures the *technical* capabilities of water systems by providing *technical* training to water systems on operations and security and addresses *managerial* capabilities by providing training to water system managers.

The **Operator Certification Program** is charged with training and licensing persons working in water and wastewater facilities in the State. Programmatic oversight helps to ensure that operators have the proper *technical* training to properly treat and monitor drinking water supplied to the public. Also, with oversight from the DEQ Operator Certification section, ORWA provides study material and training for operators for all classifications of water facilities, as well as *managerial* training for system managers and board members. The examinations for operators are administered by the ORWA by means of a DEQ contract, and during SFY21, 895 individual water operator exams and 87 water laboratory operator exams were given. Also during SFY 2021, 0 public water supply systems did not have available an appropriately licensed operator in responsible charge.

DEQ has made efforts to make these systems aware of training and testing opportunities that are available to them at little or no charge, and will continue to work with them until a licensed operator is hired.

In addition to the training offered by ORWA, training is available in classroom settings (taught by DEQ and other certified instructors/agencies) and via the internet several times during the year. Online classes and exams for operators and other environmental professionals are available at any place with an internet connection, including classes over Asset Management presented by one of the members of the Capacity Development Staff.

The **Source Water Assessment Program (SWAP)** provides a focus on water quality anti-degradation and protection of beneficial uses for both surface and ground waters. The SDWA Amendments require development and implementation of a SWAP to analyze existing and potential threats to the quality of the public drinking water throughout the state. DEQ maintains approval from EPA to administer the SWAP program. The SWAP program in Oklahoma was developed utilizing EPA's *Source Water Assessment and Protection Programs Guidance*, and SWAP assessments include the following:

- Delineation of the source water protection area;
- Inventory of the potential contaminant sources within the area;
- Determination of the susceptibility of the PWS to contamination from the inventoried sources; and
- Release of the results of the assessments to the public.

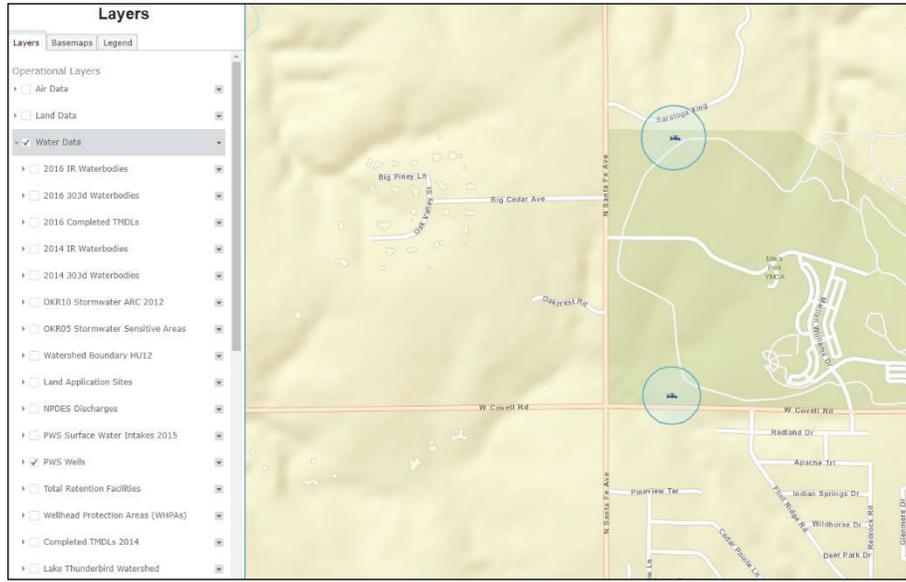


Figure 1: Sample map indicating location of well and wellhead protection areas.

The data collected from a SWAP is summarized in the water system’s annual Consumer Confidence Report, which identifies the system’s vulnerability and susceptibility score. This report is available for public review.

Much of data found in a SWAP is also available via a geographic information system on the DEQ website. All DEQ-regulated discharges, wells, surface intakes, and other planning information can be found through an interactive mapping system that allows the user to view any combination of items on the map. A map may be viewed that includes the system’s water source (ground or surface) and all known contaminants located within a defined distance from the proposed well site.

The ***Area-Wide Optimization Program (AWOP)*** was piloted in April of 1999 in Oklahoma by EPA Region 6. This program started as a multi-state effort to optimize particle removal and disinfection capabilities of filtration water treatment plants. The goal of AWOP is to maximize public health protection from disease-causing microbial contaminants by identifying performance problems in the water treatment and distribution system. Following the AWOP model is one of the most cost-effective and economical ways a PWS can improve their ability to produce safe drinking water. Water systems having the most trouble with their filtration treatment are identified and prioritized in terms of their need for assistance.

EPA Region 6 and Process Applications, Inc. in Fort Collins, CO, have assisted in the development of AWOP. The States of Arkansas, Iowa, Louisiana, Missouri, New Mexico, Oklahoma, and Texas are participants in the EPA Region 6 AWOP group, and a larger AWOP “super” group has been created with states from Region 7 (Missouri, Iowa, and Kansas). DEQ continues its involvement in AWOP by attending quarterly regional and biennial national meetings and by participating in and hosting multi-state comprehensive performance evaluations (CPE) and training workshops.



Figure 2: Conducting a Filter Study during the Eufaula CPE.

From 1997 through the end of SFY 2021, DEQ has conducted 25 optimization and six mandatory CPEs of water systems in the state. The original scope of the CPE effort was and continues to be to assist the community and to train engineers in understanding the intricacies of optimizing water treatment. A CPE provides analysis of the facility's design capabilities and a system's administrative, operational, and maintenance practices, leading to a report that addresses the *TMF* aspects of the water system. Following the CPE, the participating water system receives a report within 60 days from DEQ that outlines factors that may influence the optimization of its treatment operations.

In Oklahoma, the AWOP Coordinator and the CDS have been collaborating to find ways to further the incorporation of *TMF* concepts in the CPE process, with a focus on bolstering the administrative review with elements from the capacity development program, including *TMF* assessments and water loss audits.

The ***Drinking Water State Revolving Fund Loan Program*** was established by the 1996 SDWA Amendments, which allowed EPA to make a capitalization grant to Oklahoma to fund the DWSRF loan program. This program, co-managed by DEQ and OWRB, is dedicated to providing low-interest loans to upgrade public water system infrastructure. It is designed to help those in greatest need based on a priority system that places a primary emphasis on drinking water quality. DWSRF Project Engineers assure the *technical* capabilities of water systems by reviewing engineering reports on proposed construction projects. Borrowers also receive *technical*, *managerial*, and *financial* assistance from the CDS, who conducts a capacity development assessment and water loss audit on each borrower, providing assistance and guidance to correct any found deficiencies.

Currently, 52 water systems are on the DWSRF Project Priority List for a total of over \$706,442,391.40 in projects to be funded within the next few years. DWSRF applicants are assisted throughout the planning, design, bidding, contracting and construction phases of their project by DEQ engineers, environmental

specialists, and the CDS. Applications for the DWSRF program are accepted at any time throughout the year.

