



## EPA Region 7 TMDL Review

TMDL ID:KS-VE-01-LM040201

State: KS

**Document Name:**

EUREKA CITY LAKE

**Basin(s):** VERDIGRIS BASIN

**HUC(s):** 11070101

**Water body(ies):** EUREKA LAKE

**Tributary(ies):**

**Pollutant(s):** EUTROPHICATION, SEDIMENT/SILTATION

**Submittal Date:**3/13/2003

**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 was formally submitted to the United States Environmental Protection Agency (EPA) from the Kansas Department of Health and Environment (KDHE) in a letter format received on March 13, 2009.

### 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.*

The LC for Eureka City Lake is set at 417 lbs/yr, or 3.07 lbs/day for total phosphorus (TP), and 9,668 lbs/yr or 71.08 lbs/day for total nitrogen (TN). The LC for sediment is 9,080,000 lbs/yr, or 66,760 lbs/day. Atmospheric deposition accounts for 21 lbs/yr, or 0.15 lbs/day TP, and 1,412 lbs/yr, or 10.38 lbs/day TN. Eutrophication is a result of increased TP and TN loadings into the water body that causes an increase in algal growth. With eutrophication impairments, chlorophyll a (chl<sub>a</sub>) are used as a surrogate measure to allocate algal growth and is also used as a parameter for WQS. Targeting TP and TN will decrease algal growth, thus reducing eutrophication within the water body. Allocations have been provided to reduce sediment loadings into Eureka City Lake. Achievement of these loadings will assist in the attainment of WQS. The required reduction of 54 percent TP and 58 percent TN is needed to correspond to the desired endpoint of 10 parts per billion (ppb) chl<sub>a</sub>. EPA agrees that attainment of the LCs should result in the attainment of WQS.

### 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.*

Eureka City Lake's eutrophication, bundled with siltation impairment, is addressed through a narrative nutrient WQS.

The KS WQS state that:

1) "The introduction to plant nutrients into streams, lakes, or wetlands from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life." (K.A.R. 28-16-28e(c)(2) (A)); and

2) "Suspended solids added to surface waters by artificial sources shall not interfere with the behavior, reproduction, physical habitat, or other factors related to the survival and propagation of aquatic or semi-aquatic or terrestrial wildlife." (K.A.R. 28-16-28E(c)(2)(B)).

Designated uses for Eureka City Lake are Primary Contact Recreation (A); Expected Aquatic Life Support; Domestic Water Supply; Food Procurement; Industrial Water Supply; Irrigation Use; and Livestock Watering. This submittal states that Primary Contact Recreation and Domestic Water Supply uses are impaired/threatened by eutrophication bundled with siltation.

Numeric criteria for TP and TN are derived through the use of the BATHTUB model. BATHTUB is an empirical receiving water quality model that was developed by the United States Corp of Engineers used to address TMDL-related issues associated with morphometrically complex lakes and reservoirs. Sediment and nutrient loadings into the lake were determined by comparing data from other lakes in the area with similar land use patterns. This comparison was done due to the lack of data regarding the original design capacity of the lake.

The numeric target to address the impairment of eutrophication should be reflective of primary contact recreation and drinking water supply uses. A numeric target of chl<sub>a</sub> less than 10 ppb is the desired endpoint. To address the siltation impairment of this TMDL, at least 50 percent of the lake should be 10 feet or greater in depth in 2016, to ensure that the lake preserves its potential for public water supply. For support of continuous recreation use, concurrent with preservation of storage capacity, the lake average depth near shoreline should not decrease by less than 0.5 feet by 2016.

The LC is 417 lbs/yr, or 3.07 lbs/day TP, and 9,668 lbs/yr, or 71.08 lbs/day TN. The LC for sediment is 9,080,000 lbs/yr, or 66,760 lbs/day. Reduction of TP to less than 20 ppb, and TN to less than 334 ppb, will protect the water quality of Eureka City Lake and maintain the designated uses. Siltation protection shall be provided by maintaining sedimentation at or below levels of 5.2 acre feet per year.

#### **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.*

Pollutants of concern for Eureka City Lake are nutrients and sediment. Eutrophication results from an increase of TN and TP within the lake; the increase of TN and TP encourage algal

growth. The increases of these nutrients are often a result of soil erosion within the watershed and of the shoreline. TP and TN are targeted pollutants in this TMDL because these two nutrients are often present in sediments entering the lake as a result of erosion. Sediment is also targeted and allocated as a pollutant in this TMDL due to excess watershed and shoreline erosion.

Chla concentrations are monitored and targeted throughout this submittal because it is a useful parameter for determining the biological productivity of a water body. Targeting these pollutants demonstrates an established link of eutrophication to TP and TN, TP and TN to chla, and sediment to siltation.

