



EPA Region 7 TMDL Review

TMDL ID:MO_3245U-01

State: MO

Document Name: CAVE SPRING BRANCH

Basin(s): NEOSHO -LAKE O' THE CHEROKEES BASIN

HUC(s): 11070206

Water body(ies): CAVE SPRING BRANCH

Tributary(ies):

Pollutant(s): TOTAL NITROGEN, TOTAL PHOSPHORUS

Submittal Date:10/27/2010

Approved:Yes

Submittal Letter

State submittal letter indicates final Total Maximum Daily Load(s) (TMDL) for specific pollutant(s)/water(s) were adopted by the state, and submitted to 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 EPA, date of receipt of any revisions, and the date of original approval if submittal is a phase II TMDL.

This TMDL document was formally submitted by the Missouri Department of Natural Resources (MDNR). The United States Environmental Protection Agency (EPA) received this document by mail on October 27, 2010. Revisions to this document were received by email on November 18, 2010.

Water Quality Standards Attainment

The water body's loading capacity (LC) 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. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards (WQS) [40 CFR § 130.7(c)(1)]. A statement that WQS will be attained is made.

This stream is listed as Cave Spring Branch on the 2008 Missouri 303(d) List, but identified as Cave Springs Branch in the U.S. Geological Survey (USGS) Geographic Names Information System.

On the 1998 Missouri 303(d) List, Cave Springs Branch was not given a water body identification (WBID) because it is an unclassified water body. On the 2002 Missouri 303(d) List, Cave Springs Branch was assigned WBID 9002. A numbering system for unclassified stream segments has since been developed that links the unclassified water body segment to the first downstream classified water body.

The length of Cave Springs Branch in Missouri is approximately four miles and has a watershed area of 8.12 square miles. The impaired segment of Cave Springs Branch is the last two-tenths mile of stream in Missouri before the water body flows into the state of Oklahoma (Delaware County). Once in Oklahoma, Cave Springs Branch flows approximately three miles before entering Honey Creek which flows northwest into the Grand Lake of the Cherokees.

Cave Springs Branch had episodes of poor water quality due to malfunctions of the wastewater treatment facilities (WWTF) at the Simmons Foods, Inc. (MO0036773) poultry processing plant. Of particular concern were occasional acutely toxic levels of ammonia that were discharged during the times of WWTF malfunction. Chronically high concentrations of nitrogen and phosphorus stimulated excessive algae growth in the water body which resulted in exceedances of Missouri's General Criteria (10 CSR 20-7.031 (3)). A 1998 dye trace study at the Simmons Foods, Inc. facility confirmed a hydrologic connection between the storm water collection basins at Simmons Food, Inc. and surface waters (Miller and O'Brien Springs).

Reductions in nutrient effluent concentrations from the Simmons Food, Inc. facility have resulted in increased water quality and decreased exceedances of the general criteria in Cave Springs Branch. The improvement has not been quantitatively assessed by MDNR and future assessments of water quality are needed to determine current conditions in the water body.

Effluent and storm water discharges from the facility, as well as other potential sources of nutrients such as land application of poultry litter and fertilizer, continue to contribute to elevated nutrient concentrations in Cave Springs Branch. Elevated levels of nutrients can stimulate excess production of benthic (bottom growing) algae in the water body, which in turn can cause or contribute to exceedances of the narrative (general) water quality criteria and cause low levels of dissolved oxygen. Elevated levels of nutrients in Cave Springs Branch must be reduced in order to resolve the impairment.

To address the nutrient levels, total nitrogen (TN) and total phosphorus (TP) TMDL targets were selected because both nutrients are generally elevated by point and nonpoint sources. The EPA nutrient Ecoregion 39 (where Cave Springs Branch is located) Level III-Ozark Highlands, reference concentrations were used. The reference concentration for TN is 0.289 milligram per liter (mg/L) and the reference concentration for TP is 0.007 mg/L.

The ecoregion nutrient targets are expressed as annual means. The TMDL uses a method to target specific concentrations at differing flows which will result in an annual average equal to the ecoregion target. As such, the ecoregion concentration will not be the target at all flows. These differing concentrations are calculated based on the range of current concentrations and a ratio adjustment such that the ecoregion targets are met.