From 1998 to the present, the program has entered into binding commitments totaling over \$1,653,661,528.97 to fund a total of 226 water system upgrades. In addition to funding infrastructure improvements, the program funds the CD Baseline Assessment Project, some lab equipment in the State Environmental Lab, many Small System Technical Assistance efforts, SWAP programs, partially funds the PWS Program, and is funding the agency's water loss auditing work.

In SFY 2021, the DWSRF provided subsidies in the form of principal forgiveness to public water supplies that have Disinfection Byproduct (DBP) violations or serve disadvantaged communities. The total amount of subsidies given will be determined by the FY 2021 Capitalization Grant. For SFY 2021, the DWSRF committed \$2,597,022.50 in health-based or DBP subsidy to 8 systems, and \$977,130 disadvantaged subsidy to 11 systems.

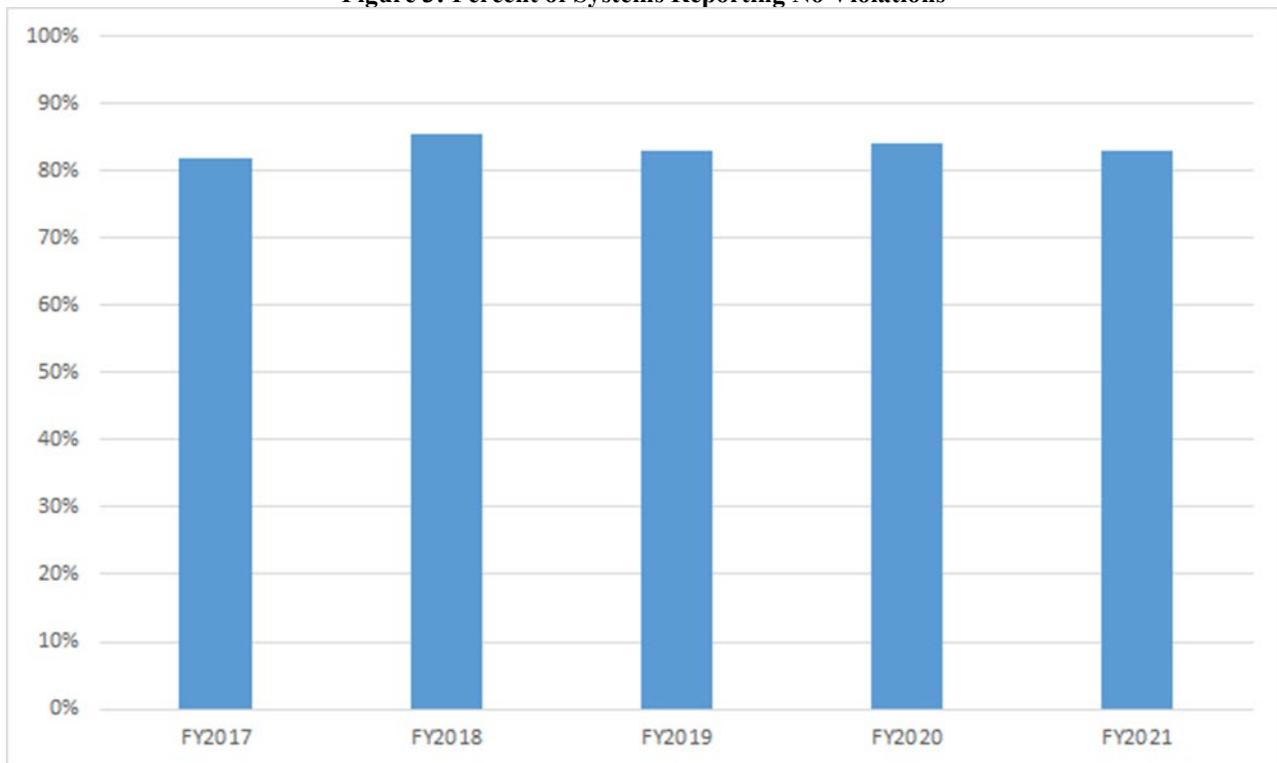
The PWS ***Sanitary Survey Program*** is implemented by DEQ, in cooperation with EPA Region 6. In the course of conducting inspections, field staff from the Environmental Complaints and Local Services (ECLS) and WQD divisions of DEQ provide *technical* assistance to PWS system personnel in resolving compliance issues. Across the state, ECLS and WQD staff members inspect surface water systems quarterly and ground water systems semiannually. In SFY 2021, 264 Sanitary Surveys were conducted by ECLS and WQD staff, and 225 primacy site inspections were completed by ECLS.

6. Challenges to Oklahoma’s Capacity Development Strategy

Mile for mile, Oklahoma offers the nation’s most diverse terrain. It is one of only four states with more than ten ecoregions, and has by far the most changes in ecoregions per mile in America. Oklahoma’s ecoregions, terrains, and sub-climates include everything from Rocky Mountain foothills to cypress swamps, from tallgrass prairies to hardwood forests, and pine-covered mountains. Each is graced with wide blue lakes, tumbling freshwater rivers, and peaceful country streams. Additionally, there is one man-made type of terrain: urban turf. This wide variety of ecoregions creates source waters with a correspondingly wide range of quality and conditions. This variability in source water quality creates a correspondingly wide variety of treatment challenges for public water supplies.

EPA sets national limits on contaminant levels in drinking water to ensure that the water is safe for human consumption; these limits are known as maximum contaminant levels (MCL). For some regulations, EPA establishes treatment techniques (TT) in lieu of an MCL to control unacceptable levels of contaminants. Figure 3 shows the yearly trend in the percentage of systems in Oklahoma reporting no MCL or TT violations.

Figure 3: Percent of Systems Reporting No Violations



The State of Oklahoma's PWS Program currently oversees 1,346 active entities that meet the federal definition of a PWS. Of these, 1,122, or approximately 83%, reported no MCL or TT violations.

Of the 1,357 PWSs in Oklahoma during the calendar year 2020:

- 6 systems had 5 violations for exceeding the MCL for arsenic;
- 1 system had 1 violation for arsenic monitoring;
- 1 system had 1 violation for exceeding the MCL of the Inorganic Contaminant (IOC) group;
- 7 systems had 7 violations for IOC group monitoring;
- 26 systems had 56 violations for exceeding the nitrate MCL in at least one of their wells;
- 107 systems had 137 nitrate monitoring violations;
- No system had Synthetic Organic Contaminant (SOC) group MCL violations;
- 35 systems had 738 SOC group monitoring violations;
- No system had violations of Volatile Organic Carbon (VOC) MCLs;
- 13 systems had 542 violations of VOC monitoring;
- 2 systems had 9 Radionuclide MCL violations;
- 8 systems had 88 violations for Radionuclides monitoring;
- 159 systems had 981 violations of the Disinfection Byproducts Rule (DBPR) MCL;
- 7 systems had 17 violations of the DBPR Treatment Technique requirement;
- 181 systems had 402 DBPR monitoring violations;
- 4 systems had 4 Revised Total Coliform Rule (RTCR) Acute MCL violations, leading to 5 mandatory boil orders that were issued based on positive fecal coliform or E-coli test results;
- 280 systems had 616 RTCR MCL violations that indicated a confirmed coliform positive sample;
- 35 systems had 105 violations of the Surface Water Treatment Rule (SWTR) monitoring requirements;
- 20 surface water PWS systems had 75 Surface Water Treatment Rule (SWTR) Treatment Technique violations;
- No system had a treatment technique violation of the Lead and Copper Rule;
- No system had any Ground Water Rule (GWR) Treatment Technique Violation;
- 33 systems had 42 monitoring violations of the GWR;
- 28 systems had 30 Lead and Copper Rule Monitoring violations; and
- No systems had violations related to failure to perform public notice (PN)
- DEQ has not yet determined Consumer Confidence Report (CCR) for 2020.

