UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

13 JUL 2016

Ms. Sara Parker Pauley, Director
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65102

RE: Approval of TMDL document for Creve Coeur Creek

Dear Ms. Pauley:

This letter responds to the submission from the Missouri Department of Natural Resources, received by the U.S. Environmental Protection Agency, Region 7, on January 7, 2015, for a Total Maximum Daily Load document which contained a TMDL for *Escherichia coli*. Creve Coeur Creek was identified on the 2014 Missouri Section 303(d) List as impaired for *E. coli*. This submission fulfills the Clean Water Act statutory requirement to develop TMDLs for impairments listed on a state's § 303(d) List. The specific impairment (water body segment and pollutant) are:

Water Body Name	**WBIDs**	**Cause**
Creve Coeur Creek	MO_1703	*Escherichia coli*

The EPA has completed its review of the TMDL document with supporting documentation and information. By this letter, the EPA approves the submitted TMDL. Enclosed with this letter is the EPA Region 7 TMDL Decision Document which summarizes the rationale for the EPA's approval of the TMDL. The EPA believes the separate elements of the TMDL described in the enclosed document adequately address the pollutants of concern, taking into consideration seasonal variation and a margin of safety.

Although the EPA does not approve the monitoring or implementation plans submitted by the state, the EPA acknowledges the state's efforts. The EPA understands that the state may use the monitoring plan to gauge the effectiveness of the TMDL and determine if future revisions are necessary or appropriate to meet applicable water quality standards. The EPA recognizes that technical guidance and support are critical to determining the feasibility of achieving the goals outlined in this TMDL document. Therefore, the implementation plan in this TMDL provides information regarding implementation efforts to achieve the loading reductions identified.

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The EPA appreciates the thoughtful effort that the MDNR has put into this TMDL. We will continue to cooperate with and assist, as appropriate, in future efforts by the MDNR to develop TMDLs.

Sincerely,

Karen A. Flournoy

Karen A. Flournoy
Director
Water, Wetlands and Pesticides Division

Enclosure

cc: Mohsen Dkhili, MDNR

EPA Region 7 TMDL Review

TMDL ID: MO_1703 **State:** MO
Document Name: CREVE COEUR CREEK

Basin(s): LOWER MISSOURI RIVER BASIN
HUC(s): 10300200
Water body(ies): CREVE COEUR CR.
Tributary(ies): NONE
Cause(s): E. COLI - PRIMARY CONTACT RECREATION

Submittal Date: 1/7/2015 **Approved:** Yes

Submittal Letter and Total Maximum Daily Load Revisions

The state submittal letter indicates final TMDL(s) for specific pollutant(s) and water(s) were adopted by the state, and submitted to the EPA for approval under Section 303(d) of the Clean Water Act [40 CFR § 130.7(c)(1)]. Include date submitted letter was received by the EPA, date of receipt of any revisions and the date of original approval if submittal is a revised TMDL document.

The TMDL document for bacteria was submitted by the Missouri Department of Natural Resources on January 7, 2015. After comments from the U.S. Environmental Protection Agency, a revised final TMDL was submitted as an email attachment on February 10, 2015.

Water Quality Standards Attainment

The targeted pollutant is validated and identified through assessment and data. The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. The TMDL(s) and associated allocations are set at levels adequate to result in attainment of applicable water quality standards [40 CFR § 130.7(c)(1)]. A statement that the WQS will be attained is made.

Creve Coeur Creek was first listed as impaired by bacteria in 2006 due to data showing elevated *Escherichia coli* concentrations. The state's 2014 listing methodology determines a water body to be impaired by bacteria if the geometric mean in a given recreational season exceeds the water quality criteria of 206 *E. coli* counts per 100 milliliters of water (206/100mL) in any of the last three years for which there are available data.

Data collected from Creve Coeur Creek by the U.S. Geological Survey, or USGS, and the Metropolitan St. Louis Sewer District show exceedances of the state's whole body contact recreation category B criterion. This assessment is based on the geometric mean of at least five samples collected during the state's recreational season (April 1 through October 31). Bacteria data collected from Creve Coeur Creek within the last five years are expected to be the most representative of the stream's current condition.

