UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

OCT 19 2018

REPLY TO THE ATTENTION OF:

WW-16J

Glenn Skuta, Watershed Division Director
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Mr. Skuta:

The U.S. Environmental Protection Agency has conducted a complete review of the Mississippi Headwaters Total Maximum Daily Loads (TMDL) For Little Turtle Lake and Lake Irving, located in Beltrami County, Minnesota. The TMDLs are calculated for total phosphorus and address the nutrient/ eutrophication related impairments to the Aquatic Recreation designated use of Little Turtle Lake and Lake Irving.

EPA has determined that these TMDLs meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, EPA hereby approves Minnesota's two Mississippi Headwaters TMDLs For Little Turtle Lake and Lake Irving. The statutory and regulatory requirements, and EPA's review of Minnesota's compliance with each requirement, are described in the enclosed decision document.

We wish to acknowledge Minnesota's effort in submitting these TMDLs, and look forward to future submissions by the State of Minnesota. If you have any questions, please contact Mr. Peter Swenson, Chief of the Watersheds and Wetlands Branch, at 312-886-0236.

Sincerely,

Linda Holst

Linda Holst
Acting Director,
Water Division

Enclosure

cc: Celine Lyman, MPCA
Phil Votruba, MPCA

wq-iw8-57g

Mississippi Headwaters TMDL

For Little Turtle Lake and Lake Irving

EPA Final Review and Comments

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements for approvable TMDLs. Additional information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable. These TMDL review guidelines are not themselves regulations. They are an attempt to summarize and provide guidance regarding currently effective statutory and regulatory requirements relating to TMDLs. Any differences between these guidelines and EPA's TMDL regulations should be resolved in favor of the regulations themselves.

This document is a final review of the TMDL document titled:

> Mississippi Headwaters Total Maximum Daily Loads for Little Turtle Lake and Lake Irving,
> Minnesota Pollution Control Agency, October 2018

Section 1. Identification of Waterbody, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the waterbody as it appears on the State's/Tribe's 303(d) list. The waterbody should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the waterbody and specify the link between the pollutant of concern and the water quality standard (see section 2 below).

The TMDL submittal should include an identification of the point and nonpoint sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the NPDES permits within the waterbody. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of the natural background. This information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation.

The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as:

(1) The spatial extent of the watershed in which the impaired waterbody is located;
(2) The assumed distribution of land use in the watershed (e.g., urban, forested, agriculture); (3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) Present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and
(5) An explanation and analytical basis for expressing the TMDL through *surrogate measures*, if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment impairments; chlorophyll a and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Section 1 Review Comments:

The waterbodies are identified as they appear on the 303(d) list.

Table 1-1 of the TMDL document provides identification information for the two waterbody impairments addressed which matches listing information in the Minnesota proposed 2018 impaired waters list[1] shown in Review Table 1. Both waterbodies are located in the National Hydrography Dataset 8-digit Hydrography Unit 07010101 (Mississippi River - Headwaters).

Table 1-1. Water Quality Impairments Addressed by This Report

Lake Name	Lake ID	Use Classification	Year Listed	Impairment
Irving	04-0140-00	2B, 3C	2010	Nutrient/eutrophication biological indicators
Little Turtle	04-0155-00	2B, 3C	2008	Nutrient/eutrophication biological indicators

Excerpted from the TMDL document

[1] Minnesota's Proposed 2018 Impaired Waters List – Updated April 4, 2018
https://www.pca.state.mn.us/water/minnesotas-impaired-waters-list

TMDL Review Table 1 - MN 303d List Information					
Water body name	AUID	Affected designated use	Year added to List	Pollutant or stressor	TMDL target completion year
Irving	04-0140-00	Aquatic Recreation	2010	Nutrient/ eutrophication biological indicators	2018
Little Turtle	04-0155-00	Aquatic Recreation	2008	Nutrient/ eutrophication biological indicators	2018

Excerpted from Minnesota's Proposed 2018 Impaired Waters List

<u>The TMDL identifies the priority ranking of the waterbody</u>

Section 1.3 of the TMDL document addresses the priority ranking for the waterbody impairments.

The MPCA's schedule for TMDL completions, as indicated on the 303(d) impaired waters list, reflects Minnesota's priority ranking of this TMDL. The MPCA has aligned our TMDL priorities with the watershed approach and our Watershed Restoration and Protection Strategy (WRAPS) cycle. The schedule for TMDL completion corresponds to the WRAPS report completion on the 10-year cycle. The MPCA developed a state plan Minnesota's TMDL Priority Framework Report to meet the needs of Environmental Protection Agency's (EPA's) national measure (WQ-27) under EPA's Long-Term Vision for Assessment, Restoration and Protection under the CWA Section 303(d) Program. As part of these efforts, the MPCA identified water quality impaired segments, which will be addressed by TMDLs by 2022. The surface waters addressed by this TMDL are part of that MPCA prioritization plan to meet EPA's national measure.
[Excerpted from the TMDL document]

<u>The TMDL clearly identifies the pollutant(s) for which the TMDL is being established.</u>

Section 2 of the TMDL document identifies the pollutant of concern as Total Phosphorus.

<u>The link between the pollutant of concern (POC) and the water quality standard is specified.</u>

Table 2-1 of the TMDL document shows the water quality standard expressed directly in terms of Total Phosphorus (the pollutant of concern) as well as in terms of the response variables of Chlorophyll-a and Secchi Depth.

Table 2-1. Lake Nutrient/Eutrophication Standards for Lakes, Shallow Lakes, and Reservoirs in the Northern Lakes and Forest Ecoregion [Minnesota State Legislature 2008]

TP (ppb)	Chl-*a* (ppb)	Secchi Depth (m)
≤ 30	≤ 9	≥ 2.0

ppb = parts per billion

Excerpted from the TMDL document

Section 3 of the TMDL document provides further discussion on the relationship between the pollutant of concern and the response variables.

Distinct relationships were established between the causal factor (TP) and the response variables (Chl-a and Secchi transparency). TP has often been found to be the limiting factor in freshwater lakes. As lake P concentrations increase, algal abundance increases, which results in higher Chl-a concentrations and reduced lake transparency. Based on these relationships, the Chl-a and Secchi standards are expected to be met by meeting the P target in each lake.
[Excerpted from the TMDL document]

Section 1.2 of the TMDL document discusses the relationship between P, and the impaired aquatic recreational use.

The Mississippi Headwaters Watershed of north-central Minnesota has aquatic-recreation use impairments from eutrophication (P) in two lakes (Lake Irving and Little Turtle Lake), which are shown in Figure 1-1.
The state of Minnesota classifies streams and lakes into categories that are protected for specific, designated uses. All impairments addressed in this TMDL are Class 2B and Class 3C waters.

The quality of Class 2B surface waters shall be such as to permit the propagation and maintenance of a health community of cool or warm water sport or commercial fish and associated aquatic life, and their habitats. These waters shall be suitable for aquatic recreation of all kinds including bathing, for which the waters may be usable. This class of surface water is not protected as a source of drinking water.

[Excerpted from the TMDL document]

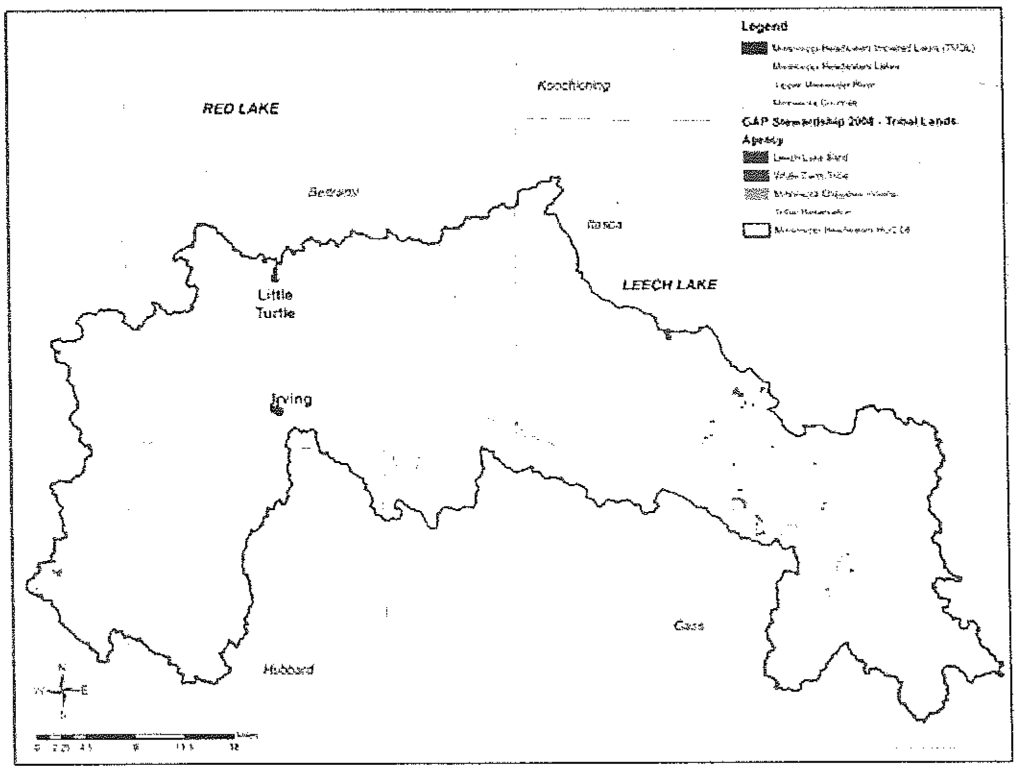
<u>Waters within Indian Country, (as defined in 18 U.S.C. Section 1151) are identified and discussed.</u>

Section 3.1 of the TMDL document discusses the location of tribal lands and potential impacts of the TMDL on any downstream tribal waters.