Per Section I of The State of Oklahoma Capacity Development Strategy, DEQ ensures that new systems have *TMF* capabilities to provide safe and affordable drinking water. All new systems are referred to the CDS, who then assesses the system's *TMF* capabilities. The CDS then ensures that the system has an appropriately certified operator, notes the dates of sanitary surveys/inspections, determines if plans & specifications were submitted to and approved by DEQ, and makes TA referrals as indicated. No new community systems were identified by DEQ in SFY 2021.

7. ETT Implementation

At the direction of EPA, DEQ has implemented an Enforcement Response Policy (ERP) and Enforcement Targeting Tool (ETT) aimed to identify PWS systems with health-based violations as opposed to the previous approach, where all the significant non-compliance (SNC) systems were treated equally regardless of the severity of the violation.

This approach utilizes the ETT formula as a basis for determining a PWS's enforcement priority points. It will also be used to help identify and prioritize systems for enforcement response. In the formula, violations that pose a greater risk to public health are given greater importance. The formula calculates a score for each system based on open-ended violations and violations that have occurred over the past 5 years, but does not include violations that have returned to compliance or are on the "path to compliance" through a specified enforcement action.

Under this policy, violation types are "weighted" with points being assigned for each violation type based on its threat to public health. Points for each "unaddressed" violation are added together to provide total score for each water system. Water systems whose scores exceed "11" are considered priority systems for enforcement unless the violations can be returned to compliance within six months.

The Capacity Development Section and the Monitoring and Reporting Section track new community and NTNC systems that appear on the ETT list during their first three years of operation, providing them with technical assistance aimed at getting them back into compliance. However, no new community or NTNC systems were formed during SFY21.

ETT scores for PWS systems are available at <https://echo.epa.gov/>.

8. Program Initiatives

Water Loss Auditing and Control

Since 2015, DEQ has worked to standardize and promote water loss auditing across the state by the use of the M36 Water Loss Audit Method developed by the American Water Works Association (AWWA). The program has had continuous success tracking and identifying sources of loss and non-revenue water across the state using this scientifically sound, repeatable, and comparable method.

An M36 method water loss audit quantifies volumes and values of real and apparent water losses from a distribution system. Real loss is defined as water that escapes the water distribution system through leakage, breaks, and storage overflows. This loss is water that is treated but is never delivered to customers and results in increased operational costs and stress on source water supplies. Apparent loss is revenue lost due to customer meter inaccuracies, billing system data errors, and/or unauthorized consumption. It is water that *could* have been sold, resulting in lost revenue for the system and distorted production and consumption data.

An M36 method water loss audit also determines the volumes and values of revenue and nonrevenue water that a PWS is producing. Revenue water is the water that a system sells to customers. The amount of revenue water a system can deliver has a direct impact on its ability to pay for operations, make debt obligations, and provide for capital improvement and emergency response funding. In contrast, nonrevenue water is the sum of the real and apparent losses occurring at a system as well as all unbilled authorized usage, such as water used for municipal buildings, parks, swimming pools, irrigation, firefighting, and system flushing. Unbilled authorized usage is a necessity; however, these amounts can become excessive if not tracked. A water loss audit is often the first time many PWS systems become aware of the impact of unbilled authorized usage and are able to begin controlling it.

Tables 3 and 4 below summarizes the volumes and percentages of water use and loss from the 232 systems across the state that have participated in the water loss auditing and control program.

Table 3: Summary Water Balance - Total Yearly Gallons (±15,000 gallons)

Volume from Own Sources: 48,751,184,000	Water Sold As Exports: 4,555,095,000	Authorized Consumption: 39,948,929,000	Billed Authorized Consumption: 38,072,562,000	Billed Metered Consumption: 38,114,542,000	Revenue Water: 38,194,317,000	
	Water Supplied: 51,004,903,000		Unbilled Authorized Consumption: 1,866,098,000	Billed Unmetered Consumption: 39,232,000		Non-Revenue Water: 13,132,601,000
			Water Losses: 11,292,154,000	Apparent Losses: 1,182,180,000	Unbilled Metered Consumption: 830,264,000	
					Unauthorized Consumption: 135,024,000	
Water purchased as Imports: 6,218,013,000	Real Losses: 10,232,164,000	Water Main Leaks, Storage Overflows, Customer Service Line Leaks: 10,232,164,000				

Table 4: Summary Water Balance – Total Yearly Percentages

Volume from Own Sources: 96.5%	Water Sold As Exports: 8.8%	Authorized Consumption: 77.8%	Billed Authorized Consumption: 77.8%	Billed Metered Consumption: 74.1%	Revenue Water: 74.2%	
	Water Supplied: 92%		Unbilled Authorized Consumption: 3.6%	Billed Unmetered Consumption: 0.1%		Non-Revenue Water: 25.8%
			Water Losses: 22.2%	Apparent Losses: 2.3%	Unbilled Metered Consumption: 1.6%	
					Unauthorized Consumption: 0.3%	
Water purchased as Imports: 12.3%	Real Losses: 19.9%	Water Main Leaks, Storage Overflows, Customer Service Line Leaks: 19.9%				

Apparent Losses

As defined earlier, apparent loss is water lost due to customer meter inaccuracies, billing system data errors, and/or unauthorized consumption. It is water that could have been sold and contributes to revenue loss, distorted production, and consumption data. Annually, apparent losses account for a smaller

percentage of total water loss than real losses (2.3% as compared to 22.2%; see Table 2); however, apparent losses still represent a significant loss of revenue to most systems participating in the audit, costing on average \$32,251.00 per audited system and over \$7.321 million for the group. Apparent loss figures are summarized in Table 5, below:

Table 5: Apparent Losses

	Minimum	Maximum	Average	Total
Annual Apparent Loss:	3,000 Gal/Yr	98,440,000 Gal/Yr	5,091,364 Gal/Yr	955,989,000 Gal/Yr
Annual Cost of Apparent Loss:	\$187.00	\$591,708.00	\$32,251.00	\$7,321,091.00
Unauthorized Consumption	4,000 Gal/Yr	10,230,000 Gal/Yr	579,500 Gal/Yr	135,024,000Gal/Yr
Customer Metering Inaccuracies	0 Gal/Yr	75,750,000 Gal/Yr	3,899,800 Gal/Yr	949,709,000Gal/Yr
Systematic Data Handling Errors	4,000 Gal/Yr	12,592,000 Gal/Yr	435,860 Gal/Yr	101,555,000Gal/Yr

Real Losses

Real loss is defined as water that escapes the water distribution system through leakage, breaks, and storage overflows. This loss is water that is treated but is never delivered to customers and results in increased operational costs and stress on source water supplies. Overall, real water losses account for 22.2% of the total water supplied (Table 2) and is the largest category of water loss observed from the audited systems. Real water loss is composed of three types of loss: water main leaks, storage area overflows, and leaks on customer service lines (portions that are the responsibility of the system). The AWWA software is not detailed enough to break down real water loss into these three categories and simply reports the amount as a total of all three.

