UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
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December 12, 2017

Mr. Caleb Osborne
Associate Director
Office of Water Quality
Arkansas Department of Environmental Quality
5301 Northshore Drive
Little Rock, AR 72118-5317

Re: Amendments to *Regulation No. 2: Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas*, as amended by third party rulemaking initiated by the Cities of Harrison and Yellville, AR

Dear Mr. Osborne:

The Environmental Protection Agency (EPA) has completed its review of the amendments to *Regulation No. 2: Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas* that were made in relation to the Third Party Rulemaking process initiated by the Cities of Harrison and Yellville, AR. The amendments to Regulation No. 2 were adopted by the Arkansas Pollution Control and Ecology Commission (APC&EC) on January 1, 2017 and became effective as state law on February 15, 2017. These amendments were submitted to the EPA for approval on March 31, 2017 by the Arkansas Department of Environmental Quality (ADEQ).

At this time EPA is approving the new and revised provisions to Regulation 2.511 and Appendix A of Regulation No. 2, including the site specific criteria changes for chloride, sulfate and total dissolved solids (TDS) in the upstream reach and TDS in the downstream reach of Crooked Creek. These amendments are approved pursuant to the Clean Water Act (CWA) § 303(c) and its implementing regulations at 40 CFR Part 131. The amended criteria are effective for CWA purposes. The EPA anticipates that ADEQ will evaluate the need for a Tier 2 review to determine if the use of assimilative capacity for chloride, sulfate and TDS is appropriate during the National Permit Discharge Elimination System permitting process.

The approval of new and revised water quality standards is subject to the results of consultation under section 7(a)(2) of the Endangered Species Act (ESA). Section 7(a)(2) of the ESA requires that federal agencies consult with the U.S. Fish and Wildlife Service (Service), as appropriate, to ensure that actions they take, fund, or authorize are not likely to jeopardize the continued existence of listed species or result in the adverse modification or destruction of habitat. That consultation has been concluded with the Service's concurrence that EPA's approval of the revised criteria is not likely to adversely affect threatened and endangered species or critical habitat by letter dated September 8, 2017.

I appreciate the APC&EC's and the ADEQ's effort in the review of these revised provisions of the State's standards and also appreciate ADEQ's assistance with coordinating meetings and correspondence with the third party. If you have any questions or concerns, please contact me at 214-665-7101, or contact Russell Nelson at 214-665-6646 or nelson.russell@epalgov.

Sincerely,

William K. Honker, P.E.
Director
Water Division

Enclosure

cc: Sarah Clem, Branch Manager
Water Division ADEQ

TECHNICAL SUPPORT DOCUMENT:

EPA REVIEW OF SITE-SPECIFIC CRITERION REVISION TO *REGULATION 2: REGULATION ESTABLISHING WATER QUALITY STANDARDS FOR SURFACE WATERS OF THE STATE OF ARKANSAS* FOR CROOKED CREEK, ARKANSAS

Revision Adopted by the Arkansas Pollution Control and Ecology Commission Modifying Water Quality Standards for Chloride, Sulfate and Total Dissolved Solids for Crooked Creek in Boone and Marion Counties, AR

U.S. EPA REGION 6
WATER DIVISION
December 1, 2017

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I. Introduction

Background

As described in § 303(c) of the Clean Water Act (CWA) and in the standards regulation within the Code of Federal Regulations (CFR) at 40 CFR § 131.20, states and authorized tribes have primary responsibility to develop and adopt water quality standards to protect their waters. State and tribal water quality standards consist of three primary components: designated uses, criteria to support those uses, and an antidegradation policy. In addition, CWA § 303(c)(1) and 40 CFR § 131.20 require states to hold public hearings at least once every three years to review and, as appropriate, modify and adopt new and revised standards.

Under CWA § 303(c) and 40 CFR § 131.21, the Environmental Protection Agency (EPA) reviews new and revised surface water quality standards that have been adopted by states and authorized tribes. Authority to approve or disapprove new and/or revised standards submitted to EPA for review by states and tribes in EPA Region 6 has been delegated to the Water Division Director in Region 6. Tribal or state water quality standards are not considered effective under the CWA until approved by EPA.

The purpose of this Technical Support Document (TSD) is to describe the basis for EPA's action on site-specific amendments to Regulation No. 2: *Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas* adopted by the Arkansas Pollution Control and Ecology Commission (APC&EC). These amendments are site-specific chloride, sulfate and total dissolved solids (TDS) water quality criteria for Crooked Creek. These revisions are further described in the subsection below titled "Summary of Revised Provisions."

