

NICHOLAS COUNTY WATER DISTRICT

1639 OLD PARIS RD

CARLISLE, KY 40311

859-289-3157

May 11, 2020

Mr. Roy Gray

Utility Regulatory & Safety Investigator

Public Service Commission

211 Sower Boulevard

P.O. Box 615

Frankfort, KY 40602

RE: Periodic Water Inspection

Nicholas County Water District

Dear Mr. Gray:

Nicholas County Water District (NCWD) is in receipt of your Periodic Water Inspection letter dated February 24, 2020. Accordingly, is NCWD's response to the deficiencies:

1. *Utility did not have written inspection records as required by 807 KAR 5:006 Section 26(6)(b). for hydrants, valves, and vehicles.*

NCWD has started documenting when it inspects its valves, meters, and meter settings. During the inspection any issues with the hydrants, valves, and vehicles will be documented and a work order will be created.

2. *Nicholas County Water District is not in compliance with the Division of Water as required in 807 KAR 5:066, Section 3(1).*


Please see the enclosed corrective action plan that has been submitted and accepted by the Division of Water.

3. *Utility has master meters that have not been tested as specified in 807 KAR 5:066, Section 16(1). (4" meters over one year).*

NCWD has scheduled to have the meter(s) that it purchases water from Buffalo Trail Water Association tested. The other meters it purchases water from (City of Carlisle, Western Fleming County Water District, and Kentucky American Water) NCWD has requested the meter test results be made available. The Harrison County Water Association master meter where NCWD wholesales water a similar request has been made.

If you have any questions, please do not hesitate to contact me.

Sincerely,



Kirk Robinson

Distribution Operator

Enclosures:

Response to Division of Water Agreed Order

Nicholas County Water District Corrective Action Plan Case Number DOW 160339 February 18, 2019

This corrective action plan is designed to take advantage of all available resources to address disinfection by-product issues from the source to distribution. This plan describes the actions that the District has taken to maintain five consecutive quarters in compliance.

Background:

Nicholas County Water District (NCWD) serves a population of 3,478 through 1,554 service connections. The distribution system consists of 187 miles of water line connected to five pump stations and three storage tanks with a combined capacity of 390,000 gallons. The average daily demand is approximately 366,9200 gallons purchased from four water suppliers.

The area of the system out of compliance is the Concord tank zone. This area consists of approximately 33 miles of distribution main serving 200 customers. Pressure is maintained by variable speed pumps and 100,000-gallon standpipe tank. The average daily demand is approximately 32,000 gallons purchased from Carlisle Water Department.

NCWD began monitoring for disinfection by-products in 2013. Since that time NCWD has been under an Agreed Order in 2016 for Stage 2 HHA non-compliance at both sites. Carlisle Water Department was also under an Agreed Order at the same time. Following seven consecutive quarters in compliance NCWD is out of compliance at site SM2 sourced by Carlisle. The compliance history for both systems are shown below.

Nicholas County HAA Compliance History																								
Site	Source	HAA mg/L	11/5/13	2/4/14	5/5/14	8/4/14	11/3/14	2/2/15	5/4/15	8/4/15	11/5/15	2/2/16	5/3/16	8/2/16	11/9/16	2/7/17	5/2/17	8/9/17	11/7/17	2/6/18	5/8/18	8/6/18	11/6/18	2/5/19
			4Q13	1Q14	2Q14	3Q14	4Q14	1Q15	2Q15	3Q15	4Q15	1Q16	2Q16	3Q16	4Q16	1Q17	2Q17	3Q17	4Q17	1Q18	2Q18	3Q18	4Q18	1Q19
SM2	Carlisle	Result	0.038	0.057	0.111	0.04	0.043	0.048	0.053	0.081	0.070	0.042	0.041	0.059	0.031	0.066	0.081	0.047	0.061	0.088	0.043	0.076	0.054	0.070
		LRAA	-	-	-	0.062	0.063	0.061	0.046	0.056	0.063	0.062	0.059	0.053	0.043	0.049	0.059	0.056	0.064	0.069	0.060	0.067	0.065	0.061
SM4	Western	Result	0.074	0.038	0.077	0.058	0.04	0.046	0.101	0.045	0.055	0.043	0.044	0.055	0.037	0.023	0.029	0.044	0.045	0.022	0.040	0.067	0.029	0.014
		LRAA	-	-	-	0.062	0.053	0.055	0.061	0.058	0.062	0.061	0.047	0.049	0.045	0.040	0.036	0.033	0.035	0.035	0.038	0.044	0.040	0.038