Lake Irving and Little Turtle Lake lie outside of tribal lands; however, the receiving waters of these lakes (Mississippi River and the Turtle River, respectively) flow

through the Leech Lake Indian Reservation situated to the east of Bemidji via the Mississippi River Headwaters Watershed. No impairments downstream along the main stem of the upper Mississippi River drainage were documented (other than mercury) within the Leech Lake Reservation boundary and within the Mississippi River Headwaters Watershed as a whole. See Figure 3-1 below for location of tribal lands within the Mississippi River Headwaters Watershed.
[Excerpted from the TMDL document]

Figure 3-1. Mississippi River Headwaters Watershed – Impaired Lakes and Tribal Lands



Excerpted from the TMDL document

The location and quantity of point and non-point sources are identified.

Section 3.12 of the TMDL document provides a phosphorus source summary, and Section 4.2 of the TMDL document provides additional details and discussion. Sources identified and discussed in the TMDL document include:

Permitted Municipal Separate Storm Sewer Systems (MS4s):

Portions of the Bemidji MS4 (permit number MS400265) extend into the watershed of Lake Irving as summarized in Table 4-4.
[Excerpted from the TMDL document]

Table 4-4. Lake Irving Contributing MS4 Areas

Reach	MS4	Permit No.	Contributing Area
Tributary	Bemidji	MS400265	1047.5 acres
Lakeshed	Bemidji	MS400265	3317.7 acres

Excerpted from the TMDL document

No existing MS4 areas are identified for the Little Turtle Lake watershed.

Construction and Industrial Stormwater:

Stormwater inputs from construction and industrial sources are discussed in section 4.2.14.2 of the TMDL document.

P loading from potential future permitted construction stormwater sites within each lake watershed were estimated based on the total area of permitted construction sites by County [Leegard 2015].
[Excerpted from the TMDL document]

The following MN General Permits are cited in the TMDL document as covering permitted stormwater sources contributing to the waterbodies.
Minnesota Construction Stormwater Permit: MNR100001
Minnesota Industrial Stormwater Permit: MNR050000.

Natural Background P Inputs:

Natural background P sources to lakes include surface runoff from the natural landscape, background stream-channel erosion, groundwater discharge, and atmospheric deposition of windblown particulate matter from the natural landscape.
[Excerpted from the TMDL document]

Internal P Loads from Lake Bottom Sediments:

Section 3.12 of the TMDL document discusses the cycling of P between lake sediments and aquatic vegetation and the water column resulting in internal loads.

Lake nutrient cycling, or internal loading, refers to several processes that can cause P *to be released into the water column where it can be available to algal growth, often in dissolved P forms. For the purposes of this TMDL study, lake P cycling can occur from these types of processes:*

1. P can be released from lake sediments in aerobic and anaerobic conditions, as typically moderated by amounts of available iron, organic loading, and other factors such as legacy sources.

2. Sediment resuspension of from physical disturbance by bottom-feeding fish (e.g., rough fish such as carp and black bullheads), particularly in shallow-lake areas, can cause nutrient resuspension, including P. Small particles (clay and silt) are most vulnerable to resuspension; these particles also have the largest specific area (surface area per mass) and, therefore, are capable of holding much more P per unit mass than larger particles (sand). Carp and black bullhead populations were not noted by the DNR Fish Surveys for Lake Irving; however, low levels of black bullheads were noted in Little Turtle Lake. Bottom-feeding fish can influence resuspension of bottom sediments in either lake.

3. P can be released from decay of macrophytes, particularly of dense stands of invasive species, such as curly-leaf pondweed (Potamogeton crispus) and Eurasian watermilfoil (Myriophyllum spicatum), which can dominate littoral areas. Neither of these invasive species were noted in Lake Irving, Little Turtle Lake, or Lake Bemidji. Curly-leaf pondweed typically dies off early- to mid-summer and is subject to rapid decay in warm water, which potentially contributes to summer P concentrations. In other instances, macrophytes can be effective at stabilizing sediment and limiting resuspension. However, peak macrophyte growth can increase pH and contribute to daily minimum DO concentrations at the sediment-water interface, which causes P release from sediments. Wave mixing of deeper waters can result in transport of sediment P into the surface waters.

4. High concentrations of TP and dissolved P from tributary and lakeshed runoff pulses can contribute to elevated in-lake concentrations and increased algal growth. The resulting increased biological growth, decay, and deposition may increase the pool of soluble/dissolved P of surficial lake sediments and, hence, may be temporally mistaken for traditional internal loading sources. Therefore, particular attention was paid to HSPF-generated TP and dissolved P loading rates to each lake.

[Excerpted from the TMDL document]

Sections 4.2.8 and 4.2.9 of the TMDL document discusses how the rate of internal P loading from lake bottom sediments was estimated.

The wide range of Minnesota study estimates of internal loading rates reflect the range of lake sediment chemistries, low DO influenced sediment release rates, resuspension, and in the case of Lake Irving, potential back-flows from Lake Bemidji. This study's requisite lake diagnostic examinations included evaluation of lake mixing

and P/temperature/DO concentration dynamics. Sediment chemical analyses that are required to employ Nürnberg-type P release equations [Nürnberg, 1995] and lake sediment cores used to measure aerobic and anaerobic release rates (James 2017) were not available. As a result, a collective weight of evidence approach was used to assess potential internal loading for each lake based on three methods: (1) literature values reported for similar northern Minnesota lakes, (2) growing-season calculated changes in monthly mean surface TP concentrations used to estimate P mass balance changes; and (3) back-calculated internal loading (or unexplained residuals) calculated from annual HSPF stream flows and P loads incorporated into the BATHTUB model for quantification of annual P mass balances.
[Excerpted from the TMDL document]

This TMDL made use of the lake water quality model BATHTUB (BATHTUB for Windows Version 6.20) developed by Dr. William W. Walker (1999) for the U.S. Army Corps of Engineers. BATHTUB calculates a steady-state P mass balance for an ideal, well-mixed lake. The P mass balance includes inputs of watershed load, municipal and industrial wastewater discharges, septic systems, feedlots, atmospheric deposition, and internal loading; as well as two outputs, the outflow load (lake TP concentration multiplied by the outflow water volume) and its complement, the "retained load" (portion of the total load that settles and remains in the lake's bottom sediments). The retained load prediction is the critical part of the P mass balance. BATHTUB has several optional sub-models for calculating the retained load; the option used for all lakes in this study is the Canfield-Bachmann "lake" option. The Canfield-Bachmann formulation predicts the retained P load from a statistical relationship between retention and total load, based on data for 704 lakes and reservoirs (626 in the U.S). Whenever a Canfield-Bachmann model application has an explicit internal load specified, that load actually represents a deviation from a "normal" internal load reflected in the 704 lakes used in the original model development. And conversely, a "zero" internal load in a Canfield-Bachmann model application actually implies a "normal" internal load.
[Excerpted from the TMDL document]

Inputs from Upstream Rivers:

Upstream tributaries contributing P include the Turtle River which discharges into Little Turtle Lake and the Mississippi River which discharges into Lake Irving.

Section 4.2.2 discusses how upstream tributary inflows are incorporated into the Bathtub Model.

Tributary inflows in the lake segment(s) are specified by the user as mean annual flow volume (hectometers [hm^3]); pollutant concentrations are entered as flow-weighted mean concentrations.

