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

MAY 04 2011

REPLY TO THE ATTENTION OF:
WW-16J

RECEIVED
MAY 12 2011
BY:

Rebecca Flood, Assistant Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Ms. Flood:

The U.S. Environmental Protection Agency has conducted a complete review of the final Total Maximum Daily Load (TMDL) for Jessie Lake (#31-0786), including supporting documentation and follow up information. Jessie Lake (#31-0786) is located in northeastern Minnesota, in Itasca County. The TMDL addresses the Aquatic Recreation Use impairment due to excess nutrients (total phosphorus).

The TMDL meets 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 one TMDL for total phosphorus for Jessie Lake (#31-0786). 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 this TMDL and look forward to future TMDL 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,

Tinka G. Hyde
Director, Water Division

Enclosure

Cc: Nolan Baratono, MPCA
Dave Johnson, MPCA

wq-iw10-03g

TMDL: Jessie Lake, Itasca County, MN
Date: 05/04/2011

DECISION DOCUMENT FOR JESSIE LAKE NUTRIENT TMDL

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.

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.

Comment:

Location Description/Spatial Extent: Jessie Lake (MN DNR# 31-0786) is located in Itasca County in northeast Minnesota. Minnesota Department of Natural Resources (DNR) identification numbers are used by MPCA in place of an assessment unit ID for this lake. The lake is within the 8-digit HUC Big Fork River watershed. Flow from the Big Fork River watershed discharges into the Rainy River Basin which then flows into Lake of the Woods and eventually to Hudson Bay.

The surface area of the lake is 1,723 acres, and 26% of that surface area comprises the littoral zone. It is a relatively shallow lake, with a maximum depth of 40 feet and an average depth of 22.9 feet. The lake receives drainage from four upland subwatersheds and the direct watershed surrounding the lake shoreline. The four upland subwatersheds listed clockwise from the west include: the Northwest Inlet (4,033 acres), Spring Creek (7,913 acres) bordering the north lakeshore, northeast inlet (731 acres), and Poole's Creek watershed (3,772 acres), which is adjacent to the northeast inlet subwatershed. Flow from Poole's creek enters Jessie Lake at the southern end of the lake, near the lake's outflow, Jessie Brook (Section 3.1 of the TMDL).

Average precipitation recorded in the area over the last 20 years ranges from 21.7 to 34.2 inches per year. Average temperatures and growing season length measured by the United States Forest Service (USFS) indicated that both have increased over the 93 year period they were recorded. Groundwater contributions to Jessie Lake are likely an important contributing component to the lake's water budget. Geologic formation data indicate that the local water table is higher than the surface of Jessie Lake. Soils in Jessie Lake watershed are sandy loams and loamy sands. These soil types have higher infiltration and percolation rates that can also promote groundwater flow to the lake (Section 3.2 and 3.3 of the TMDL).

Land Use: Land use was determined for the Jessie Lake watershed through use of 2007 National Agricultural Statistical Survey (NASS) data. The NASS data were combined with a 2001 National Land Cover dataset (NLCD) after local watershed knowledge indicated NASS data underestimated pasture/hayfield land use classification. A set of aerial photos from the year 2000 was also used to confirm the land use classifications.

The dominant land use/land cover in the 20,738.4 acre Jessie Lake watershed is forested land, with 66.9% and 10.6 % of the watershed acreage classified as deciduous and evergreen forest, respectively. Open water comprises 11.4% of the area, and wetlands an additional 5.6%. Percent coverage of human influenced land use categories include 3.6% for grass/pasture and

non agricultural fields, and 1.7% for low and medium density developments, and open spaces (Section 3.2 of the TMDL).

Problem Identification: Jessie Lake water quality exceeds the water quality standards for total phosphorus, chlorophyll-a, and Secchi depth. In-lake water quality monitoring was conducted by State, County, and local entities in 1986, 1992, and 1998-2007. Average annual total phosphorus, from samples taken at least monthly from May to September, exceeded the 30 µg/l standard in 6 of the 12 monitored years. Similarly, chlorophyll-a concentrations exceeded the 9 µg/l standard in 8 of the 12 years it was monitored. Secchi disk readings, taken in 1985 and at weekly intervals from 2001-2007, exceeded the 2.0 m standard all years except 1998.