The targets for TN and TP were based on load duration curves (LDCs), which determine the TMDL for each of these parameters at every flow probability. These reductions in nutrients protects the general (narrative) criteria of the stream and the TMDLs should result in WQS attainment. The LCs at 50 percent flow exceedance are 10.3 pound per day (lb/day) TN and 0.25 lb/day TP.

Numeric Target(s)

Submittal describes applicable WQS, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL 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.

Cave Springs Branch, WBID 3245U-01, is not classified and therefore has no designated beneficial uses assigned to it. All water bodies in Missouri are protected by the general narrative criteria contained in Missouri's WQS CSR 20-7.013(3) pertaining to the protection of aquatic life. These criteria are also called narrative criteria, since they do not contain specific numeric limits. The narrative criteria not being met in Cave Springs Branch are (3) (A)(C) and (G):

- Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses;
- Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;
- Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community.

To address the nutrient levels, TN and TP TMDL targets were selected because both nutrients are generally elevated by point and nonpoint sources. The EPA nutrient Ecoregion 39 (where Cave Springs Branch is located) Level III-Ozark Highlands, reference concentrations were used. The reference concentration for TN is 0.289 mg/L and the reference concentration for TP is 0.007 mg/L.

The ecoregion nutrient targets are expressed as annual means. The TMDL uses a method to target specific concentrations at differing flows which will result in an annual average equal to the ecoregion target. As such, the ecoregion concentration will not be the target at all flows. These differing concentrations are calculated based on the range of current concentrations and a ratio adjustment such that the ecoregion targets are met.

The targets for TN and TP were based on LDCs, which determine the TMDL for each of these parameters at every flow probability. These reductions in nutrients protects the general (narrative) criteria of the stream and the TMDLs should result in WQS attainment. The LCs at 50 percent flow exceedance are 10.3 lb/day TN and 0.25 lb/day TP.

Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety (MOS) that do not exceed the LC. If submittal is a phase II TMDL there are refined relationships linking the load to WQS attainment. If there is an increase in the TMDL there is a refined relationship specified to validate the increase in TMDL (either load allocation (LA) or waste load allocation (WLA)). This section will compare and validate the change in targeted load between the versions.

In the absence of Missouri numeric criteria for nutrients in freshwater streams, ambient water quality criteria recommendations provided by EPA are used to quantify TN and TP LCs in Ecoregion 39 and Cave Springs Branch. Reference conditions for TN and TP in Level III Ecoregion 39 streams are as follows: TN = 0.289 mg/L and TP = 0.007 mg/L. For this TMDL, recommended TN and TP criteria are used directly in developing LCs for TN and TP.

To develop LDCs for TN and TP, measurements were collected from USGS sites in the vicinity of the impaired stream. These data were adjusted such that the median of the measured data was equal to the ecoregion reference concentration. This was accomplished by subtracting the difference of the data median and the reference concentration. Where this would result in a negative concentration, the data point in question was replaced with the minimum concentration seen in the measured data. This resulted in a modeled data set which retained much of the original variability seen in the measured data. This modeled data was then regressed as instantaneous load versus flow. The resultant regression equation was used to develop the LDC. Allowable pollutant loads were calculated for all flow conditions by multiplying flow by either the EPA-recommended ecoregion reference concentration or the concentration established using the regional streams (Ozark/Osage River EDU), whichever concentration is higher.

To develop the TMDL expression of maximum daily loads, the background discharge at the stream outlet was modified from the traditional approach using synthetic flow estimation. Since the design flow from permitted facilities would overwhelm the background natural low flow, the sum of permitted volumes was added to the derived stream discharge at all percentiles of flow to take into account the increases in flow volume as well as pollutant load. The TMDL LDCs flatten at low flow because at these lower flows the TMDL target is dominated by the point source flow.

The ecoregion nutrient targets are expressed as annual means. The TMDL uses a method to target specific concentrations at differing flows which will result in an annual average equal to the ecoregion target. As such, the ecoregion concentration will not be the target at all flows. These differing concentrations are calculated based on the range of current concentrations and a ratio adjustment such that the ecoregion targets are met.