Turtle River Inlet P load contributions to Little Turtle Lake are shown in Table 4-5 Lake Total Maximum Daily Load Summary for Little Turtle Lake.
Mississippi River Inlet P load contributions to Lake Irving are shown in Table 4-6 Lake Total Maximum Daily Load Summary for Lake Irving.

Watershed Surface Runoff Loading:

Section 4.2.1 of the TMDL document discusses P loading to the lakes via direct surface runoff from surrounding lakesheds and tributary watersheds.

> *Watershed loading to lakes was provided from the calibrated Upper Mississippi Headwaters HSPF Model [Ackerman 2015]. Mean annual runoff and flow-weighted mean TP concentrations for watershed loading were provided as input to BATHTUB. Table 4-1 includes watershed areas and average areal rates of runoff from HSPF.*
> *[Excerpted from the TMDL document]*

Table 4-1 of the TMDL shows information on the area and flow from the contributing watersheds draining directly to the lakes as well as to the upstream tributaries.

Table 4-1. Watershed Areas, Average Areal Rates of Runoff.

Impaired Lake	Source	Acres	Flow (in/ac/yr)
Little Turtle	Lakeshed	1,069.4	5.37
	Tributaries	24,762.3	4.15
Irving	Lakeshed	8,085.6	8.64
	Tributaries	346,559.5	4.62

Excerpted from the TMDL document

> *A calibrated 1995 through 2009 HSPF model was used to develop loading estimates based on land cover in the Lake Irving and Little Turtle Lake Watersheds. HSPF is a continuous model that employs precipitation and other climatic variables to predict runoff and pollutant loading to waterbodies. Mean annual runoff (inches) and TP loads (pounds per acre) for each modeled land use in the watersheds were used to calculate mean annual loading to each lake.*
> *[Excerpted from the TMDL document]*

Subsurface Sewage Treatment Systems (Septic Systems):

Estimates were made for the existing contribution of septic systems.

> *Because sanitary sewer is available to all homes around Irving, none were assumed to use SSTS. A desktop analysis was performed to estimate the number of homes and cabins around Little Turtle Lake; 54 homes and cabins were identified. An assumption*

was made that approximately half of the homes are occupied year-round, while the remaining 27 are seasonally occupied (100 days per year). Average house size was assumed to be 2.56 people per home, which is the 2009 through 2013 average for Beltrami County from the 2010 U.S. Census. A statewide noncompliance rate of 20% [MPCA 2013] was used to estimate the proportion of septic systems that are noncompliant. Assumptions were made that complying and non-complying septic systems retain 95 and 50% of their phosphorus loads, respectively. An estimate of annual TP loss per capita of 1 kilogram [Heiskary and Wilson, 2005] was used to estimate mean annual TP loading to septic systems.
[Excerpted from the TMDL document]

Atmospheric Loading:

An atmospheric phosphorus deposition of 0.268 kilogram per hectare per year (kg/ha/yr) [Twarowski et al. 2007] was used to quantify average annual total (wet + dry) deposition on the lake surface. Values that were reported for dry and wet years were 0.249 and 0.290 kg/ha/yr, respectively.
[Excerpted from the TMDL document]

Table 4-5. Lake Total Maximum Daily Load Summary for Little Turtle Lake

Little Turtle Lake Load Allocation		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lb/year	lb/day	lb/year	lb/day	lb/year	%
Loading Capacity				1,145.89	3.14		
Margin of Safety 10%				114.59	0.31		
Total Load (excluding MOS)		1,541.83	4.22	1,031.30	2.82	510.53	33.11
Wasteload	Total WLA	0.59	< 0.01	0.59	< 0.01	< 0.01	–
	Construction Stormwater	0.14	< 0.01	0.14	< 0.01	< 0.01	–
	Industrial Stormwater	0.45	< 0.01	0.45	< 0.01	< 0.01	–
Load	Total LA	1,541.24	4.22	1,030.71	2.82	510.53	33.12
	Turtle River Inlet	967.05	2.65	860.40	2.36	106.65	11.03
	Lakeshed	93.40	0.26	58.21	0.16	35.19	37.68
	Internal Load	341.22	0.93	0	0	341.22	100
	SSTS	27.47	0.08	0	0	27.47	100
	Atmospheric deposition	112.10	0.31	112.10	0.31	0.00	–
Total Load (excluding MOS)		1,541.83	4.22	1,031.30	2.82	510.53	33.11

Excerpted from the TMDL document

Table 4-6. Lake Total Maximum Daily Load Summary for Lake Irving

Irving Lake Load Allocation		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lb/year	lb/day	lb/year	lb/day	lb/year	%
Loading Capacity				11,442.38	31.33		
Margin of Safety 10%				1040.22	2.85		
Total Load (excluding MOS)		24,368.77	66.72	10,402.16	28.48	13,966.61	57
Wasteload	Total WLA	742.44	2.03	474.94	1.30	267.50	36
	Bemidji MS4	736.34	2.02	468.84	1.28	267.50	36
	Construction Stormwater	2.39	0.01	2.39	0.01	0	-
	Industrial Stormwater	3.71	0.01	3.71	0.01	0	-
Load	Total LA	23,626.33	64.69	9,927.22	27.18	13,699.11	58
	Mississippi Inlet	15,712.46	43.02	9382.1	25.69	6,330.36	40
	Lakeshed	686.24	1.88	385.8	1.06	300.44	44
	Internal Load	7,004.36	19.18	0	0	7,004.36	100
	SSTS	63.95	0.18	0	0	63.95	100
	Atmospheric deposition	159.32	0.44	159.32	0.44	0	-
Total Load (excluding MOS)		24,368.77	66.72	10,402.16	28.48	13,966.61	57

Excerpted from the TMDL document

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the first criterion.

Section 2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. (40 C.F.R. §130.7(c)(1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether or not the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

Section 2 Review Comments:

Applicable WQS are identified, described, and a numerical water quality target is included.

Section 2 of the TMDL document provides information regarding the applicable water quality standards for total phosphorus as well as for the response variable of chlorophyll-a and secchi depth.

Table 2-1 shows the applicable lake standards (Minn. R. 7050.0150, subp. 5a) along with one or both of the eutrophication response standards for Chl-a and Secchi transparency. Minn. R. 7050.0150, subp. 4, defines summer average as a representative average of concentrations or measurements of nutrient-enrichment factors, taken over one summer season [Minnesota State Legislature 2008]. Summer season is subsequently defined as a period annually from June 1 through September 30.
[Excerpted from the TMDL document]

Table 2-1. Lake Nutrient/Eutrophication Standards for Lakes, Shallow Lakes, and Reservoirs in the Northern Lakes and Forest Ecoregion [Minnesota State Legislature 2008]

TP (ppb)	Chl-*a* (ppb)	Secchi Depth (m)
≤ 30	≤ 9	≥ 2.0

ppb = parts per billion

Excerpted from the TMDL document

Additional clarification of the applicability of the nutrient/eutrophication standards are provided in Section 3.3 of the TMDL document.

*For a lake to be determined impaired, measured summer-average lake TP concentrations must show exceedances of the TP standard shown in Table 2-1 along with one or both of the eutrophication response standards for Chl-*a *and Secchi transparency.*
[Excerpted from the TMDL document]

The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. If the target is not the pollutant of concern, the linkage between the surrogate and POC is described.

The pollutant of concern is P, which has a numerical water quality target of ≤ 30 ppb. It is expected that the response criterion Chl-a and Secchi transparency will also be met when the P criterion is met.

Clear relationships were established between the causal factor TP and the response variables Chl-a and Secchi transparency. Based on these relationships, the Chl-a and Secchi standards are expected to be met.
[Excerpted from the TMDL document]

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the second criterion.

Section 3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a waterbody for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is additionally expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

The TMDL submittal should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling. EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

TMDLs must take into account *critical conditions* for steam flow, loading, and water quality parameters as part of the analysis of loading capacity. (40 C.F.R. §130.7(c)(1)). TMDLs should define applicable *critical conditions* and describe their approach to estimating both point and nonpoint source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

Section 3 Review Comments:

The loading capacity is presented for the POC (including daily loads)

Table 4-5 of the TMDL document, Lake Total Maximum Daily Load Summary for Little Turtle Lake shows the loading capacity of Little Turtle Lake as 1,145.89 lbs of Phosphorus per year or 3.14 lbs./day.

Table 4-6 of the TMDL document, Lake Total Maximum Daily Load Summary for Lake Irving shows the loading capacity of Lake Irving as 11,442.38 lbs of Phosphorus per year or 31.33 lbs./day.