The *E. coli* target is based on the geometric mean during the recreational season for waters designated with the whole body contact recreation category B use. The concentration value of 206 counts/100 mL will serve as the numeric target for TMDL development. Achieving this targeted load will also result in achieving the state's whole body contact recreation category B water quality criterion. The loading capacity was calculated using the load duration curve that identifies the maximum allowable daily pollutant load for any given day as a function of the flow occurring that day.

The water quality standard for whole body contact recreation category B at any flow exceedance will be attained per the loading capacity established by the TMDL document. For example at the 75 percent flow exceedance, the loading capacity is 2.22E+10 counts per day.

The TMDL allocations for *E. coli* are set at levels adequate to attain all applicable WQS in Creve Coeur Creek.

Designated Use(s), Applicable Water Quality Standard(s) and Numeric Target(s)

The submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria, and a numeric target. If the TMDL(s) is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

The following designated uses for Creve Coeur Creek are in the Missouri water quality standards at 10 CSR 20-7.031- Table H, and in the Missouri Use Designation Dataset (version 1) described at 10 CSR 20-7.031(1)(P). The MUDD includes the EPA approved use determinations:

- Livestock and wildlife protection
- Irrigation
- Protection and propagation of fish, shellfish and wildlife – warm water habitat
- Human health protection
- Secondary contact recreation
- Whole body contact recreation category B

The whole body contact recreation category B designated use for Creve Coeur Creek is impaired by *E. coli* bacteria. Whole body contact recreation includes activities in which there is direct human contact with surface water that results in complete body submergence, thereby allowing accidental ingestion of the water as well as direct contact with sensitive body organs, such as the eyes, ears and nose. (Category A waters include water bodies that have been established as public swimming areas and waters with documented existing whole body contact recreational uses by the public. Category B applies to waters designated for whole body contact recreation, but are not contained within category A.)

In Missouri's water quality standards at 10 CSR 20-7.031(5)(C) and Table A, specific numeric criteria are given for the protection of the whole body contact recreation use. For category B waters, *E. coli* counts, measured as a geometric mean of at least five samples collected during the recreation season, shall not exceed 206 counts/100 milliliters of water. The state's recreational season is defined in 10 CSR 20-7.031(5)(C) being from April 1 to October 31.

The TMDL established for *E. coli* is protective of all the designated uses for Creve Coeur Creek.

Pollutant(s) of Concern

A statement that the relationship is either directly related to a numeric water quality standard, or established using surrogates and translations to a narrative WQS is included. An explanation and analytical basis for expressing the TMDL(s) through surrogate measures, or by translating a narrative water quality standard to a numeric target is provided (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae). For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and a margin of safety that do not exceed the loading capacity. If the submittal is a revised TMDL document, there are refined relationships linking the load to water quality standard attainment. If there is an increase in the TMDL(s), there is a refined relationship specified to validate that increase (either load allocation or wasteload allocation). This section will compare and validate the change in targeted load between the versions.

There is a direct link between the bacteria TMDL target and Missouri's water quality standard using *E. coli* as the primary measurement parameter. Selection of *E. coli* as the numeric target enables the use of the highest quality data available and provides consistency with Missouri's water quality standards.

The bacteria target is based on the whole body contact recreation category B criterion of 206 *E. coli* counts per 100 milliliters of water (206/100mL).

Source Analysis

Important assumptions made in developing the TMDL document, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, nonpoint and

background sources of pollutants of concern are described, including magnitude and location of the sources. The submittal demonstrates all significant sources have been considered. If this is a revised TMDL document any new sources or removed sources will be specified and explained.

In the absence of a national pollutant discharge elimination system permit, the discharges associated with sources were applied to the load allocation, as opposed to the wasteload allocation for purposes of this TMDL document. The decision to allocate these sources to the LA does not reflect any determination by the EPA as to whether these discharges are, in fact, unpermitted point source discharges within this watershed. In addition, by establishing these TMDL(s) with some sources treated as LAs, the EPA is not determining that these discharges are exempt from NPDES permitting requirements. If sources of the allocated pollutant in this TMDL document are found to be, or become, NPDES-regulated discharges, their loads must be considered as part of the calculated sum of the WLAs in this TMDL document. Any WLA in addition to that allocated here is not available.

