

Area Wide Optimization Program



Individual Program Background Information 2019



South Carolina Department of Health and Environmental Control

Official Recognition of AWOP:

Since 1997, the South Carolina Department of Health and Environmental Control (DHEC) has participated in EPA's Region 4 Multi-State Area-Wide Optimization Program (AWOP). The goal of the program is to maximize public health protection by optimizing particulate removal and reducing disinfection by-product formation at all surface water treatment plants and associated distribution systems. The South Carolina AWOP awards and recognition program, started in 2001, is held in conjunction with our annual surface water meeting.

Official Adoption of AWOP Goals

South Carolina Department of Health and Environmental Control (SC DHEC) decided to become a charter member of the EPA Region 4 Optimization Program in 1997. At that time, staff members were concerned that upcoming regulations would challenge the ability of the surface water treatment plant operators to maintain the current level of protection against waterborne pathogens while attempting to meet the disinfection by-product regulations. Simply meeting those regulations would have been tough without the added burden of meeting the Interim Enhanced Surface Water Treatment Rule (IESWTR). The goal of the Department has been to ensure the protection of public health against Cryptosporidium and other emerging microscopic pathogens. SC DHEC believes that, from a public health protection standpoint, it is imperative for each water system to set optimization of their surface water treatment plant(s) for particle removal as the baseline from which they work toward disinfection by-product control.

SC DHEC adopted the optimization performance criteria as goals for all surface water treatment plants in the state. SC DHEC has asked all surface water treatment plants in the state to make a conscious effort to meet these goals on a continuous basis. To build support for the South Carolina Area-Wide Optimization Program (AWOP), in April 1998 the Chief of the DHEC Bureau of Water sent letters announcing the program to all surface water utilities in the state. Each letter described the optimization performance criteria and goals adopted by DHEC and pointed to the improved public health protection associated with optimized performance

National Optimization Goals adopted by your PWSS Program – Check all that apply:

Water Treatment Plants

Microbial (Turbidity): Raw Water Individual Settled CFE IFE _____
Post BW w/FTW Post BW wo/FTW Disinfection (CT) _____

DBPs (TTHM/HAA5): Plant Effluent Enhanced Coagulation Disinfection

Chloramine Application: Ammonia Control _____ Dosing (Chlorine & Ammonia) _____

Distribution Systems

Individual Site DBPs Long Term System DBPs Tank Operations _____
Secondary Disinfection, Free Chlorine _____
Secondary Disinfection, Chloramines (monochloramine, Ammonia & Nitrite) _____

Description of Current AWOP Team Members and Responsibilities

1. Richard Welch, Jr., P.E. – AWOP Team Leader, Section Manager, AWOP Facilitator
2. Doug Kinard, P.E. – Division Director
3. Bill Randolph – Compliance Engineer, Evaluation, TPI and PBT Coordinator
4. Lindsey Bounds – Compliance Engineer, Status Coordinator, TPI & PBT Facilitation
5. Kyle Maurer, PhD., P.E. – Compliance Engineer, TPI and PBT Facilitation
6. Mohammad Korkzan – Compliance Engineer, TPI and PBT Facilitation
7. Fred Taylor – Environmental Scientist, Certified operator, TPI and PBT Facilitation
8. Debra Boston – Environmental Scientist, Certified operator, Team Member
9. Kevin King – Permitting Engineer, Team Member
10. Tracy Scott. – Permitting Engineer, Team Member
11. Rene Chavis – Permitting Engineer, Team Member

Inventory of State-Wide Treatment Facilities¹	Number
Rapid rate filtration treatment plants ^{2,3}	59
Utilizing static settling without tubes or plates	36
Utilizing static settling with tubes or plates	22
Utilizing sludge blanket clarification (upflow, pulsator)	0
Utilizing contact adsorption clarification	0
Utilizing sludge recirculation (including ballasted clarification)	0
Utilizing DAF, or other alternative clarification process	3
Utilizing direct/in-line filtration	0
Utilizing packaged filtration (package plants)	1
Slow sand filter plants	0
Diatomaceous earth filter plants	0
Membrane treatment plants	2
Bag or cartridge filtration plants	0
Primary disinfectant	
Free chlorine	39
Chloramines	24
Ozone	0
UV	0
Secondary disinfectant	
Free chlorine	0
Chloramines	0
¹ Limited to surface water treatment plants (includes surface, GUDI, blended sources). ² All surface water treatment plants, except cartridge, membrane and slow sand. ³ When a plant utilizes multiple treatment processes or configurations identified below, please include them all in this inventory, e.g., a package plant that utilizes a CAC will be included as a rapid rate plant using CAC and packaged filtration.	