The method to establish a cause and effect relationship between POC and the numerical target is described and the TMDL analysis is documented and supported

Section 4.2 of the TMDL document discusses the models used to develop the quantitative predictive relationship between the pollutant of concern and the water quality standards. The phosphorus water quality standard is a concentration based standard and is therefore achieved directly by reducing the pollutant loads as prescribed in the TMDL load allocations. Chl-a and Secchi Depth are eutrophication response variables that are partially dependent on the concentration of phosphorus.

In developing the lake nutrient standards for Minnesota lakes (Minn. R. 7050), the MPCA evaluated data from a large cross section of lakes within each of the state's ecoregions [MPCA 2005]. Clear relationships were established between the causal factor TP and the response variables Chl-a and Secchi transparency. Based on these relationships, the Chl-a and Secchi standards are expected to be met.
[Excerpted from the TMDL document]

The HSPF water quality model was used to estimate watershed P loading rates. The BATHTUB model was then used to predict the response of the lakes in terms of Chl-a and Secchi depth. The results of the bathtub modeling analysis are presented in Tables 4-2 and 4-3 for Little Turtle Lake and lake Irving respectively.

Watershed loading to lakes was provided from the calibrated Upper Mississippi

Headwaters HSPF Model [Ackerman 2015]. Mean annual runoff and flow-weighted mean TP concentrations for watershed loading were provided as input to BATHTUB. [Excerpted from the TMDL document]

BATHTUB is an empirical eutrophication model used to predict lake responses to nutrient loading. BATHTUB uses steady-state water and nutrient mass balances to model advective transport, diffusive transport, and nutrient sedimentation [Walker 2004]. Lake responses (e.g., Chl-a concentration or Secchi depth) are predicted by empirical relationships developed by Walker [1985]. [Excerpted from the TMDL document]

BATHTUB modeling was conducted for each lake incorporating HSPF flow and nutrient inputs from watershed sources, and employing reported Minnesota atmospheric P deposition and estimated P loading from septic tanks. The unexplained residuals or P loads that are needed to balance the income and outgo budgets defined from HSPF inputs in the BATHTUB modeling were tabulated for each lake. Greater reliance was placed on this annual mass balance approach, which was based on the Mississippi River Basin calibrated HSPF model.
For Little Turtle Lake, the unexplained residual determined from lake P growing season increased concentrations mimic the value defined from HSPF mass balances, with a value of about 0.23 mg/m2/day. This value also represents the lower range of aerobic sediment P release rates of about 0.2 mg/m2/day noted by James (2017) in Lake of the Woods.
However, the HSPF/BATHTUB mass balance defined internal loading for Lake Irving was a factor of 10 higher than that calculated from the growing season monthly P increase method. Given the magnitude of Mississippi River inflows and the significance of the low flows in influencing Lake Irving's DO and P concentrations, preference was given to the time period modeled HSPF mass balance method. This higher sediment P generated internal loading rate (3.3 mg/m2/day) reflects peak growing season loss rates, similar to monitored shallow lake anaerobic P release rates from other recent Minnesota sediment studies (Lake of the Woods with 0.2 to 4.4 net P release in mg/m2/day).
TMDL allocations were based on internal P load (BATHTUB derived), translated to an annual P release rate of 3.3 mg/m2/day for Lake Irving and 0.23 mg/m2/day for Little Turtle Lake. Existing and TMDL-reduced mass balances are summarized in Table 4-2 for Little Turtle Lake and Table 4-3 for a Lake Irving.
[Excerpted from the TMDL Document]

Table 4-2. Little Turtle Lake BATHTUB Model Summary.

Name	Little Turtle Lake Existing				Little Turtle Lake Reduced			
	lb/yr	%Total	Conc (µg/L)	Export (lb/acre/yr)	lb/yr	%Total *	Conc (µg/L) *	Export (lb/acre/yr)
Turtle River	967.6	62.8	41.4	0.04	860.4	82.5	41.4	0.04
Lakeshed	93.4	6.1	70.6	0.09	58.2	5.7	50.0	0.06
SSTS	27.5	1.8	10,000	11.12	0			
Precipitation	112.1	7.3	39.1	0.24	112.1	9.6	39.1	0.24
Internal Load	341.2	22.1			0			
Tributary Inflow	1,088.5	70.6	44.1	0.04	918.6	90.4	41.9	0.04
Total Input	1,541.8	100.0	55.9	0.06	1030.7	100.0	41.6	0.04
Total Outlet**	914.5	59.3			645.1	62.3		
Retention	627.2	40.7				37.7		

*Values modeled to meet standards
** Includes advective correction to balance water budget

Excerpted from the TMDL document

Table 4-3. Lake Irving BATHTUB Model Summary

Name	Lake Irving Existing				Lake Irving Reduced			
	lb/yr	%Total	Conc (µg/L)	Export (lb/acre/yr)	lb/yr	%Total *	Conc (µg/L) *	Export (lb/acre/yr)
Miss. River	15,718.6	64.5	43.6	0.05	9,880.0	90.9	29.0	0.03
Bemidji MS4 to Mississippi	185.3	0.8	76.4	0.15	114.6	1.1	50.0	0.10
Lakeshed MS4	551.0	2.3	73.5	0.14	354.2	3.3	50.0	0.09
Lakeshed NonMS4	686.2	2.8	81.9	0.16	391.9	3.6	50.0	0.10
SSTS	63.9	0.3	10,000	25.87	0	0	10,000.0	0.09
Precipitation	159.3	0.7	39.1	0.24	159.3	1.5	39.1	0.24
Internal Load	7,004.4	28.7			0	0		
Tributary Inflow	17,205.1	70.6	45.4	0.05	10,740.7	98.8	30.1	0.03
Total Input	24,368.8	100.0	63.6	0.07	10,870.3	3.0	30.2	0.03
Total Outlet**	24,619.8	101.0	65	0.07	10,849.5	100	30	0.03
Retention	-251.0	-1.00			103.5	0.9		

*Values modeled to meet standards
** Includes advective correction to balance water budget

Excerpted from the TMDL document

The critical conditions are described and accounted for.

Section 4.3 of the TMDL document discusses how critical conditions were addressed during TMDL development. Critical conditions are accounted for in the TMDL by addressing the TMDL loading to meet water quality standards during the summer season when peak algal growth due to P inputs are expected to occur.

> *In deeper lakes, P concentrations may tend to decline or not change substantially in the absence of major runoff events during the growing season. However, warmer summer temperatures can result in periodic higher algal growth rates and higher Chl-a concentrations. Warmer summer lake temperatures can also increase the potential for lake internal P release or loading that can also contribute to increased algal Chl-a. This seasonal variation has been factored into the development of Minnesota's lake standards, based on swimmable and fishable beneficial uses, for the summer critical recreation (June through September) [Heiskary and Wilson 2005]. This TMDL's targeted allocations are based on Minnesota's lake standards and summer critical conditions. [Excerpted from the TMDL document]*

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the third criterion.

Section 4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Where possible, load allocations should be described separately for natural background and nonpoint sources.

Section 4 Review Comments

The load allocations for existing NPS loads are accounted for.

Load allocations and associated reductions are presented in Tables 4-5 and 4-6 of the

TMDL document. Loads are expressed in both annual and daily terms. The load allocations are broken down further for upstream sources, direct runoff from the lakeshed, internal loadings and atmospheric deposition. Existing loads from septic systems are acknowledged, but a load allocation is not provided as SSTSs are not allowed to discharge to surface waters.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the forth criterion.

Section 5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to individual existing and future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit.

The individual WLAs may take the form of uniform percentage reductions or individual mass based limitations for dischargers where it can be shown that this solution meets WQSs and does not result in localized impairments. These individual WLAs may be adjusted during the NPDES permitting process. If the WLAs are adjusted, the individual effluent limits for each permit issued to a discharger on the impaired water must be consistent with the assumptions and requirements of the adjusted WLAs in the TMDL. If the WLAs are not adjusted, effluent limits contained in the permit must be consistent with the individual WLAs specified in the TMDL. If a draft permit provides for a higher load for a discharger than the corresponding individual WLA in the TMDL, the State/Tribe must demonstrate that the total WLA in the TMDL will be achieved through reductions in the remaining individual WLAs and that localized impairments will not result. All permittees should be notified of any deviations from the initial individual WLAs contained in the TMDL. EPA does not require the establishment of a new TMDL to reflect these revised allocations as long as the total WLA, as expressed in the TMDL, remains the same or decreases, and there is no reallocation between the total WLA and the total LA.

Section 5 Review Comments

The WLAs are properly assigned.