Excess nutrients (total phosphorus) have led to algal blooms, including a severe event that was followed by fish kills in 1998. Due to excess nutrients, Jessie Lake is impaired and does not attain its designated use for aquatic recreation in Class 2B waters in Minnesota. As a result of the impairment, Jessie Lake was placed on Minnesota's 2004 303(d) list (Section 5.0 of the TMDL).

Priority Ranking: The priority ranking of Minnesota waterbodies is implicit in their schedule to complete TMDLs. Once Jessie Lake was listed in 2004 on the 303(d) list, the TMDL was prioritized to begin in 2005 and be completed by 2008 ('TMDL Summary Table' in the TMDL).

Pollutant of Concern: The pollutant of concern is the pollutant that contributes to the impairment of the designated use. At Jessie Lake, excess total phosphorus increases algal growth which consequently increases chlorophyll-a, a component of algal cells. Increased algal cells in the water column cause a decrease in clarity, and subsequent decline in Secchi disk measurements. Given the relationships between these variables, a total phosphorus target of 29 µg/L was selected in order to attain all three components of the eutrophication water quality standards and lead to attainment of designated uses (Section 2.0 of the TMDL).

Source Identification (point and nonpoint sources): There are no known point sources contributing the pollutant of concern to Jessie Lake. No Municipal Separate Storm Sewer Systems (MS4s), or wastewater treatment plant (WWTP), or individually permitted industrial discharges are located in the Jessie Lake watershed. Also, there are no known general NPDES permits in the Jessie Lake watershed. Non-point sources include phosphorus in tributary and direct watershed inflows, internal loading from lake-bottom sediments, septic systems in the direct lake and four subwatersheds, ambient groundwater inflows, and atmospheric deposition (Section 6.0 of the TMDL). A more detailed summary of the loading estimated to occur from these sources will be described in Section 3 of this document.

Future Growth: Jessie Lake is in a rural part of Itasca County where future growth is expected to be minimal. There were no WWTP expansions or discharges anticipated in the watershed area at the time of developing the TMDL, and MPCA states that WWTP expansions are unlikely in the future. While growth and development are not anticipated to be significant, MPCA anticipates development on or near lakeshore properties will have greater impacts to phosphorus loading, relative to other watershed locations, due to the proximity of lakeshore properties to the lake itself. In order to control this anticipated source of phosphorus, MPCA has set aside a wasteload

allocation for future construction permits to limit their total phosphorus load to 0.04 lbs/day (Section 7.5 of the TMDL).

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

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,

Comment:

Designated Uses: Jessie Lake is a Class 2B water with a designated use of aquatic recreation that is currently impaired by excess nutrients (total phosphorus) (Section 2.2.1 of the TMDL).

Standards: Minnesota Rules 7050.0150(3) set forth narrative criteria for Class 2B waters of the State. Numeric criteria were developed for total phosphorus, chlorophyll-a, and Secchi depth. These three parameters make up eutrophication standards that indicate attainment of the narrative criteria and designated uses (MN Rules 7050.0222). The numeric eutrophication standards that apply to Jessie Lake are those set forth for Class 2B lakes in the Northern Lakes and Forests Ecoregion: total phosphorus cannot exceed 30 µg/L, chlorophyll-a cannot exceed 9 µg/L, and Secchi depth cannot be less than 2.0 meters (Section 2.2.1 of the TMDL).