Chronology of Events

August 5, 2015	The Cities of Harrison and Yellville, AR, filed a petition with the APC&EC to amend Regulation No. 2
August 28, 2015	The APC&EC initiated the rulemaking proceedings via Minute Order No. 14-33
September 2-3, 2015	Public notice of the proposed rule-making was published
October 19, 2015	Public hearing on the proposed rule-making was held in Harrison, Arkansas
November 2, 2015	Public comment period ended on the proposed changes to Regulation No. 2
January 27, 2017	APC&EC Minute Order No. 17-03 signed adopting changes to Regulation No. 2

March 31, 2017	EPA Region 6, received a letter from ADEQ, requesting approval of revisions to Regulation 2

Summary of Revised Provisions

By letter dated March 31, 2017, ADEQ submitted water quality standards revisions adopted by APC&EC via Minute Order No. 17-03 to EPA for review and approval. These amendments were developed subject to Regulation No. 2.306, which allows for the modification of water quality criteria. These revisions are located in Regulation 2.511 and Appendix A. These site-specific revisions for minerals (chloride, sulfate and total dissolved solids (TDS)) are applicable to the upstream reach of Crooked Creek from the Harrison Waste Water Treatment Plant (HWWTP) to station WHI0193 for chloride, sulfate and TDS, and downstream reach of Crooked Creek from sampling station WHI0193 to the mouth of Crooked Creek for TDS as described in Table 2.

II. Revised Provisions EPA is Approving

Background

The City of Harrison, Arkansas, discharges treated wastewater to Crooked Creek under the authority of a National Pollutant Discharge Elimination System (NPDES) permit for the Harrison Waste Water Treatment Plant (HWWTP). The HWWTP discharge enters the upper segment (11010003-049) of Crooked Creek approximately 73.4 miles upstream of its confluence with the White River. This permit was scheduled for renewal in October 2012. The City of Yellville, Arkansas, discharges treated wastewater from the Yellville WWTP (YWWTP) to the downstream segment (11010003-048) of Crooked Creek approximately 22.5 miles upstream of its confluence with the White River. Yellville's National Pollution Discharge Elimination System (NPDES) permit (No. AR0034037) was scheduled for renewal in March 2015.

The Cities of Harrison and Yellville contracted with FTN Associates, Ltd., (FTN) to analyze the chloride, sulfate and TDS concentrations in the discharges from the HWWTP and YWWTP. FTN developed a use attainability analysis (UAA) entitled *Use Attainability Analysis Report, Crooked Creek, Boone and Marion Counties, Arkansas*, supporting Arkansas' amended criteria. The initial analysis reported that **both discharges meet current sulfate and chloride criteria for Crooked Creek** (20 mg/L for both sulfate and chloride); however, **neither discharge meets the current TDS criterion** of 200 mg/L. The UAA referred to further analysis that showed that if end-of-pipe permit limits for either city were set to current instream criteria for sulfate or chloride due to the fact that the receiving waters are listed as impaired, neither city would consistently meet such limits. As a result of this analysis, Harrison and Yellville evaluated alternatives for meeting anticipated permit limits. The UAA, was designed to determine what the existing and attainable uses are and determine if the direct discharges from the HWWTP and YWWTP support those uses. The primary focus of the UAA was to provide scientific support for the adoption of alternative site-specific criteria for chloride, sulfate and TDS in the upstream segment (11010003-049) and for TDS in the downstream segment (11010003-048) of Crooked Creek.

Action

The EPA is approving the revised site-specific criteria for chloride, sulfate and TDS in the upstream reach of Crooked Creek from the HWWTP to station WHI0193 and the site-specific criteria for TDS in the downstream reach of Crooked Creek from WHI0193 to its confluence with the White River. These criteria are approved pursuant to Sec. 303(c) of the CWA and are in effect for CWA purposes. The EPA anticipates that ADEQ will evaluate the need for a Tier 2 review to determine if the use of assimilative capacity for chloride, sulfate and TDS is appropriate during the NPDES permitting process.

This and EPA's prior approvals of site-specific criteria for minerals in AR have been based on a weight-of-evidence, using water quality, biological, and toxicity testing data, as well as data in published literature. Although EPA is approving these amendments, the review of the supporting UAA and additional supporting material was challenging due to the difficulty of discerning 1) the basis for the revised site-specific criteria, given the impairment status of Crooked Creek on Arkansas' 303(d) list, and 2) the effect of subtle changes in minerals concentrations using instream biological or toxicity testing data based on species that are not necessarily sensitive to the parameters of interest.

