North Carolina
Capacity Development Report
For
Public Water Systems

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Public Water Supply Section
N.C. Division of Water Resources
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Water Resources
ENVIRONMENTAL QUALITY

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1.0 Introduction

The primary objective of the North Carolina Public Water Supply Section is to ensure that water delivered by public water systems is safe for consumption and does not pose a danger to public health. This is accomplished through compliance oversight through the *North Carolina Drinking Water Act* and the federal *Safe Drinking Water Act*, which are represented in 15A NCAC 18C, the *Rules Governing Public Water Systems* (*Rules*), copies of which are available online at: https://deq.nc.gov/about/divisions/water-resources/drinking-water/plan-review/rules-governing-public-water-systems. A public water system is a water provider that delivers water for human consumption to at least 15 service connections, or regularly serves an average of at least 25 individuals for at least 60 days of the year.

The Public Water Supply Section serves the public interest and assists public water systems through a multi-faceted approach that includes:

- Enforcement of water sample monitoring requirements and evaluation of analytical results,
- Review and approval of engineering infrastructure plans and specifications,
- Comprehensive site visits,
- Development of programs to encourage and support local drinking water protection activities,
- Examination and professional certification of water system operators, and
- Other initiatives designed to facilitate compliance with the *Rules*.

1.1 Definition of Capacity

The 1996 *Safe Drinking Water Act Amendments* obligated states to ensure that all new community water systems and non-transient non-community water systems, beginning operation after Oct. 1, 1999, demonstrate technical, managerial and financial capacity. In response, the Public Water Supply Section developed a Capacity Development Program to meet the state's specific needs. The goal of the program is to require technical, managerial, and financial planning of new and existing community and non-transient non-community water systems that will improve systems' service and sustainability. Therefore, "capacity," as used in this report, refers to the technical, managerial and financial capabilities of a water system to comply with the provisions of the *Safe Drinking Water Act*.

The U.S. Environmental Protection Agency (EPA) required the Public Water Supply Section to develop milestones as part of its Capacity Development Program. The milestones were published in the *Public Water System Capacity Development Guidance Document* (March 2000), and they are available online at https://ncdenr.s3.amazonaws.com/s3fs-public/Water%20Quality/capacitydevguide.pdf. The milestones primarily include tracking the number of projects that have completed the engineering infrastructure approval and certification requirements. Chapter 3 of this report discusses these milestones.

The milestones, while valuable and reflective of the increase in capacity of water systems in North Carolina, do not provide a comprehensive view of overall capacity gains across the state, nor do they reflect the combined efforts of Public Water Supply Section employees in the central and regional offices to improve water systems' capacities. A more comprehensive view of the program's dedication to water system capacity is realized when the milestones are considered in conjunction with:

- Improvements in compliance trends (Chapter 2),
- Assistance provided to water systems by regional office staff (Chapter 4),
- Assistance provided to water systems by the Compliance Services Branch (Chapter 5),
- Support provided to the Division of Water Infrastructure (Chapter 6),
- Statewide drinking water protection programs (Chapter 7), and
- Examination and certification of competent water system operators by the N.C. Operator Certification Program (Chapter 8).

2.0 Assessing Water System Capacity through Compliance with Drinking Water Rules

Systems are required to monitor water samples for contaminants regulated through the *Safe Drinking Water Act*. Water systems collect water samples according to EPA-mandated monitoring schedules, and compare sample results to contaminant-specific maximum contaminant levels. Systems base the locations and frequency of required samples on the population served, water system type, and source water type. In accordance with EPA requirements, the Public Water Supply Section issues a notice of violation for each missed or incorrectly collected sample, which are considered "monitoring violations." The EPA also requires that systems with contaminants detected above the maximum contaminant level (MCL) receive a notice of violation for each exceeding contaminant. These violations are referred to as MCL violations.

The Public Water Supply Section uses monitoring and MCL compliance rates as indicators of water system capacity. An evaluation of the water system capacity includes: the percentage of noncompliant systems, the population served by compliant systems, the performance of new public water systems, and the performance of systems that have been active since the beginning of the Capacity Development Program.

2.1 Overall Compliance Rates of Water Systems

Figure 1 provides compliance information for public water systems in North Carolina regarding federal and state drinking water regulations. Data from 1999 are included as the baseline for comparison since the Capacity Development Program began on October 1, 1999. The percentage of systems receiving monitoring notices of violation has decreased significantly since 1999, while the percentage of systems receiving MCL notices of violation has remained relatively stable. These results are significant considering federal requirements have become more stringent during the same period and that increasing numbers of systems are completing all their monitoring requirements.

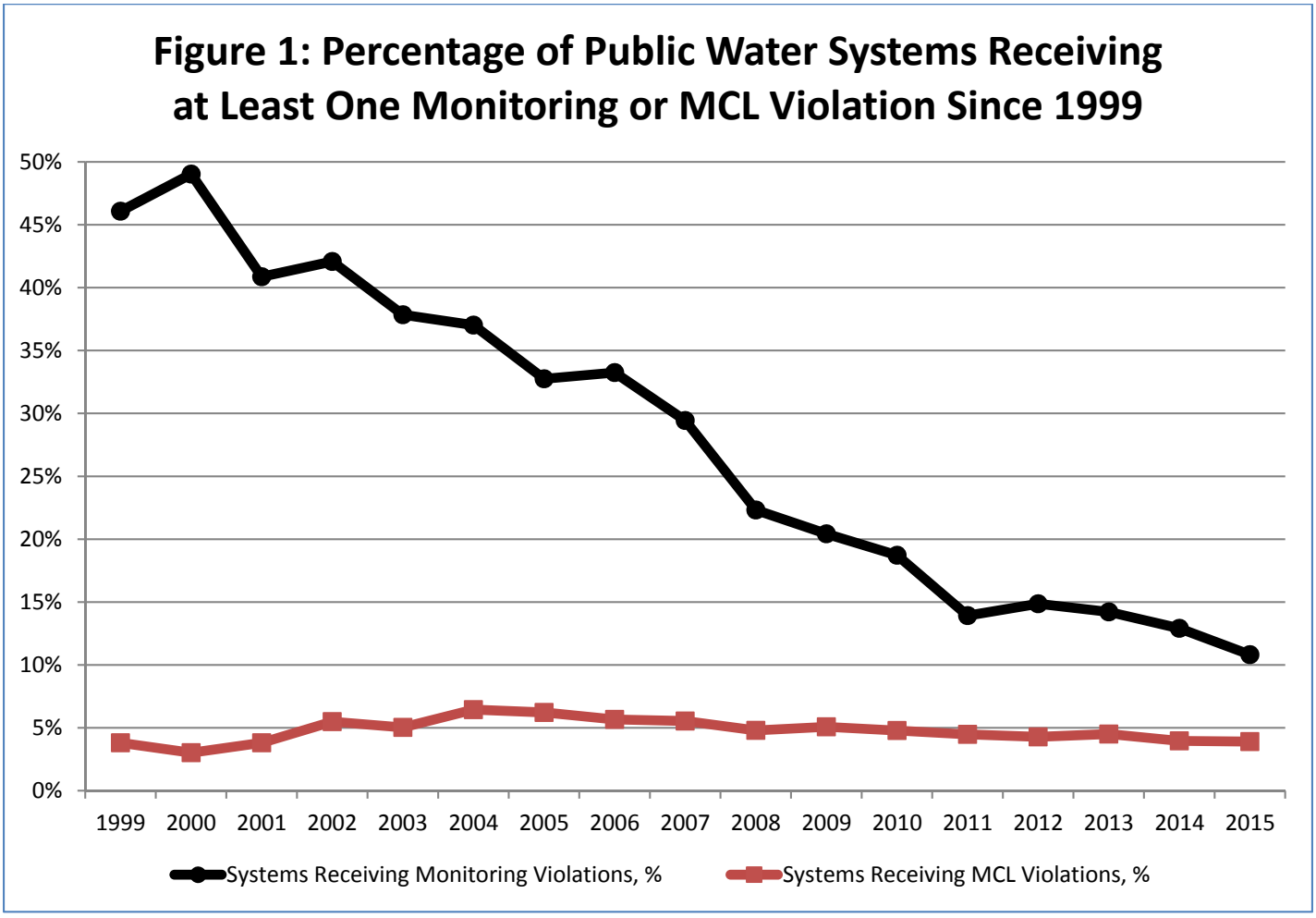


Table 1 (page 4) shows the number of water systems and water systems with at least one MCL or monitoring violation received in a calendar year. Calendar year 1999 is included as the baseline year, followed by data from recent years. Systems are categorized by type and size of population served. Table 1 also shows the percentage of systems that received a notice of violation as compared to the total number of active water systems within each system category. It is important to note while reviewing this data, and all proceeding tables and figures, that transient water systems are not subject to plan review and therefore, are not subject to the capacity development milestones to which community and non-transient non-community water systems are subject.

Monitoring violations occur when a water system fails to collect a required sample or complete analytical tests within the required monitoring period. A typical community system monitors at least monthly and has a large number of required tests. A water system missing a single analytical test during the course of a year would appear on the table as having a monitoring violation.

Maximum contaminant level violations indicate the number of systems with at least one contaminant exceeding permissible levels during the given year. Maximum contaminant level violations can be either acute, meaning the exceedance poses an immediate health risk, or chronic, meaning the exceedance poses a health risk if exposure continues for an extended amount of time. A typical system has many opportunities to test contaminant levels during the course of one year. Most systems receiving bacteriological MCL violations return to compliance by the next compliance period. A public water system receiving at least one violation during the year will appear on this table.

2.2 Population Served by Compliant Community Water Systems

Another method of evaluating capacity, compliance, and public health protection is to examine the number of people served by compliant public water systems. Figure 2 (page 5) demonstrates the population served by compliant community water systems as a percentage of the total population served by community water systems. Large water systems serve greater percentages of the population than smaller systems, and even one violation received by a large system disproportionately decreases overall population compliance percentages. For example, the largest water system in North Carolina received one monitoring violation in 2004 and one MCL violation in 2005. As new rules are implemented the Public Water Supply Section expects to see an adjustment period of increased violations. One example of this adjustment occurred in 2004 when the Disinfection Byproducts Rule expanded to almost every community system. See Appendix A for a schedule of new rule implementation.

In 2015, systems with no MCL violations served approximately 97 percent of the state's community water system service population, and systems with no monitoring violations served 75 percent of the service population. The community water system service population with no monitoring violations decreased in 2015 after the state's two largest water systems both received monitoring violations; however, this does not indicate that more systems received monitoring violations than would be typical of a normal calendar year. Water systems that received more than one MCL violation served approximately 0.7 percent of the population. Four community systems, comprising 0.03 percent of the population, received MCL violations for acute contaminants. Acute contaminants differ from chronic contaminants because they can cause an immediate health risk.