AWOP Vision:

Drinking water optimization in South Carolina has been a priority of our agency since the program inception in 1997. Drinking water optimization has been part of our agency's Strategic Plan for several years. The high standards and goals set by the program have created a more technically capable regulated community in our state.

The vision for our program is to have 95 percent of our population served by plants optimized for both microbial and disinfection byproducts. Several challenges face our utilities in their quest for DBP optimization. Through research, regulation, technical assistance, and targeted training, we are becoming able to help them with this challenge.

Status Component Implementation:

Microbial Ranking Criteria

The SC AWOP team has developed a priority ranking system to facilitate surface water systems prioritization with respect to public health risk potential. This system has been very successful, and it has been reevaluated several times since its development. The prioritization allows the team to apply resources and optimization tools where the need is greatest. The scoring worksheet used to evaluate each plant considers a 2-year regulatory compliance (MCL, treatment technique), sanitary survey results from a 2-year period, and operational data (turbidity measurements) taken over a 1-year period. Using this worksheet has allowed the team to focus on those systems that have the greatest need for optimized performance.

Microbial Optimization Worksheet

2-year regulatory compliance	Points (Per #)	Results of last 2 Sanitary Surveys	Points (Per #)
# Acute MCL violations	40	# Overall unsatisfactory surveys	40
# MCL violations	20	# Overall needs improvement surveys	20
# Treatment technique violations	20	# Individual items unsatisfactory	10
		# Individual items need improvement	5

Operational Data based on 1-year					
Filtered Turbidity		Settled Turbidity		Raw Turbidity	
# days > 1 NTU	20	# days > 10 NTU	5	# days > 250 NTU	5
# days > 0.5 NTU	10	# days > 5 NTU	2	# days > 100 NTU	2
# days > 0.3 NTU	2	# days > 2 NTU	0.5	# days > 50 NTU	1
# days > 0.1 NTU	1			# days > 25 NTU	0.5
Is plant operated 24/hr day?			No = 20		
Does plant have more than one clearwell?			No = 20		

DBP Ranking Criteria

A scoring and ranking system was developed for the DBP status component. The DBP goals used to determine optimization were developed by the EPA Technical Support Center. Disinfection by-product data is collected by the team and input into spreadsheets. To determine optimization with respect to the DBP goals, locational running annual averages (LRAA's) are calculated and the maximum LRAA is taken from each location for a 1-year period. All of the maximums are averaged and the average of these maximums must be less than 60 ug/l for THM's and less than 40 ug/l for HAA's.

DBP Optimization Worksheet

2-year regulatory compliance	Points (Per #)	Results of last 2 Sanitary Surveys	Points (Per #)
# Acute MCL violations	40	# MCL violations (non-acute)	20
# Acute MRDL violations	80	# MRDL violations (non-acute)	20
# TT violations (TOC)	20		
# Overall unsatisfactory surveys	40	# Individual items unsatisfactory	10
# Overall needs improvement surveys	20	# Individual items need improvement	5
Operational Data based on 1-year			
THM Avg of Max LRAA	HAA Avg of max LRAA	TOC Performance Ratio	
Max > 120	100	Max > 111	100
Max > 86	75	Max > 67	75
Max > 75	50	Max > 55	50
Max > 54	25	Max > 38	25
		PR < 0.9	100
		PR < 1	66
		PR < 1.1	33

Average of Maximum LRAA Determination Worksheet (example data)