The EPA recognizes that at this point in time, the science surrounding minerals toxicity is evolving. Recent studies have indicated that traditional toxicity testing cannot capture all of the impacts of minerals on aquatic life and that a field-based methodology may be more appropriate. Given this evolution, Arkansas' approach to development site-specific criteria relying on Reg. 2.303, 2.306 and guidance in the states dated Continuing Planning Process (2000) document has resulted in the 3rd party proponents relying on the 95th percentile of instream mineral conditions to derive criteria. Any site-specific criteria that have been derived using this approach, may require re-evaluation in the near future. Please see the additional discussion below of questions that EPA identified with this submittal. Addressing these questions moving forward will ensure that Arkansas' CWA programs are in alignment, and that criteria in Arkansas are based on sound science, and are sufficient to protect the applicable designated uses, consistent with the CWA and EPA's implementing regulations.

The EPA has concluded informal Endangered Species Act consultation, and the U.S. Fish and Wildlife Service has concurred by letter dated September 8, 2017, that EPA's approval of these revised criteria is not likely to adversely affect threatened and endangered species or critical habitat.

Discussion

Crooked Creek's Status on Arkansas' 303(d) List

As noted earlier, the Cities of Harrison and Yellville reportedly undertook the development of site-specific criteria for Crooked Creek based on an initial analysis that suggested neither city would consistently meet NPDES permit limits if set to meet instream criteria for sulfate or chloride. 40 CFR 122.4(i) prevents a permit from being issued if a discharge will cause or contribute to the violation of WQS. This regulatory requirement means

that if Crooked Creek is impaired for chloride, sulfate, and TDS, permit limits based on current chloride, sulfate and TDS criteria (20/20/200 mg/L) would apply as "end-of-pipe limits" when both cities' currently expired permits are renewed. The APC&EC adopted the revised criteria for chloride and sulfate in the upstream segment and TDS in both the upstream and downstream segments of Crooked Creek in its January 2017 amendments (described in **Table 1** below) to address those permitting concerns.

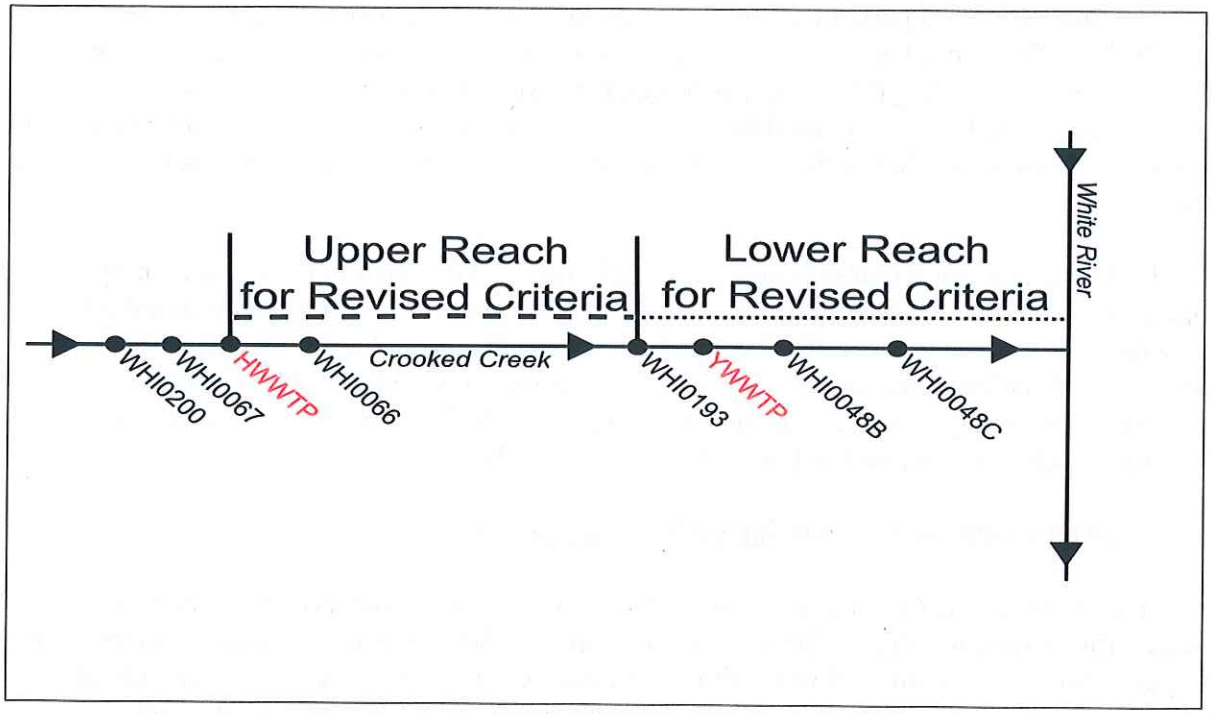
Table 1. Site-specific water quality criteria for Crooked Creek.