The population of the Creve Coeur Creek watershed is not directly available; however, using U.S. Census Bureau census block data from 2010, the population of the Creve Coeur Creek watershed was estimated to be approximately 62,645.

Land use calculations are based on data from 2000 to 2004 at 30-meter resolution obtained from Thematic Mapper imagery.

Land use in the Creve Coeur Creek watershed

Land Use Type	*Acres*	*Square Miles*	*Percentage*
Impervious	1,048	1.64	5.92
High-Intensity Urban	140	0.22	0.79
Low-Intensity Urban	11,106	17.35	62.77
Row and Close-grown Crops	172	0.27	0.97
Grassland	2,463	3.85	13.92
Forest & Woodland	2,198	3.43	12.42
Herbaceous	5	0.01	0.03
Wetland	304	0.48	1.72
Open Water	253	0.40	1.45
Barren	0	0	0
Total:	17,692	27.65	99.99

These calculations are presented in Table 3 within the TMDL document. The watershed is predominantly an urban environment, with areas categorized as urban or impervious accounting for over 69 percent of the watershed. Table 6 within the TMDL document presents land use data for the riparian corridor within the Creve Coeur Creek watershed. This analysis used the land use data calculated in Section 2.4 with in the TMDL document and defined the riparian corridor as including a 30-meter area on each side of all streams included in the National Hydrography Dataset 1:24,000-scale flowline.

The Creve Coeur Creek watershed contains 21 permitted facilities. Five of these facilities have general permits and the remaining 16 have storm water permits. There are no facilities with site-specific permits in the Creve Coeur Creek watershed, nor are there any permitted CAFOs. A summary of the general and storm water permits in the Creve Coeur Creek watershed can be found in Table 5 within the TMDL document.

There are no municipal or domestic wastewater permitted facilities or outfalls in the Creve Coeur Creek watershed. However, the urban area within the watershed is serviced by a sanitary sewer system maintained by the Metropolitan St. Louis Sewer District. A sanitary sewer system is designed to carry household waste, which includes both greywater and sewage, to a wastewater treatment facility; in this case, the Missouri River wastewater treatment facility, permit number MO-0004391, located about 2 miles north of the watershed. Although the treatment facility is located outside the watershed, the presence of the sewerage system infrastructure within the Creve Coeur Creek watershed is a potential source of bacteria due to possible overflows.

Sanitary sewer overflows are untreated or partially treated sewage releases from a sanitary sewer system. Overflows could occur for a variety of reasons including blockages, line breaks, sewer defects, lapses in sewer system operation and maintenance, inadequate sewer design and construction, power failures and vandalism. Sanitary sewer overflows can occur during either dry or wet weather and at any point in the collection system, including manholes. Such overflows are unpermitted and unauthorized by the federal Clean Water Act.
In addition to unintended overflows, six constructed sanitary sewer overflows, installed to relieve the sanitary sewers from excess flow caused by inflow and infiltration of storm water during high rain events, were located within the watershed. The Metropolitan St. Louis Sewer District has eliminated three of these constructed sanitary sewer overflows. The three remaining overflows, as well as the three eliminated overflows, are all located upstream of the impaired segment.

No combined sewer overflows exist within the Creve Coeur Creek watershed. Therefore, combined sewer overflows do not cause or contribute to the bacteria impairment of Creve Coeur Creek.

Bacterial inputs to streams from urban runoff can be caused by sanitary sewer overflows, but also commonly results from residential and green space runoff carrying domestic and wild animal wastes. Another component of urban runoff is runoff originating from highway corridors. The Federal Highway Administration published research showing that runoff from highway corridors may also contain bacteria. Sources of *E. coli* to highway areas identified in the study include bird droppings, soil and vehicles carrying livestock and stockyard wastes, which may periodically "seed" a roadway. The study further notes that the magnitude and contributions from highway systems are site-specific and can be affected by numerous factors, such as traffic, design, maintenance, land use, climate and accidental spills. For these reasons, the significance of any highway contributions of bacteria in the Creve Coeur Creek watershed cannot be quantified in this TMDL document.