Target: The TMDL target was set at 29 µg/L for total phosphorus. Selection of the target is supported by bi-variate statistical relationships between all three variables: total phosphorus and chlorophyll-a and Secchi depth, and total phosphorus and Secchi depth. These relationships were developed using data from lakes throughout Minnesota and they are illustrated in figure 2.1 of the TMDL document. Given these relationships, if total phosphorus targets are met, then corresponding improvement is expected to occur in chlorophyll-a and Secchi depth. The target was selected below the 30 µg/L to be conservative and to help fulfill the margin of safety requirement. Annual mean total phosphorus values in Jessie Lake from 1998 to 2007 have

ranged from 19 to 49 µg/L. While the selected target (29 µg/L) is within this historical range, reduction of phosphorus loads will be necessary to achieve this target (Section 2.2.2 of the TMDL).

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

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 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.

Comment: In equation form, the TMDL for Jessie Lake may be expressed as follows:

TMDL = WLA + LA + MOS

11.37 lbs/day = 0.04 lbs/day + 11.33 lbs/day + Implicit

WLA = Waste Load Allocation, which functions as reserve capacity in this TMDL (i.e., future loadings from point sources);
LA = Load Allocation (i.e., loadings from nonpoint sources including natural background); and
MOS = Margin of Safety.

The loading capacity, or total maximum daily load, for Jessie Lake was determined as **11.37 lbs of total phosphorus per day**. This is the estimated amount of total phosphorus load the lake can receive and still meet eutrophication water quality standards. It is the sum of WLA, LA, and MOS.

The TMDL was determined in a multi-step process. First, current loads to the lake were determined using modeled, measured, and back calculated estimates of phosphorus loads from all sources identified (Section 1 of this Decision Document, and Section 6 of the TMDL). Second, the numerical loading capacity was determined by iteratively running the Canfield-Bachman model using differing phosphorus loads until the model results indicated that the total phosphorus target of 29 µg/l would be met, and therefore water quality standards would be attained. Last, the resulting amount of phosphorus reductions required to meet standards was determined as the difference between current loading and loading capacity, and these phosphorus loads were allocated to the various sources (Sections 4 and 5 of this Decision Document, and Section 7.0 of the TMDL).

Modeling Summary: The Canfield-Bachman model was used to: a) estimate current loads to the lake using water balance and nutrient data from subsequent steps; b) determine the reduction in phosphorus load (load and wasteload allocations) necessary to meet water quality standards; and c) to validate results from an internal loading model (Section 6.0, and Appendix A and B attached to the TMDL document).

The Canfield-Bachman model is accepted by MPCA for in-lake water quality modeling in Minnesota lakes. Model estimates were compared with actual in-lake data results from 1998 to 2007 (with the exception of 2004 because no late summer samples were taken in this year). Model estimates were within one standard deviation of the observed data, meaning that model results fell within the natural range of the data for the nine years that data were compared. Also, to further support the appropriateness of the model results, sensitivity analysis was conducted by varying model inputs within published ranges and the results confirmed that load allocations did not change at a level that would require implementation recommendations to differ. For these reasons, the model results appear to enumerate load allocations that can reasonably be assumed to attain water quality standards.

Source Assessment Analyses: Watershed loads from phosphorus in tributary and direct watershed runoff were both modeled and measured. Continuous flow measurements were taken in two tributaries and the lake outflow (Spring and Poole's Creek, and Jessie Brook). Flows from the ungauged subwatersheds (direct lakeshed, NW, and NE inlets) were modeled with a watershed runoff model that used 2007 NASS land use data, slope, and soil type. The model estimates were calibrated to data from Poole's Creek watershed because of its similar physical characteristics (soil, slope, and land use). The resulting flow record was used in concert with in-stream water quality data collected for two years on each stream (Spring, Poole's, NE and NW Inlet, and Jessie Brook) between 1998 and 2001. The results were used to generate phosphorus loading from tributary watersheds to Jessie Lake (Table 3.4 in the TMDL). Given that tributary loadings were derived from measured and calibrated model data for all tributaries, the results provide sufficient estimates of tributary phosphorous loadings. **The mean load from these tributary and direct watersheds was calculated as 1,572 lbs/yr** (Section 6.2.4 and 6.2.5, and Appendix A and B of the TMDL).