2.3 New System Performance

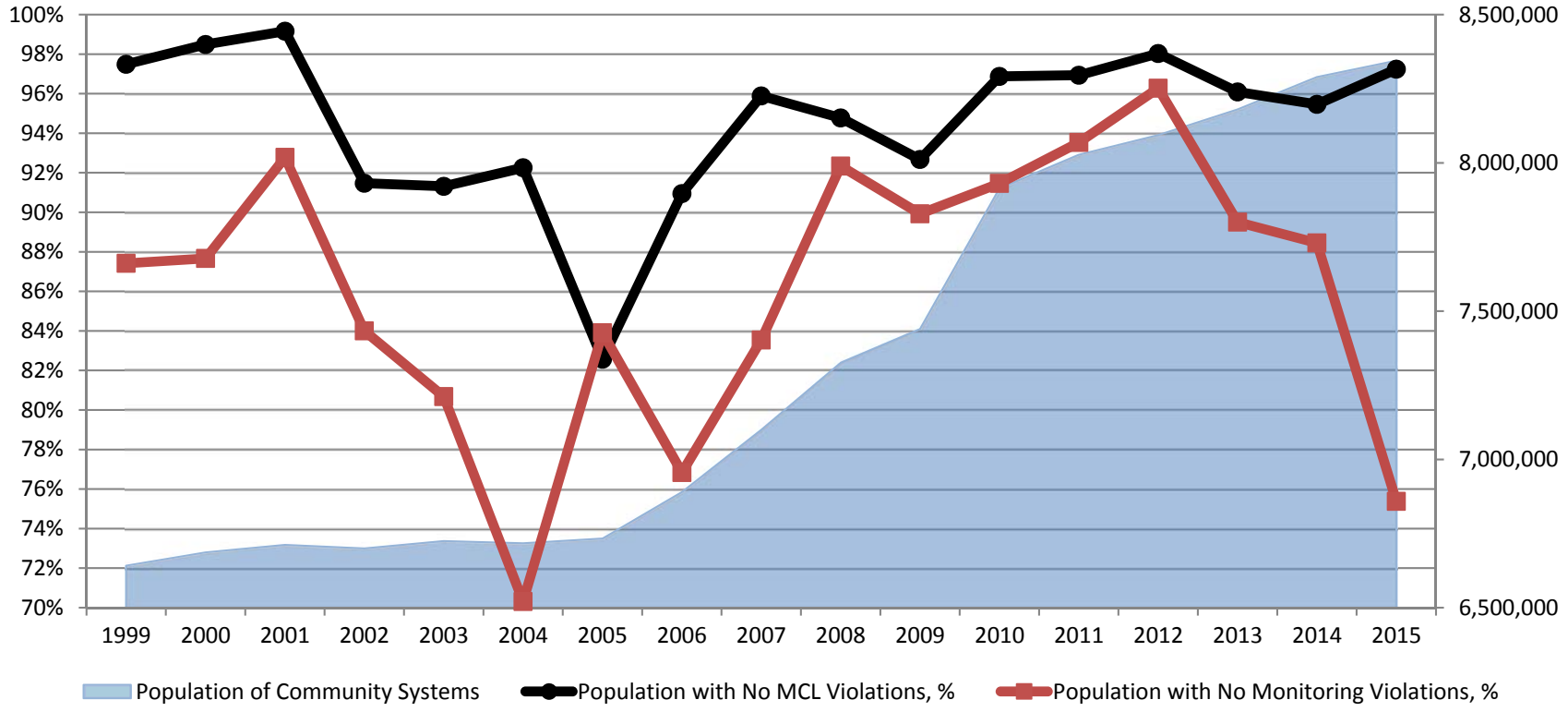
The Public Water Supply Section evaluates performance of new public water systems by tracking compliance rates following their initial date of operation. Table 2 (page 6) compares new and "found" system performance to the performance of all systems during the period from 2013 through 2015. Found systems started operations without the knowledge or approval of the Public Water Supply Section and were discovered by regional office staff while conducting fieldwork. Found systems did not complete the plan review process and thus have not completed the capacity development milestones. These systems are often improperly constructed and system owners have little or no understanding of compliance requirements. The Public Water Supply Section staff work with these systems to either stop operations or to prepare them for compliance oversight. These data show that new non-transient non-community and transient water systems exhibit better compliance with monitoring requirements than found systems. It should also be noted that new community and non-transient non-community systems do as well or better with compliance than existing systems, which shows the benefit of their completion of the capacity development milestones, as well as the benefit of Public Water Supply staff outreach.

Table 3 (page 7) shows the beginning year of new systems and the historic compliance trends of those systems that have remained active. In general, these systems exhibit improving compliance rates as time increases, meaning that the longer a system is in operation, the better able it is to comply with state and federal regulations. This implies that the planning inherent in the capacity development process, the technical assistance delivered by the Public Water Supply Section during the process, and increased familiarity and experience can help improve the compliance of new water systems. However, the compliances trends displayed also show remaining room for improvement, which the Public Water Supply Section will continue to seek in its effort to increase the capacity of all new systems.

Table 1: The Number of Public Water Systems with Maximum Contaminant Level (MCL) and Monitoring (MR) Violations

Calendar Year	Population	Community					Non-Transient Non-Community					Transient Non-Community					Totals				
		Systems	MCL	%	MR	%	Systems	MCL	%	MR	%	Systems	MCL	%	MR	%	Systems	MCL	%	MR	%
1999	< 500	1700	44	3%	483	28%	541	23	4%	174	32%	6038	265	4%	3322	55%	8279	332	4%	3979	48%
(baseline)	500 - 9,999	555	9	2%	154	28%	132	1	1%	28	21%	87		0%	34	39%	774	10	1%	216	28%
	10,000 - 49,999	92	4	4%	15	16%											92	4	4%	15	16%
	≥ 50,000	24	1	4%	2	8%											24	1	4%	2	8%
	Totals	**2371**	**58**	**2%**	**654**	**28%**	**673**	**24**	**4%**	**202**	**30%**	**6125**	**265**	**4%**	**3356**	**55%**	**9169**	**347**	**4%**	**4212**	**46%**
2012	< 500	1465	27	2%	160	11%	346	8	2%	47	14%	3643	189	5%	630	17%	5454	224	4%	837	15%
	500 - 9,999	485	32	7%	54	11%	62			9	15%	56	4	7%	10	18%	603	36	6%	73	12%
	10,000 - 49,999	103	4	4%	7	7%											103	4	4%	7	7%
	≥ 50,000	29		0%	1	3%											29	0	0%	1	3%
	Totals	**2082**	**63**	**3%**	**222**	**11%**	**408**	**8**	**2%**	**56**	**14%**	**3699**	**193**	**5%**	**640**	**17%**	**6189**	**264**	**4%**	**918**	**15%**
2013	< 500	1454	40	3%	153	11%	340	12	4%	41	12%	3551	177	5%	565	16%	5345	229	4%	759	14%
	500 - 9,999	479	29	6%	68	14%	58	1	2%	7	12%	59	7	12%	11	19%	596	37	6%	86	14%
	10,000 - 49,999	105	5	5%	13	12%											105	5	5%	13	12%
	≥ 50,000	29	2	7%	5	17%											29	2	7%	5	17%
	Totals	**2067**	**76**	**4%**	**239**	**12%**	**398**	**13**	**3%**	**48**	**12%**	**3610**	**184**	**5%**	**576**	**16%**	**6075**	**273**	**4%**	**863**	**14%**
2014	< 500	1432	32	2%	116	8%	327	7	2%	42	13%	3459	153	4%	517	15%	5218	192	4%	675	13%
	500 - 9,999	479	31	6%	63	13%	58	3	5%	10	17%	56	3	5%	5	9%	593	37	6%	78	13%
	10,000 - 49,999	105	5	5%	10	10%											105	5	5%	10	10%
	≥ 50,000	29	2	7%	4	14%											29	2	7%	4	14%
	Totals	**2045**	**70**	**3%**	**193**	**9%**	**385**	**10**	**3%**	**52**	**14%**	**3515**	**156**	**4%**	**522**	**15%**	**5945**	**236**	**4%**	**767**	**13%**
2015	< 500	1422	28	2%	99	7%	318	7	2%	30	9%	3391	160	5%	423	12%	5131	195	4%	552	11%
	500 - 9,999	478	27	6%	55	12%	57			9	16%	56			4	7%	591	27	5%	68	12%
	10,000 - 49,999	106	7	7%	10	9%											106	7	7%	10	9%
	≥ 50,000	29		0%	4	14%											29	0	0%	4	14%
	Totals	**2035**	**62**	**3%**	**168**	**8%**	**375**	**7**	**2%**	**39**	**10%**	**3447**	**160**	**5%**	**427**	**12%**	**5857**	**229**	**4%**	**634**	**11%**

Figure 2: Percent of Population Served by Compliant Community Public Water Systems



Year	Population of Community Systems	Percent of Population with No MCL Violations	Percent of Population with No Monitoring Violations
1999	6,641,864	97%	87%
2000	6,687,094	98%	88%
2001	6,711,693	99%	93%
2002	6,699,981	91%	84%
2003	6,724,862	91%	81%
2004	6,717,416	92%	70%
2005	6,733,306	83%	84%
2006	6,890,114	91%	77%
2007	7,099,817	96%	84%
2008	7,326,060	95%	92%
2009	7,439,647	93%	90%
2010	7,913,896	97%	91%
2011	8,027,685	97%	94%
2012	8,093,809	98%	96%
2013	8,180,600	96%	90%
2014	8,289,739	95%	88%
2015	8,344,870	97%	75%

Table 2: Comparison of Public Water Systems Beginning Operation Between 2013 to 2015 and All Active Public Water Systems During the Last Three Years with Contaminant and Monitoring Violations

System Begins (Years)	Compliance Period (Years)	Community						Non-transient non-community						Transient non-community						TOTALS					
		Systems	SS*	MCL	%	MR	%	Systems	SS	MCL	%	MR	%	Systems	SS	MCL	%	MR	%	Systems	SS	MCL	%	MR	%
All Systems 2013-2015	2013-2015	2,076	71%	181	9%	517	25%	402	86%	33	8%	130	32%	3,673	98%	538	15%	1,308	36%	6,151	88%	752	12%	1,955	32%
New Systems that completed the Capacity Development requirements 2013-2015	2013-2015	20	85%	2	10%	5	25%	6	67%	0	0%	2	33%	0	0%	0	0%	0	0%	26	81%	2	8%	7	27%
Found Systems [β] 2013-2015	2013-2015	1	100%	0	0%	0	0%	1	100%	0	0%	1	100%	84	98%	10	12%	38	45%	86	98%	10	12%	39	45%

* *Small Systems (SS)* indicates percent of systems that serve less than 500 persons and operated during the indicated year.

