TMDL: Addendum to Kentucky Statewide Total Maximum Daily Load (TMDL) for Bacteria Impaired Waters: Big Sandy River, Little Sandy River, and Tygarts Creek Basin Appendices

ATTAINS TMDL ID: KYACT_4

LOCATION: Big Sandy River Basin Counties (Boyd, Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Martin, Morgan, Pike), Little Sandy River Basin Counties (Boyd, Carter, Elliott, Greenup, Lawrence, Rowan), Tygarts River Basin Counties (Greenup, Carter, Rowan)

STATUS: Final

IMPAIRMENT/POLLUTANT: 19 TMDLs are being approved for the 18 waterbodies in the Big Sandy River, Little Sandy River, and Tygarts Creek basins identified in the following pages. The TMDLs addressed in this document identify *Escherichia coli* (*E. coli)* and/or fecal coliform loads as a surrogate to address the bacteria impairments in the Big Sandy River basin, Little Sandy River basin, and Tygarts Creek basin, and the 19 pollutant-waterbody combinations are being addressed for not meeting criteria for bacteria and not supporting the designated uses of primary contact recreation (PCR) and/or secondary contact recreation (SCR).

BACKGROUND: The Kentucky Division of Water (KDOW) submitted the final *Addendum to Kentucky Statewide Total Maximum Daily Load (TMDL) for Bacteria Impaired Waters: Big Sandy River, Little Sandy River, and Tygarts Creek Basin Appendices* (the "Addendum," "Submission," or "Report") with a submittal letter requesting review and approval to the EPA Region 4 on August 9, 2021. The 19 TMDLs were developed according to the methodology described in the *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters* (the "Core Document"), which was approved by the EPA on February 22, 2019. The KDOW provided a preliminary draft Report to the EPA staff on January 8, 2020; the EPA staff provided comments to the KDOW staff on January 24, 2020. The KDOW sent another draft that incorporated language addressing the expiration of Kentucky's fecal coliform water quality criteria on March 26, 2021; the EPA staff provided feedback on April 2, 2021. The KDOW incorporated the EPA feedback in the Report that was placed on public notice on June 17, 2021.

The Submission included:

- Submittal Letter
- TMDL Summary Sheet
- Copies of published advertisements and the public notice for the proposed draft Document
- Report: *Addendum to Kentucky Statewide Total Maximum Daily Load (TMDL) for Bacteria Impaired Waters: Big Sandy River, Little Sandy River, Tygarts Creek Basin Appendices*

This document explains how the Submission meets the statutory and regulatory requirements of TMDLs in accordance with Section 303(d) of the Clean Water Act (CWA) and the EPA's implementing regulations in 40 Code of Federal Regulations (CFR) Part 130.

REVIEWER: Margaret Stebbins, KY Listing and TMDL Coordinator, stebbins.margaret@epa.gov

Waters Addressed in this TMDL Approval Action:

Bacteria-Impaired Stream Segments in the Big Sandy River Basin:

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Bear Creek 0.0 to 2.0	KY486557_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Animal Feeding Operations (NPS), On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Big Creek 0.0 to 1.95	KY487161_01	PCR (nonsupport)	*E. coli*	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Blaine Creek 8.2 to 17.6	KY487428_01	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Upstream/Downstream Source
Blaine Creek 35.0 to 39.7	KY487428_03	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Package Plant or Other Permitted Small Flows Discharges
Johns Creek 0.0 to 5.8	KY495347_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, Rural (Residential Areas)

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Johns Creek 24.0 to 34.3	KY495347_02	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Managed Pasture Grazing, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
Left Fork Middle Creek Levisa Fork 0.0 to 9.65	KY496241_01	PCR (nonsupport)	Fecal Coliform	*E. coli*	Source Unknown
Left Fork Middle Creek Levisa Fork 0.0 to 9.65	KY496241_01	SCR (nonsupport)	Fecal Coliform	Fecal Coliform	Source Unknown
Levisa Fork 0.0 to 5.8	KY496312_01	PCR (partial support)	*E. coli*	*E. coli*	Municipal (Urbanized High Density Area), Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Residential Districts
Levisa Fork 31.2 to 54.55	KY496312_04	PCR (nonsupport)	*E. coli*	*E. coli*	Municipal (Urbanized High Density Area), Non-Point Source, Package Plant or Other Permitted Small Flows Discharges

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Levisa Fork 65.05 to 97.8[2]	KY496312_06	PCR (nonsupport)	*E. coli*	TMDL not included in this document	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Package Plant or Other Permitted Small Flows Discharges, Urban Runoff/Storm Sewers
Levisa Fork 97.8 to 101.0[2]	KY496312_07	PCR (nonsupport)	Fecal Coliform	TMDL not included in this document	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Urban Runoff/Storm Sewers
Levisa Fork 118.5 to 127.45	KY496312_08	PCR (partial support)	Fecal Coliform	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Sewage Discharges in Unsewered Areas
Middle Creek Levisa Fork 0.0 to 4.6	KY498108_01	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, Package Plant or Other Permitted Small Flows Discharges, Urban Runoff/Storm Sewers
Paint Creek 0.0 to 7.1	KY500114_01	PCR (partial support)	*E. coli*	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Residential Districts, Unspecified Domestic Waste
Paint Creek 7.1 to 8.2	KY500114_02	PCR (nonsupport)	Fecal Coliform	*E. coli*	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Unspecified Domestic Waste

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Pond Creek 0.0 to 9.7[2]	KY501044_01	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Package Plant or Other Permitted Small Flows Discharges
Rockcastle Creek 0.0 to 3.7	KY502158_01	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source, Rural (Residential Areas)
Tug Fork 0.0 to 10.45	KY1548311_01	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, Residential Districts, Unspecified Urban Stormwater
Wolf Creek 0.0 to 6.6	KY507001_01	PCR (nonsupport)	*E. coli*	*E. coli*	Rural (Residential Areas), Unspecified Urban Stormwater

[1]Segments with PCR impairment due to fecal coliform have a TMDL developed for *E. coli* in this document.
[2]A TMDL is not included because this segment will be proposed for delisting on a future 303(d) list based on the most recent monitoring data.

