EPA Region 7 TMDL Review

TMDL ID: NE-MT1-L0090 **State:** NE
Document Name: CARTER LAKE

Basin(s): MISSOURI RIVER
HUC(s): 10230006
Water body(ies): CARTER LAKE
Tributary(ies): NONE
Pollutant(s): ALGAE, TURBIDITY

Submittal Date: 6/26/2007 **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.

A letter dated June 22, 2007, and received by EPA June 26, 2007, formally submitted this TMDL document for approval. Supplemental information was received via email as a revision on September 6, 2007.

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 pollutant is defined as algae and turbidity linked to excessive nutrients loading. Phosphorus is targeted as the pollutant to reduce impairments. Carlson's Trophic State Index (TSI) was used to link the concentration of total phosphorus to the quantity of algae and turbidity in the system. A TSI for total phosphorus (TSITP) <70 was set as a target to achieve TSI for Chlorophyll (algae) and secchi depth (turbidity) of <65. TSIs of <65 would meet the standard for algae and turbidity. The load capacity for phosphorus is set at 1462 pounds per year to result in attainment of water quality standards.

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 2004 and 2006 Nebraska Surface Water Quality Report included Carter Lake on Part 5 Section 303(d) List for algal toxins, total phosphorus, total nitrogen, chlorophyll a, and pH (2006 submittal has not been approved at this time). The Nebraska Water Quality Standards Designated Uses list

Carter Lake as Primary Contact Recreation, Aquatic Life-Warm Water class A, Agriculture Water Supply, and Aesthetics. Carter Lake was included on the impaired waters list due to algae and turbidity. Nebraska does not have numeric water quality standards for lakes that include total phosphorus, total nitrogen and chlorophyll a. However, the TMDL target values for total phosphorus (96µg/l) and chlorophyll a (33µg/l) will meet the Nebraska narrative standards. The phosphorus target was determined using the Canfield-Bachmann Natural lake model and the EUTROMOD Loading Model Function. For total nitrogen, the TN:TP ratio indicates a phosphorus limited system. The phosphorus target will achieve a narrative total nitrogen standard. Algal toxins produced by blue green algae have been shown to be correlated to phosphorus, measures of transparency and overall chlorophyll concentrations. For pH, during photosynthesis, the phytoplankton uptake carbon dioxide and give off oxygen. The pH value increases with the decrease in available hydrogen cations. Peaks in pH should occur in the afternoon, when the greatest amount of radiant energy reaches the water. Decreasing total phosphorus will reduce phytoplankton and decrease their effect on pH resulting in the lake meeting the pH standard of 6.5-9.0.

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 Nebraska does not have numeric water quality standards for lakes that include total phosphorus, total nitrogen and chlorophyll a, however the values for total phosphorus (96 µg/l) and chlorophyll a (33 µg/l) will meet the Nebraska targets.

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 following are the three quantified sources listed for Carter Lake: 1) phosphorus load from regulated storm water discharges within MS4 areas; 2) nonpoint source phosphorus load from the watershed areas; and 3) atmospheric deposition. It seems all significant sources have been identified.

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.

Targets for this TMDL were set to reduce phosphorus loading to achieve an in-lake TSITP<70 resulting in TSI for Secchi depth and chlorophyll of <65. This will be accomplished with a total phosphorus loading capacity of 1,462 pounds per year. Using the Technical Support Document method to express this annual load as a daily maximum, results in a daily loading capacity of 10.7 pounds. Expressing this TMDL in daily time steps could mislead the reader by implying a daily response to a daily load. The lake is affected during the growing season by many different factors including: internal lake nutrient loading, water residence time, wind action and the interaction between light penetration, nutrients, sediment load and algal response. Therefore, the annual load is more meaningful to the lakes trophic state determination.

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.

For the City of Omaha, Nebraska, waste load allocations are assigned for the areas within the corporate limits, which is 98.9% of the total watershed area, and are covered under permit number NE 0133698. Based on relative land use size, the individual WLA for City of Omaha is 904 pounds per year resulting in a maximum of 6.64 pounds per day. For WLA assigned to the City of Carter Lake, Iowa see the Iowa TMDL for Carter Lake.

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 combined watershed non-point sources and atmospheric deposition. The watershed nonpoint source load is 9.4 pounds per year, equivalent to a maximum 0.069 pounds per 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.

Based on data availability for this TMDL study an explicit margin of safety of 10% of the loading capacity is reserved for a MOS, which results in a maximum of 10.7 pounds per day.

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.

TSI targets are applied to the growing season when nuisance algal blooms and low transparency in the lake are prevalent. The model selected uses growing season mean (GSM) in-lake total phosphorus concentrations to calculate an annual average total phosphorus load.

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)].

The TMDL was placed on NDEQ website for public review, and a notice of availability was placed in the Omaha World Herald. The public comment period was from May 14, 2007 through June 18, 2007. No public comments were received.

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].

Monitoring activities will be focused on the lake and will encompass physical, chemical, and biological elements. All monitoring activities will follow existing NDEQ protocols, and all monitoring results will be used to revise the plan as appropriate. NDEQ has determined a long term monitoring plan is required to evaluate the progress in meeting the water quality goals and objectives identified in this plan. Parameters, frequencies, and responsible parties are outlined in Table 7 of the submittal.

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.

For the City of Omaha, Nebraska, the areas within the corporate limits, which is 98.9% of the total watershed area, are covered under permit number NE0133698. Therefore, reasonable assurance is not required and increased reductions in nonpoint source loads are not being required in lieu of less stringent WLAs.