Source Analysis

Important assumptions made in developing the TMDL, 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. Submittal demonstrates all significant sources have been considered. If this is a phase II TMDL any new sources or removed sources will be specified and explained.

The Cave Springs Branch watershed has only one site specific permit for Simmons Foods, Inc. (MO0036773) which also is the holder of several other permits. The site specific permit is for the poultry processing and offal rendering plant near South West City, Missouri. The permit lists the main effluent outfall, one storm water outfall, one instream monitoring site and two "outfalls" which are ground water monitoring wells. Design flow for the facility is listed as 2.0 million gallons per day. The most recent operating permit was issued September 20, 2006, and expires September 19, 2011.

Seven permits within the Cave Springs Branch watershed are general permits for broiler houses (MOG01), which use dry litter manure systems that consist of production buildings and stacking sheds. Poultry litter is stored in the building until flock cycles and weather conditions allow for removal and land application of the manure. The general permits for these facilities state that the poultry litter is sold and the mortalities are rendered. The number of chickens covered by the seven general permits issued to Simmons Foods, Inc. is 1,804,333. The seven

facilities covered by the MOG01 general permit are “no discharge” facilities and should only discharge as a result of an extreme storm event. Since these concentrated animal feeding operations (CAFOs) are no discharge facilities, they are unlikely to impact water quality during critical low flow periods. The watershed has a significant amount of grassland and pasture, so the number of smaller animal feeding operations (AFO) that are not permitted could be high, particularly during seasonal feeding months in the winter.

There are three storm water permits to control storm water runoff from land disturbance and construction activities within the Cave Springs Branch watershed. One type of storm water permit (MOR10B) authorizes discharges from land disturbances that impact one or more acres. This permit requires that a Storm Water Pollution Prevention Plan (SWPPP) be developed before any site vegetation is removed or disturbed and before a permit can be issued. The SWPPP requires that the permittee use best management practices (BMPs) onsite to reduce the amount of sediment and other pollutants in the storm water associated with the land disturbance activities. The permittee must fully implement the provisions of the SWPPP required under this general permit throughout the term of the land disturbance project. The other type of storm water permit (MOR109) authorizes discharges from land disturbances that impact one acre or more that are near valuable water resources. In the case of Cave Springs Branch, portions of the water body are known to be losing; land disturbance activities within 1000 stream feet of a losing section are required to obtain the MOR109 permit. This class of general permit also requires the preparation of a SWPPP and implementation of that plan.

Illicit straight pipe discharges of household waste are potential point sources in rural areas. These are discharges straight into streams or land areas and are different than illicitly connected sewers. There is no specific information on the number or existence of any illicit straight pipe discharges of household waste in the Cave Springs Branch watershed.

There are 191 acres (3.7 percent) of the Cave Springs Branch watershed classified as urban land use, a small portion of the incorporated area of South West City, MO is included in those acres. The portions of the watershed classified as urban are predominantly areas of impervious surfaces, such as broiler houses and the Simmons Foods, Inc. processing plant. These areas are covered by state operating permit requirements and would not be considered nonpoint sources of nutrients. Therefore, runoff from urban areas (i.e., lawns, golf course and urban impervious) are not a significant source of nutrients to the Cave Springs Branch watershed.

Failing septic systems are sources of nutrients that can reach nearby streams through both surface runoff and ground water flows. The rural population of the Cave Springs Branch watershed is estimated at 219 persons. Based on this population and an average density of 2.5 persons per household, there may be approximately 87 septic systems in the watershed. No precise information exists on the failure rate of onsite wastewater treatment systems within McDonald County or the Cave Springs Branch watershed.

Riparian habitat conditions can have a strong influence on instream nutrients. Wooded riparian buffers are a vital functional component of stream ecosystems and are instrumental in detention, removal and assimilation of excess nutrients, soil and other pollutants before they reach the stream. Almost 77 percent of the land area in the Cave Springs Branch mainstem riparian corridor is classified as grassland, which may include pasture areas. Grassland provides limited riparian habitat compared to wooded areas, very little shading and can also be associated with livestock activity. Another 6 percent of the riparian corridor is classified as cropland which also provides limited habitat and shading and can be associated with high nutrient loads and erosion related to runoff from agricultural areas. A lack of good riparian habitat conditions may be considered as one possible component of water quality problems in Cave Springs Branch.