Compliance based upon the LRAA <= 0.060 mg/L

Nicholas County THM Compliance History																								
Site	Source	THM mg/L	11/5/13	2/4/14	5/5/14	8/4/14	11/3/14	2/2/15	5/4/15	8/4/15	11/5/15	2/2/16	5/3/16	8/2/16	11/9/16	2/7/17	5/2/17	8/9/17	11/7/17	2/6/18	5/8/18	8/6/18	11/6/18	2/5/19
			4Q13	1Q14	2Q14	3Q14	4Q14	1Q15	2Q15	3Q15	4Q15	1Q16	2Q16	3Q16	4Q16	1Q17	2Q17	3Q17	4Q17	1Q18	2Q18	3Q18	4Q18	1Q19
SM2	Carlisle	Result	0.064	0.055	0.086	0.089	0.075	0.053	0.039	0.114	0.086	0.046	0.067	0.076	0.057	0.077	0.134	0.063	0.078	0.050	0.036	0.091	0.049	0.050
		LRAA	-	-	-	0.074	0.076	0.076	0.064	0.070	0.073	0.071	0.078	0.069	0.062	0.069	0.086	0.083	0.088	0.081	0.057	0.064	0.057	0.057
SM4	Western	Result	0.068	0.042	0.065	0.086	0.061	0.059	0.078	0.045	0.052	0.044	0.039	0.061	0.062	0.031	0.043	0.060	0.048	0.018	0.037	0.058	0.035	0.019
		LRAA	-	-	-	0.065	0.064	0.068	0.071	0.061	0.059	0.055	0.045	0.054	0.057	0.053	0.054	0.049	0.046	0.042	0.041	0.040	0.037	0.037

Compliance based upon the LRAA <= 0.080 mg/L

Carlisle HAA Compliance History																						
Site	HAA mg/L	11/11/13	2/10/14	5/12/14	8/11/14	11/10/14	2/27/15	5/11/15	8/10/15	11/9/15	2/8/16	5/9/16	8/8/16	11/14/16	2/13/17	5/8/17	8/14/17	11/13/17	2/12/18	5/16/18	8/14/18	11/12/18
		4Q13	1Q14	2Q14	3Q14	4Q14	1Q15	2Q15	3Q15	4Q15	1Q16	2Q16	3Q16	4Q16	1Q17	2Q17	3Q17	4Q17	1Q18	2Q18	3Q18	4Q18
SM3	Result	0.13	0.064	0.116	0.032	0.04	0.026	0.065	0.078	0.091	0.080	0.022	0.065	0.036	0.051	0.063	0.028	0.063	0.028	0.048	0.047	0.030
	LRAA	-	-	-	0.086	0.063	0.054	0.041	0.052	0.065	0.079	0.071	0.063	0.045	0.042	0.042	0.044	0.051	0.050	0.048	0.047	0.042
SM4	Result	0.115	0.063	0.098	0.026	0.026	0.024	0.059	0.062	0.088	0.067	0.041	0.029	0.027	0.057	0.071	0.009	0.050	0.066	0.034	0.057	0.042
	LRAA	-	-	-	0.076	0.053	0.044	0.034	0.043	0.058	0.069	0.065	0.056	0.041	0.039	0.046	0.041	0.047	0.049	0.040	0.052	0.050