The AWWA software did, however, provide a number of performance indicators that detailed the volume, cost, and relative magnitude of real water loss. These are summarized in Table 6, below:

Table 6: Real Losses

	Minimum	Maximum	Average	Total
Current Annual Real Losses	140,000 Gal/Yr	481,150,000 Gal/Yr	44,104,000 Gal/Yr	10,232,164,000 Gal/Yr
Annual Cost of Real Loss (Valued at Variable Production Cost)	\$24.00	\$887,190	\$32,251.00	\$14,608,471.00

Leak Detection, Meter Analysis, and Loss Correction

Conducting water loss auditing with the AWWA M36 method has improved understanding of real and apparent losses at participating systems; however, this is only the first step towards the ultimate goals of reducing water loss and retaining system revenue. The next step, intervention, takes the results gained from the water loss audit and uses it to guide efforts to find the specific sources of water loss and to implement solutions. This section summarizes the efforts of the technical assistance program conducted

by the DEQ and the ORWA which focused on conducting leak detection and meter analysis at PWS systems where an AWWA M36 water loss audit has indicated that significant problems with real and/or apparent loss may exist.

PWS systems that participated in the water loss auditing pilot project and met the criteria of either nonrevenue water (as % of supply) greater than 20% or having apparent loss of greater than 10 gallons per connection per day (or both) qualified for leak detection and/or meter analysis technical assistance from ORWA. Participation in the technical assistance project was driven by the level of interest of the PWS in receiving the help (meaning that the system would benefit from the technical assistance in proportion to the level of effort and interest that the system contributed to the program).

For systems that chose to participate, ORWA met with system personnel, reviewed the results of the water loss audit, and then coordinated an in-depth schedule of leak detection and meter analysis help. The typical technical assistance event took place over 2-3 weeks' time and involved locating leaks, analyzing meters and training PWS staff how to conduct their own leak detection and meter analysis. Following the completion of this technical assistance effort, participating systems receive a detailed report indicating the location, volume, and value of all identified leaks. Systems are encouraged to act on the information provided and make repairs where possible.

Table 7 and Figure 4 summarize the results of the program's first four years, below:

	FY2017	FY2018	FY2019	FY2020	FY2021	Total
Systems receiving leak detection help	7	12	5	5	9	38
Systems receiving customer meter analysis help	6	2	4	0	0	12
Total # leaks detected	36	52	28	52	103	271
Gal/yr leaks detected	163,510,176	296,427,081	73,592,064	607,588,637	557,503,689	1,698,621,649
Value/Yr of detected leaks	\$460,188	\$574,155	\$235,508	\$822,056	1,649,730	\$3,741,640
Total # leaks repaired	18	12	25	43	71	169
Gal/yr leaks repaired	81,755,087	82,490,000	54,662,400	589,350,024	458,467,200	1,266,724,711
Value/Yr of leaks repaired	\$230,094	\$176,316	\$165,575	\$779,745	\$1,457,581	\$2,807,312

Table 7: Leak Detection / Meter Analysis Results

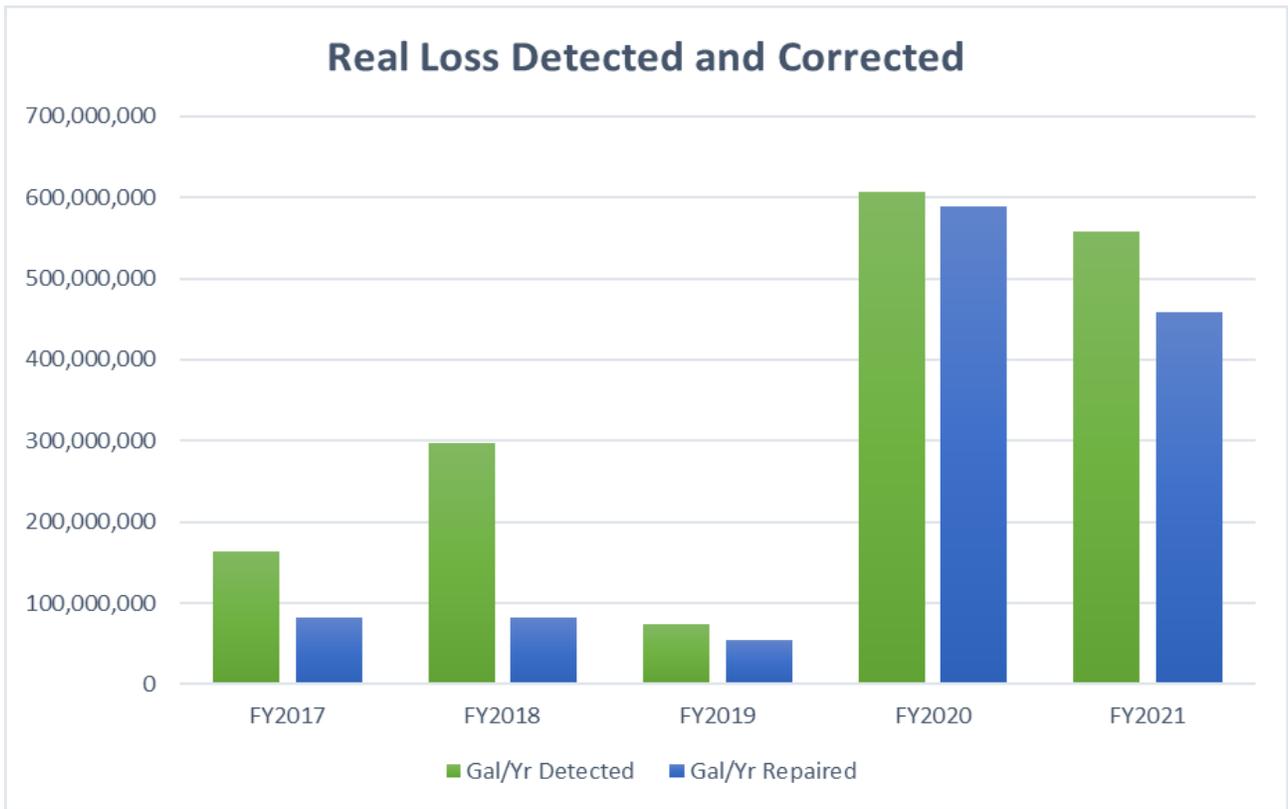


Figure 4: Gallons per year of Leaks Detected and Repaired

In total, 38 systems have received leak detection help from the ORWA, where, together, they have identified 271 leaks estimated at 1,698,621,649 gallons/year. Of the 271 leaks identified by ORWA, 169 of them have been repaired by the systems. These repairs have recovered an estimated 337,167,488 gallons of water per year valued at an estimated \$2,807,312 per year.

The amount of saved revenue has shown real, immediate, and positive impact- even saving at least one system from the brink of bankruptcy. Additional benefits seen by systems that have participated in the program are increased financial capacity, continued loss reduction, and better operational knowledge and decision making.