	Existing Criteria			Revised Criteria		
Stream Reach	**Chloride (mg/L)**	**Sulfate (mg/L)**	**TDS (mg/L)**	**Chloride (mg/L)**	**Sulfate (mg/L)**	**TDS (mg/L)**
Upstream reach (from HWWTP to WHI0193)	20	20	200	22.6	24.4	269
Downstream reach (from WHI0193 to mouth of Crooked Creek)	20	20	200	No change	No change	238

The supporting UAA reports that all designated uses including the Ozark Highlands fishery aquatic life use are being attained in Crooked Creek. Although Crooked Creek is meeting its aquatic life use, the supporting UAA refers to Arkansas' 2008 §303(d) list which identifies the upstream segment of Crooked Creek (11010003-049) as impaired due to exceedances of chloride, sulfate, TDS and beryllium. The suspected sources of these contaminants were identified as unknown. The 2008 §303(d) list also identified the downstream segment (11010003-048) of Crooked Creek as impaired due to exceedances of TDS and temperature. The suspected sources of chloride, sulfate, and TDS were listed as unknown and the suspected source of the temperature impairment was identified as resource extraction.

The upper (11010003-049) and lower (11010003-048) reaches of Crooked Creek continued to be listed as impaired on ADEQ's draft 2010 §303(d) list. A draft Total Maximum Daily Load (TMDL) for the entire length of Crooked Creek was developed by FTN on behalf of ADEQ in 2011. The draft TMDL identified 33 facilities with regulated stormwater discharges and a single continuous discharge (DM Petroleum Cleanup) upstream of the HWWTP and YWWTP continuous outfalls to Crooked Creek. The draft TMDL notes that Crooked Creek arises in the Boyd Shale, "which is rich in chlorides and sulfates" (ADEQ 2007). In reference to the NPDES permit for the HWWTP, the draft TMDL stated that "the elevated minerals concentrations [in Crooked Creek] are a reflection of the geology of the watershed." Although this may suggest other sources, the only exceedance of the applicable 20 mg/L criteria for chloride and sulfate occurred at a single sampling site (WHI0066) in the upstream segment of Crooked Creek downstream of the HWWTP (Table 2). However, ADEQ requested withdrawal of the draft TMDL in 2012. In comments on the proposed action, EPA questioned why the TMDL was withdrawn. FTN describes the basis for withdrawal as "technical issues" with the TMDL Although no discussion of these technical issues was provided by FTN, it appears that the draft TMDL was withdrawn because ADEQ failed to follow set procedures in its development.

Figure 1. Schematic diagram of outfalls, ADEQ monitoring stations, and upper and lower reaches of Crooked Creek.



Arkansas' draft 2012 §303(d) list did not identify the downstream segment (11010003-048) of Crooked Creek as impaired by chloride and sulfate, but did identify TDS impairment. Similarly, the draft 2014 §303(d) list identifies the upstream segment of Crooked Creek (11010003-049) as impaired only due to exceedances of TDS. The suspected sources of TDS remain as unknown. Arkansas' current 2016 §303(d) list only identifies the upstream segment (11010003-049) as impaired only by TDS. The suspected sources of TDS were identified as unknown. The downstream segment (11010003-048) of Crooked Creek is no longer on the 2016 §303(d) list. Given that only the upstream segment (11010003-049) of Crooked Creek is listed on ADEQ's 2016 §303(d) list as exceeding the current TDS criteria, it is unclear why APC&EC adopted revised criteria for chloride and sulfate in the upstream segment of Crooked Creek in its January 2017 amendments.