[β] *Found Systems* indicates the number of public water systems identified during this three-year period that were not previously on the PWS Section inventory list. It is anticipated that the number of found systems will increase as PWS Section staff perform more inspections.

Table 3: The Number of Public Water Systems Beginning Operation Between 2008 and 2015 with Contaminant and Monitoring Violations

System Begins (Year)	Compliance Period (Year) ‡	Community						Non-transient non-community						Transient non-community						TOTALS					
		Systems	SS*	MCL	%	MR†	%	Systems	SS	MCL	%	MR	%	Systems	SS	MCL	%	MR	%	Systems	SS	MCL	%	MR	%
2008	2008	20	90%	0	0%	3	15%	5	100%	0	0%	0	0%	48	100%	2	4%	21	44%	73	97%	2	3%	24	33%
	2009	19	89%	1	5%	1	5%	5	100%	0	0%	2	40%	46	100%	4	9%	16	35%	70	97%	5	7%	19	27%
	2010	19	84%	1	5%	1	5%	5	100%	0	0%	2	40%	43	100%	0	0%	6	14%	67	96%	1	1%	9	13%
	2011	19	84%	1	5%	1	5%	4	100%	0	0%	2	50%	42	100%	3	7%	8	19%	65	95%	4	6%	11	17%
	2012	19	84%	2	11%	1	5%	4	100%	0	0%	0	0%	40	100%	3	8%	8	20%	63	95%	5	8%	9	14%
	2013	19	79%	2	11%	1	5%	4	100%	0	0%	2	50%	37	95%	3	8%	5	14%	60	90%	5	8%	8	13%
	2014	16	75%	1	6%	0	0%	3	100%	0	0%	1	33%	37	95%	0	0%	5	14%	56	89%	1	2%	6	11%
	2015	15	73%	1	7%	1	7%	3	100%	0	0%	1	33%	36	94%	0	0%	4	11%	54	89%	1	2%	6	11%
2009	2009	7	100%	0	0%	2	29%	5	100%	0	0%	1	20%	50	100%	2	4%	22	44%	62	100%	2	3%	25	40%
	2010	7	100%	1	14%	0	0%	4	100%	0	0%	1	25%	50	100%	3	6%	15	30%	61	100%	4	7%	16	26%
	2011	7	86%	1	14%	0	0%	4	100%	0	0%	2	50%	47	100%	2	4%	10	21%	58	98%	3	5%	12	21%
	2012	7	86%	0	0%	0	0%	3	100%	0	0%	1	33%	46	100%	3	7%	10	22%	56	98%	3	5%	11	20%
	2013	7	86%	1	14%	2	29%	3	100%	0	0%	0	0%	45	100%	3	7%	8	18%	55	98%	4	7%	10	18%
	2014	6	50%	0	0%	1	17%	3	100%	0	0%	0	0%	43	100%	2	5%	11	26%	52	94%	2	4%	12	23%
	2015	6	50%	0	0%	0	0%	3	100%	0	0%	1	33%	42	100%	2	5%	12	29%	51	94%	2	4%	13	25%
2010	2010	26	85%	0	0%	8	31%	12	75%	1	8%	3	25%	63	100%	1	2%	27	43%	101	93%	2	2%	38	38%
	2011	26	85%	0	0%	3	12%	11	73%	0	0%	3	27%	63	100%	3	5%	14	22%	100	93%	3	3%	20	20%
	2012	25	84%	0	0%	1	4%	9	67%	0	0%	1	11%	56	100%	0	0%	7	13%	90	92%	0	0%	9	10%
	2013	23	87%	0	0%	3	13%	9	67%	0	0%	0	0%	54	100%	2	4%	6	11%	86	93%	2	2%	9	10%
	2014	22	86%	1	5%	2	9%	7	71%	0	0%	0	0%	53	100%	1	2%	8	15%	82	94%	2	2%	10	12%
	2015	22	86%	1	5%	2	9%	7	71%	0	0%	1	14%	52	100%	1	2%	6	12%	81	94%	2	2%	9	11%
2011	2011	13	92%	0	0%	3	23%	6	100%	0	8%	1	17%	59	98%	6	10%	23	39%	78	97%	6	8%	27	35%
	2012	12	92%	0	0%	2	17%	6	100%	0	0%	1	17%	57	98%	6	11%	14	25%	75	97%	6	8%	17	23%
	2013	12	92%	0	0%	0	0%	6	100%	0	0%	1	17%	51	100%	3	6%	7	14%	69	99%	3	4%	8	12%
	2014	12	92%	0	0%	0	0%	6	100%	0	0%	0	0%	49	100%	2	4%	3	6%	67	99%	2	3%	3	4%
	2015	12	92%	0	0%	1	8%	6	100%	0	0%	1	17%	46	100%	3	7%	1	2%	64	98%	3	5%	3	5%
2012	2012	15	73%	0	0%	5	33%	9	89%	0	0%	4	44%	43	98%	4	9%	20	47%	67	91%	4	6%	29	43%
	2013	15	73%	2	13%	0	0%	9	89%	1	11%	4	44%	43	98%	7	16%	11	26%	67	91%	10	15%	15	22%
	2014	15	73%	0	0%	0	0%	9	89%	1	11%	2	22%	37	97%	3	8%	7	19%	61	90%	4	7%	9	15%
	2015	14	79%	0	0%	0	0%	8	88%	0	0%	1	13%	36	100%	2	6%	7	19%	58	93%	2	3%	8	14%
2013	2013	12	83%	0	0%	3	25%	3	67%	0	0%	1	33%	28	93%	4	14%	13	46%	43	88%	4	9%	17	40%
	2014	12	83%	0	0%	2	17%	3	67%	0	0%	2	67%	28	93%	1	4%	9	32%	43	88%	1	2%	13	30%
	2015	12	83%	2	17%	2	17%	3	67%	0	0%	1	33%	27	93%	1	4%	6	22%	42	88%	3	7%	9	21%
2014	2014	4	75%	0	0%	2	50%	2	50%	0	0%	0	0%	25	100%	2	8%	7	28%	31	94%	2	6%	9	29%
	2015	4	75%	0	0%	1	25%	2	50%	0	0%	1	50%	24	100%	1	4%	4	17%	30	93%	1	3%	6	20%
2015	2015	5	100%	0	0%	0	0%	2	100%	0	0%	0	0%	31	100%	3	10%	11	35%	38	100%	3	8%	11	29%

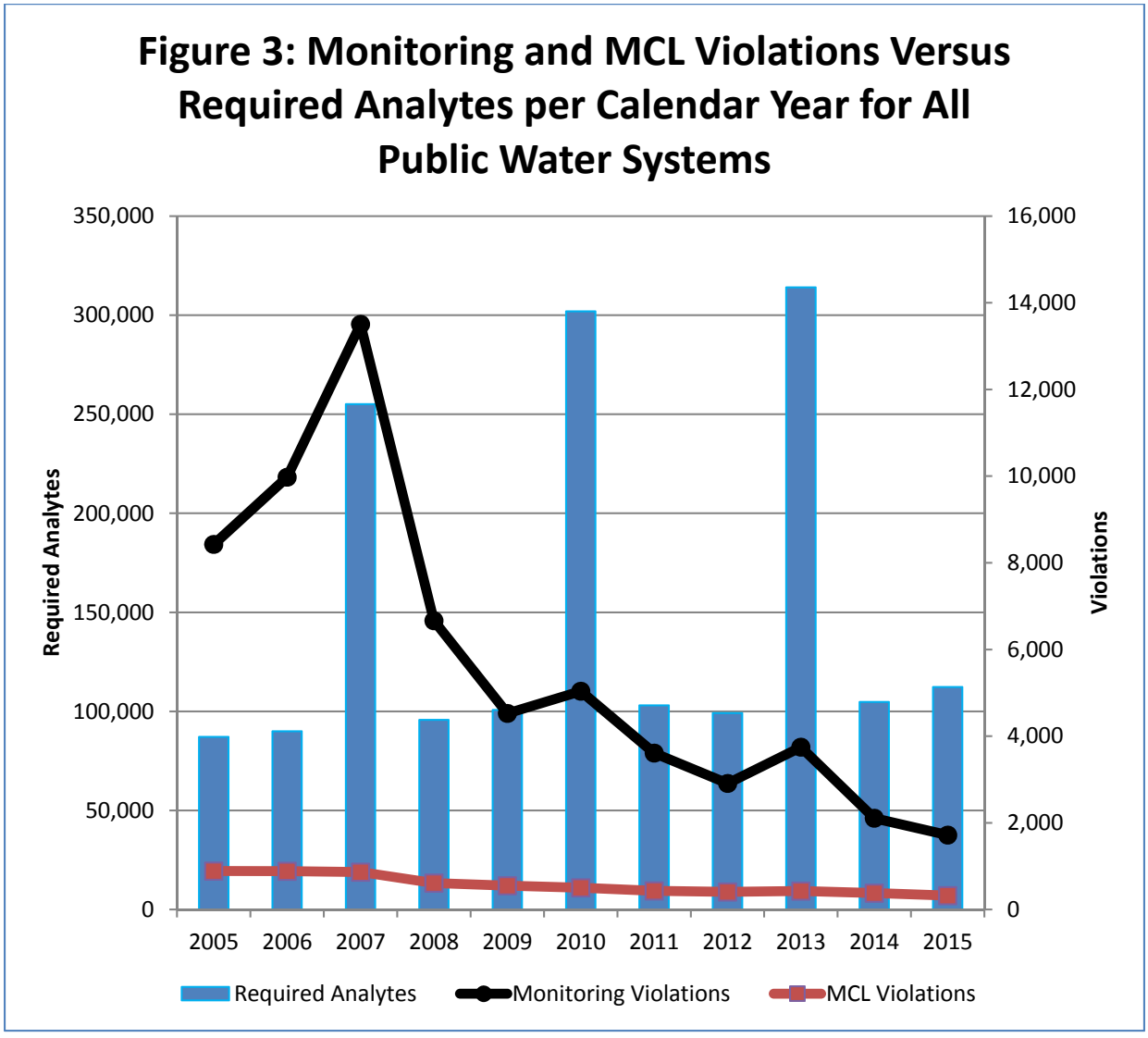
* *Small Systems (SS)* indicates percent of systems that serve less than 500 persons and operated during the indicated year.

† *Compliance Period (Year)* summarizes the number of new systems that remain active and their compliance for each subsequent compliance period. For example, in 2015, only 15 of the 20 community systems that began operation in 2008 were still active.

2.4 Violations versus Required Contaminant Sampling Events

The Public Water Supply Section analyzed contaminant monitoring schedules from 2005 through 2015 with respect to the total number of analytes, since many contaminant schedules include multiple analytes. Each analyte is a chemical compound, element, or specific biological group required for analysis under state and federal rules, and omission of a single analyte results in a violation. Staff compared the number of analytes required for analysis to the number of monitoring and MCL violations issued for each calendar year during 2005 through 2015.