Lands used for agricultural purposes can be a source of nutrients. Accumulation of nitrogen and phosphorus on cropland occurs from decomposition of residual crop material, fertilization with chemical and manure fertilizers, atmospheric deposition, wildlife excreta and irrigation water. There are 475 cropland acres (9.1 percent) in the Cave Springs Branch watershed which can add to agricultural runoff problems within the watershed.

In 2007, there were approximately 4,731,395 broilers and other meat-type chickens raised in McDonald County. The number of broilers raised within the Cave Springs Branch watershed is 1,807,331 based on the number of animal units found in the current broiler house permits. The poultry litter from these birds is sold, but it is not known whether the litter is removed from the watershed. If some or all of the litter is spread within the Cave Springs Branch watershed, it could contribute to nutrient runoff into the impaired stream segment.

County wide data from the National Agricultural Statistics Service were combined with watershed area information to estimate 795 cattle in the Missouri portion of the Cave Springs Branch watershed. The cattle are most likely located on the 3,829 acres (77 percent) of grassland within the watershed and runoff from these areas

can potentially be a source of nutrients to the impaired segment. For example, animals grazing in pasture areas deposit manure directly upon the land surface and, even though a pasture may be relatively large and animal densities low, the manure will often be concentrated near the feeding and watering areas in the field. These areas can quickly become barren of plant cover and increase the possibility of erosion and contaminated runoff during a storm event. When pasture land is not fenced off from the stream, cattle or other livestock may contribute nutrients directly to the stream while walking in or adjacent to the water body.

Any CAFO that does not obtain a national pollution discharge and elimination system (NPDES) permit must operate as a no discharge facility. Any discharge from an unpermitted CAFO is a violation of Section 301. It is 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 (e.g., in excess of 25-year and 24-hour frequency/duration) or are from a man-made conveyance.

Permitted CAFOs identified in this TMDL are part of the assigned WLA. At this time, AFOs and unpermitted CAFOs are considered under the LA because there is currently not enough detailed information to know whether these facilities are required to obtain NPDES permits. This TMDL does not reflect a determination by EPA that such 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 an AFO or CAFO that discharges, any future WLA assigned to the facility must not result in an exceedance of the sum of the WLAs in this TMDL as approved.

All known sources have been considered.

Allocation - Loading Capacity

Submittal identifies appropriate WLA for point, 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 phase II TMDL the change in LC will be documented in this section.

The total LC at the 50 percent flow exceedance are 10.3 lb/day TN and 0.25 lb/day TP. The total WLA at all flow conditions are 4.8 lb/day TN and 0.12 lb/day TP. The total LA at the 50 percent flow exceedance are 5.5 lb/day TN and 0.13 lb/day TP. The MOS is implicit and the sum of the WLA and LA do not exceed the LC.

WLA Comment

Submittal lists individual WLAs 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 WQS excursions, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLAs. 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 phase II TMDL any differences in phase I and phase II WLAs will be documented in this section.

Because the no discharge CAFO facilities have zero discharge during critical low flow conditions, these facilities receive zero WLA in the TMDL. The WLA for Cave Springs Branch is therefore allotted entirely to the Simmons Foods, Inc. facility.

Cave Springs Branch WLA for TN and TP were obtained using the load value from the LDC for the respective percentile flow exceedance. The WLA values are in lb/day and the corresponding flow values are in cubic feet per second. At all flow conditions, the WLA for TN is 4.8 lb/day and the WLA for TP is 0.12 lb/day.

LA Comment

Includes all nonpoint sources loads, natural background, and potential for future growth. If no nonpoint sources are identified the LA must be given as zero [40 CFR § 130.2(g)]. If this is a phase II TMDL any differences in phase I and phase II LAs will be documented in this section.

Cave Springs Branch LA for TN and TP were obtained using the load value from the LDC for the respective percentile flow exceedance. The LA values are in lb/day and the corresponding flow values are in cfs. As an example, at the 50 percentile flow exceedance the LA for TN is 5.5 lb/day and the LA for TP is 0.13 lb/day.