Bacteria-impaired Stream Segments in the Little Sandy River Basin:

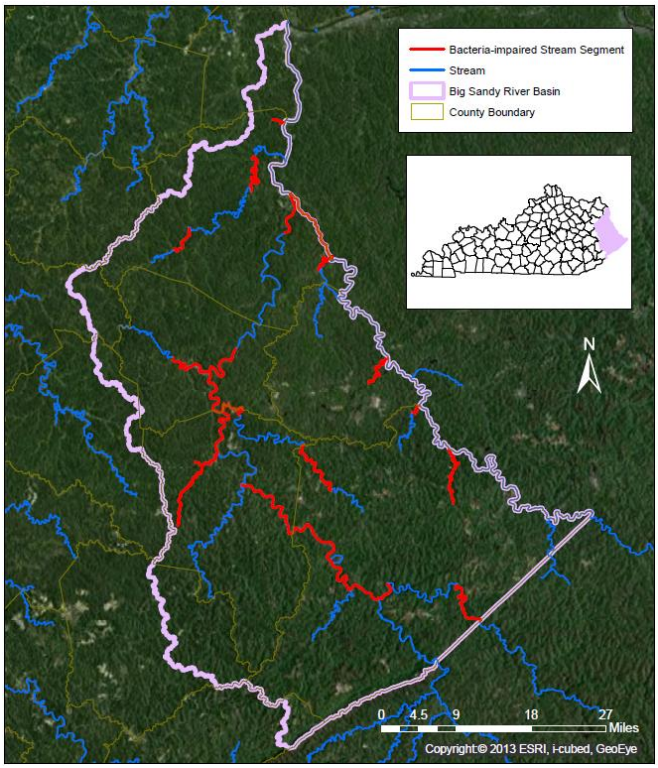
Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
East Fork Little Sandy River 24.9 to 26.4	KY491469_03	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source
Little Sandy River 0.0 to 0.15[1]	KY496857_01	PCR (nonsupport)	Fecal Coliform	not applicable	Package Plant or Other Permitted Small Flows Discharges

[1]A TMDL is not included because this segment will be proposed for delisting on a future 303(d) list. The original listing was in error.

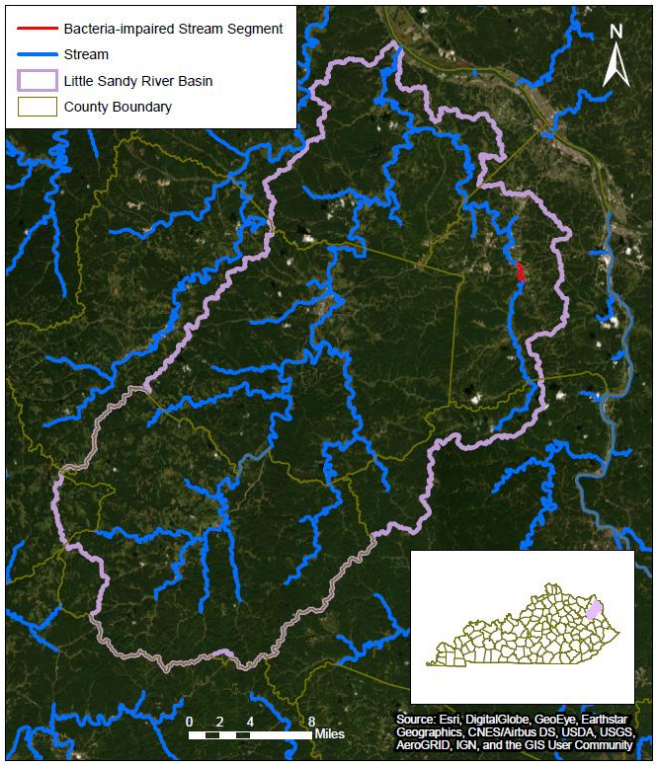
Bacteria-impaired Stream Segments in the Tygarts Creek Basin:

Waterbody Name	Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant[1]	Suspected Source(s)
Buffalo Creek 0.0 to 6.7	KY488320_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source