Compliance based upon the LRAA <= 0.060 mg/L

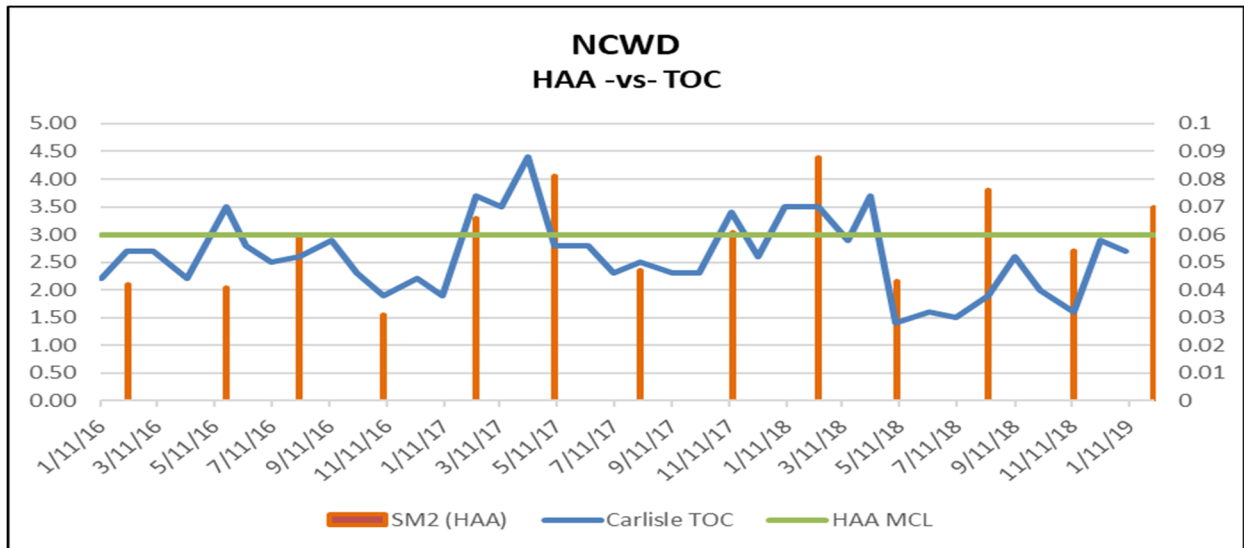
Carlisle THM Compliance History																						
Site	THM mg/L	11/11/13	2/10/14	5/12/14	8/11/14	11/10/14	2/27/15	5/11/15	8/10/15	11/9/15	2/8/16	5/9/16	8/8/16	11/14/16	2/13/17	5/8/17	8/14/17	11/13/17	2/12/18	5/16/18	8/14/18	11/12/18
		4Q13	1Q14	2Q14	3Q14	4Q14	1Q15	2Q15	3Q15	4Q15	1Q16	2Q16	3Q16	4Q16	1Q17	2Q17	3Q17	4Q17	1Q18	2Q18	3Q18	4Q18
SM3	Result	0.1	0.069	0.138	0.055	0.05	0.019	0.037	0.103	0.079	0.063	0.040	0.045	0.022	0.047	0.035	0.057	0.038	0.041	0.024	0.047	0.031
	LRAA	-	-	-	0.079	0.073	0.036	0.036	0.066	0.075	0.077	0.056	0.048	0.032	0.040	0.035	0.049	0.042	0.044	0.032	0.040	0.033
SM4	Result	0.075	0.065	0.128	0.051	0.048	0.02	0.034	0.123	0.088	0.065	0.061	0.074	0.027	0.062	0.072	0.090	0.054	0.062	0.039	0.065	0.043
	LRAA	-	-	-	0.080	0.073	0.062	0.038	0.056	0.066	0.078	0.084	0.072	0.057	0.056	0.059	0.063	0.070	0.070	0.061	0.055	0.052

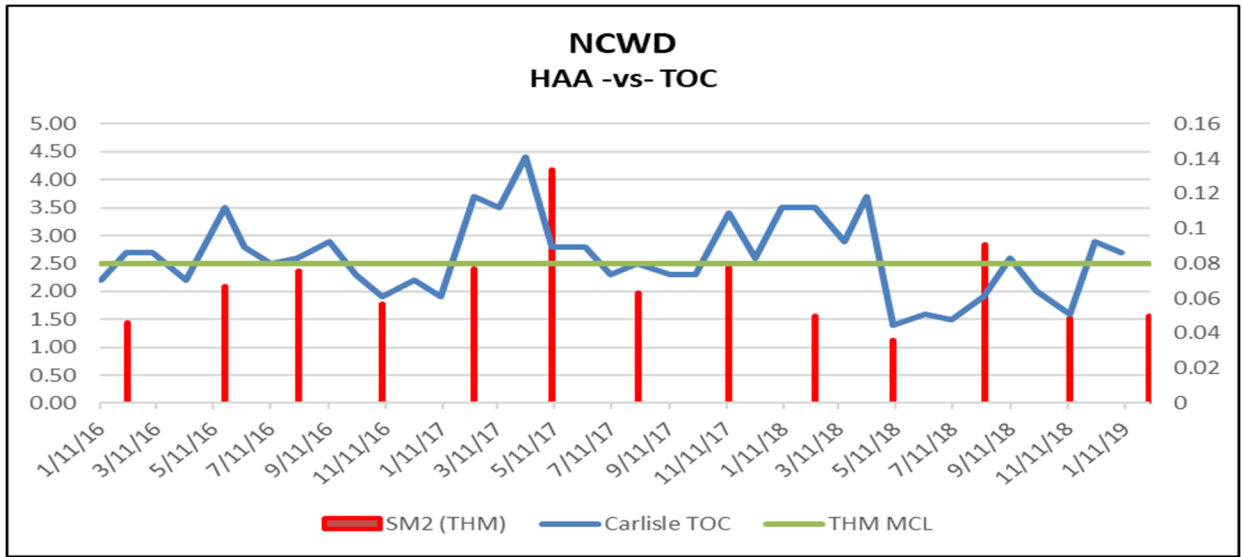
Compliance based upon the LRAA <= 0.80 mg/L

DBP Formation and Assessment

The first step in meeting compliance was to assess water quality and operations from treatment to tap to identify problem areas and determine where the greatest DBP reduction could be achieved. DBP's are formed in the treatment process and are often exacerbated in the distribution system due to a variety of conditions such as corrosion, water age, temperature, booster chlorination, etc. This is often the case with THM, however HAA's tend to degrade with water age even in the presence of biofilms. Commonly, after Stage 2 compliance samples are analyzed we find that plant tap is well below the MCL while DBP concentration at the sample sites are two to three times greater than the tap. The typical conclusion is that DBP's are increasing through distribution, therefore the distribution system is the problem. This is usually a false assumption because DBP precursors in the water leaving the plant continues to react thereby increasing DBP's. The formula is contact time with organic material in the presence of chlorine equals DBP's formed. The larger the organic load after treatment, measured as Total Organic Carbon (TOC) the greater the DBP concentration. The greatest contribution distribution offers to the problem is time.