Margin of Safety

Submittal describes explicit and/or implicit MOS 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 phase II TMDL any differences in MOS will be documented in this section.

An implicit MOS was incorporated into the TMDL based on conservative assumptions used in the development of the LDCs. The conservative approaches used include ecoregion nutrient targets based on the 25th percentile of all TN and TP data from the Ozark Highlands Ecoregion (Level III, 39) and the use of dry weather, critical low flow conditions for WLA development. The use of regional targets in lieu of national or state wide targets serves to ensure that implementation will result in minimally impacted stream systems.

Seasonal Variation and Critical Conditions

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 WQS. If this is a phase II TMDL any differences in conditions will be documented in this section.

The Cave Springs Branch TMDL takes seasonal variation into account through the use of LDCs. The TMDL LDC represents flow under all possible stream conditions and seasons, and avoids the constraints associated with using a single-flow critical condition. The results obtained using the LDC method are more robust and reliable over all flows and seasons when compared with those obtained under critical low-flow conditions. Using a LDC for TMDL development during these conditions will be protective.

Public Participation

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

This water quality limited segment of Cave Springs Branch is included on the EPA-approved 2008 Missouri 303 (d) List. The public notice period for the draft Cave Springs Branch TMDL was July 30 to September 13, 2010. Public notices to comment on the draft Cave Springs Branch TMDL were distributed via mail and e-mail to major stakeholders in the watershed or other potentially impacted parties. Announcement of the public notice period for this TMDL was also issued as a press release to local media outlets in the proximity of the Cave Springs Branch watershed. The public notice, the TMDL Information Sheet and the TMDL document were posted on MDNR's website, making them available to anyone with Internet access. Any comments received and MDNR's response to those comments, have been placed in the Cave Springs Branch administrative record. Two comments were received and the TMDL was edited accordingly.

Monitoring Plan for TMDL(s) Under 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 WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used) [40 CFR § 130.7].

Post-TMDL monitoring will be scheduled and carried out by MDNR about three years after the TMDL is approved, or in a reasonable period of time following the compliance schedule outlined in the Simmons Foods, Inc. (MO0036773) permit and the application of any new effluent limits. MDNR will also review all data collected by the USGS at the ambient monitoring station located at the Missouri-Oklahoma state line. Additionally, MDNR will routinely examine physical habitat, water quality, invertebrate community and fish community data collected by other state and federal agencies in order to assess the effectiveness of TMDL implementation. One example is the Resource Assessment and Monitoring Program administered by the Missouri Department of Conservation. This program randomly samples streams across Missouri on a five- to six-year rotating schedule. Permittee instream monitoring data will also be used for screening purposes to compare the stream's current condition with post-TMDL conditions.

Reasonable Assurance

Reasonable assurance only applies when less stringent WLAs are assigned based on the assumption of nonpoint source reductions in the LA 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.

EPA believes that point source permitting authority and nonpoint source measures discussed in the implementation plan (see Section 10 of the TMDL) provides reasonable assurances that the TMDL allocations can be achieved.

MDNR has 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 MDNR should provide reasonable assurance that instream WQS 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 WLAs 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 LAs and point source WLAs do not exceed the WQS-based LC 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.

Implementation of the Cave Springs Branch TMDL will be through revised permit effluent limits for the Simmons Foods, Inc. (MO0036773) operating permit. The Missouri State Operating Permit for Simmons processing facility currently requires instream monitoring where Cave Springs Branch crosses the Missouri-Oklahoma state line. Permittee instream monitoring data will be used for screening purposes to compare the stream's current condition with post-TMDL conditions.

Because records do not capture where poultry litter is transported once it leaves the site, research should be conducted to determine whether the litter is removed from, or land applied within, the Cave Springs Branch watershed.

In places, cattle had complete access to Cave Springs Branch. Eliminating cattle as sources of nutrients to the stream will assist in decreasing instream concentrations of TN and TP in the water body.

The concept of BMPs is one of a voluntary and site specific approach to water quality problems. Activities or practices that may be implemented include various forms of pasture and cropland management, erosion control, groundwater protection, waste management and riparian and stream bank protection. Educating and providing information to landowners within the watershed would be an important education and outreach opportunity that can guide land use practices.