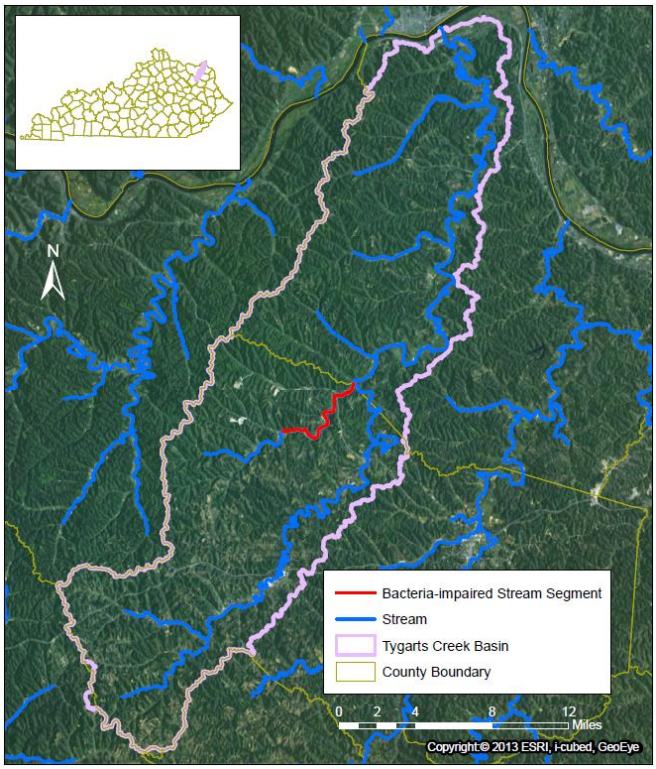
Location of Waters Addressed in this TMDL Approval Action:



Bacteria impaired Waterbodies in the Big Sandy River Basin (Figure C.1 in the Report)



Bacteria impaired Waterbodies in the Little Sandy River Basin (Figure G.1 in the Report)



Bacteria impaired Waterbodies in the Tygarts Creek Basin (Figure N.1 in the Report)

EPA TOTAL MAXIMUM DAILY LOAD REVIEW DOCUMENT
KENTUCKY STATEWIDE BACTERIA TMDL: BIG SANDY RIVER, LITTLE SANDY RIVER, AND TYGARTS CREEK BASINS

This document contains the EPA's review of the above-referenced TMDL. This TMDL review document includes TMDL review guidelines that summarize currently effective statutory and regulatory requirements relating to TMDLs. These TMDL review guidelines are not themselves regulations. Any differences between these guidelines and the EPA's TMDL regulations should be resolved in favor of the regulations themselves. The italicized sections of this document describe the EPA's statutory and regulatory requirements for approvable TMDLs. The sections in regular type reflect the EPA's analysis of the state's/tribe's compliance with these requirements.

Section 303(d) of the CWA and the EPA's implementing regulations at 40 CFR Part 130 set out the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for the EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and the EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.

Introduction

The *Kentucky Statewide Bacteria Total Maximum Daily Load for Bacteria Impaired Waters* consists of a Core Document and a set of river basin appendices that are submitted as addendums to the Core Document. The core background and methodology document, and the first river basin appendices (Green River and Tradewater River), were approved by the EPA in 2019. Each appendix was designed to contain TMDLs for the bacteria-impaired segments within that basin as of the Kentucky 2016 CWA Section 303(d) list. The Core Document approval specified a process by which the KDOW could add more impaired waters to the Statewide Bacteria TMDL to address bacteria impairments in all 13 basins. The KDOW is following that process by submitting this addendum containing the Big Sandy River, Little Sandy River, and Tygarts Creek basin appendices addressed by this Decision Document. The Big Sandy River, Little Sandy River, and Tygarts Creek basins addendum presents information related to new segments being added under the Statewide Bacteria TMDL, but the addendum is not a stand-alone document. The method for developing a TMDL for each of the bacteria-impaired segments within the Big Sandy River basin, Little Sandy River basin, and Tygarts Creek basin appendices, including general information and the TMDL loadings, can be found in the Core Document. Table 1.3-3 of the Addendum, reproduced below, outlines a list of TMDL elements and their location within the Core Document or Addendum documents.

Where to Find Information in the Big Sandy River, Little Sandy River, and Tygarts Creek Basins Addendum and the Core Document

TMDL Element	Description	Location
Water Quality Standards	Describes recreational uses, water quality standards, and waterbody assessment.	Sections 1.0 and 2.0 of Core TMDL
Water Quality Criteria	Provides the indicator bacteria used to assess pathogen levels in waterbodies and the bacteria standards for Kentucky's surface waters.	Section 1.3 of addendum
Physical Setting	Provides an overview of Kentucky's physical setting including soils, geology, and hydrology.	Section 3.0 of Core TMDL
Source Assessment	Defines point and non-point sources of bacteria pollution and provides examples of bacteria sources that affect Kentucky's waterbodies.	Section 4.0 of Core TMDL

TMDL Element	Description	Location
Monitoring and Data Validation	Describes the types of data used for assessment and TMDL development.	Section 5.0 of Core TMDL
TMDL Development	Provides a description of the TMDL calculation process and of required components such as the margin of safety factor, seasonality, and critical conditions.	Section 6.0 of Core TMDL
Implementation	Provides a description of the implementation process (e.g., permit translation, development of watershed plans, coordination with local stakeholders, types of funding assistance and other resources.)	Section 7.0 of Core TMDL
Public Participation	Provides a summary of the process used to solicit public comment on the core TMDL document and DOW response to those comments.	Section 2.0 of addendum
MS4 Communities in Kentucky	Provides a list organized by county of Municipal Separate Storm Sewer System (MS4) communities in Kentucky (as of September 2018.)	Appendix A of Core TMDL
Percent of Households Serviceable by Sewer	Provides the percent of households serviceable by sewer in Kentucky (2010). The list is organized by county and includes county population totals, and total number of households and serviceable households.	Appendix B of Core TMDL
National Land Cover Database Classification Descriptions (NLCD 2011)	Defines the nationwide land cover classifications. The descriptions provide information on land cover and land use.	Appendix P of Core TMDL

1. Description of Waterbody, Pollutant of Concern and Pollutant Sources

The TMDL analytical document must identify the waterbody as it appears on the state/tribe's Section 303(d) list, including the pollutant of concern. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for the EPA's review of the load and wasteload allocations, which is required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyll a, and phosphorus loadings for excess algae.

