



EPA Region 7 TMDL Review

TMDL ID:KS-NE-01-L-22000

State: KS

Document Name:

COUNCIL GROVE LAKE

Basin(s): NEOSHO BASIN

HUC(s): 11070201

Water body(ies): COUNCIL GROVE LAKE

Tributary(ies): CROOKED CREEK, EAST BRANCH MUNKERS CREEK, HAUN CREEK, LAIRDS CREEK, LANOS CREEK, MUNKERS CREEK, NEOSHO RIVER, WEST FORK NEOSHO RIVER

Pollutant(s): EUTROPHICATION, NITROGEN, PHOSPHORUS

Submittal Date:3/13/2009

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.

The Kansas Department of Health and Environment (KDHE) formally submitted eight TMDL documents in a letter received by the United States Environmental Protection Agency (EPA) on March 13, 2009. The Council Grove Lake submittal is a phase 2 (revised) TMDL.

Revisions to Council Grove Lake were received by email on April 1, 2009 and April 6, 2009.

The original (phase 1) TMDL was approved by EPA on September 30, 2002.

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 is set using a lake eutrophication model (BATHTUB) to analyze the annual total nitrogen (TN) and total phosphorus (TP) loads that Council Grove Lake can receive and meet its designated uses. To address the identified impairment (eutrophication), a chlorophyll *a* (chl_a) concentration of 10 micrograms per liter (ug/L) was used to link TN and TP concentrations to the level of eutrophication. The Carlson's Trophic State Index (TSI) is derived from chl_a concentrations and provides a scale of eutrophication levels.

EPA agrees this is an appropriate translator for this TMDL. The desired endpoints under this TMDL will be refined based on additional monitoring and evaluation. Because lake conditions represent responses to environmental loads occurring over an extended period of time, expression of the load as an average annual value is the preferred approach found in current scientific limnological literature.

Table 2 of the TMDL document lists the LCs as 1,116,444 pounds/year (lbs/yr) TN and 163,536 lbs/yr for TP to achieve a chl_a concentration below 10 ug/L. This is a 19 percent TN and a 32 percent TP reduction in load from the current conditions.

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.

KS WQS state that:

- 1) "The introduction of 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) "The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating, or emergent aquatic vegetation." (K.A.R. 28-16-28e(c)(7)(A)).

Beneficial uses:

Primary Contact Recreation
Expected Aquatic Life Support
Drinking Water
Ground Water Recharge
Industrial Water Supply
Food Procurement
Irrigation
Livestock Watering

*The submittal states that all uses are impaired to a degree by eutrophication.

The translation of the narrative standards using numeric nitrogen and phosphorous targets was derived through the use of models. The models included the Spreadsheet Tool for Estimating Pollutant Load (STEPL) and BATHTUB, an empirical receiving water quality model that was developed by United States Army Corps of Engineers, which has been commonly applied to address many TMDLs relating to issues associated with morphometrically complex lakes and reservoirs.

The desired end point for this TMDL will be to maintain the chl_a concentration below 10 ug/L by 2016. Table 2 of the TMDL, lists the LC for each parameter.

Parameter	LC	Percent Reduction
Total Nitrogen (lbs/yr)	1,116,444	19
Total Phosphorus (lbs/yr)	163,536	32
Total Nitrogen (ug/L)	877	7
Total Phosphorus (ug/L)	151	20
Chlorophyll <i>a</i> (ug/L)	6	9

lbs/yr = pounds per year ug/L = micrograms per liter

The state of Kansas does not have numeric criterion for nutrients in their WQS. Council Grove Lake exceeded the narrative WQS which states that "water shall be free from" aesthetically objectionable conditions. High turbidity negatively affects the development of a phytoplankton community. Nutrient availability remains high but is not fully translated into algal productivity due to light limitations. Trophic state assessments of potential algal productivity were made based on chl_a, nutrient levels (TN and TP), and values from the TSI which effectively links TN, TP, and chl_a to the narrative standards.

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.