Figure 3 shows the total number of required analytes as bars (referenced by the scale on the left axis) versus the number of monitoring and MCL violations as lines (referenced by the scale on the right axis) issued to water systems during each calendar year. This figure shows that despite the substantial number of analytes required for analysis, the number of violations has decreased markedly since 2005. Many federal drinking water rules require three-year cyclical sampling to be performed and reported by the end of the three-year compliance periods ending in 2007, 2010, 2013, etc. The large increases of required analytes in 2007, 2010 and 2013 are due to these three-year compliance periods. Triennial samples that were not collected in 2007 resulted in the large spike in monitoring violations. The 2010 and 2013 data do not show as significant of a spike, which implies that activities performed by regional office staff, outreach efforts by central office staff, training events hosted by the Public Water Supply Section, and other programs had a positive effect on monitoring compliance. Note that MCL violations dropped from 889 to 323 during the 11-year period.



2.5 Lead and Copper Specific Compliance

In addition to an overall analysis of compliance, the Public Water Supply Section specifically analyzed the number of violations related to lead and copper rule monitoring. Lead and copper are two containments that are not typically found in detectable concentrations leaving water treatment facilities. However, higher levels may be found at customer taps due to the release of lead and copper from pipes and pipe fittings in customer's plumbing containing these materials. The release of lead and copper from pipes and fittings increases when the water produced and sent out into the distribution system is corrosive, so water systems can reduce the amount of lead and copper that is released from customer's pluming by reducing the corrosivity of the water leaving the treatment facility. The intent of the lead and copper rule is to manage the corrosivity of the water such that at least 90 percent of samples are below the action level. When compliant, water systems are considered to be supplying non-corrosive water.

The lead and copper rule requires community and non-transient non-community water systems to collect samples at targeted sites throughout the distribution system based on the plumbing within homes and businesses that each system serves. These targeted sites are selected based primarily on customer plumbing that is suspected to contain lead and/or copper. Samples are collected from the customer's taps to determine the presence of lead and copper in the water, and any detectable concentrations are then compared to the lead and copper "action levels". Unlike many of the other rules enforced by the Public Water Supply Section, the lead and copper rule does not have a specified MCL for lead or copper. Instead, the rule lists lead and copper "action levels", which requires any system that exceeds these levels to take action to reduce the level of lead and/or copper present at customer taps. The action level for lead is 0.015 mg/L, and the action level for copper is 1.3 mg/L. The comparison with the action level for each contaminant is based on the calculated 90^{th} percentile level of all collected samples. The 90^{th} percentile calculation produces a result that will exceed the action level if greater than 10 percent of the individual samples collected are found to be above the action level. If a calculated 90^{th} percentile level of either lead or copper exceeds the action level, a water system will be required to take the following action steps:

- Collect water quality parameter samples at entry points and representative locations within the distribution system. The parameters include pH, alkalinity, conductivity, temperature, calcium, and corrosion inhibitors (if added).
- Collect source water lead and copper samples, and if results warrant, develop a source water treatment recommendation.
- Perform an optimized corrosion control treatment study and develop treatment recommendations.
- Send public education material out to all water system customers (lead only).
- Install corrosion control treatment if the action level continues to be exceeded.

Failure to collect all required lead and copper samples, sampling too late/outside of the monitoring period, or failing to sample at all will result in the issuance of a monitoring violation. Failure to complete any of the required steps in the case of an action level exceedance would also result in the issuance of a monitoring and/or treatment technique violations. In addition, the failure of a system to provide lead consumer notices for all locations where samples were collected, and the failure of larger systems (serving a population greater than 50,000) to maintain water quality parameter results within specified optimal parameters, will also result in violations. A list of all lead and copper rule violations issued by the Public Water Supply Section is provided below.

The Public Water Supply Section issues the following lead and copper rule violations in accordance with the requirements specified in Section .1507 of the *Rules Governing Public Water Systems*:

- Initial Tap Sampling (Type 51) - occurs when a water system fails to correctly collect or report a lead and copper tap sample during the initial 6-month monitoring period.
- Follow-Up or Routine Tap M/R (Type 52) - occurs when a water system fails to correctly collect or report a lead and copper tap sample after the initial 6-month monitoring period.
- Water Quality Parameter M/R (Type 53) - occurs when a water system fails to correctly collect or report water quality parameter samples.
- Initial/Follow-Up/Routine SOWT M/R (Type 56) - occurs when a water system fails to correctly collect or report source water lead and copper samples.
- OCCT/SOWT Recommendation/Study (Type 57) - occurs when a water system fails to provide the Public Water Supply Section with an adequate optimal corrosion control treatment or source water treatment recommendation strategy.
- OCCT/SOWT Install Demonstration (Type 58) - occurs when a water system fails to install an optimal corrosion control treatment or source water treatment system to reduce contamination.
- Public Education (Type 65) - occurs when a water system fails to correctly distribute public education information to customers or report the distribution to the Public Water Supply Section.
- Lead Consumer Notice (Type 66) - occurs when a water system fails to correctly distribute the lead consumer notice to customers or report the distribution to the Public Water Supply Section.

Figure 4 (page 11) shows the results of the lead and copper rule violations analysis from the years 2005 through 2015. The figure displays the total number of lead and copper rule violations for each three-year monitoring period as bars, and each total bar is divided into multiple sections based on the number of each violation type that comprises the total. Beginning in 2009, the Public Water Supply Section began issuing Type 53 and Type 56 violations together with the previously issued Type 57 violations. As can be observed from the figure, the number of type 53 and 56 violations issued are roughly equivalent for the three most recent three-year periods. The three Type 58 violations issued during the three-year period from 2011-2013 were issued based on information collected during site visits made by regional office staff. Type 58 violations are always issued based on information collected by regional staff while physically inspecting water systems during site visits. The number of lead and copper violations shown for the three-year period from 2014 through 2016 is expected to increase as violations are issued for 2016.

Under the lead and copper rule, all water systems are required to tell consumers about the results of lead testing conducted at their homes, even if there is no lead detection as a result of those samples. The Public Water Supply Section began issuing Type 66 violations in 2014 for water systems that failed to meet this requirement. These violations are issued every six months, and are shown separately in Figure 5 (page 12), as they would only be included for the current three-year period from 2014 through 2016 and would have skewed the violation results presented in Figure 4. Lead consumer notice compliance for systems on annual or three-year monitoring is evaluated in the second half of each year, which is clearly shown by the higher bars indicating more required notices during two monitoring periods from July through December. The lack of history with Type 66 violations makes it difficult to define a trend; however, it can be observed from the figure that the number of Type 66 violations issued in 2015 decreased significantly from 2014. A total of 113 Type 66 violations were issued in 2014, while that number dropped to 64 violations in 2015.

Figure 4: Lead and Copper Rule Violation Count per 3-Year Period by Type

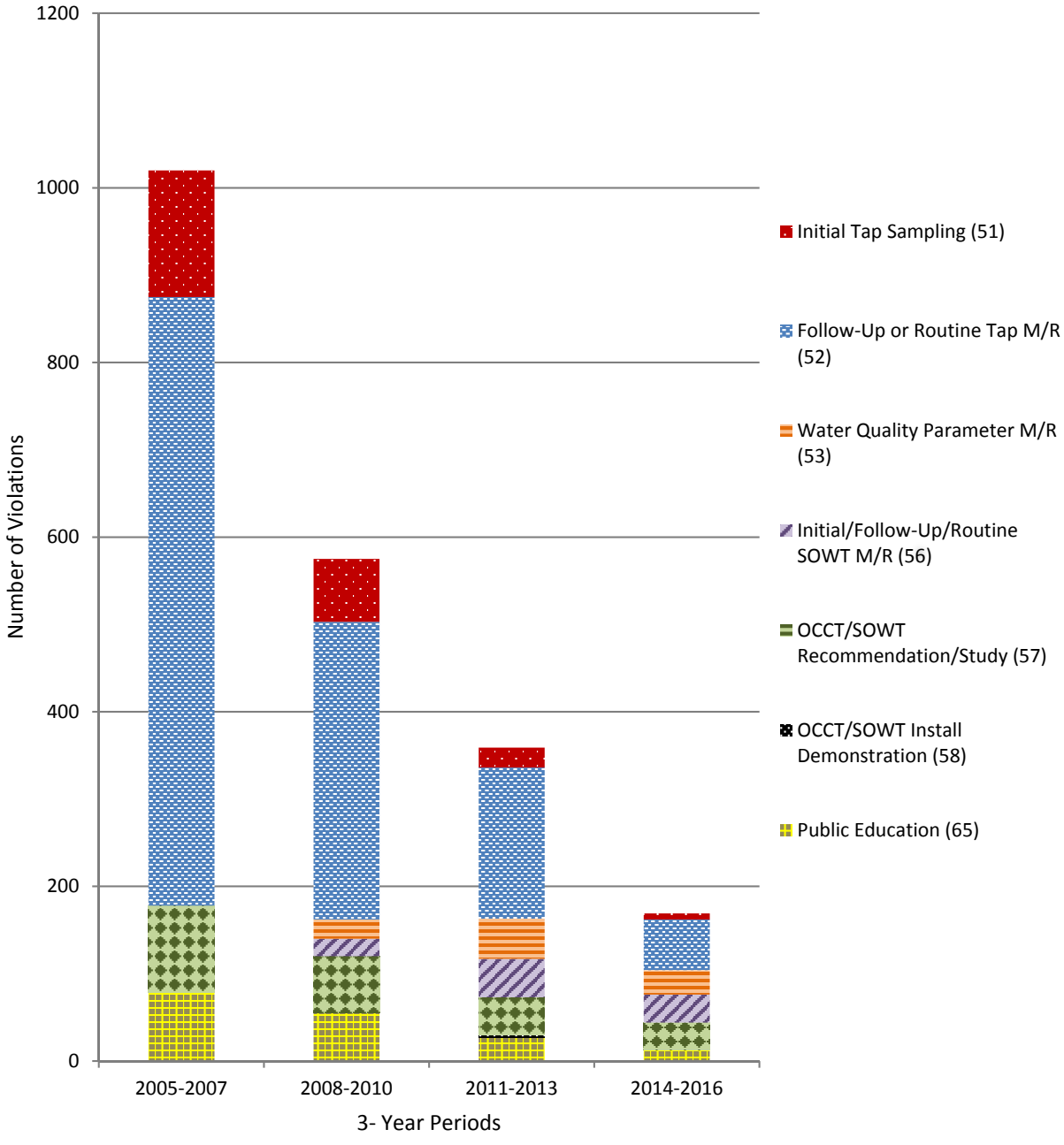
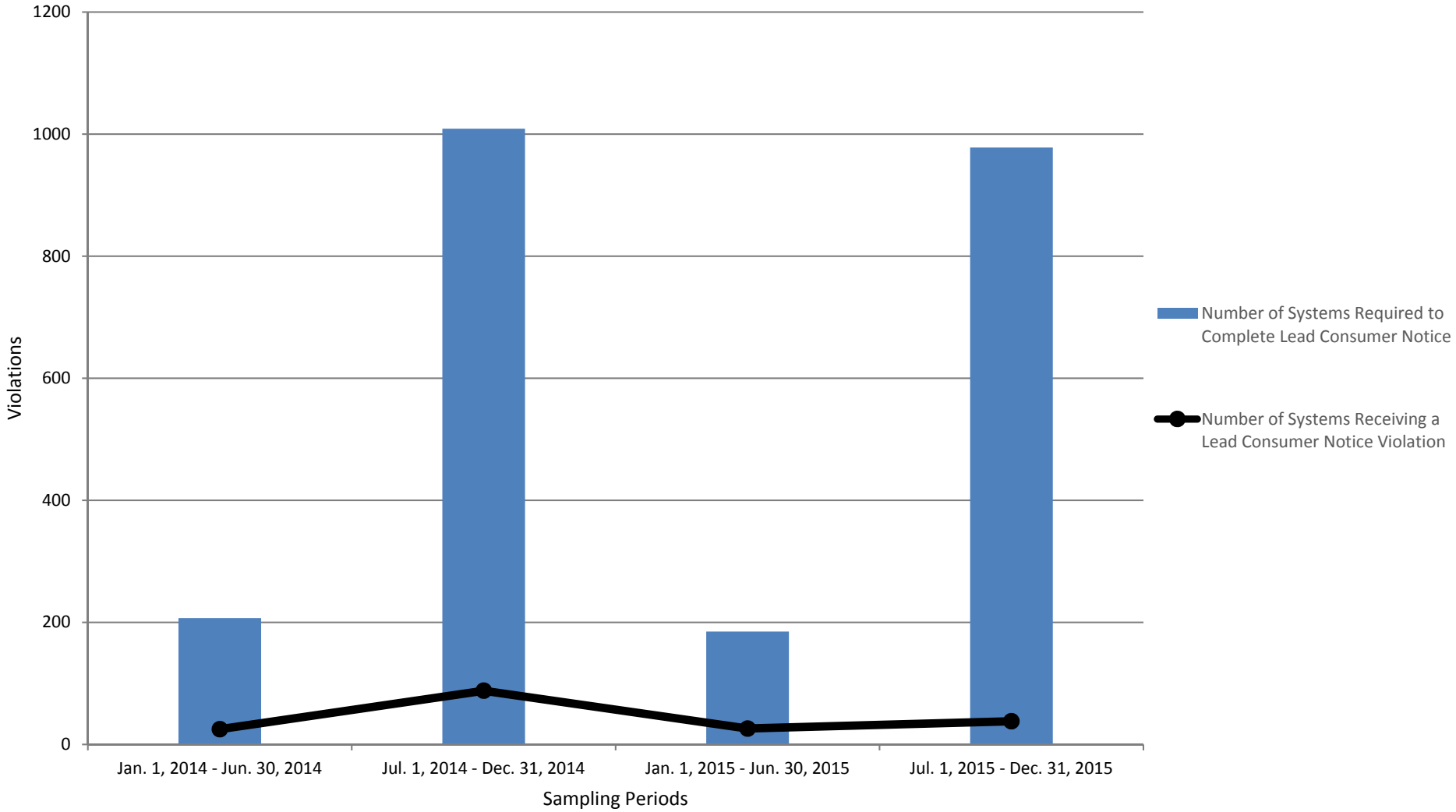