The KDOW utilizes a watershed management framework approach to water quality management. The framework divides Kentucky's major drainage basins into five groups of basins, which are cycled

through a five year staggered process that involves monitoring, assessment, prioritization, plan development, and plan implementation. Section 5.0 of the Core Document provides an overview of the KDOW process for monitoring and data validation.

Seventeen waterbody-pollutant combinations in the Big Sandy River basin (HUC8s 05070201, 05070202, 05070203, 05070204), one waterbody-pollutant combination in the Little Sandy River basin (HUC8 05090104), and one waterbody-pollutant combination in the Tygarts Creek River basin (HUC8 05090103) are impaired because of elevated bacteria. Tables C.1, G.1, and N.1 of the Addendum provide a summary of the stream segments in the Big Sandy River basin, Little Sandy River basin, and Tygarts Creek basin, respectively, that have been included on the Section 303(d) list for impairment due to fecal coliform and/or *E. coli*. The Addendum also includes maps of the Big Sandy River, Little Sandy River, and Tygarts Creek basins identifying the impaired segments (Figure C.1, CG.1, and N.1, respectively).

There are 29 facilities located in or upstream of the impaired segments in the Big Sandy River, Little Sandy River, and Tygarts Creek River basins that have Kentucky Pollutant Discharge Elimination System (KPDES) permits authorizing the discharge of treated effluent directly into segments, 27 of which are Sanitary Wastewater Systems (SWS) and two that are Phase II Municipal Separate Storm Sewer Systems (MS4s). For more specific information on point sources and KPDES permittees in the Appendices, see Section 5 of this decision document and Appendix C, G, and N of the Addendum. Common nonpoint sources in Kentucky include wildlife, agriculture, animal feeding operations, human waste, household pets, and prohibited sources. See Section 4.0 of the Core Document for additional information about point and nonpoint sources in Kentucky.

Predominant land cover in the Big Sandy River basin is deciduous forest (74.12%), followed by grassland/herbaceous (10.92%), open developed (3.31%), and pasture/hay (2.9%). Land cover is summarized for the Big Sandy River basin in Table C.2 and Figure C.2 of the Addendum. Predominant land cover in the Little Sandy River basin is deciduous forest (67.78%), followed by pasture/hay (12.08%), grassland/herbaceous (6.54%), and open developed (4.51%). Land cover is summarized for the Little Sandy River basin in Table G.2 and Figure G.2 of the Addendum. Finally, predominant land cover in the Tygarts Creek basin is deciduous forest (68.02%), followed by pasture/hay (13.64%), grassland/herbaceous (7.09%), and open developed (5.01%). Land cover is summarized for the Tygarts Creek basin in Table N.2 and Figure N.2 of the Addendum.

Assessment: The EPA concludes that the KDOW has adequately identified the impaired waterbodies, the pollutants of concern, and the magnitude and location of the pollutant sources in the Big Sandy River, Little Sandy River, and Tygarts Creek basins addressed in this Submittal.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable state/tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the statewide antidegradation policy. Such information is necessary for the EPA's review of the load and wasteload allocations which is required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality

criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.

The targets for the TMDL are derived from KDOW's Water Quality Standards, 401 Kentucky Administrative Regulations (KAR) 10:031, which are further summarized in Table 1.3-1 in the Report:

> The Primary Contact Recreation (PCR) Water Quality Criteria (WQC) are in effect from May 1 through October 31. For this designated use, 401 KAR 10:031 Section 7(1)(a) states that:
>
> *Escherichia coli content shall not exceed 130 colonies per 100 ml as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 240 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period for Escherichia coli. Fecal coliform criteria listed in subsection (2)(a) of this section shall apply during the remainder of the year.*
>
> The Secondary Contact Recreation (SCR) WQCs are in effect for the entire year. 401 KAR 10:031 Section 7(2)(a) states:
>
> *Fecal coliform content shall not exceed 1000 colonies per 100 ml as a monthly geometric mean based on not less than five (5) samples per month; nor exceed 2000 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period.*

Prior to November 1, 2019, PCR criteria also existed for fecal coliform. Those expired WQC are summarized in Table 1.3-2 of the Addendum for informational purposes. Prior to the expiration of the fecal coliform PCR criteria, several waterbodies in the Big Sandy River basin had been assessed as failing to meet those WQC and were listed as impaired due to fecal coliform. The TMDLs for waterbodies with PCR fecal coliform impairments were calculated in the Addendum using the *E. coli* criteria, since the *E. coli* WQC must be met for a waterbody to support the PCR designated use. Tables C.1, G.1, and N.1 of the Addendum reproduced above in the "Waters Addressed in this TMDL Approval Action" section of this document, identify both the listed pollutant and the TMDL pollutant to make it clear when a segment was listed for fecal coliform, but *E. coli* criteria were used to calculate the TMDL.