Storm water discharges of urban runoff within the entire Creve Coeur Creek watershed are regulated through municipal separate storm sewer system permits. For this reason, urban storm water runoff is considered a point source for this TMDL document.

Regarding the remaining general and non-MS4 storm water permits in Table 5 within the TMDL document; activities in the watershed will be conducted in compliance with all permit conditions, including monitoring and discharge limitations. It is expected that compliance with these permits will result in bacterial loadings at or below applicable targets. For these reasons, these facilities are not expected to cause or contribute to the bacterial impairment of Creve Coeur Creek.

Illicit straight pipe discharges of household waste are also potential point sources of bacteria. These sources are illegal and unpermitted discharges straight into streams or land areas and are different from illicitly connected sewers. However, there are no specific data on the number or presence of illicit straight pipe discharges of household waste in the Creve Coeur Creek watershed. Due to the presence of a sewerage system throughout the watershed, illicit straight pipe discharges are not expected to be significant contributors of *E. coli* to Creve Coeur Creek.

Typical nonpoint sources of pollution that have the potential to influence water quality include various sources associated with runoff from agricultural lands, unregulated urban storm water, onsite wastewater treatment systems, and riparian corridor conditions.

Storm water runoff from lands used for agricultural purposes is often a source of bacterial loading to water bodies. Activities associated with agricultural land uses that may contribute bacteria to a water body include manure fertilization of croplands or pastures, and livestock grazing. However, as noted in Section 2.4 within the TMDL document, agricultural land in the Creve Coeur Creek watershed is virtually nonexistent. Less than 1 percent of the land use area within the watershed was classified as cropland and from recent aerial imagery these areas were found to be athletic fields or disturbed green spaces. For this reason, bacterial loading from cropland is not a likely contributor to the impaired condition of Creve Coeur Creek.

Onsite wastewater treatment systems may contribute bacteria to Creve Coeur Creek either directly or as a component of MS4-permitted storm water. The exact number of onsite wastewater treatment systems in the Creve Coeur Creek watershed is unknown, however such systems are known to exist in areas of the county developed prior to the sewerage systems serviced by the Metropolitan St. Louis Sewer District. Due to the overall urban nature of the watershed, the number of onsite wastewater systems present in the watershed is expected to be low.

EPA's Spreadsheet Tool for Estimating Pollutant Load website estimates the failure rate of onsite wastewater treatment systems in St. Louis County as being 39 percent. A more recent study conducted by the Electric Power Research Institute suggests that up to 50 percent of onsite wastewater treatment systems may be failing. Despite the lack of specific data showing that onsite wastewater treatment systems are a significant problem in the Creve Coeur Creek watershed, the available failure rate data suggests that onsite wastewater treatment systems in the watershed are potential contributors of bacteria to Creve Coeur Creek either directly or as a component of MS4 storm water. However, due to the overall urban nature of the watershed, the number of onsite wastewater systems present in the watershed is expected to be low.

Although livestock sources and animal feeding operations appear to be insignificant or non-existent in the Creve Coeur Creek watershed, any concentrated animal feeding operation that does not obtain an National Pollutant Discharge Elimination System permit must operate as a no discharge operation. Any discharge from an unpermitted CAFO is a violation of Section 301 of the Clean Water Act. It is the EPA's position that all CAFOs should obtain an NPDES permit because it provides clarity of compliance requirements, authorization to discharge when the discharges are the result of large precipitation events such as in excess of the 25-year and 24-hour frequency/duration event or are from a man-made conveyance. However, many large CAFOs contend that they do not discharge and therefore are not required to obtain an NPDES permit. It is the EPA's opinion that many of the "no discharge" CAFOs may not have adequate land application area to ensure the agronomic uptake of land applied waste or are not designed, constructed, operated or maintained so that they will not discharge. Furthermore, there are likely many animal feeding operations that meet the definition of a medium CAFO, i.e., discharge via a man-made conveyance, but are unpermitted and have not limited their impact on waters by applying best professional judgment to effluent reductions, pursuant to a permit.