The state of Kansas does not have numeric criterion for nutrients in their WQS. A lake eutrophication model (BATHTUB), determined that a load reduction of nutrients (TN and TP) is required to reach the chl_a endpoint. Using the STEPL and BATHTUB models, a LC of 1,116,444 lbs/yr TN and 163,536 lbs/yr for TP was derived in order to translate the narrative standards as a chl_a concentration below 10 ug/L. This reduction in TP and TN loading is an established link in the reduction of chl_a concentrations. Chl_a concentrations are linked to eutrophication through trophic indices. Kansas state eutrophication TMDL targets are 12 ug/L chl_a for primary contact recreational lakes, 20 ug/L for secondary contact recreation lakes, and 10 ug/L for federal lakes and lakes serving as water supplies. The chl_a target was set at a concentration below 10 ug/L by 2016. Based on the STEPL modeling results, nearly all of the nutrient loads come from the watershed. The lake is in excess of TP concentrations and the cropland is identified as the most important phosphorus source.

The phase 2 TMDL uses an expanded data set to make more refined loading and LC estimates. The chl_a target decreased from 12 ug/L (in the phase 1 TMDL) to the current 10 ug/L. The phase 2 TMDL uses improved modeling techniques with current monitoring data and better sourcing information. The TMDL still targets phosphorous as a translator and has added a refined nitrogen target from the original phase 1 TMDL requirement.

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.

Within this watershed, there are three National Pollution Discharge Elimination System (NPDES) permitted municipal wastewater treatment plants (Alta Vista KS0096733, Dwight KS0051675, and White City KS0096873) in the headwaters of the watershed. Dwight municipal wastewater treatment plant (MWTP) seldom discharges effluent while Alta Vista and White City MWTPs consistently discharge below their design flow.

There are ten registered confined animal feedlot operations (CAFOs and AFOs) that are either certified (8) or permitted (2). One of the two permitted facilities has an NPDES permit (A-NEMR-C001/KS01217218). All of the permitted livestock facilities have waste management systems designed to minimize runoff entering their operation or detaining runoff emanating from their facilities.

The dominant land use in the watershed is grassland (67 percent) of which pasture/hay accounts for about 11 percent. Cultivated cropland occupies around 21 percent, 4 percent is woody and deciduous forests, and urban area is less than 1 percent.

Because of moderate grazing density of the livestock operations throughout the watershed and the dominant watershed land use of grassland, animal waste from both confined and unconfined feeding sites poses a potential source of phosphorous loading into Council Grove Lake.

Nonpoint source loading includes runoff due to intense storms and low soil permeability averages, urban fertilizers, and failing septic systems. Urban fertilizer with stormwater runoff is considered a minor contributing nutrient factor due to low urban landuse in the watershed. Failing septic systems may be a minor source of nutrients.

Natural background sources are identified as leaf litter, atmospheric deposition, and geological formations which may contribute to nutrient load.

The phase 2 TMDL provides greater detail on the sourcing for the CAFOs and AFOs, the watershed soil permeability, and the NPDES permits (including design flow), than the original phase 1 TMDL.

All known potential 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 LC is 1,116,444 lbs/yr TN and 163,536 lbs/yr TP. The WLA is 4,647 lbs/yr TN and 1,328 lbs/yr TP. The LA is 1,010,302 lbs/yr TN and 147,341 lbs/yr TP.

The LC for the original phase 1 TMDL was 103,094 lbs/ year TP. TN was not listed and a statement that initial allocations will be based on a proportional decrease between current conditions and the desired endpoint was included. The current phase 2 (revised) TMDL has LCs set for 1,116,444 lbs/yr TN and 163,536 lbs/yr TP. The phase 2 TMDL displays a more refined LC. The chla target decreased from 12 ug/L to 10 ug/L and the phase 2 TMDL uses improved modeling techniques with current monitoring data, as well as better sourcing information. The TMDL still targets phosphorous as a translator and has added a refined nitrogen target.

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 for TN is 59 lbs/day. $((4,647 * 4.64)/365)$

The WLA for TP is 5.8 lbs/day. $((1,328 * 4.64)/365)$

(see Appendix E within the TMDL for documentation of conversion assumptions)

The WLA for the original phase 1 TMDL was 1,627 lbs/yr TP. No reduction in TN or TP were required. The current phase 2 TMDL sets the WLA for 4,647 lbs/yr TN and 1,328 lbs/yr TP. The phase 2 TMDL displays a more refined WLA. It shows a decrease in TP and sets a numeric value for TN.

There are three NPDES permitted facilities within this watershed.