The KDOW developed TMDLs through the use of a flow-based equation. Targets for each applicable WQC were calculated using the TMDL equation based on the type, timing, and amount of data collected for each impaired segment. Section 6.1 of the Core Document notes that the term "WQC" in the flow-based equations incorporates the full definition of each applicable criterion as specified in 401 KAR 10:031 Section 7. The criteria for geometric means specify a concentration benchmark, an averaging period, a minimum number of samples, and season when applied. The criteria for single sample maxima specify a concentration benchmark, a percent exceedance, a sample collection period, and season when applied. Loads based on the WQC accordingly incorporate all the elements included in the WQC. Details on the data collected for each waterbody are included Appendices C, G, and N of the Addendum.

The designated use classifications for each waterbody addressed in the Report are PCR and/or SCR and are identified in Appendices C, G, and N of the Addendum, as well as at the beginning of this document.

PCR or SCR waters are defined, respectively, as "waters suitable for full body contact recreation during the recreation season of May 1 through October 31" or "waters suitable for partial body recreation, with minimal threat to public health due to water quality" (401 KAR 10:001).

***Assessment**:* The EPA concludes that the KDOW has properly addressed its water quality standards when setting numeric water quality targets.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

As described in the EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. The EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 CFR Section 130.2(f)). The loadings are required to be expressed as either mass-per-time, toxicity, or other appropriate measure (40 CFR Section 130.2(i)). The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for the EPA's review of the load and wasteload allocations which is required by regulation.

In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 CFR Section 130.7(c)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

Section 6 of the Core Document describes the KDOW method for determination of the loading capacity (i.e., "TMDL"), which is expressed as a function of flow (Q), based on the applicable WQC value according each segment's use designation. A flow-based TMDL equation is provided in Table S.3 of the Core Document, as well as at the end of this document.

As described in Section 6.1 of the Core Document, the KDOW derived the flow-based equations shown in Table S.3 of the Core Document from the standard equation: TMDL = $\sum$WLA + $\sum$LA + MOS, to include segment, upstream, and tributary bacteria loads expressed as colonies per day. Upstream and tributary contributions represent an aggregate of point and nonpoint sources; segment allocations are broken into equations to represent SWS, MS4, Combined Sewer Overflow (CSO) point sources, and nonpoint sources. Waterbody specific TMDL allocation equations are detailed in Appendix C, G, and N of the Addendum for the impaired segments in the Big Sandy River, Little Sandy River, and Tygarts Creek basins, respectively.

Section 6.1 of the Core Document notes that the term "WQC" in the flow-based equations incorporate the full definition of each applicable criterion as specified in 401 KAR 10:031 Section 7; therefore, calculation of loads for each impaired segment based on the applicable criteria and associated flow will meet the WQC.

Assessment: The EPA concludes that the process to determine the loading capacity has been appropriately designed to establish a level necessary to attain and maintain the applicable water quality standard. The TMDL is based on a reasonable approach for establishing the relationship between pollutant loading and water quality.

4. Load Allocation (LA)

The EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 CFR Section 130.2(g)). Load allocations may range from reasonably accurate estimates to gross allotments (40 CFR Section 130.2(g)). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.

Nonpoint source pollution from bacteria is correlated to land use and typically results from discharge of pollutants to surface water in response to rain events. Sources can include wildlife, Kentucky's no discharge operational permits, agriculture, animal feeding operations, human waste (i.e., failing septic systems), and household pets. General descriptions of these sources are discussed in Sections 4.2.1 through 4.2.6 of the Core Document. Detailed information on nonpoint sources across the Commonwealth is provided in Figures 4.2-1 through 4.2-6, as well as Tables 4.2-1 through 4.2-3 of the Core Document. The loads to surface water from non-KPDES permitted sources are regulated by laws such as the Kentucky Agricultural Water Quality Act (AWQA, KRS 224.71-100 through 224.71-145, i.e., implementation of individual agriculture water quality plans and corrective measures), the federal CWA (i.e., the TMDL process) and 401 KAR 5:037 (Groundwater Protection Plans), among others.

The LA for each segment is expressed as a flow-based equation that is equal to the sum flow due to nonpoint sources multiplied by the appropriate WQC based on the segment's designated use and a conversion factor, which converts bacteria concentration to a daily load. LAs equations are provided for each segment in the Big Sandy River, Little Sandy River, and Tygarts Creek basins in Appendices C, G, and N, respectively, of the Addendum.

Assessment: The EPA concludes that the expressions provided in the Report to calculate LAs are reasonable and will result in attainment of the water quality standards.

5. Wasteload Allocation (WLA)

The EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 CFR Section 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero.
If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.

In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. However, it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.

The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the state/tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.

The WLA for each segment is divided into SWS, MS4, and CSO components, as applicable; each component is expressed as a daily load in a flow-based equation that is equal to the sum of flow from that source multiplied by the appropriate WQC based on the segment's designated use and a conversion factor.

Section 7.1.1 of the Core Document describes how the flow-based WLAs provided for each type of entity should be translated into permits. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average and 240 colonies/100 ml as a maximum weekly average. Fecal coliform limits are no longer included due to the expiration of the PCR fecal coliform criteria and the fact that for SCR-impaired segments, SWS sources had to meet the PCR criterion year-round.