Animal feeding operations are considered under the load allocation because there is currently not enough detailed information to know whether these facilities are required to obtain NPDES permits. This TMDL document does not reflect a determination by the EPA that such a facility does not meet the definition of a CAFO nor that the facility does not need to obtain a permit. To the contrary, a CAFO that discharges or proposes to discharge has a duty to obtain a permit. If it is determined that any such operation is a CAFO that discharges, any future WLA assigned to the facility must not result in an exceedance of the sum of the WLAs in the TMDL document as approved.

All known sources of the *E. coli* cause of impairment to Creve Coeur Creek have been considered in the submitted TMDL document. Any future point sources should be evaluated against the TMDL and the range of flows, which any additional bacterial loading will affect.

Allocation - Loading Capacity

The submittal identifies appropriate loading capacities, wasteload allocations for point sources and load allocations for nonpoint sources. If no point sources are present, the WLA is stated as zero. If no nonpoint sources are present, the LA is stated as zero [40 CFR § 130.2(i)]. If this is a revised TMDL document the change in loading capacity will be documented in this section. All TMDLs must give a daily number. Establishing TMDL "daily" loads consistent with the U.S. Court of Appeals for the D.C. circuit decision in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015, (April 25, 2006).

A TMDL calculates the loading capacity of a water body and allocates that load among the various pollutant sources in the watershed. The loading capacity is the maximum pollutant load that a water body can assimilate and still meet water quality standards. It is equal to the sum of the wasteload allocation, load allocation and the margin of safety, and can be expressed as the equation:

$$TMDL = LC = \Sigma WLA + \Sigma LA + MOS,$$

where LC is the loading capacity, ΣWLA is the sum of the wasteload allocations, ΣLA is the sum of the load allocations and MOS is the margin of safety.

For Creve Coeur Creek, the bacteria TMDL is expressed as *E. coli* counts per day using a load duration curve. To develop a load duration curve, the TMDL target concentration is multiplied by the flow and a conversion factor to generate the maximum allowable load at different flows. Figure 9, in the TMDL document, is the bacteria TMDL load duration curve calculated for Creve Coeur Creek. The y-axis describes bacteria loading as counts per day, which are plotted against the flow duration intervals on the x-axis, which represent the frequency for which a particular flow is met or exceeded. The load duration curve presented in Figure 9, in the TMDL document, represents the loading capacity as a solid curve over the range of flows. Bacteria measurements collected from Creve Coeur Creek during the recreation season are charted as well. Flow condition ranges presented in Figure 9 illustrate general base-flow and surface storm water runoff conditions consistent with the EPA guidance on using the load duration curves for TMDL development. Table 7, in the TMDL document, presents selected TMDL loading capacities and TMDL allocations for Creve Coeur Creek at various flow exceedances along the load duration curve.

The water quality standard for whole body contact recreation category B at any flow exceedance will be attained per the loading capacity established by the TMDL document. For example at the 75 percent flow exceedance, the loading capacity is 2.227E+10 counts per day.

The TMDL allocations for *E. coli* are set at levels adequate to attain all applicable WQS in Creve Coeur Creek.

Wasteload Allocation Comment

The submittal lists individual wasteload allocations for each identified point source [40 CFR § 130.2(h)]. If a WLA is not assigned it must be shown that the discharge does not cause or contribute to a water quality standard excursion, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLA. Any such exceptions must be explained to a satisfactory degree. If a WLA of zero is assigned to any facility it must be stated as such [40 CFR § 130.2(i)]. If this is a revised TMDL document, any differences between the original TMDL(s) WLA and the revised WLA will be documented in this section.