Capacity Development Baseline Assessment

In 2017, DEQ began work on a project to assess the TMF capacity of small municipal PWSs and rural water districts in Oklahoma. Named the Capacity Development Baseline Assessment, the project was designed to develop a clear concept of state-wide TMF needs, to determine which systems are most in need of help, and to delineate the unique set of needs faced by each system. The project functions by conducting capacity development assessments at all municipal PWS systems and rural water districts in Oklahoma serving 10,000 or fewer people. By using the capacity development assessment tools developed by the DEQ and used originally for assessing DWSRF borrowers and newly created systems, a clearer picture of the TMF sustainability needs across the state was gained.

The baseline capacity development assessment project was implemented as a cooperative venture between the WQD and the Environmental Complaints and Local Services (ECLS) Division at DEQ. To complete the large number of assessments required in this project, a group of local ECLS inspectors were called up to conduct the assessments with PWS system personnel. Given that ECLS inspectors are the DEQ personnel that PWS systems see most frequently, relationships and trust were already established and a framework for efficient completion of the project already existed. This project capitalized on this framework to conduct the assessments.

The results of this project allowed DEQ staff to identify trends and correlations within the data including the state-wide average assessment score and the greatest issues affecting a significant proportion of Oklahoma water systems. **826 Capacity Development Assessments have been completed as of August 31, 2021.** Additional details about the participating PWSs are in following tables and figures:



Table 8: Summary Characteristics of Audited Community Water Systems

Total Number of CDAs Completed (as of 6/31/2021):	826
Average Score:	77.59%

Preliminary results of the 826 completed indicate that, on average, assessed water systems have slightly over 77% of the necessary TMF capacity issues to achieve sustainability. This means that, on average, assessed systems are missing almost one quarter of the items, procedures, policies, and resources needed to become sustainable. The range of assessed values are shown in Figure 5:

Figure 5: Score Range of Assessed Systems

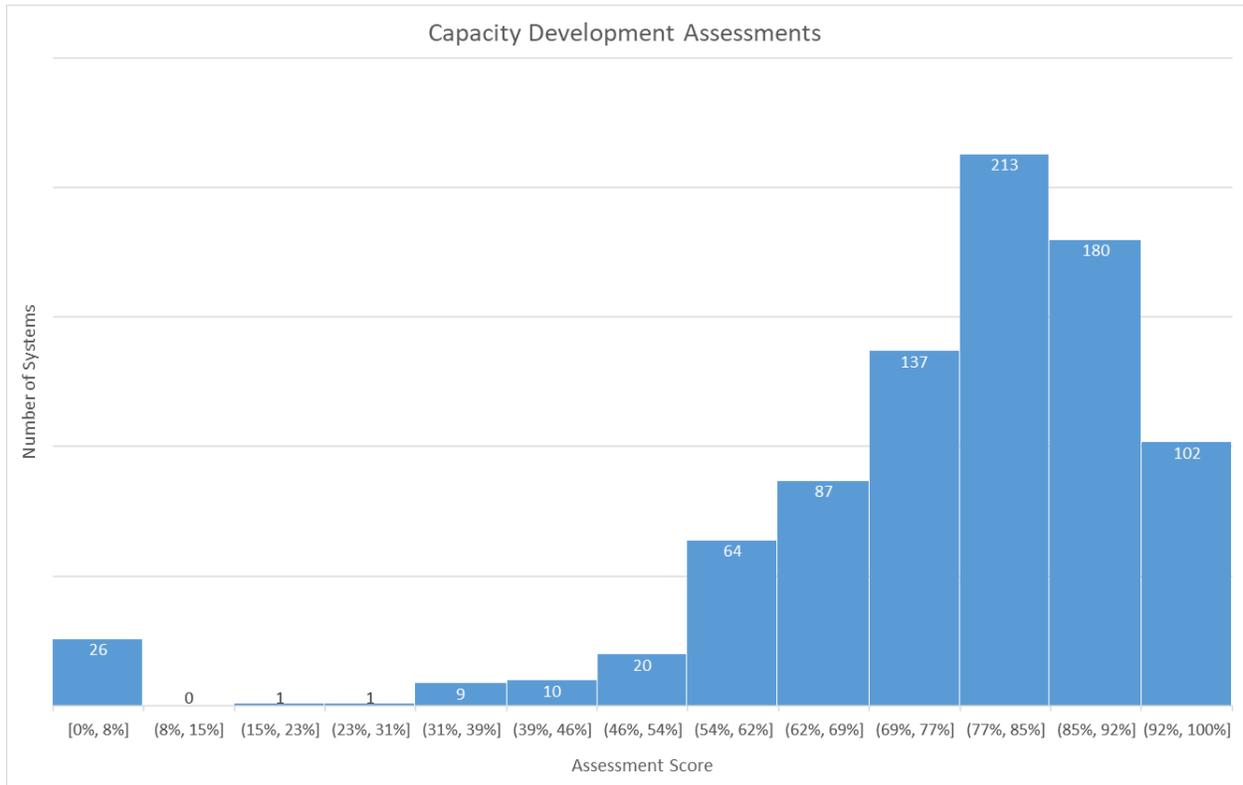


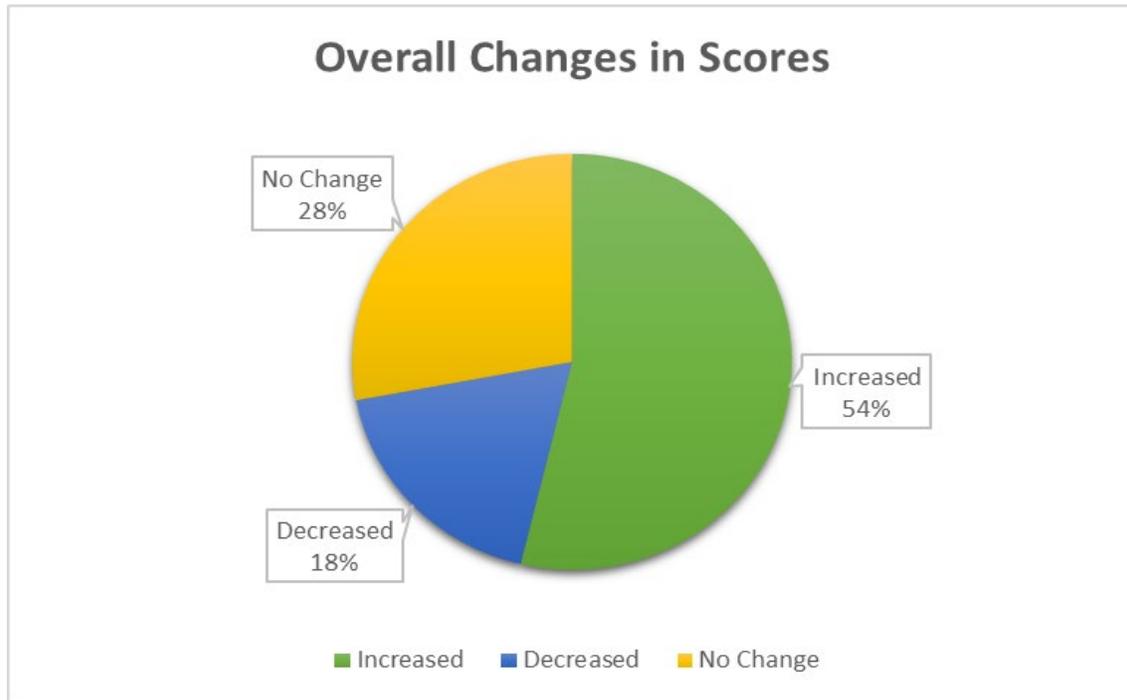
Table 9 identifies the top ten issues among systems below.