Table 4.1-1 of the Core Document lists all Kentucky communities with CSOs as of September 2016; Figure 4.1-1 shows the locations of communities with CSO sites (Commonwealth of Kentucky, 2017). The KDOW provides the following assumptions to facilitate implementation of the CSO-WLA: dry weather CSO flows are prohibited and CSO entities are expected to comply with a Long Term Control Plan or KPDES permit designed to meet WQS.

Figure 4.1-2 of the Core Document shows the locations of all MS4 communities in the Commonwealth and a Table with further information appears in Appendix A of the Core Document. The KDOW provides the following assumptions to facilitate implementation of the MS4-WLA in the permit:

- The MS4-WLA is not an end-of-pipe limit;
- The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the stormwater contribution from individual MS4 outfalls;
- MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan; and
- An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

There are 29 facilities located in or upstream of the impaired segments in the Big Sandy River, Little Sandy River, and Tygarts Creek basins that have KPDES permits authorizing the discharge of treated effluent directly into segments. 27 of the directly discharging facilities are SWS: 12 individual family residences with on-site wastewater treatment systems (KYG400695, KYG402232, KYG402633, KYG400973, KYG401180, KYG400696, KYG401964, KYG401607, KYG401260, KYG402062, KYG400186, KYG402476); Fallsburg Elementary School (KY0083640), Creekside Cabin Rentals (KY0104744), Blaine Elementary School (KY0075299), Honey Branch Regional Sewage Treatment Plant (KY0103578), Barkwood Estates (KY0101648), Big Sandy Community and Technical College

Hagerhill Campus (KY0098183), Brookside Apartments (KY0095401), Carl D. Perkins Comprehensive Rehab Center (KY0041084), Mountain Comprehensive Care Center (KY0094781), Paintsville Sewage Treatment Plant (KY0020630), Prestonburg Sewage Treatment Plant (KY0027413), River Road Disposal System (KY0094129), Riverview Village Housing Comp. (KY0044113), Thelma Waste Control Inc #1 (KY0083208), and Carter Elementary School (KY0110469). The other two permitted dischargers are Phase II MS4s: Boyd County Fiscal Court (KYG200002) and the Kentucky Department of Transportation (KYS000003). Any new discharger must meet the KDOW permitting requirement and not cause or contribute to impairment.

WLA equations are provided for each segment in the Appendices C, G, and N of the Addendum.

Assessment: The EPA concludes that the expressions provided in the Report to calculate WLAs are reasonable and will result in attainment of water quality standards. The TMDL accounts for all point sources discharging to impaired segments in the watershed and the WLAs incorporate the full definition of each applicable criterion and require that bacteria concentrations comply with WQC (TMDL targets). This is incorporated in to the SWS permit limits at the point of discharge.

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality [CWA Section 303(d)(1)(C), 40 CFR Section 130.7(c)(1)]. The EPA 1991 guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

As indicated in footnote (9) to Table S.3 and Section 6.2 of the Core Document, an implicit MOS was applied in the statewide approach for all TMDLs, based on the following assumptions:

1. Upstream and tributary bacterial concentrations were at the maximum allowable limit; there was no dilution capacity from these areas.
2. Although all sources were provided an allocation at the WQC, not all sources discharged at that maximum allocation at the same time.
3. There was no bacteria die-off. In reality, bacteria concentrations diminish downstream from their source; thus, bacteria loads to the upper portion of a segment would diminish prior to reaching the lower portion of the segment.
4. For SCR-impaired segments, SWS sources had to meet the PCR criterion year-round.

Assessment: The EPA concludes that the TMDL incorporates an adequate margin of safety.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described [CWA Section 303(d)(1)(C), 40 CFR Section 130.7(c)(1)].

For stormwater and nonpoint sources, the instream WQC vary for the PCR and SCR seasons. Seasonality was addressed in the Addendum for these sources by requiring that the WQC be met instream during all seasons, applying the appropriate PCR or SCR criteria, and over the range of flow conditions that occur.

For sanitary wastewater bacteria sources, seasonality was addressed in the TMDL calculations by requiring KPDES-permitted sanitary wastewater facilities to meet end-of-pipe limits based on the PCR WQC throughout the year (a permit requirement).

Seasonality is discussed further in Section 6.3 of the Core Document.

Assessment: The EPA concludes the TMDL allocations ensure protection of water quality standards throughout all seasons.

8. Monitoring Plan to Track TMDL Effectiveness

The EPA's 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur. Such a TMDL should provide assurances that nonpoint source controls will achieve expected load reductions, and such a TMDL should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

The KDOW utilizes a watershed management framework approach to water quality management. The framework divides Kentucky's major drainage basins into five groups of basins which are cycled through a five year staggered process that involves monitoring, assessment, prioritization, plan development, and plan implementation. There is currently one watershed-based plan (WBP) in development in the Big Sandy River, Little Sandy River, and Tygarts Creek basins for the Elkhorn Creek area. The WBP will provide a comprehensive assessment of the health of the Elkhorn Creek watershed, citizen and stakeholder concerns, watershed remediation strategies, and implementation plans for the future. Monitoring plans will be included in the WBP to track impairment status in the watershed.

In addition, the Watershed Management Branch and Kentucky Waterways Alliance have jointly published the Watershed Planning Guidebook for Kentucky Communities. The publication provides guidance on forming a watershed planning team, developing supportive partnerships, understanding watershed hydrology, finding data sources, monitoring for new data, analyzing data, selecting best management practices (BMPs), securing funding, and measuring progress of plan implementation. Segment-specific monitoring information can be found in Appendices C, G, and N of the Addendum.

