EPA Region 7 TMDL Review

TMDL ID: IA 06-LSR-03105-L_0 **State:** IA
Document Name: SILVER LAKE (DICKINSON)

Basin(s): LITTLE SIOUX RIVER
HUC(s): 10230003
Water body(ies): SILVER LAKE (DICKINSON)
Tributary(ies): UNNAMED TRIBUTARY, WEST BRANCH LITTLE SIOUX RIVER
Pollutant(s): PHOSPHORUS, TURBIDITY

Submittal Date: 3/20/2009 **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 Iowa Department of Natural Resources (IDNR) formally submitted this TMDL document in a letter received by the United States Environmental Protection Agency (EPA) on March 20, 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 Silver Lake (Dickinson) is set at 8,499 pounds per year (lbs/yr) for total phosphorus (TP) which calculates to 45.9 pounds per day (lbs/day) to achieve a chlorophyll *a* (chla) concentration of 34 micrograms per liter (µg/L) and a Secchi depth (SD) target of 1.0 meter (m). The targeted Carlson's Trophic State Index (TSI) values for TP and chla are 65 and SD is 60.

The LC is set using a lake eutrophication model (BATHTUB) to analyze the annual TP loads that Silver Lake (Dickinson County) can receive and meet its designated uses. To address the identified pollutant, of turbidity, a chla concentration of 34 micrograms per liter (ug/L) was used to link TP concentrations to the level of eutrophication.

Carlson's TSI provides insight to the complex relationships between transparency (as measured by Secchi depth), chla and TP in lakes. 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.

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.

TMDL targeted WQS:
The state of Iowa WQS are published in the Iowa Administrative Code, Environmental Protection Rule 567, Chapter 61. Although Iowa does not have numeric criteria for sediment or nutrients, narrative water quality criteria apply. Chapter 61.3(2) of the WQS contains the general water quality criteria applicable to all surface waters. These narrative criteria require that waters be free of "aesthetically objectionable conditions."

Beneficial Uses:
A1 - primary contact recreation
C - drinking water supply
HH - human health (fish consumption)
B(LW) - aquatic life (lakes and wetlands)

The submittal states the water body is impaired for the primary contact recreation use by turbidity.

The translation of the narrative standards using a numeric phosphorus target was derived through the use of models. The models include the Generalized Watershed Loading Function (GWLF) and BATHTUB, an empirical receiving water quality model that was developed by the 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. Modeling is used for water quality simulations to translate TP LCs to SD, chla, and TP targets.

The TMDL lists the target for each parameter.

	Targeted TSI	Targeted value	LC (lbs/yr)	LC (lbs/day)
SD	60	1.0 meter	N/A	N/A
chla	65	34 ug/L	N/A	N/A
TP	65	68 ug/L	8,499	45.9 lbs/day

Trophic state assessments (through TSI values) of potential algal productivity were made based on chla, nutrient levels (TP), and transparency (as measured by SD) which effectively links TP, chla, and SD 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 Iowa does not have numeric criteria for nutrients or turbidity in their WQS. A lake eutrophication model (BATHTUB), determined that a load reduction for nutrients is required to reach the chla and SD endpoints. Using the GWLF and BATHTUB models, a LC of 8,499 lbs/yr TP was derived in order to translate the narrative standards as a chla concentration of 34 ug/L and a SD of 1.0 meter (m). This reduction in TP loading is an established link in the reduction of chla concentrations and increased transparency. Chla concentrations are linked to eutrophication through trophic indices. The chla target was set at a TSI of 65. SD is targeted at a TSI of 60 (1.0 m). Based on the GWLF modeling results, nutrient loads from the watershed (primarily row crops) and internal lake loading. The lake has an excess of TP concentrations and cropland is identified as the most important phosphorus source.

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.

In the absence of a National Pollution Discharge Elimination System (NPDES) permit, the discharges associated with sources were applied to the LA, as opposed to the WLA for purposes of this TMDL. The decision to allocate these sources to the LA does not reflect any determination by EPA as to whether these discharges are, in fact, unpermitted point source discharges within this watershed. In addition, by establishing these TMDLs with some sources treated as LAs, EPA is not determining that these discharges are exempt from NPDES permitting requirements. If sources of the allocated pollutant in this TMDL are found to be, or become, NPDES-regulated discharges, their loads must be considered as part of the calculated ∑WLA in this TMDL. WLA in addition to that allocated here is not available.

Row crops (46.1%) and internal loading (39%) are the most significant sources as shown by the water quality modeling.

Loss of wetlands and introduction of agricultural tile drains have affected watershed hydrology and increased nutrient loads to the lake. Loss of surface water storage, which causes water levels to remain high for longer periods, increased siltation and carp populations, prevents the establishment of aquatic vegetation along the shore. In shallow lakes, this also increases nutrient loads by facilitating the resuspension of sediment and phosphorus via wind mixing, carp, power boating, and loose bottom sediments.

The dominant land use in the watershed is row crops (85.3%). Conservation areas occupy around 8.6%, 2.6% is urban/roads, 1.9% is wetlands/water and farmsteads are 1.6%.

Smaller sources of TP also exist, such as non-agricultural land uses, ground water sources, failing septic systems and natural or background sources. Natural/background sources can include wildlife in the watershed, geese at the lake, and atmospheric deposition.

There are no permitted point sources within this watershed.

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.

Allocations were set using models (BATHTUB and GWLF). The LC is 8,499 lbs/yr (45.9 lbs/day) TP. The WLA is zero. The LA is 7,649 lbs/yr (41.3 lbs/day) TP. TP is also targeted at a TSI value of 65 and 68 ug/L. SD is targeted to attain a TSI value of 60 and 1.0 m transparency. Chla is targeted to attain a TSI value of 65 and 34 ug/L.

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 set at zero. There are no known point sources in this watershed.

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 set at 7,649 lbs/yr (41.3 lbs/day) TP. There is no allowance for increased TP loading for future growth as the potential is very low.

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 is set at an explicit 10%. This is equivalent to 850 lbs/yr (4.6 lbs/day) TP.

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.

The critical period for the occurrences of high non-algal turbidity and/or algal blooms resulting from high phosphorus levels in the lake is the growing season (April-September). Seasonal variation has been incorporated in this TMDL since the peaks of algal growth occur in the summer months.

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.

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 draft TMDL was posted on the IDNR website on February 3, 2009 and comments were accepted until March 6, 2009. On February 17, 2009 a public meeting was held in Lake Park, Iowa to obtain comments and input. Meetings were also held on February 19, 2008, and April 8, 2008. IDNR did not receive written comments on the draft Silver Lake (Dickinson County) TMDL.

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].

As stated in the TMDL, "Future monitoring will be conducted as part of the IDNR Ambient Lake Monitoring Program. Through this program, three sampling events are scheduled every summer (between Memorial Day and Labor Day). One sample location from the deepest part of the lake and many chemical, physical and biological parameters are measured."

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.

No reasonable assurances are required. There are no point sources in the watershed and the WLA is set at zero.