Table 9: Ten Most Common TMF Issues

Percentage of systems without	TMF Capacity Issue
77.9%	Without SoonerWarn (Mutual Aid).
69.2%	No written plan to regularly test backflow preventers.
68.5%	Do not conduct energy audit on regular basis.
59.2%	Have no written plan to eliminate dead ends in distribution system when feasible.
62.5%	System has no water rights management plan, or is unaware of the water rights needs for the future.
57.1%	System has not conducted a risk assessment (EPA VSAT or other method) and an emergency response plan (ERP) and has not certified with EPA that both steps have been completed. ERP must be reviewed and practiced annually.
55.7%	System has no written plan to respond to and address deficiencies noted on sanitary surveys or other inspections.
53.9%	Does not track water loss yearly with AWWA M36 Method.
52.5%	Operations & Maintenance plan is not regularly reviewed by board.
44.8%	Have no written policy for communication with state/fed regulators, customers, governing boards, and other entities.

Since the completion of the Baseline Assessment Projects, DEQ and ECLS staff have made an effort to follow up with systems who completed their initial capacity development assessment in order to evaluate the effectiveness of the assessment and the technical assistance provided to the systems who have requested help. So far, 234 follow up capacity development assessments have been conducted. The follow ups have yielded the follow results listed in Figure 6:

Figure 6: Follow Up Changes in Capacity Development Assessment Scores



An overview of the baseline capacity development assessments over a four-year period yielded the following three conclusions:

1. Of the TMF issues surveyed, all of the top ten issues are technical issues.

All of the top ten issues were found to be in the technical section of TMF capacity. Specifically, two out of the ten were issues related to Operation & Maintenance (O&M). The two O&M aspects that systems tend to lack most include: lack of a plan that is regularly updated, and plans that are not reviewed on a regular basis by the board. A complete and up-to-date O&M plan is critical to PWS system sustainability – it should cover all aspects of system operations and be both thorough and straight-forward enough so that an operator who is not familiar with a PWS system could operate it and produce safe water in an emergency. O&M plans are also excellent tools to train new staff and to document and preserve institutional knowledge concerning system operations. PWS governing boards are encouraged to review O&M plans at least annually to become familiar with system operational challenges and to develop a knowledge base for making accurate, strategic and financial decisions.

2. Capacity development assessment score relates to system population.

Assessment score and water system population showed a slight positive correlation suggesting that higher scores correspond to higher populations. Systems with higher populations have access to more funding

and other resources allowing for higher levels of sustainability. Systems serving smaller populations may have lower assessment scores due to issues such as having a volunteer staff, a smaller revenue base, or less ability to access needed professional services. This finding reinforces that TMF sustainability assistance should be primarily directed towards PWS systems serving smaller populations in rural areas.

3. Operators leaving or retiring has a major impact on the over sustainability of a system.

There are multiple factors that contribute to the small percentage of systems whose capacity development assessment score has decreased over time. One of the biggest influences on decreasing scores has been identified as employee turnover within the systems. Many of the small systems that are assessed by DEQ have one operator who has run the system for many years, often times taking on many different responsibilities within their community. As those employees retire or leave their systems the institutional knowledge carried by that employee is lost.

9. New Initiatives

Asset Management

Asset management is the practice of operating a PWS so that the cost of owning and operating infrastructure capital assets is minimized while delivering the service level that satisfies customers. Termed “applied common sense” by the water industry, it is a means of operating a system that maximizes efficiencies and maintains sustainability, allowing a system to provide safe water at an affordable cost - indefinitely.

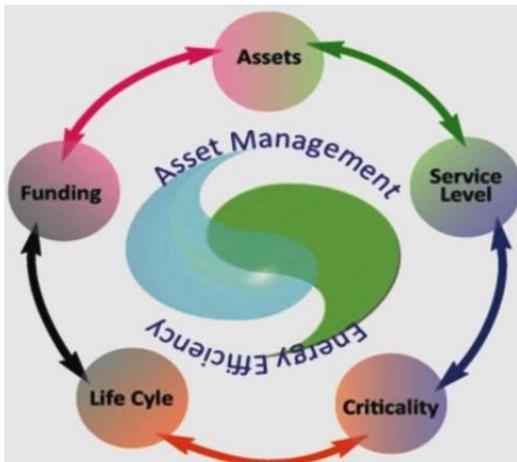


Figure 6: The Five Core Components of Asset Management

An asset management plan is built around 5 core components:

- Building an asset inventory,
- Determining a target level of service,
- Determining criticality of assets,
- Calculating life cycle costing, and
- Developing a long-term funding plan.

Building an asset management plan that follows these core components guides systems toward obtaining the longest and most efficient use of infrastructure possible while ensuring customers receive the quality of service they expect from the system.

America’s Water Infrastructure Act of 2018 (AWIA) requires that states amend their capacity development strategies to include a description of how the state will encourage the development of asset management plans at PWS systems. The Capacity Development Section has completed a revision of the state’s strategy, which now includes the promotion of asset management best practices and details the training and technical assistance that the agency will provide. The strategy revisions focus on providing training seminars, one-on-one assistance, and providing for 3rd-party asset management plan development via the ORWA technical assistance contract.

Also, because no low-cost/free option existed, the Capacity Development Section has developed an asset management plan tool that is available to any Oklahoma PWS system, free of charge. The Microsoft Excel-based tool assists systems in cataloging their assets, determining the likelihood and consequence of failure, and exploring timeframes and funding options for asset replacement. In FY21, CapDev staff have assisted with the completion of 6 Asset Management Plans for systems using the free tool created by the section. Three training seminars, as well as an online version of the training, were conducted by the CapDev staff.

DEQ is on track to be the first state agency in EPA Region 6 to complete the required strategy revision.

Lead Testing in School and Child Care Program Drinking Water Grant Program

Starting in early CY2020, the Capacity Development Section began implementation of a new program aimed at reducing or eliminating lead from the drinking water in public schools and public or private childcare centers. Using funding appropriated by the Water Infrastructure Improvements for the Nation (WIIN) Act Section 2107, the Lead Testing in School and Child Care Program Drinking Water Grant Program (or LWSC for short) offer free and voluntary testing of drinking water outlets for lead to any Oklahoma public school or public/private child care center that requests to participate, along with direction on how to address high lead levels based on EPA’s “3Ts” guidance.

In the past, lead was a common component of faucets and water supply plumbing. If the water transported and delivered by such plumbing is corrosive, lead can leach out from the lines and fixtures and enter the water exposing anyone using the water to lead. Lead is a highly toxic metal that is harmful to all humans, and no level of lead in the body is considered safe. Children are at particular risk of adverse health effects from lead, including nervous system damage, learning impairment, bone development problems, hearing damage, and anemia. The LWSC program aims to protect the health of children by reducing or eliminating children’s exposure to lead in the water they drink at school or childcare centers.