Assessment: Although not a required element of the EPA's TMDL approval process, the KDOW provided adequate information about its rotating basin monitoring plans and other initiatives that could be established to evaluate the progress toward attainment of water quality standards. The EPA is taking no action on the monitoring plan.

9. Implementation Plans

On August 8, 1997, Bob Perciasepe (the EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs regions to work in partnership with states/tribes to achieve nonpoint source load allocations established for Section 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that regions assist states/tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by the EPA, they help establish the basis for the EPA's approval of TMDLs.

Section 7.0 of the Core Document discusses several options to support implementation of bacteria allocations.

For KPDES-permitted sources of bacteria to impaired waterbodies, an approved TMDL is implemented through the permitting process. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average and 240 colonies/100 ml as a maximum weekly average. New or expanded SWS sources will be allowed to discharge to an impaired segment covered by the Addendum contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. In contrast to the continuously flowing discharges from SWS facilities, permitted discharges from stormwater sources are intermittent and vary widely in flow, composition, and duration. Because of the complexity of stormwater discharges, KDOW follows the EPA-recommended process of having the permitting authority express the limits for Phase I and II stormwater permittees in narrative, rather than numeric, terms when translating the WLA into effluent limitations in the permit. Narrative requirements often are expressed in the permit as BMPs or other stormwater management measures.

Nonpoint sources' compliance with the LA is voluntary, and many of these sources are not regulated by the KDOW. Thus, reducing the bacteria load from nonpoint sources will depend on voluntary actions by citizens, property owners, and other stakeholders who use the land resources within the watershed of an impaired water. Under Kentucky's continuing planning process umbrella, the KDOW's Watershed Management Branch will provide technical support for developing and implementing watershed plans to address water quality and quantity problems and threats. Within the Watershed Management Branch and through the Kentucky Management Framework, a basin coordinator is assigned to work with citizens in the Big Sandy River, Little Sandy River, and Tygarts Creek basins. The basin coordinator for the Big Sandy River, Little Sandy River, and Tygarts Creek basins is currently Michaela Lambert and she serves as a facilitator for agency activities and as a point of contact for local organizations interested in addressing clean water issues. Additionally, Non-Governmental Organizations, such as Watershed Watch and Kentucky Waterways Alliance, assists in monitoring and data collection as well as networking and creating alliances for watershed stewardship.

As mentioned above in Section 8 of this document, local watershed teams may choose to develop a WBP to detail conditions in their watershed and guide efforts to protect and restore threatened or impaired waters. WBPs provide an integrative approach for identifying and describing who, when, where, what, and how actions should be taken in order to meet water quality standards. There is currently one WBPs in the draft stages in the Big Sandy River, Little Sandy River, and Tygarts Creek

basins, which will include implementation plans outlining the most effective BMPs for the Elkhorn Creek watershed, interested and invested stakeholders, and action items relating to each BMP. The final detailed plan will be located on the Big Sandy River, Little Sandy River, and Tygarts Creek Basins Coordination webpage at the following address: https://eec.ky.gov/Environmental-Protection/Water/Outreach/BasinCoordination/Pages/BigSandyRiverBasin.aspx.

Assessment: Although not a required element of the TMDL approval, the KDOW discussed how information derived from the TMDL analysis process can be used to support implementation of the TMDLs. The EPA is taking no action on the implementation portion of the Submission.

10. Reasonable Assurances

The EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for the EPA to determine that the load and wasteload allocations will achieve water quality standards.

In a waterbody impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, states/tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in state/tribe's implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."

The loads to surface water from non-KPDES permitted sources are regulated by laws such as the Kentucky Agricultural Water Quality Act (AWQA, KRS 224.71-100 through 224.71-145, i.e., implementation of individual agriculture water quality plans and corrective measures), the federal CWA (i.e., the TMDL process) and 401 KAR 5:037 (Groundwater Protection Plans), among others.

As described above, the KDOW assigns a basin coordinator to each river basin. Basin coordinators work with a variety of government agencies, local officials, nonprofit groups, businesses, citizens, and other stakeholders to develop and support a local watershed management team associated with each priority watershed. Coordinators bring together the ongoing efforts in the watershed to evaluate water quality, educate the general public, identify common goals, secure needed funding, and carry out watershed improvement activities. They build community support by promoting awareness of issues, developing relationships, and involving partners in projects, which creates a network of stakeholders with a vested interest in the success of the effort.

Also as mentioned above in Sections 8 and 9 of this document, there is currently one WBP in development in the Big Sandy River, Little Sandy River, and Tygarts Creek basins covering the Elkhorn Creek watershed. When the plan is finalized, it will detail the strategy and the workplan to implement restoration efforts in the Big Sandy River, Little Sandy River, and Tygarts Creek basins. More details can be found on the KDOW Big Sandy River, Little Sandy River, and Tygarts Creek basins webpage:

https://eec.ky.gov/Environmental-Protection/Water/Outreach/BasinCoordination/Pages/BigSandyRiverBasin.aspx.

Cooperation and active participation by the general public and various industry, business, and environmental groups is critical to successful implementation of TMDLs. The Core Document links to a number of publications and information resources on the EPA's Nonpoint Source Pollution webpage (http://www.epa.gov/polluted-runoff-nonpoint-source-pollution) relating to the implementation and evaluation of nonpoint source pollution control measures. Local citizen-led and implemented management measures have the potential to provide the most efficient and comprehensive avenue for reduction of loading rates from nonpoint sources. The KDOW supports these efforts through the Kentucky Nonpoint Source Pollution Control Program, which awards grants to projects that focus on reducing nonpoint source pollution in the Commonwealth.