Figure 5: Lead Consumer Notice Violation Count per 6-Month Sampling Period



3.0 Assessing Capacity through Capacity Development Program Objectives

The August 2000 report, "North Carolina's Capacity Development Strategy for Existing Public Water Systems," identified indicators to evaluate the progress of the Capacity Development Program. Below is an excerpt from this report.

> The primary component of North Carolina's Capacity Development Program is an evaluation of technical, managerial and financial capacity during the planning stages of new construction, expansion or system alteration. Therefore, a key indicator of water system capacity is compliance with the requirements specified in Section .0300 of the *Rules Governing Public Water Systems*. Specifically, the Public Water Supply Section uses existing databases to track the following information:
>
> - Number of public water systems with approved plans and specifications,
> - Number of public water systems with a completed water system management plan (WSMP),
> - Number of public water system projects with a submitted engineer's certification that documents the system is constructed in accordance with approved plans and specifications,
> - Number of public water system projects with an applicant certification that documents the system has an operation and maintenance plan and an emergency management plan
> - Number of public water systems that have an appropriate certified operator in responsible charge.
>
> The above information, in addition to compliance information, is used to measure improvements in capacity.
>
> In addition, the Public Water Supply Section tracks the number of water supply intakes with state-approved source water protection plans and/or source water assessments as a measure of improved capacity.

Supporting activities for capacity development include, site visits made by regional office staff, compliance and enforcement, source water protection planning and related activities that encourage local participation in drinking water protection activities, operator certification, and water system infrastructure funding. North Carolina's Capacity Development Program works to facilitate internal coordination between all of these supporting activities in an effort to enhance capacity in all activity areas. An example of this coordination is the Capacity Development Program's development of a sanitary survey report form for regional staff that prepopulates water system information from the state drinking water database. During site visits, regional offices verify the accuracy of inventory information in the database and mark only the changes for each water system. A variety of other reports that were developed also make important data available. The Public Water Supply Section continues to explore ways in which information from these activities can streamline activities and enhance the capacity of regulated water systems.

3.1 Increases in Systems Completing Capacity Development Measures

Table 4 (page 14) is a summary of the numbers of systems that have completed the specific Capacity Development Program activities identified in Section 3.0. This table provides the percent completed compared to the total community and non-transient non-community systems.

By program definition, systems that complete the measures depicted in Table 4 increase their capacity. The systems represented in Table 4, with plans approved, have water infrastructure designed in accordance with applicable rules that help to ensure the water is treated and distributed safely. Systems covered by valid water system management plans have acknowledged their water system policies and have certified that their anticipated budget allows the system to remain viable over time. Systems with applicant certifications for projects have operation and maintenance protocols and emergency management plans. These are used for upkeep of the water system and can be applied during water-related emergencies. Systems with final approval have completed all the capacity development measures for at least one project.

Table 4: Capacity Development Measures

10/1/99 through:	Total Number of Community and Non-transient non-community Systems	Systems with Plans Submitted		Systems with Plans Approved		Systems Covered by Complete Water System Management Plans‡		Systems with Engineer's Certification		Systems with O&M and EM Plans*		Systems with Final Approval**	
		#	%	#	%	#	%	#	%	#	%	#	%
Dec. 31, 2005	2,776	1,310	47.2	1,118	40.3	1,502	54.1	839	30.2	538	19.4	549	19.8
Dec. 31, 2006	2,749	1,399	50.9	1,210	44.0	1,551	56.4	939	34.2	711	25.9	727	26.4
Dec. 31, 2007	2,705	1,477	54.6	1,291	47.7	1,573	58.2	1,076	39.8	995	36.8	954	35.3
Dec. 31, 2008	2,649	1,564	59.0	1,366	51.6	1,597	60.3	1,173	44.3	1,104	41.7	1,077	40.7
Dec. 31, 2009	2,549	1,644	64.5	1,445	56.7	1,584	62.1	1,310	51.4	1,255	49.2	1,247	48.9
Dec. 31, 2010	2,592	1,701	65.6	1,503	58.0	1,614	62.3	1,385	53.4	1,336	51.5	1,328	51.2
Dec. 31, 2011	2,546	1,744	68.5	1,554	61.0	1,620	63.6	1,450	57.0	1,406	55.2	1,398	54.9
Dec. 31, 2012	2,496	1,788	71.6	1,600	64.1	1,625	65.1	1,503	60.2	1,453	58.2	1,452	58.2
Dec. 31, 2013	2,471	1,829	74.0	1,645	66.6	1,638	66.3	1,555	62.9	1,506	60.9	1,508	61.0
Dec. 31, 2014	2,429	1,858	76.5	1,667	68.6	1,630	67.1	1,584	65.2	1,544	63.6	1,539	63.4
Dec. 31, 2015	2,409	1,890	78.5	1,699	70.5	1,628	67.6	1,606	66.7	1,567	65.0	1,563	64.9

*Tank rehabilitation projects do not require an Applicant Certification or a WSMP. A water system may receive final approval for a tank rehabilitation project based on a valid engineer's certification only.

**It is important to note that not all projects are built during the same year that plans are approved and that an authorization to construct is issued. An authorization to construct is valid for a period of two years. Some projects that receive this authorization are not constructed.

‡ The number of systems covered by complete WSMPs has been updated to include multiple systems under single ownership with a master WSMP.

"*Systems with Plans Submitted*" means the number of systems with at least one set of engineering plans and specifications submitted for review during the indicated period.

"*Systems with Plans Approved*" means the number of systems with at least one set of engineering plans and specifications reviewed and approved during the indicated period.

"*Systems with Water System Management Plan Complete*" means the number of systems with at least one WSMP completed during the indicated period.

"*Systems with Engineer's Certification*" means the number of systems having at least one engineer's certification during the indicated period in which a project was constructed according to approved plans and specifications.

"*Systems with O&M and EM Plans"* means the number of systems having at least one applicant certification during the indicated period that a project had an operation and maintenance plan and an emergency management plan.

"*Systems with Final Approval"* means the number of systems meeting all our capacity development requirements during the indicated period and for which a permit to operate was issued.

The Capacity Development Program assures that an increasing number of public water systems have evaluated their capacity in accordance with the program's objectives as discussed in Section 3.0 of this report. From Oct. 1, 1999 through the end of 2015, approximately 1,890 systems submitted 28,2418 projects for review; 1,563 systems achieved final approval status for 19,6750 projects. The Public Water Supply Section sends written correspondence on a monthly basis to systems that have projects approaching their "authorization to construct" deadline and for which no engineer's certification or applicant certification have been received. This correspondence informs the system to submit the required documentation, request an extension of the authorization to construct, or withdraw the application if the project will not be constructed. As of Dec. 31, 2015, approximately 1,628 systems were covered by a water system management plan self-assessment deemed satisfactory by the Public Water Supply Section. Note that one WSMP may include multiple systems under single ownership.

The Public Water Supply Section has received an average of approximately 1,655 project plans per year since the inception of the Capacity Development Program. Section staff either approves the plans or issues comments for plans that do not meet minimum rule requirements. The Public Water Supply Section does not approve all plans submitted. Approximately 9 percent of plans are withdrawn by the applicant or recycled by the Public Water Supply Section due to the applicant's lack of response to comments after an extended period. Section staff sends reminder letters to applicants and provides an opportunity to respond to comments prior to closing the project.