In its November 2015 comments on the draft supporting UAA, EPA questioned the need for revised chloride and sulfate criteria since the UAA initially reported that both the upper and lower segments of Crooked Creek were meeting applicable criteria (see **Background**). In contrast to what was initially reported, FTN's March 2017 response stated that **Crooked Creek did not meet the existing chloride and sulfate criteria downstream of the HWWTP; Crooked Creek did meet the existing chloride and sulfate criteria downstream of the YWWTP discharge; and Crooked Creek did not meet the existing TDS criterion downstream of either discharge.** This is inconsistent with ADEQ's 2016 §303(d) list as outlined in the previous paragraph.

The EPA is concerned that this inconsistency may be a result of ADEQ's revisions to its Assessment Methodology. In a review of the 2016 draft Methodology, EPA initially commented

on the shift from a 10% to a 25% exceedance rate, noting that EPA could not ascertain why mineral concentrations should be assessed at this higher exceedance frequency. The alteration of ADEQ's methodology is a particular concern given that EPA disapproved APC&EC's removal of the 1 in 10 (10%) exceedance rate for minerals from Reg. 2 in its January 24, 2008 action. As a result of EPA's action, the 10% exceedance rate for minerals criteria remains effective for CWA purposes. Modifying the exceedance rate in the Assessment Methodology would create an inconsistency between the Methodology and the CWA-effective water quality standards reflected in Reg. 2.

EPA requests that Arkansas consider these issues, and ensure that its assessment of Crooked Creek and other waters in the state align with the applicable water quality standards. Additionally, EPA notes that per 40 CFR §131.20, states are required to review their water quality standards at least once every three years. If new information becomes available to suggest that these newly approved site-specific criteria should be revised back to ecoregional background levels, EPA expects Arkansas to act accordingly.

Arkansas' Overall Approach to Deriving the Site-Specific Criteria

In response to the Cities of Harrison and Yellville 3rd party rule, APC&EC adopted the amended criteria for chloride, sulfate and TDS (**Table 1**). These criteria are based on ninety-fifth (95th) percentile values from ADEQ monitoring stations on the upper and lower segments of Crooked Creek. These 95th percentile values were calculated using the instream data set downstream of the discharge at ADEQ monitoring stations in Crooked Creek as described in **Table 2** below.

Table 2. Ninety-fifth percentile values at ADEQ monitoring stations in Crooked Creek.

	95th Percentile Values at ADEQ Monitoring Station (mg/L)					
Parameter	**WHI0200**	**WHI0067**	**WHI0066**	**WHI0048A/ WHI0193[a]**	**WHI0048B**	**WHI0048C**
TDS	226	233	269	226	221	238
Sulfate	11.6	9.4	24.4	9.4	7.6	10.2
Chloride	8.3	11.3	22.6	10.7	7.6	7.9
Period of Record[b]	11/28/2011 07/30/2013[c]	08/05/2003 07/30/2013[d]	08/05/2003 07/30/2013[d]	08/19/2003 07/09/2013[d]	12/09/2003 06/04/2013[d]	12/09/2003 06/04/2013[d]

Notes:

(a) ADEQ discontinued monitoring at WHI0048A and moved the sampling point upstream from Yellville to WHI0193.

(b) Date range queried was from August 1, 2003, to July 31, 2013, on ADEQ surface water quality monitoring data search page (http://www.adeq.state.ar.us/techsvs/water_quality/water_quality_station.asp, accessed August 20, 2013).

(c) Represents the full period of record for this station.

(d) Actual date range of data obtained from the search query for this station.

An overarching concern with this approach of using the 95th percentile of instream data is that it is not directly linked to protection of the aquatic life designated use. Rather, this approach appears intended to ensure that criteria are put in place that would allow the affected facilities to meet NPDES permits without implementing additional controls. In effect, these values lock in current ambient conditions as the applicable criteria rather than determining the appropriate

concentrations of minerals that would protect the aquatic life designated use based on a defensible scientific rationale.

To evaluate whether ambient conditions are protective of the applicable designated use, FTN compared the aquatic communities in Crooked Creek upstream and downstream of the HWWTP and YWWTP discharges to the communities in least-disturbed Ozark Highland ecoregion reference streams. The supporting UAA reports that the aquatic communities in upstream and downstream segments of Crooked Creek are comparable, and both are comparable to those in the reference streams. A comparison of overall similarity for a combination of Crooked Creek locations versus least-disturbed reference locations suggests that depending on the season and the particular sites that are compared, sites upstream or downstream of the HWWTP or YWWTP were slightly to moderately impaired relative to least-disturbed reference sites. The reference streams were selected based only on having comparable substrate composition as Crooked Creek. While the substrate composition is one characteristic that may predict a similar benthic macroinvertebrate community, EPA recommends that Arkansas consider and document other habitat characteristics in the future to demonstrate that the reference sites are comparable to the site where site-specific criteria are being developed. It is also critical to evaluate land use and other factors to confirm that reference streams are indeed least-disturbed.