Assessment: The EPA considered the reasonable assurances contained in the Core Document and Addendum. Point sources are required to comply with their KPDES permits, which must include the requirements and assumptions of the TMDL. The point sources must meet the criteria at the point of discharge in order to meet the regulatory definition of "not causing or contributing to a water quality violation." Reductions for nonpoint sources are expected to occur as a result of the incentive and voluntary programs already in place.

11. Public Participation

The EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each state/tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 CFR Section 130.7(c)(1)(ii)). In guidance, the EPA has explained that final TMDLs submitted to the EPA for review and approval must describe the state/tribe's public participation process, including a summary of significant comments and the state/tribe's responses to those comments. When the EPA establishes a TMDL, the EPA regulations require the EPA to publish a notice seeking public comment (40 CFR Section 130.7(d)(2)).

Inadequate public participation could be a basis for disapproving a TMDL; however, where the EPA determines that a state/tribe has not provided adequate public participation, the EPA may defer its approval action until adequate public participation has been provided for, either by the state/tribe or by the EPA.

The Report was made available to the public for review and comment starting June 17, 2021 and ending July 19, 2021. The KDOW provided the opportunity for public involvement via several avenues. Legal advertisements were purchased in local newspapers throughout the Big Sandy River, Little Sandy River, and Tygarts Creek basins, including: The Herald-Leader (Lexington, Fayette Co.), The Daily Independent (Ashland, Boyd Co.), Appalachian News-Express (Pikeville, Pike Co.), Mountain Citizen (Inez, Martin Co.), Kentucky Enquirer (Ft. Mitchell, Kenton Co.), Hazard Herald (Hazard, Perry Co.), Advocate Messenger (Danville, Boyle Co.), and The Middlesboro Daily News (Middlesboro, Bell Co.).

Notice of the public comment period was posted on the Division of Water's Public Notices website and distributed to the TMDL email distribution list (TMDL@ky.gov), which is a list of persons who expressed interest in receiving information and announcements related to the Kentucky 303(d) and TMDL program. The announcement also was distributed to the Nonpoint Source Pollution Control

email list of persons interested in water quality issues (ollietheotter@ky.gov), posted to the Kentucky Energy and Environment Cabinet's (EEC) weblog Naturally Connected, the Kentucky EEC Facebook page, and the Kentucky EEC Twitter page.

No comments were received during the public notice period. Section 2.0 of the Addendum further details public participation information.

Assessment: No comments were received during the public notice period. The EPA concludes that the KDOW involved the public during the development of the TMDL and provided adequate opportunities for the public to comment on the Report.

12. Submittal Letter

A submittal letter should be included with the TMDL analytical document and should specify whether the TMDL is being submitted for a technical review or is a final submittal. Each final TMDL submitted to the EPA must be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the CWA for the EPA review and approval. This clearly establishes the state/tribe's intent to submit, and the EPA's duty to review the TMDL under the statute. The submittal letter, whether for technical review or final submittal, should contain such information as the name and location of the waterbody and the pollutant(s) of concern.

Assessment: A letter with appropriate information was included with the final Submission from the KDOW dated August 9, 2021 and signed by Carey Johnson, Director, Division of Water.

13. Conclusion

After a full and complete review, the EPA finds that the *Addendum to Kentucky Statewide Total Maximum Daily Load (TMDL) for Bacteria Impaired Waters: Big Sandy River, Little Sandy River, and Tygarts Creek Basin Appendices* satisfies all of the elements of approvable TMDLs. This **APPROVAL** is for 19 TMDLs, addressing 18 waterbodies in the Big Sandy River, Little Sandy River, and Tygarts Creek basins for use impairments due to *E. coli* and/or fecal coliform.

This Submission is not a stand-alone document. It relies on the TMDL loading equations and the general information outlined in the Core Document, *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters,* that was approved by the EPA in 2019. The Core Document details the methodology and process that the KDOW uses to establish bacteria TMDLs statewide and provides general information that is relevant to all bacteria impaired segments, regardless of location. The TMDLs in this Report are being submitted for approval as an addendum to the Core Document submission.

Segment TMDL Allocations from Table S.3 of the Core Document:

TMDL[2]	Allocations for Direct Loads to the Segment				Allocations for Upstream Loads to the Segment[7]	Allocations for Tributary Loads to the Segment[8]	MOS[9]
	SWS-WLA[3]	MS4-WLA[4]	CSO-WLA[5]	LA[6]			
$Q_S \times WQC \times CF$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{CSO} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of either *E. coli* or fecal coliform. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average and 240 colonies/100 ml as a maximum weekly average or as a fecal coliform effluent gross limit of 200 colonies/100 ml as a monthly average and 400 colonies/100 ml as a maximum weekly average.

[4]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[5]Q_{CSO} is the flow (ft^3/s) in the segment due to a CSO entity. Dry weather CSO flows are prohibited. During wet weather events, a CSO entity is compliant with its CSO-WLA if it is compliant with its Long Term Control Plan and KPDES permit.

[6]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[7]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[8]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[9]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

(d)For SCR-impaired segments, SWS sources must meet the PCR criterion year-round.