Internal loading occurs when the lake bottom becomes anoxic, and phosphorus, which is normally bound to iron under oxic conditions, is released from bottom sediments due to a

average load was 984 lbs/yr, (Minimum = 48; Maximum 3,869 lbs/yr) (Section 6.2.5 and 6.3 of the TMDL). These values make use of currently available data on groundwater and its nutrient concentration, and provide the best possible estimate of phosphorus loads to the lake from groundwater inflows.

Critical Conditions: MPCA identified the summer growing season as the critical condition that can lead to excess nutrients and water quality standards being exceeded. MPCA notes that when fish kills and algal blooms occur, they are commonly during this time (June 1 through Sep 30), indicating that conditions in the summer growing season allow excess nutrients to result in impairment of designated uses. Therefore data collection and modeling (Canfield-Bachman, internal load model, and watershed runoff) incorporated data from this time period and considered loads during these conditions. Thus the resulting TMDL allocations reflect the phosphorus reductions necessary to meet water quality standards in the summer growing season (i.e. critical condition) (Section 7.1.2 of the TMDL).

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

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.

Comment:

Load Allocations (LA): Load allocations are shown in Table 1 below. Allocations are based on average annual loads observed from 1997-2008 and the reductions required from those loads needed to meet water quality standards. Allocations are converted from annual to daily loads by dividing by 365.25 (to account for leap year). Discharge by septic systems cannot be permitted by state law and therefore received a 0 lbs/day load allocation. Load allocations to atmospheric and groundwater inputs equal their current loads to the lake (310 and 984 lbs/yr for atmosphere and groundwater respectively), as natural loads cannot be reduced through control measures. The remaining portions were assigned to watershed sources and internal loading based on what reductions can be achieved through BMPs identified in the implementation plan. The allocations require approximately a 10.5% reduction from watershed sources (tributary and direct watershed runoff), and a 40% reduction from internal loading. The larger reduction from internal loading is based on the premise that: a) given the contributing area, watershed loads represent a small proportion of the total load relative to other sources; b) aggressive implementation of watershed BMPs will occur prior to internal loading treatment because reductions in watershed sources also indirectly prevent internal loading (i.e. lesser amounts introduced from the watershed results in lesser amounts settling to lake bottom sediments); and c) internal loading was the largest estimated contributor of phosphorus and attaining water quality standards will rely on control of this source (Section 7.0 of the TMDL).

chemical change to iron. Average annual phosphorus loads to the lake were determined from the following equation:

Internal loading TP (lbs/yr) = (Mean No. of Anoxic days)*(Anoxic areal extent)*(Release Rate)

The number of days and area of lake that became anoxic was measured from dissolved oxygen profiles collected for 11 years. Soil core experiments developed release rates under oxic and anoxic conditions for both a north and south lake location. The release rates ranged from 3.9 to 7.0 mg m^{-2} day^{-1}. A phosphorus release rate of 4.0 mg m^{-2} day^{-1} was applied to the total average lake area found to be anoxic. **The resulting mean phosphorus load from internal loading was 2,398 lbs/yr.** Given that phosphorus on lake bottom sediments first originates from the other sources described in the TMDL (i.e. it must arrive in the lake before it settles to lake bottom sediments), and that release of phosphorus under oxic conditions was insignificant, the chosen calculation was deemed an appropriate representation of phosphorus from internal loading (Section 6.2.6 and Appendix C of the TMDL).

Sewage treatment in the watershed entirely relies on subsurface sewage treatment systems (SSTS). Current loads were calculated by first determining the number of septic systems equivalent to a year round load based on year-round and seasonal residence numbers as well as resort population. The result was 49 system equivalents. With 4.2 lbs of TP/yr/system and a failure rate of 50% assumed, the total annual load to Jessie Lake was calculated as:
(49 system equivalents)*(4.2 lbs TP/yr/system)*(50% failure rate) = **103 lbs TP/yr to Jessie Lake from SSTS** (Section 6.2.2 of the TMDL).