	Sample Site	2013				2014				
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
System Name	1	27	69	101	44	24	59	120	35	
	2	30	75	95	53	35	90	128	55	
	3	29	52	78	41	21	50	98	37	
	4	25	79	105	53	21	36	90	26	
	LRAA 1	4 Quarters are for site 1			60	60	57	62	60	
	LRAA 2	“ “			63	65	68	77	77	
	LRAA 3	“ “			50	48	48	53	52	
	LRAA 4	“ “			66	65	54	50	43	
	MAX LRAA	Max from any site			66	65	68	77	77	
	Avg of Max LRAA's									71
	DBP Goal									60

A priority-ranking list was developed for the DBP status component that shows which systems need the most optimization assistance and staff resources. Points are earned from regulatory compliance, sanitary survey performance, performance with respect to optimization (DBP levels), and formation potential (TOC performance). Systems earn the most points from the operational performance data. Like the microbial priority ranking, the higher DBP scores reflect worse optimization performance.

Targeted Performance Improvement (TPI) Implementation:

Annual State AWOP Report – EPA Region 4 AWOP
Annual Surface Water Meeting and AWOP Awards Program
Multi-State Comprehensive Performance Evaluation – Microbial Optimization
Multi-State Comprehensive Performance Evaluation – Disinfection Byproduct Optimization
Multi-State Comprehensive Performance Evaluation – Distribution Optimization
Performance Based Training – Microbial Optimization
Performance Based Training – Disinfection Byproduct Optimization
Sanitary Survey Program – Performance Assessment Graph / OAS Charts
Sanitary Survey School and Workshop – Regional Staff Training

AWOP Maintenance Component Implementation:

Integration

Plan Reviews ✓ Permitting ✓ Capacity Development ✓ Operator Training ✓
Technical Assistance ✓ DWSRF Prioritization ✓ Enforcement ✓ Sanitary Surveys
✓ Other (identify)

DWSRF set aside funds used to support AWOP

South Carolina's Public Water System Supervision (PWSS) program includes a technical assistance component. South Carolina is participating in an Area-Wide Optimization Program (AWOP) that encourages Public Water Systems (PWS's) with surface water treatment plants to go beyond minimal compliance with treatment techniques and water quality standards established in the State Primary Drinking Water Regulations.

South Carolina DHEC set aside funds through the Drinking Water SRF Capitalization Grant for the purpose of providing technical assistance to PWS's through the Area-Wide Optimization Program, for implementation of the Long Term Surface Water Treatment Rules, the Disinfection Byproducts Rules, and the Filter Backwash Recycle Rule, as well as other federal Rules.

Enhancements

The optimization program continues to be discussed during the annual sanitary survey at each surface water treatment plant. Charts and data are presented and discussed for the time period since the last survey of that water system. The sanitary survey report also contains an in-depth section on optimization and reporting of plant performance.

Sustain

Building Awareness & Recognition

Since the beginning of AWOP in South Carolina in 1997, our team has worked to continually build awareness of the importance for optimized performance. Though the team members have