The methodology for assigning wasteload allocations is discussed in section 4.2.14 of the TMDL document. The individual allocations are shown in Tables 4-5 and 4-6 of the TMDL document and are expressed in terms of both annual and daily loading rates.

NPDES Permitted Waste Water Treatment Plants (WWTP) and Industrial Point Sources

There are presently no NPDES permitted waste water treatment facilities or industrial facilities that discharge into the Little Turtle Lake or Lake Irving and no waste load allocations have been made or reserved for this purpose.

MS4s

The Lake Irving TMDL includes an allocation for the Bemidji MN MS4 area as shown below in Table 4-4 of the TMDL document.

Table 4-4. Lake Irving Contributing MS4 Areas

Reach	MS4	Permit No.	Contributing Area
Tributary	Bemidji	MS400265	1047.5 acres
Lakeshed	Bemidji	MS400265	3317.7 acres

Excerpted from the TMDL document

There are presently no MS4 that discharge into the Little Turtle Lake watershed and no waste allocation has been made or reserved for this purpose.

Construction and Industrial Stormwater Sources.

Section 4.2.14.2 of the TMDL document discusses the allocation of waste loads for construction and industrial stormwater, including information on the applicable permits.

The Minnesota Construction Stormwater Permit is MNR100001, and the Minnesota Industrial Stormwater Permit is MNR050000. P loading from potential future permitted construction stormwater sites within each lake watershed were estimated based on the total area of permitted construction sites by County [Leegard 2015].

The Little Turtle Lake Watershed is within Beltrami County, while Lake Irving's Watershed includes portions of Hubbard, Clearwater, Becker, and Beltrami Counties. [Excerpted from the TMDL document]

The individual allocations for construction and industrial stormwater are shown in Tables 4-5 and 4-6 of the TMDL document for Little Turtle Lake and Lake Irving respectively, and are expressed in terms of both annual and daily loading rates.

Future Growth

Future growth considerations for MS4s are discussed in Section 5 of the TMDL document. MN utilizes a standardized protocol for accommodating future growth scenarios, including a method for transferring LA to WLA to accommodate new or expanding permitted MS4s

Future transfer of watershed runoff loads in this TMDL may be necessary if any of the following scenarios occur within the project watershed boundaries:

1. *New development occurs within a regulated MS4. Newly developed areas that are not already included in the WLA must be transferred from the LA to the WLA to account for the growth.*
2. *One regulated MS4 acquires land from another regulated MS4. Examples include annexation or highway expansions. In these cases, the transfer is WLA to WLA.*
3. *One or more nonregulated MS4s become regulated. If the new MS4s have not been accounted for in the WLA, then a transfer must occur from the LA to the WLA.*
4. *U.S. Census Bureau Urban Area expansion encompasses new regulated areas for existing permittees. An example of this scenario is existing state highways that were outside an urban area at the time the TMDL was completed but are now inside a newly expanded urban area. A WLA-to- WLA transfer or an LA-to-WLA transfer is required.*
5. *A new MS4 or other stormwater-related point source is identified and is covered under an NPDES Permit. In this situation, a transfer must occur from the LA.*

Load transfers will be based on methods that are consistent with those used in setting the allocations in this TMDL (a land-area basis). In cases where the WLA is transferred from or to a regulated MS4, the permittees will be notified of the transfer and have an opportunity to comment.
[Excerpted from the TMDL document]

The EPA finds that the TMDL document submitted by MPCA satisfies the requirements of the fifth criterion.

Section 6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)). EPA's 1991 TMDL Guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

Section 6 Review Comments:

Whether the MOS is expressed explicitly and/or implicitly, a justification must be provided that explains why the MOS chosen is believed to be adequate to account for any uncertainties and errors in the data and calculation of the TMDL.

<u>A margin of safety is provided and justified. If an implicit MOS is used, conservative assumptions are identified, and their relative impacts discussed.</u>

Section 4.2.15 discusses the Margin of Safety (MOS) allocated for both Little Turtle Lake and Lake Irving, which are shown in the TMDL document in units of lbs/day in Tables 4-5 and 4-6 respectively. An explicit MOS of 10% is provided for both Little Turtle Lake and Lake Irving, and an additional implicit MOS is provided for Little Turtle Lake by using a modeling endpoint of 29 ug/l TP in place of the 30 ug/l in the WQS. The state believes the data set and modeling efforts are commensurate with the MOS chosen.

> *The watershed modeling period was from 1995 through 2009. Time-series data that were used in developing the model application included meteorological data, atmospheric deposition data, and point-source data. Precipitation, potential evapotranspiration, air temperature, wind speed, solar radiation, dew-point temperature, and cloud cover data are needed for HSPF to simulate hydrology. The*

HSPF-derived data was used for the TMDL period of 2000 through 2009 was used within BATHTUB, The simulation period included a range of dry and wet years. This range of precipitation improves the model calibration and validation, and provides a model application that can simulate hydrology and water quality during a broad range of climatic conditions. The HSPF model calibration and validation results further illustrate the calibration and fit of the data and modeling found in Ackerman, D., 2015. In-lake TP concentrations vary over the course of the growing season (June through September), generally peaking in mid to late summer. The MPCA eutrophication water quality guideline for assessing TP is defined as the June through September mean concentration. The BATHTUB model was used to calculate the load capacities of each lake, incorporating mean growing season TP values. TP loadings were calculated to meet the water quality standards during the summer growing season, the most critical period of the year. Calibration to this critical period will also provide adequate protection during times of the year with reduced loading. The use of an explicit 10% MOS accounted for environmental variability in pollutant loading, variability in water quality data (i.e., collected water quality monitoring data), calibration and validation processes of modeling efforts, uncertainty in modeling outputs, and conservative assumptions made during the modeling efforts. In addition a small implicit MOS was also incorporated into the Little Turtle Lake calculations by using an endpoint of 29 µg/L for TMDL modeling purposes.
[Excerpted from the TMDL document]

The EPA finds that the TMDL document submitted by MPCA contains an appropriate MOS satisfying the requirements of the sixth criterion.

Section 7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variations. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)).

Section 7 Review Comments:

Seasonal variation in loads and/or effects are described and accounted for.

P loads, and waterbody responses to those loads in terms of algal growth, as measured by Chl-a concentrations and Secchi disk depth, vary seasonally. Increased P loads contained in spring runoff events followed by warmer summer temperatures lead to favorable conditioning for algal growth. MN accounts for this seasonality in the effects of P on eutrophication by establishing water quality standards designed to be protective during the summer season. Section 4.3 of the TMDL document addresses seasonal variation.

> *However, warmer summer temperatures can result in periodic higher algal growth rates and higher Chl-a concentrations. Warmer summer lake temperatures can also increase the potential for lake internal P release or loading that can also contribute to increased algal Chl-a. This seasonal variation has been factored into the development of Minnesota's lake standards, based on swimmable and fishable beneficial uses, for the summer critical recreation* [season] *(June through September) [Heiskary and Wilson 2005]. This TMDL's targeted allocations are based on Minnesota's lake standards and summer critical conditions.*
> *[Excerpted from the TMDL document]*

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the seventh criterion.

Section 8. Reasonable Assurances

When a TMDL is developed for waters impaired by point sources only, the issuance of a National Pollutant Discharge Elimination System (NPDES) permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL. When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations.

Section 8 Review Comments:

<u>Reasonable Assurance that NPS Load Reductions will occur is provided in the document (applicable for waterbodies with both PS and NPS load allocations) or RA is not a required element due to a lack of permitted waste load allocations.</u>

Clean Water Legacy Act:
The CWLA was passed in Minnesota in 2006 for the purposes of protecting, restoring, and preserving Minnesota water. The CWLA provides the protocols and practices to be followed to protect, enhance, and restore water quality in Minnesota.

The CWLA outlines how MPCA, public agencies and private entities should coordinate in their efforts toward improving land use management practices and water management. The CWLA anticipates that all agencies (i.e., MPCA, public agencies, local authorities and private entities, etc.) will cooperate regarding planning and restoration efforts. Cooperative efforts would likely include informal and formal agreements to jointly use technical, educational, and financial resources.