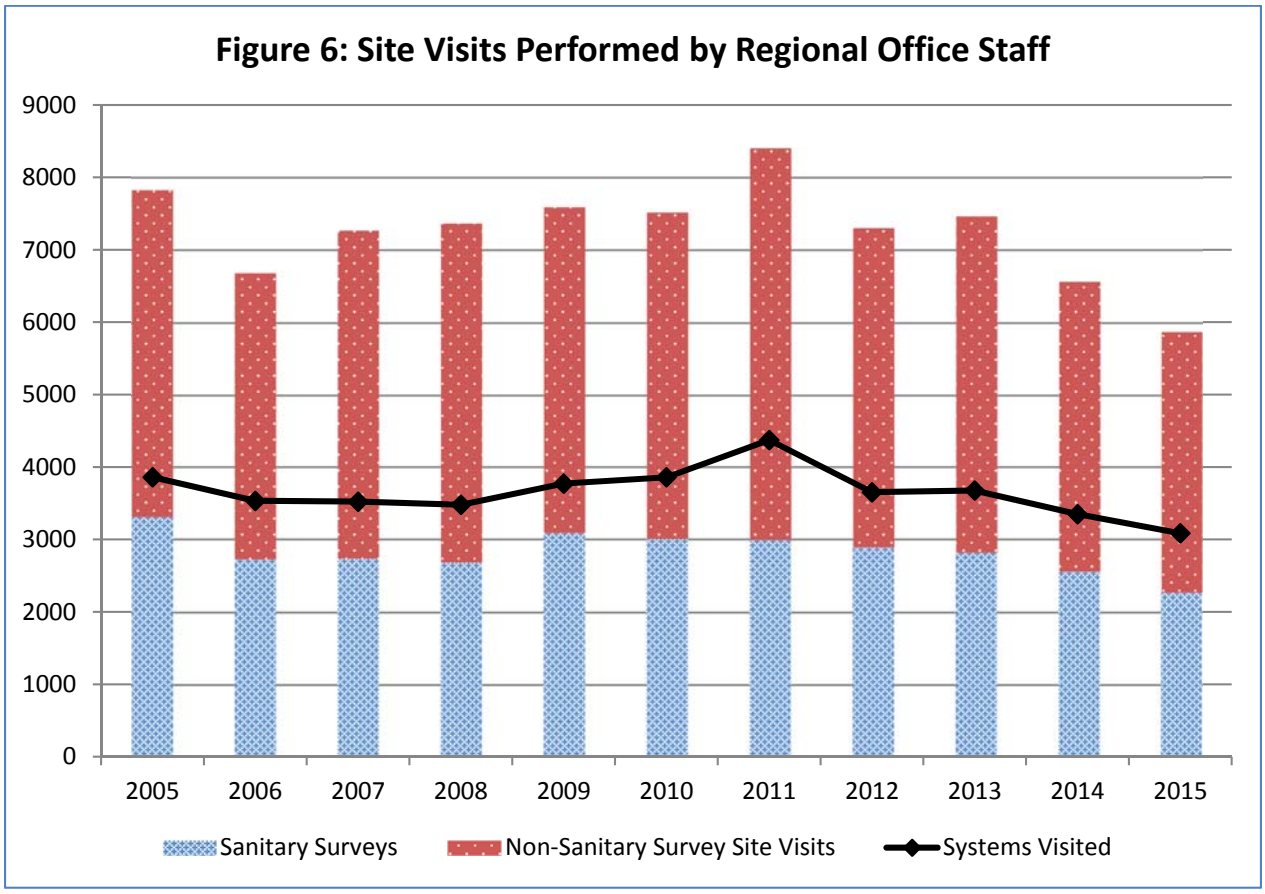
Completion of the Capacity Development Program requirements indicates that a public water system has completed both operation and maintenance plans and emergency management plans. These plans are valuable tools for the proper maintenance of the water system and provide incentive for the system to prepare for emergency and disaster events. With this requirement, the Public Water Supply Section has built a strong foundation regarding recent security concerns and federal requirements for vulnerability assessments and disaster preparedness for public water systems. A potential weakness, however, may be the lack of a requirement to update these plans on a set frequency.

4.0 The PWS Section Regional Offices

The Public Water Supply Section regional offices play a vital role in supporting and maintaining water system capacity throughout the state. Regional office staff provide services that are crucial to increasing water system capacity through better compliance with sampling and engineering infrastructure requirements, and through assistance in addressing contamination. Regional office staff also provide input to improve system management, operations, and operator compliance.

4.1 Site Visits

The seven regional offices provide support primarily through direct, onsite interaction with water systems. The most common reasons for visits are to perform sanitary surveys, provide technical assistance, perform informal and construction inspections, perform investigations regarding violations or complaints, and to provide compliance assistance. As seen in Figure 6, the Public Water Supply Section regional office staff performed approximately 5,873 visits to water systems in 2015, of which 2,260 were sanitary surveys. The solid line depicts the number of systems visited annually and the stacked columns depict the number and type of visits performed per year.



Many site visits focus on customer service and provide assistance regarding technical and regulatory concerns. Public Water Supply Section regional staff often make several visits to a given system during the course of the year to help solve site-specific problems. Of the 3,086 water systems visited in 2015, 1,291 were community systems, which serve nearly 7.6 million consumers.

In 2014, and through 2015, the Public Water Supply Section experienced a turnover of almost 40 percent of the regional staff, primarily due to retirements. These departures included five of the six regional supervisors between February and June of 2014. The process for recruitment and hiring was protracted by causes outside the agency's control, including hiring freeze periods. The turnover in staff, delays in hiring, and necessary new staff training account for the noticeable reduction in number of sanitary surveys and site visits in both 2014 and 2015.

4.1.1 Sanitary Surveys

The sanitary survey is the most comprehensive site visit the regional offices perform. Sanitary surveys are EPA-mandated site visits performed by regional staff to identify deficiencies in technical and managerial capacity. Public Water Supply Section staff evaluate the following aspects of a water system during the sanitary survey:

- Source water,
- Water treatment,
- Distribution system,
- Finished water storage,
- System pumps,
- Monitoring and reporting data verification,
- Management and operations, and
- Operator compliance.

During the sanitary survey, the Public Water Supply Section staff member inspects the water system for approximately 190 potential deficiencies that can exist within the aspects listed above. The deficiency classifications range from significant deficiencies to minor deficiencies to recommendations. All significant and minor deficiencies are rule-based, whereas recommendations represent preferred practice. The regional staff assist water systems by providing technical assistance to correct any deficiencies that exist. Technical and managerial capacity issues are identified and corrected, because of these surveys. Additionally, section staff are able to recommend improvements that have the potential to benefit the water system and improve capacity.

Public Water Supply Section staff perform sanitary surveys at the minimum frequency of surface systems once per year, community well systems every three years, and non-community systems every five years.

4.1.2 Non-Sanitary Survey Site Visits

In addition to sanitary surveys, regional office staff perform other types of visits to water systems. Described below are the most common types of non-sanitary survey site visits.

- Technical Assistance – Staff provide assistance with technical issues that require industry knowledge and expertise. Examples of technical assistance visits include evaluating leaks, well water pump and storage issues, treatment adjustments, and cross connection control.

- Informal System Inspection – These inspections vary in scope and can include updating ownership information, testing residual disinfectant concentration, collecting new well information, reviewing rules with the owner or operator to facilitate compliance and other tasks.

- Construction Inspection – Staff periodically inspect projects under construction to confirm they are constructed in accordance with the approved plans and specifications. Any non-approvable variations noted during construction will have the opportunity to be corrected prior to completion of the project, which helps ensure that approved projects can be placed into service as quickly as possible.

- Investigation – Staff may choose to perform an investigation when a water system receives a violation or if a customer has issued a complaint regarding water service or quality. In the event of a coliform violation, regional staff may help collect samples to determine if the coliform contamination has been abated. Public Water Supply Section staff provide instruction if the water remains positive for coliform. Regional staff provide training to water system representatives for response to other violations. If there are customer complaints, regional staff communicate with the complainant and may collect and analyze water samples if warranted.

- Compliance Assistance – Regional staff provide education and materials to water system representatives to facilitate a return to compliance.

Visits performed by regional office staff help systems improve compliance with sampling and engineering infrastructure requirements, as well as with management, operations and operator compliance concerns.

5.0 The PWS Section Compliance Services Program

The Public Water Supply Section has developed several initiatives that promote improvement of system compliance. The initiatives also improve the issuance and tracking of enforcement activities as well as the overall administration of the Public Water Supply Section's compliance services program. The following initiatives were completed/implemented in 2015:

- Completed rule-making for the Revised Total Coliform Rule, which became effective in North Carolina on July 1, 2015;
- Performed numerous initiatives to prepare for implementation of the Revised Total Coliform Rule. These included the following:
  - Updating Lab Data Submittal electronic submittal software, the Bacti Dashboard electronic submittal software, online Sampling Status Report, and state Public Water Supply Section website to assist water systems with rule implementation;
  - Developing forms, guidance, and training materials, including slide presentations and webinars to aide water systems in the transition to the new rule;
  - Providing numerous presentations/webinars to train regional office staff, water system owners and operators, and laboratory representatives on the requirements of the Revised Total Coliform Rule, including training sponsored by water associations such as the American Water Works Association, NC Rural Water Association, and NC Water Operators Association, as well as State Lab workshops;
  - Performing mass-mailings to inform water system representatives of new rule requirements;
  - Implementing internal processes to ensure that Revised Total Coliform Rule data is collected and recorded in SDWIS;
- Implemented new reporting tools using BusinessObjects Web Intelligence software;
- Stepped up MCL compliance activities to expedite enforcement actions; quarterly compliance reports and focused meetings were performed to determine next enforcement actions and timelines;
- Updated the Consumer Confidence Report template to incorporate various rule requirements and to assist water systems with preparation of their annual reports; and
- Worked with EPA and their contractors on development of new software (SDWIS 3.3, SDWIS Prime, Compliance Monitoring Data Portal) that will enable the Public Water Supply Section to better track and communicate compliance issues.