The program is guided by a coalition of agencies and organizations (the Secretary of Energy and Environment’s Office (OSEE), DEQ, the Departments of Education (OSDE), Health (OSDH), Human Services (ODHS), and the Oklahoma Parent Teachers Association (OPTA) and seeks to prioritize facilities that serve younger children (ages 6 and under), facilities serving or located in disadvantaged communities, and facilities that are older and are more likely to contain lead plumbing.

Along with no-cost testing, program participants implement EPA’s 3Ts guidance to:

- **Communicate**, throughout the implementation of the program, the results and important lead information to the public, parents, teachers, and larger community,
- **Train** on the risks of lead in drinking water and of the importance of testing for lead, as well as developing key partnerships to support the program,
- **Test** using appropriate testing protocols and a certified laboratory, and
- **Take Action**, including the development of a plan for helping schools and childcare facilities in their response to test results and in addressing potential elevated lead where necessary.

Despite issues with low participation due to COVID-19, the lead testing in schools program has had a very successful year. In FY21, thirty-six schools and two child care facilities have signed up to participate in the program. Currently, there are 3,326 eligible public schools and daycares in Oklahoma. Of the thirty-six schools signed up to participate, seven schools have been sampled. The total results of the seven sampling events are listed below in Figure 7 and Figure 8:

Figure 7: Results of Sampling Events

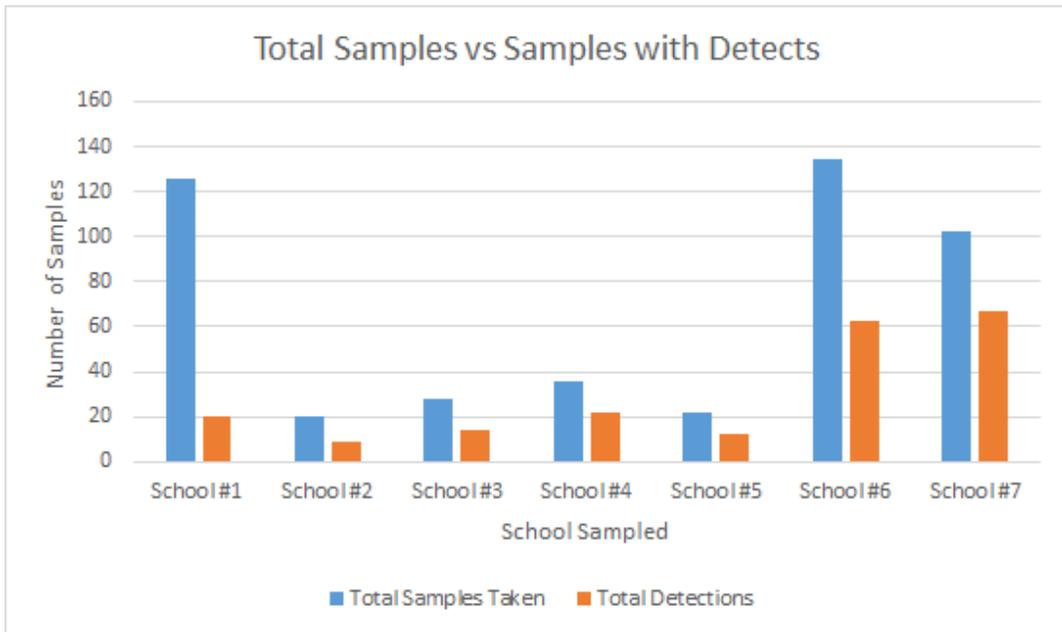
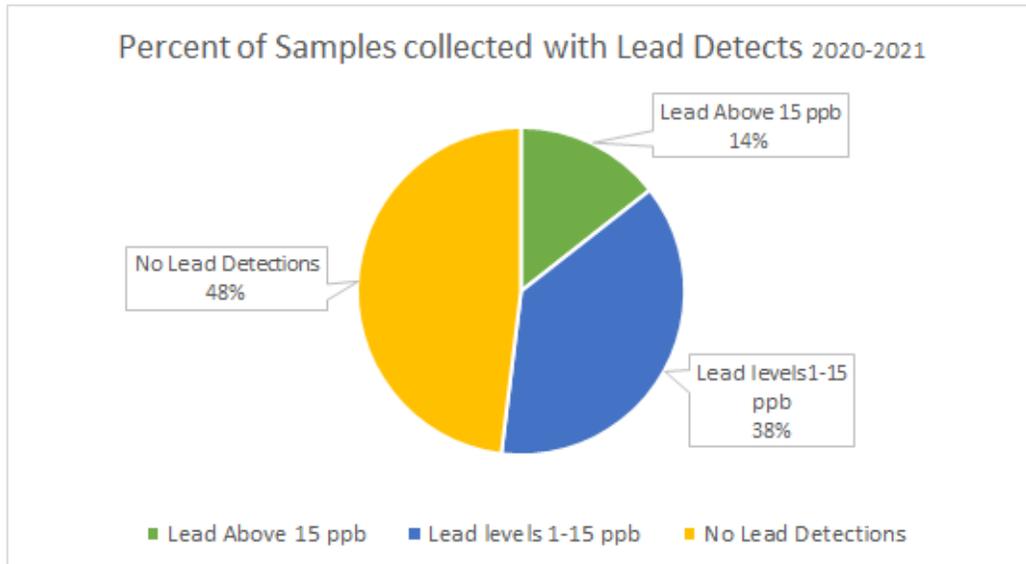


Figure 8: Percentages of Results



The seven schools who have had detections over 10 parts per billion are all currently undergoing remediation efforts to address their issues with lead identified during the sampling events. So far, \$9,028 of SCAP funding has been requested from schools and childcare facilities in the state. This SCAP funding used for remediation efforts will directly impact 2,464 students and staff in all schools & daycares tested so far.

Expected outcomes for this project are:

1. The reduction of children's exposure to lead in drinking water.
2. Training schools or childcare programs to begin implementing a testing program and mitigating lead exposure by utilizing the 3Ts toolkit in determining the best action to take for remediation.
3. Improvement of staff and community knowledge on lead in drinking water and other environmental harms.
4. Water quality improvement and lead exposure reduction in drinking water.
5. Establishment of routine practices such as those outlined in the 3Ts guidance.
6. Fostering sustainable partnerships at the state and local level to allow for a more efficient use of resources and the exchange of information among experts in various areas of school, childcare, utility, and health sectors.
7. Expanding the level of trust between the community, parents, and teachers.

The program has developed a webpage that provides flyers, fact sheet, and guidance videos on the importance of eliminating lead from school and childcare center drinking water, along with information on how to participate in the program (located at <https://www.deq.ok.gov/state-environmental-laboratory-services/environmental-public-health-information/lwsc/>). The coalition is currently working to complete testing on all schools that are signed up for the program and is planning on conducting additional outreach to gain more participation.

Disadvantaged Communities and PWS Sustainability

Adequate TMF capacity is a critical component of PWS sustainability and is required for a system to consistently provide safe drinking water to the public. Acquiring and maintaining this TMF capacity can be challenging for any water system, but systems located in small and disadvantaged communities can find it particularly difficult. A failure to maintain TMF capacity can lead to unsustainable, inefficient operation and frequent or continuous violations of health-based, primary drinking water standards.