The CWLA also provides details on public and stakeholder participation, and how the funding will be used. In part to attain these goals, the CWLA requires MPCA to develop Watershed Restoration and Protection Strategies (WRAPS). The WRAPS are required to contain such elements as the identification of impaired waters, watershed modeling outputs, point and nonpoint sources, load reductions, etc. (Chapter 114D.26; CWLA). The WRAPS also contain an implementation table of strategies and actions that are capable of achieving the needed load reductions, for both point and nonpoint sources (Chapter 114D.26, Subd. 1(8); CWLA). Implementation plans developed for the TMDLs are included in the table, and are considered "priority areas" under the WRAPS process (Watershed Restoration and Protection Strategy Report Template, MPCA). This table includes not only needed actions but a timeline for achieving water quality targets, the reductions needed from both point and nonpoint sources, the governmental units responsible, and interim milestones for achieving the actions. MPCA has developed guidance on what is required in the WRAPS (Watershed Restoration and Protection Strategy Report Template, MPCA).

<u>The parties responsible for implementation are identified:</u>

Section 8 of the TMDL document discusses how implementation efforts will be coordinated by the Hubbard Soil and Water Conservation District.

> *Implementing the TMDLs that are addressed in this document will be a collaborative effort between individuals, and state and local government. The overall effort will be led by the Hubbard Soil and Water Conservation District (SWCD) who can provide technical support, funding coordination, and local leadership. The SWCD can leverage existing relationships and regulatory frameworks to generate support for the TMDL implementation. These existing governmental programs and services will provide efficiency and related cost savings to the maximum extent possible. [Excerpted from the TMDL document]*

Section 6 of the TMDL document discusses how various water quality restoration efforts are expected to be initiated by the "Mississippi Headwater Basin local and county entities", who have been active participants in the TMDL planning and development process. This active involvement by stakeholders throughout the restoration process often leads to a greater sense of ownership in the outcome of the project and greater commitment and involvement in implementing solutions.

<u>Potential measures to achieve load reductions are identified?</u>

A discussion of regulatory and non-regulatory practices that could potentially be used to achieve the necessary load reductions needed are discussed in Section 8 "Implementation Strategy Summary" of the TMDL document. Tables 4-2 and 4-3 of the TMDL document provide a summary of the reductions needed broken down by source categories. Significant reductions in P load are called for from the Mississippi and Turtle rivers which will require BMP implementation efforts within the upstream watersheds. Also critical to providing reasonable assurance that WQS will be achieved is the successful reduction and maintenance of excessive internal loads from lake bottom sediments. It should be noted that the internal loads shown in Tables 4-2 and 4-3 represent excess internal loads above those that would normally be seen in lake systems, and it is not the intent of the TMDL to eliminate all P loads emanating from lake bottom sediments. It is anticipated that reduction of excessive internal sediment P loads is likely to require active control measures. Section 8.2.2 of the TMDL document provides a discussion of the potential measures that may be used to reduce and maintain lowered internal P loads.

Table 4-2. Little Turtle Lake BATHTUB Model Summary.

Name	Little Turtle Lake Existing				Little Turtle Lake Reduced			
	lb/yr	%Total	Conc (µg/L)	Export (lb/acre/yr)	lb/yr	%Total *	Conc (µg/L) *	Export (lb/acre/yr)
Turtle River	967.6	62.8	41.4	0.04	860.4	82.5	41.4	0.04
Lakeshed	93.4	6.1	70.6	0.09	58.2	5.7	50.0	0.06
SSTS	27.5	1.8	10,000	11.12	0			
Precipitation	112.1	7.3	39.1	0.24	112.1	9.6	39.1	0.24
Internal Load	341.2	22.1			0			
Tributary Inflow	1,088.5	70.6	44.1	0.04	918.6	90.4	41.9	0.04
Total Input	1,541.8	100.0	55.9	0.06	1030.7	100.0	41.6	0.04
Total Outlet**	914.5	59.3			645.1	62.3		
Retention	627.2	40.7				37.7		

*Values modeled to meet standards

** Includes advective correction to balance water budget

Excerpted from the TMDL document

Table 4-3. Lake Irving BATHTUB Model Summary

Name	Lake Irving Existing				Lake Irving Reduced			
	lb/yr	%Total	Conc (µg/L)	Export (lb/acre/yr)	lb/yr	%Total *	Conc (µg/L) *	Export (lb/acre/yr)
Miss. River	15,718.6	64.5	43.6	0.05	9,880.0	90.9	29.0	0.03
Bemidji MS4 to Mississippi	185.3	0.8	76.4	0.15	114.6	1.1	50.0	0.10
Lakeshed MS4	551.0	2.3	73.5	0.14	354.2	3.3	50.0	0.09
Lakeshed NonMS4	686.2	2.8	81.9	0.16	391.9	3.6	50.0	0.10
SSTS	63.9	0.3	10,000	25.87	0	0	10,000.0	0.09
Precipitation	159.3	0.7	39.1	0.24	159.3	1.5	39.1	0.24
Internal Load	7,004.4	28.7			0	0		
Tributary Inflow	17,205.1	70.6	45.4	0.05	10,740.7	98.8	30.1	0.03
Total Input	24,368.8	100.0	63.6	0.07	10,870.3	3.0	30.2	0.03
Total Outlet**	24,619.8	101.0	65	0.07	10,849.5	100	30	0.03
Retention	-251.0	−1.00			103.5	0.9		

*Values modeled to meet standards

** Includes advective correction to balance water budget

Excerpted from the TMDL document

<u>Potential resources needed for implementation are identified:</u>

A number of potential funding resources are cited in the TMDL document.

Funding resources may be obtained from the following state and/or federal programs:

- *Minnesota Clean Water, Land, and Legacy Funds*
- *EPA funding, such as Section 319 grants*
- *Natural Resources Conservation Services (NRCS) cost-share funds*
- *Local governmental funds and utility fees.*

[Excerpted from the TMDL document]

The potential costs of implementation are discussed in Section 8.3 of the TMDL document.

The cost estimate for this TMDL includes buffer implementation along NHD flowlines in impaired drainage areas (50 foot buffers on both sides of approximately 544 stream miles at approximately $200 per acre after cost share [Shaw 2016]), alum treatment on Irving Lake acres (approximately 660 acres at $1,000 per acre [Kretsch 2016]), septic updates around Little Turtle Lake (20% replacement of approximately 54 septic systems at $10,000 a system), and MIDS on high- and medium-intensity developed lands that drain to impairments (approximately 1,572 acres at $5,000 per acre) [Minnesota BWSR 2016]. The initial estimate for implementing the Mississippi River Headwaters WRAPS is approximately $2,088,000 for nonpoint source implementation such as stream buffers, alum in lakes, and SSTS updates and approximately $7,862,000 for implementing MIDS in medium- and high-intensity developed areas. Urban BMP costs that were estimated in this overview are primarily based on construction and maintenance costs. Land areas that are required for constructed BMPs generally require 2% to 5% of the watershed drainage area and land costs are not generally included because they can vary. This estimate is, by nature, a very general approximation with considerable uncertainties associated with complexity of designs, local regulatory requirements, unknown site constraints and choice of BMPs with widely variable costs per water quality volume treated. This estimate is a large-scale estimate and many other implementation strategies will likely be used in addition to or to replace general practices used in this estimate. [Excerpted from the TMDL document]

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the eighth criterion.

Section 9. Monitoring Plan to Track TMDL Effectiveness

EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur. Such a TMDL should provide assurances that nonpoint source controls will achieve expected load reductions and, such TMDL should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

Section 9 Review Comments

An effectiveness monitoring plan is provided. (Recommended for all waterbodies, required for waterbodies with both PS and NPS load allocations to ensure load reductions occur.)

Section 10 of the TMDL document discusses "Tracking Total Maximum Daily Load Effectiveness".

> *Tracking progress toward achieving the TMDL load reductions will primarily rely on monitoring each impaired watershed for (1) BMP implementation and (2) tracking attainment to lake and stream water quality standards. Each of the Mississippi River – Headwaters SWCDs (Headwaters) will track and report implementation projects annually within their jurisdictions. Therefore, existing tools, such as the pollutant reduction calculators and input into BWSR's web-based eLINK tracking system [BWSR 2016] and other methods of tracking will be used to report progress.*
> *[Excerpted from the TMDL document]*

Details are provided addressing which parties are anticipated to conduct additional water quality monitoring. Recommendations are provided regarding which parameters are to be monitored and the frequency of monitoring.