Atmospheric inputs occur when phosphorus adsorbed to particles are deposited on the lake surface either from precipitation or dry fall-out. Atmospheric loads were estimated by adding both dry (0.11 lb/ac/yr) and wet deposition rates (varied based on annual precipitation) that were determined from regional estimates for the Rainy Lake Basin (which encompasses the Jessie Lake watershed) and applying these rates to Jessie Lake's surface area. The results were 0.16, 0.18, and 0.19 lbs/ac/yr for dry, average, and wet precipitation years, and were applied to the lake surface area. **The estimated result was 310 lbs/yr from atmospheric inputs**, which comprised a small percentage of the total load to the lake (Section 6.2.1 of the TMDL). These loads were calculated from region specific deposition values and precipitation data and thus the approach was determined to accurately represent atmospheric loads of phosphorus.

High groundwater discharge to Jessie Lake is likely, given that area well logs measure water levels from 0.5 to 12 feet above water levels surrounding Jessie Lake. A total phosphorus concentration reading from a groundwater well nearest Jessie Lake was 43 µg/l, which is 13 µg/l above the state water quality standard, suggesting groundwater inputs could potentially contribute large amounts of phosphorus. The estimated groundwater load to the lake was back calculated by solving the water budget equation:

Groundwater Phosphorus contribution = $\sum$ (Jessie Lake Outflow) – $\sum$ (Jessie Lake Inflows)

Inflows included precipitation on the lake surface, flow from the four tributary subwatersheds and flow from the direct lakeshed. Outflows in the equation included discharge from Jessie Brook and evapotranspiration off the lake surface. Resulting groundwater inflow volumes, shown in table 6.2 of the TMDL, were multiplied by the previously observed total phosphorus concentration of 43 µg/l to estimate the range of phosphorus load from groundwater. **The**

Table 1. Jessie Lake Load Allocations.

Source	Total Phosphorus Allocation (lbs/day)
Watershed (Tributary Inflows + Direct Runoff)	3.85
Septic Systems	0
Atmospheric and Groundwater Inputs	3.54
Internal Loading	3.94
Total LA	11.33

The U.S. EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the fourth criterion.

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.

Comment:
Wasteload Allocations (WLA): **Future NPDES Construction permits = 0.04 lbs TP/day.**

The only permitted source to receive a WLA is future construction permits in the Jessie Lake watershed and its tributary watersheds. This WLA functions as reserve capacity as no NPDES construction stormwater permits currently exist. MPCA recognizes that all construction sites over an acre are to obtain NPDES construction permits, and that BMPs are constructed to control erosion, but despite these controls some phosphorus loads are likely to occur from this activity. Thus to help control loads from these sources a WLA of 0.04 lbs/day was given to future NPDES construction permits for areas greater than 1 acre. The WLA was determined as 1% of the total annual loading capacity determined for watershed sources (1,407 lbs/yr), and then converted to a daily load.

MPCA found no additional permitted point source dischargers in the Jessie Lake watershed or its tributary watersheds (Spring Creek, Poole's Creek, NE and NW inlets). No WWTPs, or MS4s, or individual NPDES permits were found to exist within these watersheds. Nor were general industrial or construction stormwater permits found to exist (Section 7.0 of the TMDL).

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

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.

Comment: Uncertainty in the relationship between the in-lake water quality responses to the loading scenario set forth by the TMDL is mitigated through conservative assumptions and targets. Boundary conditions for tributary flow estimates were selected to occur at in-stream monitoring locations so that extrapolation of flow estimates upstream of these locations, which would introduce error, was not necessary (See Appendix A in the TMDL). In addition, the TMDL target of 29 µg/L is 1 µg/L lower than the water quality standard for phosphorus. Also, when the loading capacity values were input in the Canfield- Bachman model, it predicted in-lake total phosphorus concentrations of 28 µg/L. This indicates that load allocations may be conservative and result in reductions of in-lake total phosphorus below the water quality standard for total phosphorus (i.e. 30 µg/L).