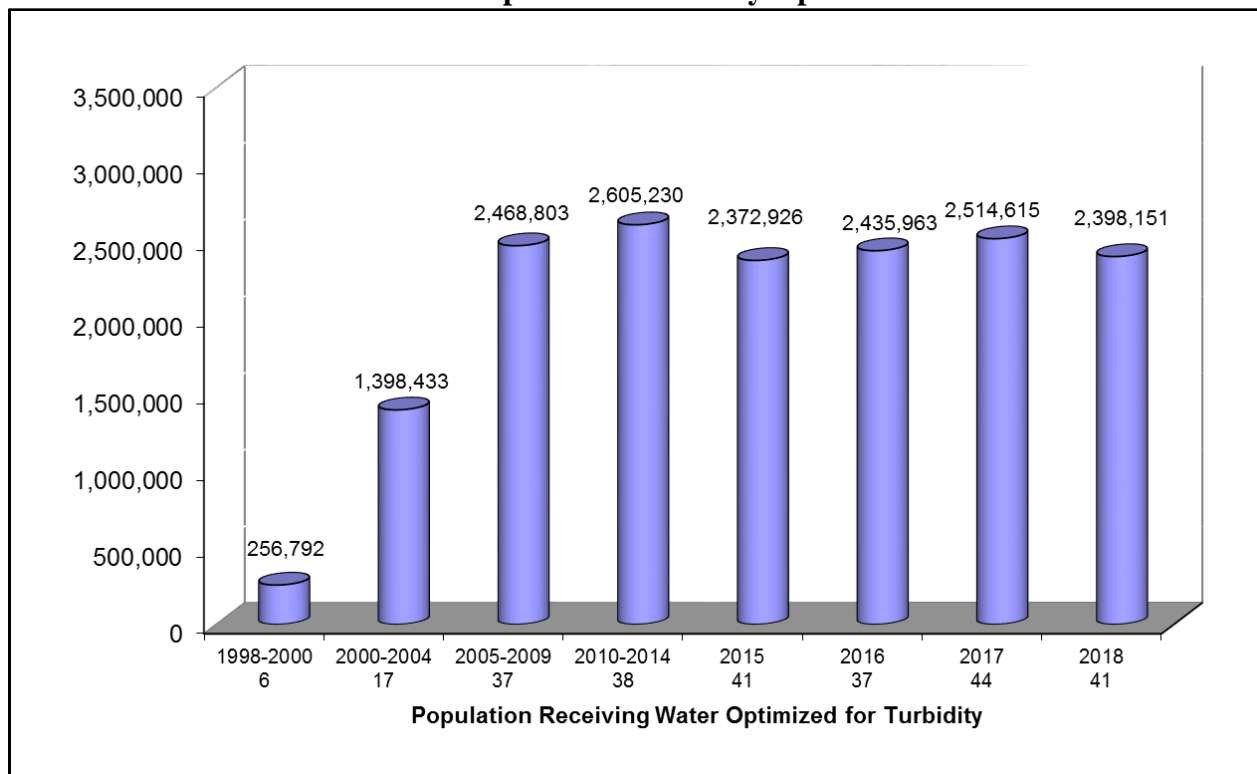
changed, the importance of optimization has not diminished. With the advent of DBP optimization, the program focus has broadened and added more technical aspects and new tools for improving optimized performance.

The AWOP awards and recognition program, which started in 2001, were again held in conjunction with our annual surface water meeting. The Director of Environmental Affairs and Chief of the Bureau of Water attended the program and were complimentary of the program. In addition, EPA Region 4 had a representative to attend the entire meeting. The distinguished guests gave positive remarks and enthusiastically supported the program. Each guest was willing to share their time to recognize and award the plants that met the optimized performance goals.

AWOP Impacts:

A powerful impact of AWOP in South Carolina has been the number of citizens that receive water from an optimized plant. The chart below shows that the number of plants that are optimized and the service population has risen dramatically.

**Area-Wide Optimization
South Carolina Population Served By Optimized Plants**



The chart above shows the population served by optimized plants. The population served by optimized plants (met settled & filtered goal) was 48,799 in 1998 and over 2.4 million in 2018. In 2018, approximately 3.0 million people in South Carolina were supplied with drinking water from surface water plants (State population 4.5 million). Approximately 80% of those people received drinking water from a plant optimized for microbial protection. This graph can be

integrated into almost any area of the agency. Meeting the turbidity optimization goals has been shown to provide a ten fold increase in public health protection.

Lessons Learned:

The optimization program continues to serve as a model for other Department programs to do more with less, i.e. getting the most out of what you have. “AWOP Thinking” has been encouraged in other program areas. Because AWOP in South Carolina bridges across several sections (compliance, monitoring, permitting, State Revolving Fund (SRF)), managers and staff in the other programs have been exposed to AWOP and made aware of the successes.

In South Carolina, the regulated community continues to respond to the raised scrutiny on public health protection. Most operators see themselves as professionals responsible for their customers well being. “AWOP Thinking” has been used to respond to and find creative solutions to challenges that water systems are facing. With the implementation of the Stage 2 DBP rule (and LT2 SWTR), plants are realizing that they need to fix problems. This has allowed staff to use the technical assistance and problem solving skills learned and honed through the Area-Wide Optimization Program.

Also, we have found that the regulated community wants to exceed the present regulatory requirements to prevent violations and enforcement actions. AWOP has been very helpful in South Carolina by reducing non-compliance, developing a better relationship with the regulated community, and building the expertise of our staff of water treatment professionals.