In addition to these initiatives, the Compliance Services Program continues to:

- Send letters and sample schedules explaining monitoring requirements to all new community and non-transient non-community water systems;
- Notify existing systems of increased or decreased monitoring requirements;
- Send lists of candidates for monitoring violations to regional staff and laboratories in order to reduce the number of notices of violation sent to systems that sampled but did not have results submitted to the Public Water Supply Section;
- Include required forms for public notification as attachments to violation letters and provide other attachments, as necessary, such as public education and lead consumer notice templates and forms for performing lead and copper calculations and corrosion control studies;
- Issue penalties for monitoring violations and issue administrative orders for new MCL and treatment technique violations;
- Inform the Children's Environmental Health Program within the N.C. Department of Health and Human Services of individual sample results that exceed the lead action level so that they can follow-up with the local health department and/or residents accordingly;
- Clarify and revise enforcement letters (notices of violation, administrative orders and administrative penalties) and use standardized templates for their ease of preparation;
- Improve the tracking and follow-up of contaminant violations by carefully reviewing remedial plans submitted by water systems;
- Incorporate remedial plans and public notices into enforcement proceedings;

- Coordinate the review of treatment change proposals with the Plan Review Unit and regional offices to determine potential impact on compliance schedules for contaminant groups such as lead and copper and disinfection byproducts;
- Modify data queries to identify unaddressed violations, identify violations that qualify for return to compliance, and to resolve errors prior to the quarterly submittal of data to the EPA;
- Continue the process of notifying water systems of impending monitoring violations for Total Coliform Rule and other contaminant group violations and began sending email notifications regarding other pending violations to provide better customer communication and improve compliance;
- Step up enforcement on systems with prolonged MCL violations which included "Last Chance" letters followed up with penalties, as necessary;
- Provide system-specific regulatory and engineering consultation for systems intending to perform pilot studies, implement treatment changes or improve compliance with drinking water regulations; and
- Use an automated phone call system and "reminder" emails to remind systems of their upcoming compliance deadlines; calls are specifically used to remind systems of their upcoming Consumer Confidence Report, Public Notification and Lead Consumer Notice deadlines, and for monitoring requirements for the Total Coliform Rule and Lead and Copper Rule.

6.0 PWS Section Support for Water System Infrastructure Funding

The Department of Environmental Quality, through the Drinking Water State Revolving Fund, has increased the capacity of water systems by providing funding mechanisms for capital improvement projects. Funding through the Drinking Water State Revolving Fund is available through low-interest and principal forgiveness loans. Since July 1, 2013, the Drinking Water State Revolving Fund Program has resided in the Division of Water Infrastructure. The Public Water Supply Section and the Drinking Water State Revolving Fund Program cooperate to ensure that funding enhances the capacity of public water systems.

The Public Water Supply Section's role in funding is to:

- Provide input to Drinking Water State Revolving Fund prioritization;
- Determine technical and managerial capacity of applicants for funding;
- Provide additional system specific input to the Drinking Water State Revolving Fund program on request;
- Provide data for Drinking Water State Revolving Fund reporting;
- Participate in the Drinking Water State Revolving Fund Needs Survey by delivering requests and providing technical assistance to water systems; and
- Utilize the 2 percent, 10 percent, and 15 percent set-asides to support capacity development activities as described in the Drinking Water State Revolving Fund Intended Use Plan.

The Drinking Water State Revolving Fund role is discussed further in Section 9.1 of this document.

7.0 Drinking Water Protection

The Public Water Supply Section, through the N.C. Drinking Water Protection Program, offers services to assist in the protection of local drinking water sources. This program is non-regulatory. Water systems may voluntarily participate to improve their current and long-term capacity by implementing proactive steps to reduce potential contamination. The program offers technical assessments of the state's more than 9,000 drinking water sources, and it maintains financial incentives through a network of collaborating state agencies.

7.1 N.C. Drinking Water Protection Program

The Public Water Supply Section continued to improve and implement North Carolina's Drinking Water Protection Program during the reporting period. The Drinking Water Protection Program evaluates the susceptibility to contamination and initiates protective strategies for the state's public drinking water resources. It is the only statewide program with an exclusive concentration on proactive drinking water source protection. Activities include delineation and assessment of drinking water sources, wellhead and surface water protection, coordination with other state agencies, and initiation of new programs designed to encourage local Drinking Water Protection Program efforts. These activities encourage public water systems to protect their water sources, supporting a multi-barrier approach to drinking water protection. Systems that maintain drinking water sources that are less susceptible to contamination may achieve greater financial and technical capacity because fewer resources may be expended for water treatment.

Partnership arrangements with other agencies and programs are a major component of the Public Water Supply Section's drinking water protection strategy. Specifically, other agencies integrate Drinking Water Protection Program data into their agendas and funding priorities. The Drinking Water Protection Program maintains relationships with agencies that fund agricultural best management practices, stormwater best management practices, land conservation, and stream restoration projects. Additionally, the N.C. Drinking Water Protection Program continued to facilitate a statewide collaborative that includes representatives from university programs, government agencies, non-profit organizations, professional associations, and regional councils of government. This diverse and semi-autonomous group has agreed to provide expertise and resources to implement strategies that encourage Drinking Water Protection activities.

In 2015, the N.C. Source Water Collaborative launched its source water protection awards program. The awards program has fostered new partnerships with two well established watershed focused organizations. Awards are presented at the organizations' joint spring conference. Eight source water protection awards were presented in 2015, representing three of the six award categories. A press release was also created to further acknowledge the awardees. The awards program is expected to continue on an annual basis.

The Drinking Water Protection Program continued to improve the functionality of its GIS mapping applications, which exist to assist local governments, water system owners, volunteer organizations and other agencies with information vital to protect drinking water. Susceptibility ratings and associated assessment results are critical components of this data and are summarized in reports made available via the Public Water Supply Section's geographic information application, currently offline. Additionally, agencies enlisting drinking water protection as a priority item within their own environmental programs use the Public Water Supply Section's GIS locator to help locate and prioritize environmental projects. To see the GIS locator, go to: http://map.ncdenr.org/pws.

The Drinking Water Protection Program promotes and provides technical expertise to assist communities with local source water protection planning. The program uses a successful seven-step process across the state to protect both ground and surface water sources. To date, the Public Water Supply Section has approved eight local surface water protection plans, which serve to protect drinking water for approximately 289,000 people. The source water protection planning process empowers local stakeholders to define and achieve long-term, proactive drinking water protection goals.

In 2014, state legislation (House Bill 894) was passed, amending G.S. 130A-320 to mandate surface water protection planning. Due to its existing voluntary surface water protection planning process, the Drinking Water Protection Program was assigned the task of implementing the legislation. The regulation mandates the development and implementation of surface water protection plans for public water systems treating and furnishing water from surface supplies. A voluntary stakeholder team of over 70 professionals has met twice to provide guidance and recommendations regarding standardized surface water protection planning formats and to help identify mandatory provisions for implementation. The team will also critique draft rule language. Stakeholders represent professional associations, non-profit organizations, councils of government, local government and local utilities, state and federal agencies, and industry representatives. Staff are currently developing draft rule language with stakeholder involvement.

7.2 N.C. Wellhead Protection Program

The Safe Drinking Water Act Amendments of 1986 established requirements for states to develop wellhead protection programs. Congress intended these programs to be a key part of a national groundwater protection strategy, which prevents contamination of groundwater used for public drinking water. North Carolina's EPA-approved Wellhead Protection Program is part of this national strategy. The Wellhead Protection Program is a voluntary pollution prevention and management program designed to protect groundwater sources of public drinking water supply. Public water systems that choose to participate in the program develop and submit a local wellhead protection plan to the Public Water Supply Section for review and approval.

In North Carolina, development of a local wellhead protection plan is viewed as a valuable supplement to existing state groundwater protection programs. The Public Water Supply Section's Wellhead Protection Program is for public water systems that decide to provide added protection to their local groundwater supplies. Upon implementation, the local wellhead protection plan reduces the susceptibility of wells to contaminants. The reduction of susceptibility to contamination increases the capacity for water systems to provide compliant drinking water by reducing the need to install costly treatment options to remove contaminants.

The Public Water Supply Section approved 12 wellhead protection plans comprising 12 water systems during the current reporting period. Of these plans, eight were renewals of previously approved plans. At the end of the current reporting period, there were 141 active wellhead protection plans covering 158 public water systems with 918 public water supply wells serving approximately 943,000 people. The Public Water Supply Section expects these plans will assist in reducing the susceptibility of these sources of public drinking water to contamination.

In addition to the review of completed wellhead protection plan submittals, the Wellhead Protection Program reviewed draft wellhead protection area delineations submitted by public water systems in the early stages of plan development. This allows the systems to receive tentative approval of their wellhead protection areas prior to proceeding with development of the remaining plan components (*i.e.*, potential contamination source inventory, management plan, etc.), which could be impacted by changes to the wellhead protection areas.

The Wellhead Protection Program continued to provide support to the state's Source Water Assessment Program and the Drinking Water Protection Program. Program support included review of work products and analysis relevant to delineation and assessment activities participation in the Source Water Collaborative, as well as assisting in the generation of Source Water Assessment Program reports.

8.0 Operators Certification Program

The N.C. Water Treatment Facility Operators Certification Board has authority to oversee the examination of water system operators and the certification of their competency to operate drinking water system facilities. The N.C. Operator Certification Program, located within the Public Water Supply Section of the Division of Water Resources, provides support to serve the Board and implement its policies. Program staff perform a variety of functions that include: administering statewide examinations, approving continuing education opportunities, managing database and state records, providing training and outreach, collecting fees, participating in the enforcement of Rules Governing Water Treatment Facility Operators (Title 15A Subchapter 18D), and conducting an annual renewal process. North Carolina currently has approximately 5,300 certified water system operators with more than 7,400 active certifications.

The N.C. Operator Certification Program continues to increase the capacity of public water systems by influencing the technical training and increasing the competency of public water system operators. In 2015, changes were initiated to improve business efficiency and to expand customer services to the state's certified operator community. An online portal to access personal information from the operator database has been welcomed and utilized by a majority of certified operators. Approximately 14 percent of operators paid the annual renewal fee utilizing the new web-based electronic payment mechanism. This percentage is expected to increase as operators become more familiar with the portal. A scheduling system and procedures for effective utilization of training and on-demand examination room are being developed at present. It is hoped that computer-based testing might begin before the end of 2016. Additionally, significant changes were made to the Operator Certification Program website to allow for a more user-friendly interface and to achieve consistency with other Division of Water Resources websites.

9.0 Partnerships

The Public Water Supply Section engages in voluntary and contractual partnerships to enhance capacity development efforts in North Carolina. Cooperation with the Division of Water Infrastructure ensures that federal funds help increase capacity for public water systems. Participation with U.S. EPA's Area-Wide Optimization Program and contracts with the N.C. Rural Water Association and the UNC School of Government Environmental Finance Center serve to augment the already substantial efforts put forth by the Public Water Supply Section.

9.1 Drinking Water State Revolving Fund

The Drinking Water State Revolving Fund is administered by the Division of Water Infrastructure within the North Carolina Department of Environmental Quality. Water systems apply to the Drinking Water State Revolving Fund Program for water infrastructure funding. The Division of Water Infrastructure prioritizes the applications and funds the highest priority projects. The Drinking Water State Revolving Fund Program increases capacity for water systems by promoting the following short-term objectives:

- Provide loans to reduce acute health risks;
- Provide loans to enable water systems with the adequate capacity to consolidate non-viable water systems;
- Provide funding for preventative and efficiency measures, such as replacement of aging infrastructure; and
- Provide technical assistance for small systems.