The submittal states that a numeric target for chla must be less than 10 ppb for primary contact recreation and drinking water supply. To address the siltation impairment of this TMDL, at least 50 percent of the lake should be 10 feet or greater in depth in 2016 to ensure that the lake preserves its potential for public water supply. For support of continuous recreation use, concurrent with preservation of storage capacity, the lake average depth near shoreline should not decrease by less than 0.5 feet by 2016.

Numeric criteria for TP and TN are derived through the use of the BATHTUB model. Sediment and nutrient loadings into the lake were determined by comparing data from other lakes in the area with similar land use patterns. This comparison was done due to the lack of data regarding the original design capacity of the lake.

#### **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 land use distribution within this watershed is occupied by 91.85 percent grassland, 3.19 percent open water, 3.18 percent developed, 1.42 percent forest, and .28 percent cultivated crops. There are no indicated permitted dischargers or non-discharging permitted facilities within the watershed. No confined animal feeding operations are located within the watershed. The origination of nutrient flux may stem from livestock on range with access to surface waters within the watershed. Sediment as a result of lake erosion is derived from sources such as dirt roads and other bare surfaces.

The possibility of failing septic systems could also be a contributor to the observed water quality of the Eureka City Lake. The 2000 Census data indicated that approximately 126 people lived in the watershed, of these, 71 people reside adjacent to the lake. These people are presumed to be served by on-site wastewater systems. Estimations of the magnitude of their potential contribution can not be made from available data.

A small portion of the watershed is woodland which could result in leaf litter contributing nutrient loading into this water body. Additional sources include, nutrient recycling, atmospheric deposition, and geological formations, including soil and bedrock. All are noted to contribute to TP and TN loads into Eureka City Lake.

EPA agrees the submittal considers all known significant sources.

#### **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 LC for Eureka City Lake is 417 lbs/yr, or 3.07 lbs/day TP, and 9,668 lbs/yr, or 71.08 lbs/day TN. The LC for sediment is 9,080,000 lbs/yr, or 66,760 lbs/day. Atmospheric deposition accounts for 21 lbs/yr, or 0.15 lbs/day TP, and 1,412 lbs/yr, or 10.38 lbs/day TN.

EPA agrees this is an appropriate 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.*

The WLA is zero because there are no indicated point sources within this watershed.

EPA agrees this is an appropriate WLA.

#### **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.*

The LA is 356 lbs/yr, or 2.61 lbs/day TP, and 7,430 lbs/yr, or 53.59 lbs/day TN. The LA for sediment is 8,172,000 lbs/yr, or 60,084 lbs/day. Atmospheric deposition accounts for 21 lbs/yr, or 0.15 lbs/day TP, and 1,412 lbs/yr, or 10.38 lbs/day TN.

EPA agrees this is an appropriate LA.

#### **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.*

The MOS has been explicitly set at 40 lbs/yr, or 0.31 lbs/day TP, and 826 lbs/yr, or 7.11 lbs/day TN. The MOS for sediment is 908,000 lbs/yr, or 6,676 lbs/day.

EPA agrees this is an appropriate MOS.

#### **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.*

Summer monitoring will continue because eutrophication impairments to drinking water supply uses are most likely to occur during the summer months as a result of warmer temperatures. Spring and summer months aggravate siltation impairments due to the increased rainfall and increased anthropogenic and livestock related activity in the watershed. Seasonality and any critical conditions have been addressed in the submittal.

#### **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)].*

Since 2002, public meetings have been held to discuss TMDLs in the Verdigris Basin. An active internet website has been established at [www.kdheks.gov/tmdl/index.htm](http://www.kdheks.gov/tmdl/index.htm) to convey information to the public on the general establishment of the TMDLs within this basin and specific TMDLs. On July 23, 2008, a public hearing was held in Neodesha on the TMDLs of the Verdigris Basin. The Verdigris Basin Advisory Committee met to discuss TMDLs of the basin on September 25, 2007 in Eureka, and on July 23, 2008 in Neodesha. The original drafts of the TMDL documents were revised based on comments throughout the 2008 public notice period. All comments were considered.

EPA agrees the TMDL received the opportunity for meaningful public input.

#### **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].*

KDHE surveyed Eureka City Lake in 2008, and will survey again in 2011. The submittal also stated that further sampling will be performed before 2013.

#### **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.*

Because the WLA for this TMDL is zero, no reasonable assurances are required. The submittal lists reasonable assurances that include numerous authorities and funding through the Kansas Water Plan. Kansas has identified several federal, local, and non-governmental organizations that may be included in the implementation process.