Over the past three years, the DEQ has been surveying the TMF needs of rural and small municipal PWS systems via the Capacity Development Baseline Assessment Project. Each system was assessed on 109 different aspects of operational sustainability. Preliminary results of the survey found that, on average, the assessed systems possessed 77.6% of needed TMF capacity, and that both decreasing TMF score and population correlated with an increasing likelihood and frequency of primary drinking water standards violations.

In state fiscal year 2020, DEQ and ORWA, as members of the Oklahoma Strategic Alliance, joined forces and developed a program aimed at improving and enhancing PWS sustainability. Named the Long-Range System Sustainability (LRSS) Program, the program leads PWS systems through a series of programs and trainings that, once complete, provide a significant boost to TMF capacity and system sustainability. The LRSS program focuses on many of the issues examined by the Baseline Assessment, and systems that complete the program demonstrate an improved TMF score, as well as improved efficiency, operations, and fiscal condition.

With the Assistance for Small and Disadvantaged Communities Drinking Water Grant Program, DEQ has begun using the guidance from the Baseline Assessment and the tools developed in the LRSS program to bring about significant positive changes at Oklahoma's underserved, small, and disadvantaged systems. This approach has several advantages:

- **Targeted TMF Assistance:** Via the recently completed Baseline Assessment, the PWS systems most in need of TMF help are known. Furthermore, the assessment specifies precisely what type of assistance is needed. Once work via this grant begins, DEQ will be able to target technical assistance on missing or malfunctioning PWS processes for maximum positive effect.
- **Rapid Deployment:** The LRSS program is completely developed and functional, having been in service for a year. By using the structure and services of the LRSS program, DEQ will be able to immediately begin work at targeted PWS systems, generating positive results quickly.

- Proven Results:** The LRSS program is a significant part of the technical assistance provided to small Oklahoma PWS systems by the Oklahoma Strategic Alliance. In its FY21, the work of alliance partners has saved over 337 million gallons of water via water loss reduction, improved small Oklahoma PWS financial operating ratios by 0.69, added over \$2 Million in revenue to PWS budgets (via rate adjustments and efficiency improvements), and helped systems implement numerous policy and procedure improvements. Similar results can be achieved for the PWS systems targeted by this program.

By using the Baseline Assessment as a roadmap and the LRSS program as the tool, DEQ has initiated rapid and significant positive changes in the PWS systems that are included in this program. DEQ CD section effectively tailors the provided TMF assistance to focus on resolution of health-based drinking water standards violations that *can* be corrected via improved operations and system optimization, as well as on improving all aspects of the system’s TMF capacity. CD section measure and report on success in terms of system compliance, capacity development assessment scores, and improvements in PWS system financial conditions (as indicated by fiscal indicators and metrics).

The Assistance for Small and Disadvantaged Communities Drinking Water Grant Program has provided TMF assistance to Oklahoma PWS systems that are both underserved (facing health-based drinking water violations), small (serving 10,000 or fewer people) and economically disadvantaged with a focus on actions that lead to resolution of violations of health-based primary drinking water standards and that significantly improve PWS system efficiency, operation, and fiscal health. In FY21, the program has assisted 48 unique systems across Oklahoma, each of them receiving customized assistance based on their needs. The specific assistance that was provided to these systems is detailed in Figure 8.

Figure 8: Type and Number of TMF Assistance Provided 01/01/2021-06/30/2021

TMF Assistance Type	# of Systems Receiving Assistance
Emergency Response Planning and Procedures	8
Operations and Maintenance Plans	18
Mutual Aid Agreements	4
Rate Analysis	11
Source Water Protection Planning	10
Standard Operating Procedures	6
Water Loss Auditing/Leak Detection Assistance	7

Each participating PWS received a package of technical assistance activities focused on their individual needs and tailored to maximize effectiveness. There is no maximum amount of time or effort that may be expended on an individual system; as much assistance and guidance as needed will be provided to the participating system.

Of the 48 systems that participated in this program within the specified time frame, 25 systems increased their Capacity Development score while the score of the remaining 23 remained the same- likely due to the *improvement* of existing policies and procedures rather than the introduction and creation of these plans. Overall the percent change in Capacity Development scores increased by 5.5%- implying that the systems who received assistance and increased their score have effectively increased their TMF capacity. These systems with increased TMF capacity are better able to respond to emergency situations, operate

effectively, and plan for the future.

Participating systems must meet the qualifications of being both underserved (by having been in violation of a health-based primary drinking water standard at some point over the past five years), and serving a disadvantaged community or communities (communities where the median household income is at 85% or less than the national median household income according to the United States Census Bureau / American Community Survey). Participation is voluntary and is driven by the level of interest of the participating system.

10. Summary and Future Plans

Enhancing the *technical, managerial, and financial* capacities of Oklahoma's water supplies is a group effort. The continued success of the DEQ CD program is dependent on the efforts of the PWS Engineering and Enforcement Section, Operator Certification Section, DWSRF staff, and the various agencies that represent FACT. This cooperative effort is very effective at promoting CD enhancement, but it can possibly be made more effective when efforts are targeted to where they are needed most. To this end, DEQ CD are looking forward to utilizing the results of the state-wide CD baseline assessment to guide the Disadvantaged Communities Program, targeting systems that need the most assistance. DEQ will also work to expand its involvement in the Oklahoma Strategic Alliance to promote small water system sustainability.

Long-Term expected outcomes for this program include:

1. A trend showing an overall reduction in the number of PWS systems out of compliance with health-based standards in small and disadvantaged communities.
2. Increased use of asset management planning to enhance sustainability and long-term viability of PWS systems in small and disadvantaged communities.
3. A trend showing improvement in financial indicators of PWS systems in small and disadvantaged communities.
4. A trend showing continued improvement in TMF assessment scores in small and disadvantaged communities, and improvement in the overall state TMF assessment score.
5. Improved performance of drinking water plants in small and disadvantaged communities.
6. Improved understanding of current and emerging threats to water quality, safe drinking water, and public health.
7. Reduction in real and apparent water loss at PWS systems serving small and disadvantaged communities.
8. Reduced number of accidents, injuries, and safety-related incidents at PWS systems.

Also, DEQ will continue to build on the success of the water loss control program by performing additional water loss audits at PWS systems that request the help and by continuing funding for ORWA's work conducting leak detection and meter analysis technical assistance. In contrast to other states where water

loss auditing and control is involuntary, these methods can obtain significant cooperation and meaningful results via voluntary participation and free technical assistance. Future results should bear out this belief.

Finally, in response to the amendments to Section 1420 of SDWA brought about by Section 2012 of the America's Water Infrastructure Act (AWIA), DEQ's CD section will increase efforts toward promoting and supporting the implementation of Asset Management (AM) at the state's PWS systems. To further support AM training, DEQ intends to explore additional training and technical assistance avenues in the state for water systems. Additionally, DEQ will be implementing the newly added strategy provisions that encourage PWS systems to development AM plans; including best management practices.

11. References

Oklahoma Capacity Development Strategy Document

SFY 2021 DWSRF Intended Use Plan

2020 State of Oklahoma Public Water Supply Program Annual Compliance Report