The Drinking Water State Revolving Fund Program also increases capacity for water systems by promoting the following long-term objectives:

- Increase the percent of population served by safe public water systems;
- Increase the safety of public water systems;
- Promote safe and affordable drinking water by reducing costs associated with capital improvements;
- Assist water systems to remain compliant with increasingly complex rules under the *Safe Drinking Water Act*; and
- Ensure technical integrity of the proposed water system improvements, advocate self-sufficiency, protect water resources from new pollution sources and promote sustainability.

As of the end of Fiscal Year 2016, approximately $647 million of Drinking Water State Revolving Fund Program funds were committed to systems in the form of low-interest and principal forgiveness loans. The Drinking Water State Revolving Fund Program continually increases its ability to provide low-interest loans to water systems through federal capitalization grants, the required 20 percent state match and the repayment-funding stream of revolving loans.

9.1.1 Failing System Loans

Some systems, especially small systems, lack the resources to consistently provide safe drinking water to the public as the *Safe Drinking Water Act* requires, resulting in long-term noncompliance. Principal forgiveness loans are available to water systems having adequate capacity that take over such a failing system. In most cases, the project includes connecting the failing system to the rescuing system and replacing the distribution system in the failing system. Currently, the Drinking Water State Revolving Fund Program is working to consolidate three non-viable public water systems serving about 671 consumers. Completion of these consolidation projects will give these consumers access to water systems with greater capacity. By these efforts, the Drinking Water State Revolving Fund Program has previously consolidated 24 failing systems since the program's inception in 2004.

9.2 Area-Wide Optimization Program

The Area-Wide Optimization Program is a joint program between the EPA and the states. EPA developed the program to help water systems meet increasingly stringent regulations and achieve higher levels of water quality. The Public Water Supply Section has participated in the Area-Wide Optimization Program since 2000 and works cooperatively with water systems to use existing equipment and treatment processes to improve or optimize water quality.

A typical scenario under the Area-Wide Optimization Program is for Public Water Supply Section employees, Area-Wide Optimization Program participants from other states, regulatory programs, representatives from the EPA, and the water system operators to optimize the water treatment processes of a water system that has volunteered to host the Area-Wide Optimization Program activities. These activities enhance capacity by optimizing the capabilities of the volunteering water system while allowing all Area-Wide Optimization Program participants to share and increase their knowledge of water treatment facilities.

In 2015, Area-Wide Optimization Program team members were involved in many outreach activities at water systems throughout the state. North Carolina Area-Wide Optimization Program staff coordinated a chloramines distribution system comprehensive performance evaluation in Archdale, and also participated in comprehensive performance evaluations in other states.

The Public Water Supply Section has awarded 56 water treatment facilities the 2015 Area-Wide Optimization Program Award for optimized treatment. Public Water Supply Section regional staff generally present these awards in the presence of the governing body of the water system. The Public Water Supply Section awards water systems each year that demonstrate outstanding turbidity and microbial removal and for meeting performance goals that are more stringent than the state and federal drinking water standards. Water systems meet these goals by increased surveillance, by reducing treatment fluctuations, and by maintaining excellent coagulation and filter performance. By reaching this level of optimized performance, employees of these water systems have demonstrated their dedication to provide their customers with the best possible drinking water quality. Providing public recognition of these awards builds elected officials' support with the utility staff activities and may help expand the number of participating systems.

9.3 UNC School of Government Environmental Finance Center

The Public Water Supply Section, through partnership with the UNC School of Government's Environmental Finance Center, has assisted in the establishment and strengthening of partnerships and collaboration between water systems, maintaining sustainable finances and rate setting. The Environmental Finance Center updated deliverables from previous contracts and executed new projects.

The Environmental Finance Center is currently working with the PWS Section on the following projects:

- Assessing the managerial capacity of water systems in North Carolina and ranking systems in terms of their managerial capacity needs;
- Training to assist water systems with managerial capacity needs; and
- Assessing the feasibility of water system management partnerships.

The projects under development will assist water systems with financial planning and enable the Public Water Supply Section to increase the financial capacity of water systems in North Carolina.

9.4 N.C. Rural Water Association

The Public Water Supply Section has a contractual agreement with the N.C. Rural Water Association for circuit riders to provide technical assistance to water systems that serve less than 10,000 people. A circuit rider receives system referrals from the Public Water Supply Section and requests for assistance from other sources. During the reporting period, the circuit riders completed 871 contacts to systems with issues such as compliance and treatment, operation and maintenance, water loss and leak detection, management techniques and emergency response. Circuit riders conduct initial visits to referred water systems to explain monitoring requirements and to enhance the systems' ability to meet all regulatory requirements.

10.0 Conclusion

Water system compliance has increased significantly since the Public Water Supply Section started implementing the capacity development strategies discussed in this report. During this time, implementation of several federal drinking water rules occurred. This initiated additional sampling requirements and new MCLs, resulting in a more complex regulatory environment for water systems. The Public Water Supply Section continues to add new initiatives to improve compliance. Compliance with sample collection and monitoring requirements has increased from 55 percent of systems in 1999 to 89 percent of systems in 2015, while compliance with MCLs has remained roughly constant during that period. Due in part to the efforts of Public Water Supply Section staff, drinking water from regulated public water systems in North Carolina has never been safer.

The Public Water Supply Section focuses the intent of all activities to increase water system compliance and the protection of public health. Some of these include:

- Regional office site visits,
- Central and regional office-facilitated and conducted trainings and outreach activities,
- Review and approval of water system infrastructure plans,
- Certification and training of water system operators, and
- Partnerships with other institutions to increase system outreach activities and develop tools to aid in achieving and maintaining compliance.

The Public Water Supply Section believes these activities result in safer water for consumers throughout the state by providing an ever-growing percentage of systems that meet all monitoring requirements and contaminant standards. These activities will continue to be crucial to achieving and maintaining water system compliance with drinking water rules.

Appendix A

Table A.1: Schedule of New Rule Implementation by EPA

Calendar Year	Rule	New Monitoring Requirements	New Level (MCL or Treatment Technique) Requirements	System Description
2002	Arsenic		MCL lowered from 0.05 mg/l to 0.01 mg/l	CWS, NTNC
2002	Disinfectants and Disinfection Byproducts Rule (DDBP)	THM and HAA quarterly sampling	THM MCL lowered from 0.10 mg/L to 0.080 mg/L as a running annual average (RAA). HAA MCL established at 0.060 mg/L as RAA.	CWS, NTNC Subpart H, population ≥ 10,000
2002	DDBP	Disinfectant residual monthly sampling (with total coliform rule schedule)	Chlorine and chloramines maximum residual disinfectant level established at 4.0 mg/L as RAA.	CWS, NTNC Subpart H, population ≥ 10,000
2002	DDBP	Total organic carbon (TOC) monthly monitoring	Treatment technique for TOC removal; ratio of actual to required removal ≥ 1.00 as RAA.	CWS, NTNC Subpart H, population ≥ 10,000
2002	DDBP	Bromate monthly monitoring	Bromate < 0.010 as RAA.	CWS, NTNC Subpart H using ozone, population ≥ 10,000
2002	Interim Enhanced Surface Water Treatment Rule (IESWTR)	Profiling and benchmarking		All system types Subpart H, population ≥ 10,000
2002	IESWTR	Turbidity	Maximum turbidity level lowered from 5 NTU to 1 NTU. 95% turbidity level lowered from 1 NTU to 0.3 NTU.	All system types Subpart H, population ≥ 10,000
2004	DDBP	THM and HAA quarterly or annual sampling	THM MCL lowered from 0.10 mg/L to 0.080 mg/L as RAA. HAA MCL established at 0.060 mg/L as RAA.	CWS, NTNC Subpart H including populations < 10,000; Groundwater
2004	DDBP	Disinfectant residual monthly sampling (with TCR schedule)	Chlorine and chloramine maximum residual disinfectant levels established at 4.0 mg/L as RAA.	CWS, NTNC Subpart H including populations < 10,000; Groundwater
2004	DDBP	TOC monthly monitoring	Treatment technique for TOC removal; ratio of actual to required removal ≥ 1.00 as RAA.	CWS, NTNC Subpart H including populations < 10000
2004	DDBP	Bromate monthly monitoring	Bromate < 0.010 as RAA.	CWS, NTNC Subpart H including populations < 10,000; Groundwater

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Table A.1 cont'd: Schedule of New Rule Implementation by EPA

Calendar Year	Rule	New Monitoring Requirements	New Level (MCL or Treatment Technique) Requirements	System Description
2005	Long Term 1 Surface Water Treatment Rule (LT1SWTR)	Profiling and benchmarking		All system types Subpart H, populations < 10,000
2005	LT1SWTR	Turbidity	Maximum turbidity level lowered from 5 NTU to 1 NTU. 95% turbidity level lowered from 1 NTU to 0.3 NTU.	All system types Subpart H, populations < 10,000
2008	Radionuclides	Radium 228, monitored at each entry point	Although new radionuclides monitoring requirements do not take effect until 2008, a number of systems began monitoring early in order to grandfather data. Early monitoring led to additional MCL violations.	CWS
2009	Ground Water Rule	Microbial source water monitoring	Introduces source water monitoring requirements and treatment technique requirements for groundwater systems.	All system types Not Subpart H
2012	Stage 2 Disinfectant / Disinfection Byproducts Rule (Schedule 1 and 2 systems)	Location-specific sampling points in the distribution system	MCLs and regulated contaminants do not change but compliance is calculated by locational running annual average. Every sampling site must be compliant with MCL.	CWS and NTNC, populations ≥ 50,000 and purchasing systems
2013	Stage 2 Disinfectant / Disinfection Byproducts Rule (Schedule 3 and 4 systems)	Location-specific sampling points in the distribution system	MCLs and regulated contaminants do not change but compliance is calculated by locational running annual average. Every sampling site must be compliant with MCL.	CWS and NTNC, populations ≤ 49,999
2014	Stage 2 Disinfectant / Disinfection Byproducts Rule (Required *Cryptosporidium* monitoring systems)	Location-specific sampling points in the distribution system	MCLs and regulated contaminants do not change but compliance is calculated by locational running annual average. Every sampling site must be compliant with MCL.	CWS and NTNC systems required to collect *Cryptosporidium* samples under §141.701(a)(4) or (a)(6)
2016	Revised Total Coliform Rule (RTCR)	Number of repeat and additional routine samples standardized	Level 1 and Level 2 assessments replace treatment technique violations for the presence of total coliform.	All system types