Model results were evaluated by comparing values to actual data. Sediment release rates used to estimate internal loads of phosphorus were within published values for other eutrophic lakes (See Section 7.4 of the TMDL). Annual average water quality estimates from the Canfield-Bachman model were compared to nine years with reported data, and estimates were within the natural range of the data (i.e. within reported standard deviations). For these reasons model estimates

and allocations set forth by the TMDL were done such that error was minimized, where possible, so that the TMDL will result in attainment of water quality standards (Section 7.3 of the TMDL).

Phosphorus concentration in groundwater inflow was estimated from one phosphorus reading of well water which indicates an area of uncertainty. The MPCA states that the lack of groundwater data is not essential to TMDL development, but the implementation plan allows for more study if needed. In addition, the MPCA is currently developing a groundwater mass flow to better understand groundwater movement (Section 7.4 of the TMDL)

The U.S. EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the sixth criterion.

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)).

Comment: Phosphorus loads can vary by season, and the contribution from identified sources varies with precipitation. For example in a dry year with little precipitation, less flushing of lake volume concentrates nutrients, and increases stratification, which are conditions that support internal loading. By contrast, in a wet precipitation year, water and nutrients are flushed through at greater rates, and increased lake mixing from high flows limits conditions necessary for internal loading.

Seasonal variation was accounted for in the Jessie Lake TMDL by using water quality data from 1998 to 2007, and streamflow data from 2000-2007. The average annual precipitation for 1998 to 2007 was 28 inches, which corroborates closely with a mean precipitation of 28.78 inches recorded for 1971-2000 in the same area. In addition, 2000 to 2007 mean annual precipitation ranged from 21 to 32 inches across years, similar to a 20 year precipitation record that ranged from 21.7 to 34.2 inches, with both the minimum and maximum precipitation recorded in 2003 and 2004. These observations support that 1998 to 2007 data used to develop the TMDL reflect wet, dry, and average conditions. Thus the resultant TMDL value incorporates seasonal variation in hydrologic conditions that affect loads to Jessie Lake.

Phosphorous loads in wet, dry, and average years were calculated for sources identified in section 6.3 of the TMDL. However, allocations were based on average loadings observed for each source because the contribution from individual sources may vary with precipitation, but the total contribution from all sources does not change as drastically (e.g. watershed loads are greater in wet years, but compensated by reduced load from internal sources in wet years) (Section 7.3 of the TMDL).

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

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.

Comment: Implementation of measures to reduce phosphorus will occur iteratively and concurrent with annual water quality monitoring conducted by Itasca County SWCD. Monitoring results will help determine if implementation has been effective or needs to be modified. The SWCD will work with Minnesota Department of Natural Resources (DNR), and active stakeholders in the watershed, to identify projects that result in water quality improvements. Monitoring data from SWCD will be used to identify effective projects. Previous education of landowners about the importance of lakeshore buffers will likely promote their willingness to participate in implementation of these measures.

Itasca SWCD will continue to work with the lake association in implementation of BMPs outlined in the implementation plan. Given that the goal of the TMDL—to improve water quality—aligns with the SWCD mission, some implementation actions can likely be funded from its existing budget (Section 9.0 and 10.0 of the TMDL).

The U.S. EPA finds that this criterion has been adequately addressed.

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.

Comment: Monitoring of lake water quality is conducted by Itasca SWCD annually, and will continue after TMDL completion. These data will determine if improvements in water quality occur as a result of implementation activities. Specific recommendations are made for monitoring that will target TMDL implementation (e.g. windshield surveys of land use in riparian areas), allow water quality progress to be tracked (e.g. phosphorus, nitrogen, chlorophyll-a, DO, dissolved iron monitoring), and refine the water budget (e.g. pressure transducer installation, and groundwater elevation readings).

The TMDL also recommends that surveys of residents and land use near tributaries should be conducted to target placement of stream buffers. In addition, natural background levels of total phosphorus in nearby ecoregions (Lakes of the Chippewa Sand Plains) are elevated, and natural background levels of Jessie Lake should also be examined to determine appropriate endpoints for water quality management. Groundwater contributions should also be studied using baseflow separation to account for the variability in this source (Section 11.0 of the TMDL)

The U.S. EPA finds that this criterion has been adequately addressed.

