EPA Region 7 TMDL Review

TMDL ID: KS-KLR-04-252_38 **Water Body ID:** KS-KLR-04-252_74, KS-KLR-04-252_76
Water Body Name: Cedar Creek
Tributary: Camp Creek and Little Cedar Creek
Pollutant: Nitrate
State: Kansas **HUC:** 10270104
BASIN: Kansas-Lower Republican Basin
Submittal Date: January 9, 2007
Approved: Yes

Submittal Letter

State submittal letter indicates final TMDL(s) 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.

The TMDL for Cedar Creek Watershed was formally submitted by Kansas Department of Health and Environment (KDHE) in a letter received by United States Environmental Protection Agency (EPA) on December 11, 2006. The public comments and KDHE's response to those comments were formally submitted by KDHE in a letter received by EPA on January 9, 2007. Revisions to Cedar Creek Watershed TMDL were submitted by email March 22, 2007.

Water Quality Standards Attainment

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. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.

The targeted pollutant is nitrate. The nitrate nitrogen target is set at 10 mg/L to address a narrative standard. This application of the drinking water use standard of 10 mg/L as nitrogen is an appropriate translator for the narrative standard. The endpoint for this TMDL will be to achieve the Kansas Water Quality Standard (WQS) of 10 mg/l to fully support any attainable Domestic Water Supply use on Cedar Creek. The long term endpoint will be a reduction of total nitrogen concentration below 8 mg/L, particularly at low flows, in accordance with the Kansas Surface Water Nutrient Reduction Plan. Meeting these targets should result in the attainment of WQS.

Loading capacity is shown as a load duration curve.

Numeric Target(s)

Submittal describes applicable water quality standards, 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.

Applicable water quality standards are listed for drinking water use and narrative standards to address expected aquatic life use.

The pollutant causing the water quality impairment is nitrate. The designated uses for Cedar Creek are Expected Aquatic Life Support, Primary Contact Recreation 'C', Domestic Water Supply, Irrigation Use and Livestock Watering for Main Stem Segment. Tributary Segments designated uses are the same except Contact Recreation for Little Cedar Creek is Primary 'B' and Contact Recreation for Camp Creek is Secondary 'b'.

Impaired Use: Expected Aquatic Life Support and Attainable Domestic Water Supply on segment 38 starting at the confluence with the Kansas River in Northwest Johnson County and traveling upstream to the headwaters south central Johnson County.

Water Quality Standard: Nitrate (as N): 10 mg/L (KAR 28-16-28e(c)(3)(A)): Domestic water supply criteria are provided in table 1a of K.A.R 28-16-28e(d).

Nutrients – Narrative: 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. (KAR 28-16-28e(c)(2)(B))".

This TMDL applies the domestic water supply criterion of 10 mg/L Nitrate as Nitrogen as numeric translator. EPA agrees that this is a protective translator at this time and further monitoring will result in a refinement of the TMDL if it is found that the water body remains impaired.

Numeric Target(s) and 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 that do not exceed the load capacity.

The link for nitrate is direct. The translation of the narrative criterion is linked to the domestic drinking water standard for nitrate nitrogen.

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, non point and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered.

There is one NPDES permitted discharger (Olathe-Cedar Creek facility KS0081299) within the watershed that contributes a nitrate load to Cedar Creek watershed that affect monitoring site 252. Four confined animal feedlots (CAFOs) that are registered certified or permitted within the watershed. These facilities (small dairy, beef, horse or swine operations) are primarily located along the west side of the watershed. These facilities are designed to minimize storm water runoff entering the facility and designed to retain runoff up to a 25-year, 24 hour rainfall event. Additionally the exceedances measured do not occur at the 1-5 % exceedance flows expected to be impacted by these systems. The WWTF is identified as the major source of loading.

Non-point sources include failing septic tanks or other on-site wastewater systems and urban storm water run off (MS4 permit). The Olathe - Lakestone Estates facility shown has a non-discharging two cell lagoon system that may contribute nitrates to Cedar Creek under extreme precipitation events (stream flows associated with such events are typically exceeded only 1-5% of the time).

