



EPA Region 7 TMDL Review

TMDL ID: KS-WA-18-LM050801
Document Name: WINFIELD CITY LAKE

State: KS

Basin(s): WALNUT RIVER BASIN
HUC(s): 11030018
Water body(ies): WINFIELD CITY LAKE
Tributary(ies):
Pollutant(s): EUTROPHICATION, 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.

This TMDL was formally submitted by the Kansas Department of Health and Environment (KDHE) to the United States Environmental Protection Agency in a letter format which was received on March 13, 2009. A revised version addressing EPA comments was received by email attachment on May 21, 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 this TMDL is 5,419 lbs/yr, or 40 lbs/day total phosphorus (TP). The TMDL lists a desired endpoint of less than 10 parts per billion (ppb) chlorophyll a (chl_a) within the watershed. This target is reflective of primary contact recreation and drinking water supply uses of Winfield City Lake. A 25 percent reduction of TP is required to attain the desired chl_a target. Phosphorus, the primary source pollutant within Winfield City Lake, is targeted in this TMDL because reduction of this nutrient will result in the decrease of algal blooms in the lake. The decrease of phosphorus should result in a decrease in algal blooms thereby helping to reverse the eutrophication process now occurring within the lake. A significant reversal of the eutrophication within the lake will result in the support of all designated uses.

EPA agrees that attainment of the LC 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.

The KS WQS state that:

- 1) "The introduction of plant nutrients into stream, lake, 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 Winfield City Lake are Primary Contact Recreation (A); Expected Aquatic Life Support; Domestic Water Supply; Food Procurement; Industrial Water Supply; Irrigation Use; Livestock Watering; and Groundwater Recharge. The submittal states that Primary Contact Recreation (A) and Domestic Supply uses are impaired/threatened by eutrophication.

Numeric criteria for phosphorus were derived through the use of the BATHTUB model. BATHTUB is an empirical receiving water quality model that was developed by the United States Corps of Engineers used to address TMDL-related issues associated with morphometrically complex lakes and reservoirs. The numeric target assigned in this submittal to address the impairment of eutrophication within the Winfield City Lake is a chla concentration less than 10 ppb. The targeted endpoint shall support primary contact recreation and drinking water supply uses.

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.

To reach Winfield City Lake's target a reduction of phosphorus concentrations within the watershed is necessary. Eutrophication is an increase of nutrients within the natural habitat or an ecosystem and is the result of excessive nutrients within a waterbody. Phosphorus, a nutrient affiliate of eutrophication, is attributed to livestock on range with access to surface waters and shoreline erosion. The presence of eutrophication essentially prevents the support of beneficial uses of Winfield City Lake. Reducing chla concentration are targeted to decrease eutrophication within this waterbody because chla is a useful parameter for determining the amount of algae present within a water body.

The submittal lists a desired endpoint of chla less than 10 ppb and an annual load of 5,419 lbs/yr, or 40 lbs/day TP. To obtain the desired LA of 4,782 lbs/yr, or 36 lbs/day TP, a reduction of below 32 ppb TP is necessary to protect water quality and maintain designated uses within the water body. To obtain the reduction of TP concentration, a reduction of loading by 2,348 lbs/yr is needed, this includes the defined MOS. The MOS for the TMDL is 542 lbs/yr, or 4 lbs/day. Atmospheric deposition accounts for 95 lbs/yr TP. The desired endpoint shall support primary contact recreation and drinking water supply uses.

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 distribution within this watershed occupies 71.5 percent permanent grass, 13.4 percent cropland, 5.6 percent forest, 4.1 percent water, 3.9 percent roads, and 1.5 percent wetland. There are no permitted dischargers, non-discharging permitted facilities, or confined animal feeding operations within the watershed. Noted potential sources include nutrient flux originated from livestock on range with access to surface waters and shoreline erosion. Background sources for this TMDL include leaf litter, nutrient recycling, atmospheric deposition, and geological formations.

In 2007, the Kansas Biological Survey (KBS) conducted a bathymetric survey of Winfield City Lake. Data from this survey and a digitized upper boundary of the lake drawn from the National Agricultural Imaging Program (NAIP) 2004 photos were combined into a single point file. This point file was used to represent the current bottom surface of the lake in conjunction with the United States Geological Survey 10' topographic maps. These maps predated the impoundment of Timber Creek to form Winfield Lake and were then digitized to provide a baseline estimate of volume loss.

The BATHTUB model was used to estimate TP loadings into this water body and the STEPL model was used to compare watershed loading potential. BATHTUB is an empirical receiving water model that was developed by the U. S. Army Corps of Engineers. BATHTUB estimated 7,225 lbs/yr TP and STEPL estimated 7,367 lbs/yr TP loading into the watershed. The BATHTUB model further suggests that the expected impact of internal loading is relatively low. Calibrated models did not assume an internal nutrient loading due to the lack of any data. The submittal states that Winfield City Lake is TP limited, therefore sediment resuspension reduction was considered due to the fact that TP is often physically attached to sediment. A reduction in sediment resuspension was stated to improve the conditions of the lake.

EPA agrees the submittal considers all known 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 Winfield City Lake is 5,419 lbs/yr, or 40 lbs/day for TP. A 25 percent reduction in TP is needed to achieve the LC. The submittal identifies a WLA of zero due to no point sources within the watershed.

The desired LA is 4,782 lbs/yr, or 36 lbs/day TP. To obtain the desired endpoint of 32 ppb, a reduction of loading by 2,348 lbs/yr TP is needed, this includes the defined MOS. This endpoint is necessary to protect the water quality of Winfield City Lake and maintain designated uses within the water body.

The MOS is 542 lbs/yr, or 4 lbs/day TP. Atmospheric deposition accounts for 95 lbs/yr, or 0.70 lbs/day TP.

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.

There are no point sources indicated within this watershed, therefore the WLA is 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 this TMDL is 4,782 lbs/yr, or 36 lbs/day. To obtain this LA, a reduction of below 32 ppb TP is necessary to protect water quality and maintain designated uses within the water body. To obtain the reduction of TP concentrations, a reduction of loading by 2,348 lbs/yr is needed, this includes the defined MOS.

Atmospheric deposition accounts for 95 lbs/yr, or 0.70 lbs/day TP.

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 was explicitly set at 10 percent and is 542 lbs/yr, or 4 lbs/day TP.

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.

Eutrophication-related impairments to drinking water supply uses most commonly occur during the summer months as a result of warmer temperatures and greater photosynthetically available radiation. Siltation related impairments are most likely to occur during the spring and summer months due to the increased rainfall, anthropogenic and livestock related activities.

Seasonal variation has been incorporated in this TMDL as a result of increased algae levels that occur because of warmer temperatures.

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)].

Public meetings to discuss TMDLs in the Walnut River Basin have been held since 2002. To convey information to the public on the general establishment of TMDLs in the Walnut River Basin, an active internet website was established at www.kdheks.gov/tmdl/index.htm.

A public hearing on the Walnut River Basin TMDLs was held in Winfield on July 22, 2008. Additionally, the Walnut River Basin Advisory Committee met to discuss these TMDLs on October 3, 2007 in El Dorado.

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

EPA agrees the TMDL received 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].

The submittals state that further sampling should occur before 2013, in addition KDHE plans to survey the lake during the timeframe of 2008 and 2011.

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 WLA for this TMDL is zero, no reasonable assurances are required. The submittal lists numerous potential state authorities to regulate nonpoint source pollutants in the watershed.