The wasteload allocation is the allowable amount of the pollutant load that can be allocated to existing or future point sources. Typically, point sources are permitted with limits for a given pollutant that are the most stringent of either technology-based effluent limits or water quality-based effluent limits. Technology-based effluent limits are based upon the expected capability of a treatment method to reduce the pollutant to a certain concentration. Water quality-based effluent limits represent the most stringent concentration of a pollutant that a receiving stream can assimilate without exceeding the applicable water quality standards at a specific location. Wasteload allocations for Creve Coeur Creek over a range of flows are presented in Table 7, in the TMDL document.

In the Creve Coeur Creek watershed, storm water runoff discharged through the municipal separate storm sewer systems is regulated through two MS4 permits. Permit number MO-R040063 regulates MS4 discharges from Missouri Department of Transportation right-of-ways and permit number MO-R040005 regulates MS4 discharges from all other areas of the watershed. Bacterial contributions from MS4 permitted entities are precipitation dependent and vary with flow. Because the entire watershed area is regulated through MS4 permits and there are no other permitted facilities found to significantly contribute bacteria loads to Creve Coeur Creek, the entire wasteload allocation is allocated to the total MS4 area as an aggregated wasteload allocation.

The wasteload allocation in this TMDL do not preclude the establishment of future point sources of potential bacterial loading. Any future point sources and permit limits should be evaluated with respect to the TMDL document or any necessary revisions. For example, at the fifty percentile flow exceedance, the WLA is 4.18E+10 counts per day.

There are no site-specific permitted point sources in the Creve Coeur Creek watershed that may contribute to *E. coli* loading. A sewerage system is present in the watershed; however, this system discharges from a treatment plant located outside of the watershed. Even so, sanitary sewer overflows still occur and are likely significant contributors of *E. coli* to Creve Coeur Creek and its tributaries. However, these discharges are unpermitted and not authorized under the Clean Water Act. For this reason, constructed sanitary sewer overflows in the Creve Coeur Creek watershed are given a wasteload allocation of zero. Elimination of bacteria loading from these sources will be accomplished through the requirements of the Metropolitan St. Louis Sewer District's consent decree.

Table 5, within the TMDL document, lists other facilities with general or non-MS4 storm water permits; however, the department assumes activities in the watershed will be conducted in compliance with all permit

conditions, including monitoring and discharge limitations. It is expected that compliance with these permits will result in bacterial loading at or below applicable targets. For these reasons, these facilities are considered to cause or contribute to the bacterial impairment of Creve Coeur Creek and the assigned wasteload allocation for these facilities is zero.
The WLA is zero for each of the non-MS4 permitted facilities in the watershed.

Load Allocation Comment

All nonpoint source loads, natural background and potential for future growth are included. If no nonpoint sources are identified, the load allocation must be given as zero [40 CFR § 130.2(g)]. If this is a revised TMDL document, any differences between the original TMDL(s) LA and the revised LA will be documented in this section.

The load allocation is the allowable amount of the pollutant load that can be assigned to nonpoint sources and includes all existing and future nonpoint sources, as well as natural background contributions. Nonpoint sources identified in this TMDL document to be potential contributors of bacteria include onsite wastewater treatment systems. If functioning properly, these systems should not be contributing to the impaired condition of Creve Couer Creek. Onsite wastewater treatment systems are assigned a load allocation of zero. Other nonpoint sources are considered minimal for the purposes of this TMDL and therefore no load allocations are assigned for these sources and the total load allocation for the TMDL document is zero.

Margin of Safety

The submittal describes explicit and/or implicit margins of safety for each pollutant [40 CFR § 130.7(c)(1)]. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided. If this is a revised TMDL document, any differences in the MOS will be documented in this section.

A margin of safety is required in the TMDL calculation to account for uncertainties in scientific and technical understanding of water quality in natural systems. The margin of safety is intended to account for such uncertainties in a conservative manner. Based on the EPA guidance, the margin of safety can be achieved through two approaches:

Explicit - Reserve a portion of the loading capacity as a separate term in the TMDL.

Implicit - Incorporate the margin of safety as part of the critical conditions for the wasteload allocation and the load allocation calculations by making conservative assumptions in the analysis.