> *River and lake monitoring will be conducted by a combination of volunteer monitors and county/SWCD technicians as resources and priorities allow. The monitoring level of effort will vary among the Headwaters entities because staffing and budgets vary. Annual reporting by the Headwaters partners will provide benchmarks for measuring progress of the implemented TMDLs and for adaptive management. Details of the lake*

and stream monitoring will be specified by the Headwaters WRAPS process. Headwater TMDL lakes' water quality should continue to be monitored; monitoring should be coordinated by the various WRAPS partners who work throughout the watershed. The monitoring goals may include the following:

- *Growing-season monitoring should be continued for Lake Irving and Little Turtle Lake for TP, Chl-a and Secchi transparency at one lake site. Secchi volunteer monitoring should target 10 to12 growing-season transparency measurements per year. Monitoring of upgradient river inlets for both lakes is encouraged.*
- *Lake Irving monitoring, particularly during peak growing-season low-flow periods (e.g., less than225 cfs at Stump Lake Dam) should include TP, total dissolved P, and three to four paired bottom water samples for TP and total iron.*
- *Initiate growing season paired monitoring of the north and south basin of Lake Bemidji for TP, Chl-a and Secchi. Secchi volunteer monitoring should target 10 to 12 growing-season transparency measurements per year. Lake monitoring sites should include three to four paired bottom water samples for TP and total iron.*
- *Growing-season interflows between Lakes Irving and Bemidji should be investigated during low-flow periods to determine the degree and magnitude of potential backwatering of flows from Lake Bemidji into Lake Irving. These low-flow evaluations should also consider the potential for Bemidji WWTP flows to be carried into Lake Irving, and include influence factors such as density and temperature. If low-flow backwatering is observed, then potential remediation measures to limit Bemidji WWTP effluent discharges is encouraged.*
- *The degree of upgradient wetland complex TP and total dissolved P contributions that result from dry and wet cycles should be further evaluated.*

[Excerpted from the TMDL document]

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the ninth criterion.

Section 10. Implementation

EPA policy encourages Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired by nonpoint sources. Regions may assist States/Tribes in developing implementation plans that include reasonable assurances that nonpoint source LAs established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. In addition, EPA policy recognizes that other relevant watershed management processes may be used in the TMDL process. EPA is not required to and does not approve TMDL implementation plans.

Section 10 Review Comments

Section 8 of the TMDL document discusses a strategy for the implementation of measures to achieve the needed P load reductions.

MS4s

Phase II MS4 NPDES-permitted stormwater communities are required by permit (the General Permit Authorization to Discharge Stormwater Associated With Small MS4s Under the NPDES/SDS Permit [MNR040000]) to develop and implement an SWPPP. This permit requires MS4s to develop regulatory mechanisms, including enforcing construction sites under the MPCA's General Permit to Discharge Stormwater Associated with Construction Activity (MN R100001) and post construction stormwater management. MS4s are also required to inventory and map the storm sewer system and implement a minimum of six control measures (public education and outreach, public participation and involvement, illicit discharge detection and elimination, construction site runoff controls, post construction.
[Excerpted from the TMDL document]

Construction and Industrial Stormwater P Load Reductions

The BMPs and other stormwater control measures that should be implemented at construction sites are defined in the state's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001). If a construction site owner/operator obtains coverage under the NPDES/SDS General Stormwater Permit and properly selects, installs, and maintains all BMPs that are required under the permit (including those related to impaired waters discharges and any applicable additional requirements found in Appendix A of the Construction General Permit) the stormwater discharges would be expected to be consistent with the WLA in this TMDL. Note that all local construction stormwater requirements must also be met.
[Excerpted from the TMDL document]

The BMPs and other stormwater control measures that should be implemented at the industrial sites are defined in the state's NPDES/SDS Industrial Stormwater Multi- Sector General Permit (MNR050000) or NPDES/SDS General Permit for Construction Sand and

> *Gravel, Rock Quarrying and Hot Mix Asphalt Production Facilities (MNG490000). If a facility owner/operator obtains stormwater coverage under the appropriate NPDES/SDS Permit and properly selects, installs, and maintains all BMPs required under the permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL.*
> *[Excerpted from the TMDL document]*

<u>Nonpoint source loads (including lakeshore and internal lake loads)</u>

The TMDL document does not include a specific discussion on a strategy that may be employed to achieve the P load reductions needed from the Little Turtle River and the Mississippi River to Little Turtle Lake and Lake Irving respectively. However, measures that could potentially be employed to reduce loading from upstream sources, from the surrounding shorelines, and from internal loadings are discussed in a number of areas:

> *A 50-foot average buffer width with a 30-foot minimum width has been recently required along public waters (Minn. Stat. 103F.48, Riparian Protection and Water Quality Practices). Local conservation districts will be the point of contact for requirements and technical assistance for implementation of buffers along public waters and shore lands. In Fiscal Year 2016, the Clean Water Legacy Fund included $5 million to the Board of Soil and Water Resources (BWSR) for local government implementation.*
> [Excerpted from the TMDL document]

Section 8.2.2 of the TMDL document, discusses potential measures to reduce direct P inputs to the impaired lakes from the lakeshed and from internal sources.

> *BMPs that are expected to reduce nutrient loads to impaired reaches and lakes are summarized below with greater detail provided by The Agricultural BMP Handbook for Minnesota [Miller et al. 2012] and the Minnesota Stormwater Manual [MPCA 2016], which includes MIDS information. Cost, targets, and other BMP information are further discussed in the Mississippi River Headwaters WRAPS Report.*
>
> - *Encouraging and tracking the adoption of lakeshore buffers and SSTS compliance rates are efforts that lake associations can provide local leadership for information campaigns, acquiring local/state funding to aid homeowners, and tracking lakeshore buffers and septic compliance rates with support provided by the headwaters counties. For example, the Courte Oreilles Lakes Association near Hayward, Wisconsin, acquired*

grants and the services of a design-build landscaping contractor to cost-effectively work with several landowners at a time to develop attractive and individualized lakeshore vegetated buffers [Courte Oreilles Lakes Association2015]. A corresponding lake TMDL was completed that showed lakeshore areas would reduce P loads by approximately 200 lb/year by enhancing or establishing shoreline buffers where none exist. A shoreline assessment is available for use that was employed on a parcel-by-parcel basis for evaluation purposes.

- *Riparian vegetation helps to filter pollutants and stabilize banks.*

- *Encouraging and tracking implementation of urban BMPs, as detailed by the Minnesota Stormwater Manual and MIDS, will cover the spectrum of source, rate, and volume controls that will substantially reduce developed land's pollutant loadings of biochemical oxygen demand(BOD) and related sediment losses, nutrients, and bacteria. Proper site designs, construction, and maintenance are key components for effective performance of urban BMPs. Encouraging and tracking implementation of agricultural BMPs, as detailed by The Agricultural BMP Manual for Minnesota, will substantially reduce agricultural lands' pollutant loadings of BOD and related sediment losses, nutrients, and bacteria. Proper site designs, construction, and maintenance are key components for effective performance of agricultural best practices.*

- *Internal loading can comprise an important portion of the P budget of impaired lakes and legacy source-impacted wetlands. Internal P loading is typically the result of excessive historical watershed loading and a recommended first step is to reduce watershed P loading as much as possible. This effort includes reducing runoff from shore lands, developed land, noncompliant SSTSs, and other upland sources (potentially including wetlands). Wetland discharge pulsing is possible from the succession of dry and wet periods, and resulting shifting water levels that can induce P release from legacy sources. During dry periods, water levels recede and provide greater oxygen concentrations for aerobic digestion of organic substrates, including mobilization of various dissolved and particulate P forms [Dunne et al. 2010]. Upon refilling during wet periods, growing-season oxygen concentrations can quickly be depleted, which results in releasing digested TP concentrations that depend on other factors, such as sediment iron, aluminum, and calcium. The extent of this occurrence from watershed wetland complexes is generally not known but can be initially characterized by relatively simple P monitoring, such as sequential diagnostic grab sampling of upgradient and downgradient waters after summer storm events.*

- *Whole lake treatment by alum can be very effective in reducing lake internal loading* *of P for10 to 30 years. Following alum treatment, a white alum band is deposited along the top of the lake's sediments and serves to trap released P. However, effectiveness in shallow lakes may be reduced because of wind mixing and disruption of the sediment's alum layer [Cooke et al. 1986]. After reducing watershed P-loading sources, the appropriateness of a whole lake alum treatment can be assessed by a detailed feasibility study. Mobilization and treatment costs could amount to approximately $1,000 per acre depending on dosage requirement sand alum costs.*

- *Hypolimnetic treatments include ferric chloride, aeration, and oxygenation. A recommended total iron to TP concentration ratio of 3:1 for lake bottom water has been used to control lake sediment-released P. If the total iron to TP ratio is less than 3:1, then iron may not effectively reduce sediment-liberated P concentrations. In the latter case, iron augmentation of lake sediments may be required by using ferric chloride or similar iron compounds. The details, including oxygen supply rates, would have to be determined by an engineering design study. Chemical treatment of lakes will require a permit from the MPCA.*

- *High oxygen depletion rates can be expected to accompany elevated lake productivity (e.g., algal concentrations). Replenishing oxygen supplies by oxygenating bottom waters may be a viable option in some cases, and would require installing a series of pipes and diffusers on the lake bottom along with a required pump house and oxygenation system on land. The details, including oxygen supply rates, would have to be determined by an engineering design study. Lake aeration (without oxygenation) will require careful examination if intended for something other than reduced winter fish kill potential. Whole lake aeration during the growing season can result in increased TP concentrations that feed increased algal growth and potentially degrade lake quality.*

- *Public education about the benefits of the above practices should continue with partnering counties providing core materials for reinforcing messages aimed at targeted audiences.*

[Excerpted from the TMDL document]

<u>Atmospheric Deposition</u>

Because reduction of atmospheric deposition of P to the lakes addressed is considered impractical, no reduction in atmospheric deposition of P is called for by this TMDL.