Facility	Permit Number	WLA TN (lbs/day)	WLA TP (lbs/day)
Alta Vista MWTP	KS0096733	3.15	0.90
Dwight MWTP	KS0051675	4.09	1.17
White City MWTP	KS0096873	5.49	1.57
Totals		12.73	3.64

All ten registered CAFOs and AFOs have a WLA of zero.

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 for TN is 12,838 lbs/day. This is 12,621 lbs/day nonpoint source loading and 217 lbs/day air deposition. The LA for TP is 645 lbs/day. This is 639 lbs/day nonpoint source loading and 5.78 lbs/day air deposition.

The LA for the original phase 1 TMDL was 91,158 lbs/yr TP and a 58 percent reduction of TN was set to ensure that the endpoint was reached. The current phase 2 TMDL has LAs set for 1,101,302 lbs/yr TN and 147,341 lbs/yr TP. The phase 2 TMDL displays a more refined LA. The chla target decreased from 12 ug/L to 10 ug/L. The phase 2 TMDL uses improved modeling techniques with current monitoring data, as well as better sourcing information. The TMDL still targets phosphorous as a translator and has added a refined nitrogen target.

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 explicit MOS is set at ten percent of the total nutrient loads (TN and TP) from the watershed. This translates to 1,290 lbs/day TN and 64.6 lbs/day TP.

The MOS for the original phase 1 TMDL was 10,309 lbs/yr TP and a six percent reduction of TN was set to ensure that the endpoint was reached. The current phase 2 TMDL has 101,495 lbs/yr TN and 14,867 lbs/yr TP, which are considerably higher. The phase 2 TMDL displays a more refined 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.

This TMDL was developed based on chla contributions to generalized lake conditions. The annual targets should result in WQS attainment regardless of the season. Seasonal variation has been incorporated in this TMDL since the peaks of algal growth occur in the summer months (May-September).

Seasonal variation and critical conditions are accounted for by conducting seasonal sampling and by considering the magnitude of runoff which is chiefly generated when the rainfall rate is greater than the rate at which rain can infiltrate the soil.

Seasonal variation is considered in the document "Lake and Wetlands Monitoring Program - 2005 annual report" by C. Edward Carney dated 2006, and included by reference in all Kansas eutrophication TMDLs. The reference discusses sampling during times representative of "normal" summer conditions.

No significant differences in seasonal variation and critical conditions were found between the phase 1 and phase 2 documents.

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)].

Public hearings on the TMDL for the Neosho Basin were held in Burlington, KS (at the Coffey County Courthouse) on July 24, 2008.

The Neosho Basin Advisory Committee met to discuss the Neosho Basin TMDLs at the Schermerhorn Nature Center (Galena) on September 27, 2007, in Burlington, KS (at the Coffey County Courthouse) on February 28, 2008, and at the Emporia City Library on May 15, 2008. Public meetings to discuss these TMDLs were also held at the above-listed locations and dates, as well as in Columbus on December 8, 2006.

The original drafts of the TMDL documents were revised based on comments received through the 2008 public comment period. All comments were considered.

An active website was established to convey information to the public on the specific TMDLs for the Neosho Basin at <http://www.kdhe.state.ks.us/tmdl>.

The original drafts of the TMDL documents were revised based on comments received throughout the 2008 public notice period. All comments were considered.

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].

Lake sampling is scheduled to occur at least three times between 2008 and 2015. Monitoring of the tributary nutrient levels during runoff events will assist direct abatement efforts toward major contributors. Tracking of nutrient loads from the existing municipal lagoons will be used to confirm their small contribution to the lake.

Monitoring between phase 1 and phase 2 TMDLs occurred at Station LM022001, where seven surveys were taken from 1987-2005. Stream chemistry was monitored at three stations (631, 632, and 637) between 1992-2004. The Tulsa District of the USACE measured inflow at the dam between 1995-2006. During the May/September growing season of 1987-2006, chla concentrations were measured.

The phase 2 submittal documents that the water body was monitored between submittals.

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.

The WLAs are set to meet WQS, so no reasonable assurances are required. The submittal does list reasonable assurances that include numerous authorities and funding through the Kansas Water Plan. Kansas has identified several federal, state, local, and non-government organizations that may be included in the implementation process.