The margin of safety for this TMDL is implicit due to conservative assumptions in the modeling of this TMDL, the use of multiple years of flow gage data collected under all flow conditions to create a robust TMDL calculation and the reduced uncertainty of the sources of impairment and their remediation through the Metropolitan St. Louis Sewer District's consent decree. Additionally, bacteria decay rates weren't applied and the direct recreation-season geometric mean was used for estimating the Clean Water Act required daily loading value.

Seasonal Variation and Critical Conditions

The submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s) [40 CFR § 130.7(c)(1)]. Critical conditions are factors such as flow or temperature which may lead to the excursion of the WQS. If this is a revised TMDL document, any differences in conditions will be documented in this section.

Missouri's water quality criteria for the protection of whole body contact recreation are applicable during the recreational season defined as being from April 1 to October 31. The TMDL load duration curve in Figure 9 of the TMDL document represents stream flow under all conditions and uses flow data collected in all seasons. For this reason, the *E. coli* targets and allocations established in this TMDL document will be protective throughout the recreation season and during flow conditions associated with storm driven flow events, including flows associated with seasonal rain patterns when bacteria loading is more likely. The advantage of a load duration curve approach is that all flow conditions are considered and the constraints associated with using a single-flow critical condition are avoided.

Public Participation

The submittal describes required public notice and public comment opportunities, and explains how the public comments were considered in the final TMDL(s) [40 CFR § 130.7(c)(1)(ii)].

There was a 45-day public notice and comment period for this TMDL document from June 22, through August. 6, 2012. Any comments received and the department's responses to those comments will be maintained on file with the department and on the Creve Coeur Creek TMDL record webpage at dnr.mo.gov/env/wpp/tmdl/1703-creve-coeur-ck-record.htm. In addition to the public notice and comment period, the department hosted a meeting to provide information to the public regarding the TMDL process and the overall goals of this and other bacteria TMDLs developed for impaired streams in St. Louis County. The public meeting was held on September 12, 2012, at the Daniel Boone Branch of the St. Louis County Library at 300 Clarkson Road in Ellisville. The meeting agenda, the department's presentation and an attendance sheet are available online on the Creve Coeur Creek TMDL record webpage. A total of 19 comments were received by groups or individuals.

Due to comments received during the 2012 public comment period and revisions made to the state's water quality standards in 2014, changes to the TMDL document were necessary. For this reason, a second public comment period was held for 90 days from May 23, to August 21, 2014. This public comment period included the Creve Coeur Creek TMDL document as well as TMDLs for Coldwater Creek, Fishpot Creek and Watkins Creek. Due to requests from the Metropolitan St. Louis Sewer District and members of the Partnership for Tomorrow, this comment period was extended an additional 60 days to October 21, 2014.

During the public comment period, the department met with groups who wanted to share their concerns regarding the TMDL document. The department met twice during the public comment period with the Metropolitan St. Louis Sewer District, once on July 22, 2014, and again on October 2, 2014. The department also met with the Missouri Department of Transportation during the public comment period on June 24, 2014, to discuss their concerns with the TMDL document and again on October 9, 2014, to discuss potential bacteria monitoring and implementation of the TMDL document. A third meeting, requested in public comments submitted by the Metropolitan St. Louis Sewer District, was held with the district on December 30, 2014. All comments received were addressed as needed.

Monitoring Plan for TMDL(s) Under a Phased Approach

The TMDL identifies a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards, and a schedule for considering revisions to the TMDL(s) (where a phased approach is used) [40 CFR § 130.7]. If this is a revised TMDL document, monitoring to support the revision will be documented in this section. Although the EPA does not approve the monitoring plan submitted by the state, the EPA acknowledges the state's efforts. The EPA understands that the state may use the monitoring plan to gauge the effectiveness of the TMDLs and determine if future revisions are necessary or appropriate to meet applicable water quality standards.