Much of the watershed remains undeveloped, typically dominated by agricultural uses (65%), urban uses; such as residential, commercial and industrial uses comprise 24% of the watershed. Another five percent is occupied by parkland or surface water. The remaining five percent is unknown land use, including government property and public roads (Lee, et al, 2005). Most of the cropland is located along the main stem in the lower third of the watershed. According to the NRCS Riparian Inventory, there are about 4,175 acres of riparian area in the watershed, most of which is categorized as forest land (40%), crop/tree mix (10%), pasture/tree mix (9%), cropland (18%), pasture land (7%) and urban/urban tree mix (7%). Background loading may also be expected from soils, wildlife, streamside vegetation or stream sediment. All significant sources have been considered.

Allocation

Submittal identifies appropriate wasteload allocations for point, and load allocations for nonpoint sources. If no point sources are present the wasteload allocation is zero. If no nonpoint sources are present, the load allocation is zero.

Nitrate excursions have only been noted under low flow conditions. Therefore, reductions in nitrate loadings within the watershed will only apply under the critical low flow condition influenced by the design flow of the Olathe-Cedar Creek Wastewater Plant is the 85% exceedance flow. Load curves were established for the nitrate domestic water criterion by multiplying the estimated flow values for Cedar Creek along the curve by the applicable water quality criterion (10 mg/l) and converting the units to derive a load duration curve of pounds of nitrate per day.

WLA Comment

Based in the assessment of sources, the distribution of excursions from water quality standards at site 252 by flow and season and the relationship of those effluent levels to in-stream flow conditions, the Olathe plant is seen as the primary contributing factor to the nitrate excursions in the watershed.

The load duration curve was constructed by applying the 10 mg/l nitrate concentration to the historic flow condition. Olathe wastewater was presumed to constitute all flow between the 85-99 percentiles. Since Olathe's average nitrate content of its wastewater was slightly below 10 mg/l, the historic load curve used 10 mg/l. Current operations and design presume a 3 MGD discharge. Hence, the load duration curve for the 3 MGD level was established assuming that future flows in the 85-99 percentile range would increase to 4.6 cfs (3 MGD). Historic flows greater than the 80th percentile flow (5.9 cfs), were assumed to be composed of 2 MGD of wastewater with the balance of flow coming from non-point and urban stormwater sources. The proportion of Olathe wastewater design flow comprising the historic flow in Cedar Creek transitioned between 100% at 4.6 cfs to and 2 MGD at 5.9 cfs. The historic load duration curve was then elevated by the addition of the incremental increase in anticipated Olathe wastewater.

In anticipation of the two stages of increased discharge from the Olathe plant in the future, two additional load duration curves were established, assuming 9 and 13.5 MGD discharges from the wastewater treatment plant.

Wasteload Allocation (WLA) at the three stages was established with the assumption of Biological Nutrient Removal installed and producing an effluent with total nitrogen of eight mg/l. The conservatively assume that all the nitrogen will be in the form of nitrate. The WLAs increase over time as a result of increased discharge volume, but the concentrations remain constant. See Appendix B, indicates the respective WLAs at the three wastewater deign flow.

Urban storm water is not seen as a significant factor in the nitrate levels seen in Cedar Creek since nitrate concentrations average less than 2 mg/L at higher flows. Johnson County and Olathe have MS4 general permits governing the discharge of storm water from their respective storm sewer systems. Any necessary revisions will include Best Management Practices to abate nitrogen loading from storm water and the current WLAs are embedded within the nitrate loads seen during runoff periods (when nitrate concentrations are not a problem).

All permitted livestock facilities (CAFOs) are non-discharging permits. The WLAs are set at zero.