Evaluations of habitat and field surveys of the fish community were carried out in the dry season (September and November 2012). Although two sampling events are reported, they are within a single year and may not be representative of average conditions. The comparison of the fish communities upstream and downstream of the HWWTP were very similar with respect to the total taxa, relative abundances, and biocriteria metric values for the Ozark Highlands streams based on ADEQ biometrics. The fish community Index of Biological Integrity (IBI) scores reported indicate that Crooked Creek "generally supports" Ozark Highland fish communities upstream of the HWWTP and "fully supports" those communities downstream of the HWWTP. Macroinvertebrate sampling was carried out during the dry season (September and/or November 2012) and during the wet season (April 2013). The percent similarity of the macroinvertebrate community between the upstream and downstream site was evaluated. Duplicate fall sampling above the HWWTP showed slight impairment (68.8% percent similarity) and no significant impairment (93.8%). Duplicate spring sampling above the HWWTP again showed slight impairment (75.0%) and no significant impairment (87.5%). However, the single sampling event from downstream of the YWWTP indicated moderate impairment (33.3%). The percent similarity in the upstream verses downstream segment suggest that the ionic makeup of the discharge from the YWWTP may be affecting the macroinvertebrate community below the discharge.

Water quality monitoring data (Table 2) indicated that TDS concentrations at both the upstream and downstream sites in both reaches of Crooked Creek exceed the current TDS criterion of 200 mg/L. Sampling data for minerals in the Yocum and Long Creek reference sites indicated that the average TDS concentration at these reference sites was 228 mg/L, suggesting that the variability in the macroinvertebrate community in Crooked Creek compared to reference sites may not be fully attributable to TDS concentrations in excess of the 200 mg/L criterion. Given that Crooked Creek is not a least-disturbed stream; there are likely other sources of

impairment (e.g., urbanization, non-point sources, stormwater and other continuous discharges) in addition to minerals contributed from the HWWTP and HWWTP affecting Crooked Creek.

The supporting UAA reported that there was no ambient toxicity testing conducted. Rather, since the ionic strength of the HWWTP and YWWTP discharges were considered well below published toxic thresholds for the types of ions present, they were considered to have a relatively minor impact on the ionic strength and composition of the receiving stream. As a result, the evaluation presented was based on empirical models developed by Mount et al. (1997). Although the HWWTP and YWWTP effluents are substantially different in terms of ionic composition, the discharges do not appear to significantly affect the ionic makeup of Crooked Creek. The ionic composition of the HWWTP effluent was reported as dominated by sodium, sulfate, calcium, and chloride, while calcium and bicarbonate ions dominate the ionic composition of the YWWTP effluent. Drawing conclusions here is challenging given that very small variations in ionic composition can result in significant differences in the structure and function of aquatic communities. It is unclear whether other analytes such as magnesium, potassium or total alkalinity and pH values may be having in effect on Crooked Creek.

While EPA agrees that the Cities of Harrison-Yellville sufficiently demonstrated that the revised site-specific criteria for Crooked Creek are protective of the use, EPA recommends that to support any future site-specific criteria development in other waters across the state, Arkansas: 1) conduct more robust sampling of minerals and the co-occurring aquatic community under a variety of hydrologic and climatic conditions, 2) better characterize appropriateness of selected reference sites, and 3) sample upstream and downstream of all applicable dischargers.

III. References

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FTN Associates, Ltd. (2011). Draft TMDLS for Chloride, Sulfate and TDS in the Crooked Creek Watershed, Arkansas. FTN No. 3013-380

FTN Associates, Ltd. (2015). Use Attainability Analysis Report, Crooked Creek, Boone and Marion Counties, Arkansas (Rep.). FTN No. R04315-0002-001

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U.S. EPA Region 6. (2008). Record of Decision. Regulation 2: Regulation Establishing Water Quality Standards for the State of Arkansas, Revisions Adopted by the Arkansas Pollution Control and Ecology Commission via Minute Order No. 07-36.