The department has not yet scheduled post-TMDL monitoring for Creve Coeur Creek. Post-TMDL monitoring is usually scheduled and carried out by the department approximately three years after the approval of the TMDL or in a reasonable period following completion of permit compliance schedules and the application of new effluent limits, or following significant implementation activities such as removal of constructed sanitary sewer overflows. The department will routinely examine water quality data collected by other local, state and federal entities in order to assess the effectiveness of TMDL implementation.

Reasonable Assurance

Reasonable assurance only applies when less stringent wasteload allocation are assigned based on the assumption that nonpoint source reductions in the load allocation will be met [40 CFR § 130.2(i)]. This section can also contain statements made by the state concerning the state's authority to control pollutant loads. States are not required under Section 303(d) of the Clean Water Act to develop TMDL implementation plans and the EPA does not approve or disapprove them. However, this TMDL document provides information regarding how point and nonpoint sources can or should be controlled to ensure implementation efforts achieve the loading reductions identified in this TMDL document. The EPA recognizes that technical guidance and support are critical to determining the feasibility of and achieving the goals outlined in this TMDL document. Therefore, the discussion of reduction efforts relating to point and nonpoint sources can be found in the implementation section of the TMDL document, and are briefly described below.

The states have the authority to issue and enforce state operating permits. Inclusion of effluent limits into a state operating permit and requiring that effluent and instream monitoring be reported to the state should provide reasonable assurance that instream water quality standards will be met. Section 301(b)(1)(C) requires that point source permits have effluent limits as stringent as necessary to meet WQS. However, for wasteload allocations to serve that purpose, they must themselves be stringent enough so that (in conjunction with the water body's other loadings) they meet WQS. This generally occurs when the TMDL(s)' combined nonpoint source load allocations and point source WLAs do not exceed the WQS-based loading capacity and there is reasonable assurance that the

TMDL(s)' allocations can be achieved. Discussion of reduction efforts relating to nonpoint sources can be found in the implementation section of the TMDL document.

Where TMDLs are developed for waters impaired by point sources only, reasonable assurance is derived from the National Pollutant Discharge Elimination System, or NPDES. The wasteload allocation for municipal separate storm sewer systems will be implemented through the NPDES MS4 permits with the ultimate goal to employ an iterative process using best management practices to the maximum extent practicable, assessment, and refocused BMPs to the MEP, leading toward attainment of water quality standards (64 FR 68753).

The consent decree established as part of the *United States of America and the State of Missouri, and Missouri Coalition for the Environment Foundation v. Metropolitan St. Louis Sewer District*, No. 4:07-CV-1120 requires specific eliminations and reductions of point sources in the Metropolitan St. Louis Sewer District's service area, for which Creve Coeur Creek is a part. This court-approved decree will provide an additional reasonable assurance of bacteria reductions in Creve Coeur Creek from point sources over a 23-year period. Progress toward meeting water quality standards in Creve Coeur Creek is expected to be long-term and will primarily be a continuation of current, ongoing or legally required activities, such as the consent decree mentioned above. The MDNR's stated intent for the implementation plan was to not impose any additional activities beyond those already being undertaken to satisfy existing regulations or legal requirements.

Storm water discharges of urban runoff within the entire Creve Coeur Creek watershed are regulated through MS4 permits. For this reason, urban storm water runoff is considered a point source for this TMDL document. Although storm water discharges are untreated, small MS4 permit holders must develop, implement and enforce storm water management plans to reduce the contamination of storm water runoff and prohibit illicit discharges. These plans must include measurable goals, must be reported on annually, and must meet six minimum control measures. These six minimum control measures are public education and outreach, public participation and involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control and pollution prevention. Entities within the Creve Coeur Creek watershed that are regulated under the MS4 permits noted in Table 5 include the Missouri Department of Transportation and the Metropolitan St. Louis Sewer District and its co-permittees, which include St. Louis County and the municipalities of Maryland Heights, Chesterfield, Creve Coeur, Town and Country and Ballwin.

A variety of grants and loans may be available to assist watershed stakeholders with developing and implementing watershed plans, controls and practices to meet the required wasteload in the TMDL document and demonstrate additional reasonable assurance.