LA Comment

The non-Point source samples from the Cedar Creek watershed indicate nitrate excursions only occurred under low flow conditions. Such conditions are not indicative of non-point source influences, although some seepage from faulty septic systems might enter Cedar Creek. The volume of that seepage would likely be small compared to the typical discharge from Olathe. The Load Allocation (LA) assigns responsibility for maintaining nitrate loads at site 252 below 10 mg/l on average under runoff conditions exceeded less than 80% of the time. The LA is represented as the 70% of the area lying between the WLA for wastewater discharges of 3, 9 or 13.5 MGD, their Margin of Safety (MOS) and their associated TMDL curve. See appendix B

Margin of Safety

Submittal describes explicit and/or implicit margin of safety for each pollutant. 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.

The Margin of Safety may be viewed as explicit under the critical low flow conditions exceeded 85% of the time or more. Under those conditions, there is no Load Allocation since all of the flow in Cedar Creek is wastewater effluent. The TMDL is established at the 10 mg/l concentration, but the actual nitrate concentrations will be a factor of the Wasteload Allocation, which is based on the expected 8 mg/l of total nitrogen to be produced by the wastewater plant after installation of Biological Nutrient Removal. Once runoff conditions appear, the Margin of Safety is viewed as implicit with the assumption that all the nitrogen discharged by the Olathe plant is nitrate. In fact, typical wastewater contains about 2 mg/l of total Kjeldahl nitrogen (organic N plus ammonia). Furthermore, the impact of the highest nitrate source, the Olathe wastewater, is diminished under runoff conditions, that have historically averaged under 2 mg/l of nitrate.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s).

Since loading capacity varies as a function of the flow present in the stream, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Sample data for the sampling site were categorized for each of the three defined seasons: Spring (Apr-Jul), Summer-Fall (Aug-Oct) and Winter (Nov-Mar).
Seasonal variation is accounted for by this TMDL, since the TMDL endpoint is sensitive to stream flow with the exceedances typically occurring at low flows during the Fall and Winter. To reach this endpoint this TMDL will concern itself with reducing nitrogen loads from wastewater sources in the watershed under critical low flow conditions of concern.

Public Participation

Submittal describes public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s).

Public notification of the second round of TMDLs in the Kansas-Lower Republican Basin was made in the Kansas Register in January 5, 2006. An active Internet Web site was established at *http: www.kdheks.gov/tmdl/* to convey information to the public on the general establishment of TMDLs and specific TMDLS for the Kansas-Lower Republican Basin., 2006 in Topeka. The TMDL was public noticed on the KDHE TMDL web site: http://www.kdhe.state.ks.us/TMDL.
A public hearing on the second round of TMDLs for the Kansas –Lower Republican Basin were held in Olathe on January 19 and in Topeka on January 30, 2006. Comments were received from Johnson County Wastewater, EPA and Stormwater Programs. The Kansas-Lower Republican Basin Advisory Committee met to discuss the second round of TMDLs in the basin on April 7, 2005 in Lawrence, July 26, 2005 in Concordia, October 20, 2005 in Lawrence and January 24, 2006 in Topeka. A meeting to discuss TMDLs of interest to the City of Olathe and Johnson County occurred on December 21, 2005.

EPA comments were received by KDHE and reviewed and given consideration and, where appropriate, incorporated into the TMDL.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies the 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).

KDHE will continue to collect bimonthly samples at Stations 252 including all forms of nitrogen, in order to assess progress and success in implementing this TMDL toward reaching its endpoint. Once plant upgrades are complete, stream and biological sampling will be done to assess low flow conditions and status of aquatic life after 2011. Use of the real time flow data available at the recent Cedar Creek near Desoto (USGS Station 06892495) stream gaging station can help evaluate the impact of quality improvement at the upgraded Olathe plant.

Routine sampling of effluent quality will be a condition of the issued permits with testing frequency consistent with Kansas Surface Water Implementation Procedures.

Reasonable assurance

Reasonable assurance only applies when reductions in nonpoint source loading is required to meet the prescribed waste load allocations.

Reasonable assurances are not applicable. The assigned WLA should be sufficient to achieve WQS.