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.

Comment: The strategy selected to reduce phosphorus loading was based on model outputs and knowledge of the watershed. Given that the greatest load was found to be from internal loading, the implementation plan outlines three mechanisms to reduce this source: Hypolimnetic aeration, hypolimnetic withdrawal, and alum treatment. The first two would require permits to be obtained for operation and further investigation to determine the appropriate placement and treatments used in conjunction with these methods. These methods reduce internal loading by mixing the water column through aeration and also withdrawing water from the bottom to aerate it. Alum treatment works to inactivate phosphorus in the bottom sediment. This application does not require permits, but it was indicated that both MPCA and MDNR (Waters and Fisheries and Ecological Services Divisions) should provide comments to guide alum treatment.

Reduction of watershed sources is suggested to occur one year after TMDL approval. The reason for prioritizing reductions in the watershed is that they will prevent further loading to the lake and thus can reduce internal loading over the longer term. The following mechanisms to reduce phosphorus in the watershed were presented in the TMDL: developing county level no net P increase ordinances, lakeshore buffers, septic system improvements, septic BMP education, upstream lake improvements, forestry BMPs, and riparian stream restorations. These reductions identify the appropriate entities needed: county staff for ordinance development, conservation district for buffer placement and riparian restoration, and USFS for forestry BMP implementation. The estimated cost for implementation of the structural and non-structural BMPs was $1,195,000 (Section 9.0 of the TMDL).

The U.S. EPA finds that this criterion has been adequately addressed.

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.

Comment: Public participation and stakeholder involvement on water quality issues have continued to occur as part of the TMDL development process. Prior to TMDL development, a Clean Watershed Partnership (CWP) diagnostic study started in 1998, which was guided by input from a technical advisory committee (TAC). The TAC is comprised of a watershed association, state university, and state, local, and federal agencies. The Itasca Soil and Water Conservation District began TMDL studies in 2006 and continued involving the TAC through multiple meetings, and distribution of articles in watershed association newsletters, newspaper articles, and a meeting at the local town hall to apprise the larger public of the TMDL study. A public comment period for the TMDL and associated documentation occurred from November 8, 2010 to December 8, 2010. The public comment period was published in the Minnesota State Register on Monday November 8, 2010, announced in a MPCA news release and by distribution to a mailing list of over 70 relevant contacts, and published on MPCAs website along with a copy of the public notice draft TMDL.

Comments from two individuals were received during the public comment period. Comments within the scope of the TMDL work were adequately addressed by MPCA. Comments concerning implementation efforts were noted to be in consideration for the implementation phase that follows TMDL approval (Section 8.0 of the TMDL and 'Response to Comments Received during the Public Comment Period' submitted with the Final TMDL).

The U.S. EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of this eleventh element.

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.

Comment: On April 12, 2011, EPA received a submittal letter dated April 4, 2011 signed by Rebecca J. Flood, MPCA Assistant Commissioner, addressed to Tinka Hyde, U.S. EPA Region 5, Water Division Director. The submittal letter identified the name of the waterbody for which the TMDL was developed. The location of the waterbody was provided in the supporting documentation. The letter explicitly states that the Jessie Lake TMDL is being submitted for final approval by U.S. EPA under Section 303(d) of the Clean Water Act.

The U.S. EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of this twelfth element.

13. Conclusion

After a full and complete review, the US EPA finds that this TMDL for total phosphorus for Jessie Lake meets all of the required elements of an approvable TMDL. This decision document addresses one **(1) TMDL** for Jessie Lake (DNR# 31-0786) as identified on Minnesota's 2004 303(d) list.

EPA's approval of this TMDL does not extend to those waters that are within Indian Country, as defined in 18 U.S.C. Section 1151. EPA is taking no action to approve or disapprove TMDLs for those waters at this time. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.