<u>Cost Considerations</u>

Section 8.3 of the TMDL document discusses the overall cost of implementation of the measures needed to achieve the P load reductions called for by the TMDL.

> *The cost estimate for this TMDL includes buffer implementation along NHD flowlines in impaired drainage areas (50 foot buffers on both sides of approximately 544 stream miles at approximately $200 per acre after cost share [Shaw 2016]), alum treatment on Irving Lake acres (approximately 660 acres at $1,000 per acre [Kretsch 2016]), septic updates around Little Turtle Lake (20% replacement of approximately 54 septic systems at $10,000 a system), and MIDS on high- and medium-intensity developed lands that drain to impairments (approximately 1,572 acres at $5,000 per acre) [Minnesota BWSR 2016]. The initial estimate for implementing the Mississippi Headwaters WRAPS is approximately $2,088,000 for nonpoint source implementation such as stream buffers, alum in lakes, and SSTS updates and approximately $7,862,000 for implementing MIDS in medium- and high-intensity developed areas.*
> *[Excerpted from the TMDL document]*

EPA believes the implementation plan serves to provide additional reasonable assurance that load allocations will be achieved. EPA does not approve implementation plans.

Section 11. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. The TMDL regulations require that each State/Tribe must subject calculations to establish TMDLs to public review consistent with its own continuing planning process (40 C.F.R. §130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's/Tribe's public participation process, including a summary of significant comments and the State's/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. §130.7(d)(2)).

Provision of inadequate public participation may be a basis for disapproving a TMDL. If EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

Section 11. Review Comments

Section 9 of the TMDL document discusses the stakeholder involvement in the TMDL development process.

Development of this TMDL report included meetings with WRAPS project members about the watershed assessment and TMDL process findings, and a 30-day public notice period for public review and comment of the draft TMDL document occurred from June 4, 2018 to July 5, 2018. All input, comments, responses, and suggestions from public meetings and the public notice period were addressed or were taken into consideration in developing and modifying the TMDL. The draft TMDL report was made available at https://www.pca.state.mn.us/sites/default/files/wq-iw8-57b.pdf. Regular updates regarding the TMDL process with the WRAPS team included meetings to discuss TMDL processes and results.
[Excerpted from the TMDL document]

WRAPS team meetings were held throughout the WRAPS/TMDL project to keep stakeholders informed on the development of the draft WRAPS/TMDL. See Table 18 of the Mississippi River Headwaters WRAPS for a specific listing of meetings held for the WRAPS/TMDL project.

- *A Bemidji MS4 meeting was held on June 12th, 2017, to present the draft TMDL to the city of Bemidji. The meeting was held to formally review the draft TMDL allocations, their development, and to receive comments and suggestions. The city of Bemidji has been an active participant and supporter of the WRAPS effort.*
- *Public and stakeholder meetings were held at key points throughout the WRAPS/TMDL project. The final Public meetings for the project were held on January 12th, 2017 (Bemidji), January 26th,2017 (Cohasset), and June 20th 2017 (Bemidji), to present the draft TMDL report and allocations before public notice and receive public comments and concerns. Subsequent WRAPS/TMDL presentations were given on July 20th, 2017, at the Beltrami SWCD's monthly Board meeting and at the Minnesota Association of Planning and Zoning Administrators annual conference on October 13th, 2017 (Bemidji).*

[Excerpted from the TMDL document]

The stakeholder process for the TMDLs has been part of the Mississippi Headwaters WRAPS process. Its technical advisory committee was formed from representatives of the following stakeholder groups:

- *Beltrami SWCD (Bill Best, Brent Rudd)*

- *Bemidji State University (Steve Balmes, Pat Welle [BSU Emeritus])*
- *Cass County SWCD (John Ringle)*
- *City of Bemidji (Craig Gray, Nate Mathews, Shon Snopl)*
- *Clearwater SWCD (Nathan Nordlund, Nick Phillips)*
- *Greater Bemidji Area Joint Planning Board (Josh Stearns)*
- *Headwaters Science Center*
- *Hubbard SWCD (Jamin Carlson and Julie Kingsley)*
- *Itasca S SWCD (Kim Yankowiak)*
- *Leech Lake Band of Objibwe (Sam Malloy)*
- *Minnesota BWSR (Jeff Hrubes, Chad Severts)*
- *Minnesota Department of Health (Chris Parthun)*
- *DNR (Andy Thompson, Dan Thul, Dick Rossman, Jaime Thibodeaux, Jennifer Corcoran, Micheal Harris, Rian Reed, Rita Albrecht, Tony Standera)*
- *Mississippi Headwaters Board (Tim Terrill)*
- *USFS–Chippewa National Forest (David Morely)*
- *Turtle River Watershed Association (Carl Isaacson).*

[Excerpted from the TMDL Document]

During the public comment period, one comment letter was received from the coordinator of the Upper Mississippi River Source Water Protection Project (UMRSWPP). The letter did not address any specific concerns with the TMDL analysis or document but rather expressed support and a desire to work cooperatively with the state in protecting the water resources of the Mississippi River. The MPCA responded by thanking the commenter for their review of the document and expression of support.

EPA finds that adequate public participation was provided for as part of the TMDL development process, meeting the requirements of the 11th criterion.

Section 12.Submittal Letter

A submittal letter should be included with the TMDL submittal, and should specify whether the TMDL is being submitted for a *technical review* or *final review and approval*. Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and

EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final review and approval, should contain such identifying information as the name and location of the waterbody, and the pollutant(s) of concern.

Section 12 Review Comments:

A letter is included along with the TMDL report submission requesting final approval of the Mississippi River Headwaters TMDL report.

MINNESOTA POLLUTION CONTROL AGENCY

520 Lafayette Road North | St. Paul, Minnesota 55155-4194 | 651-296-6300
800-657-3864 | Use your preferred relay service | info.pca@state.mn.us | Equal Opportunity Employer

August 27, 2018

Linda Holst
Water Division Acting Director
U.S. Environmental Protection Agency
Region 5, W-15J
77 West Jackson Boulevard
Chicago, IL 60604-3507

RE: Mississippi River - Headwaters Total Maximum Daily Load Report - Request for Final Approval

Dear Ms. Holst:

I am pleased to submit the Total Maximum Daily Load (TMDL) study for the impairment of nutrient/eutrophication biological indicators in two lakes (Lake Irving and Little Turtle Lake) for the Mississippi River - Headwaters Watershed to the U.S. Environmental Protection Agency (EPA) for final review and approval.

This TMDL study was open for public comment from June 4, 2018 to July 5, 2018. We are also including supporting documentation and information with this submittal, under Section 303(d) of the Clean Water Act.

Approval of this TMDL study is an important step towards the reduction in the current level of nutrient/eutrophication biological indicator pollutants in the Headwaters of the Upper Mississippi River Basin. We look forward to receiving the EPA's decision document for final approval of this TMDL study.

Thank you for your consideration.

Sincerely,

Glenn Skuta
This document has been electronically signed.
Glenn Skuta, Division Director
Watershed Division

SK/PV:jdf

Enclosure

The EPA finds that the accompanying submittal letter satisfies the requirements of the twelfth criterion.

Section 13. Conclusion

After a full and complete review, the EPA finds that the TMDLs for the Mississippi Headwaters Total Maximum Daily Loads for Little Turtle Lake and Lake Irving satisfy all the elements of approvable TMDLs. This approval is for 2 TMDLs, addressing aquatic recreation use impairments due to excess P loading.

The EPA's approval of these TMDLs extends to the water bodies which are identified in Review Table 1 of this decision document with the exception of any portions of the water bodies that are within Indian Country, as defined in 18 U.S.C. Section 1151. The EPA is taking no action to approve or disapprove TMDLs for those waters at this time. The EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.