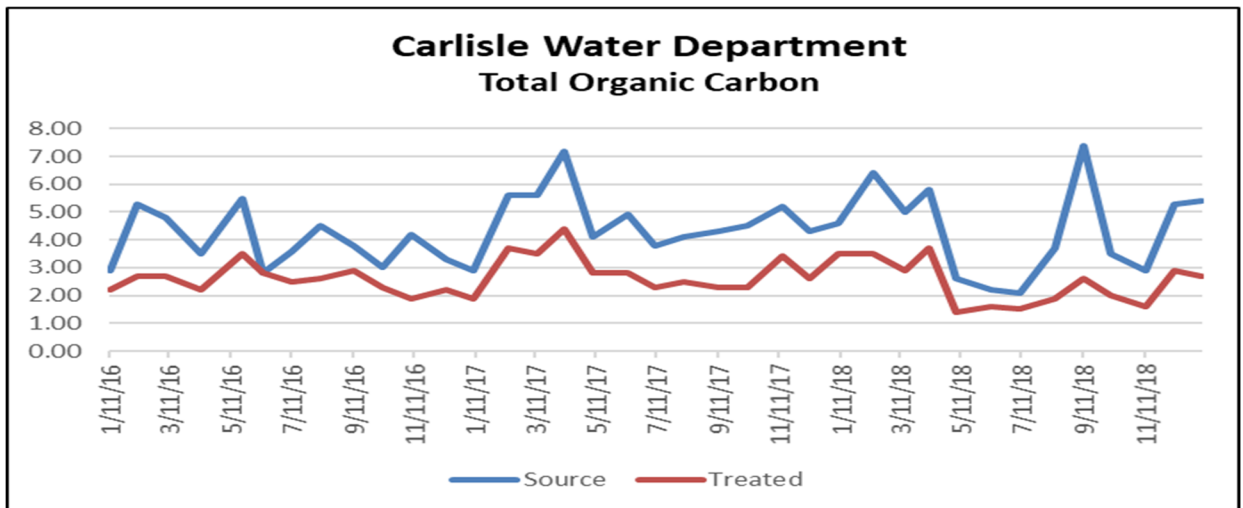
The following charts depict treated TOC measured at the treatment plant compared to HAA's in each water system. The range of data covered is 1st quarter 2016 through 1st quarter 2019.





Another interesting trend although not included would have been precipitation. Rainfall has a tremendous impact on TOC concentration through runoff and erosion. During these events TOC increases and subsequently DBP's will greatly exceed the MCL. All the while treated water with significantly higher DBP concentration is being pumped to distribution. These events go unnoticed until it corresponds with compliance sampling. This scenario significantly adds to the misunderstanding of the relationship between DBP levels in treatment and distribution. The key to understanding is realizing that grab sample results are not representative of water quality beyond the moment it was collected. For example, TOC sampled on the first day of the month cannot represent TOC for entire month. Just like free chlorine measurements in distribution are ever changing.

The long-term solution is to optimize the treatment process at the Carlisle water plant. Their source water is the Licking River and small reservoir. Raw water can be pumped directly to the plant; however, it is normally pumped to the reservoir. Small reservoirs typically excel at generating organic carbon as presented in the graph below.



The treatment process was optimized during after executing an Agreed Order in 2016 which returned the city to compliance. Carlisle is currently in compliance, but individual monitoring sites still show that DBPs do exceed the MCL.

Actions Taken:

Carlisle County Water District will take the following actions to mitigate DBPs. These actions are designed to reduce water age.

- Collect a dual sample set at the master meter during routine motioning.
- Modify flushing strategy by forcing overflowing the Concord tank instead of flushing water through the system.
- Perform routine flushing to maintain adequate chlorine residual.
- Request assistance from the KY Division of Water's Drinking Water Technical Assistance (DWTA) personnel provide support to profile water quality in the system.
- Request that DWTA assist Carlisle with additional optimization.
- Discuss with the District's engineer about the possibility of interconnecting this zone with Western Fleming Water District as an alternate long-term solution.

Carlisle expects to return to compliance by 9/30/2020.