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

SEP 21 2011

REPLY TO THE ATTENTION OF:
WW-16J

Rebecca J. 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 Diamond Lake (DNR ID 34-0044-00), including support documentation and follow up information. Diamond Lake is located in central Minnesota in Kandiyohi County. The TMDL addresses an aquatic use impairment due to excessive phosphorus.

EPA has determined that the Diamond Lake TMDL meets the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations set forth at 40 C.F.R. Part 130. Therefore, EPA approves Minnesota's phosphorus TMDL, addressing excess nutrients. 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 efforts 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: Dave L. Johnson, MPCA
Maggie Leach, MPCA

wq-iw8-28g

TMDL: Diamond Lake Nutrient TMDL, Kandiyohi County, MN
Date: September 21, 2011

DECISION DOCUMENT FOR THE DIAMOND LAKE NUTRIENT TMDL, KANDIYOHI COUNTY, MN

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:

Diamond Lake (DNR ID 34-0044-00) is located in the Middle Fork of the Crow River watershed in east-central Kandiyohi County, Minnesota. Diamond Lake is northeast (approx. 12 miles) of the city of Willmar, Minnesota (MN) and northwest (approx. 6 miles) of the city of Atwater, MN. Atwater is the only city within the boundaries of the Diamond Lake watershed and has a small portion of city lands which lie within the Diamond Lake watershed boundaries. The Diamond Lake watershed has an approximate area of 19,148 acres (29.9 square miles).

Water from Diamond Lake flows from a fixed crest dam in the northeastern corner of the lake into a public drainage system, then into the Middle Fork of the Crow River. The Middle Fork of the Crow River flows into the Upper Mississippi River. The fixed crest dam controls the water level in Diamond Lake. Diamond Lake has a surface area of 1,607 acres, a maximum depth of 27 feet, and an average depth of 16 feet. The MPCA classified Diamond Lake as a deep lake based upon the average depth of the lake being greater than 15 feet. Diamond Lake lies within the boundaries of the North Central Hardwood Forest Ecoregion (NCHF).

Land Use:

Land use in the Diamond Lake watershed is comprised of: cultivated crop lands, forested lands, medium and low intensity developed lands, emergent and woody wetlands, open water areas, and pasture/hay/idle grass lands. Figure 3-2 in the final TMDL document presents land use classifications within the Diamond Lake watershed. The Minnesota Pollution Control Agency (MPCA) estimates that land use within the watershed is primarily agricultural and is expected to remain as agricultural for the foreseeable future. Significant development is not expected in the Diamond Lake watershed.

The MPCA communicated that there are approximately 30 confined animal feeding operations within the Diamond Lake watershed. The lake front property immediately surrounding Diamond Lake is occupied by permanent and seasonal residences. The MPCA believes that a majority of these residences (approx. seventy percent) were built prior to the mid-1990s and may have inadequate subsurface sewage treatment systems. The wasteload allocations (WLA) and load allocations (LA) were calculated for all current and future sources.

Problem Identification:

Diamond Lake was originally listed on the 2006 Minnesota 303(d) list for excessive nutrients (phosphorus). Excess nutrients can lead to frequent algal overgrowth in lakes and hinder aquatic recreation activities (swimming, boating, fishing & hunting, etc.). Diamond Lake is currently on

the submitted 2010 Minnesota 303(d) list for impaired aquatic recreation due to excessive nutrients.

Priority Ranking:
The Diamond Lake watershed was given a priority ranking for TMDL development due to: the impairment impacts on public health and aquatic life, the public value of the impaired water resource, the likelihood of completing the TMDL in an expedient manner, the inclusion of a strong base of existing data and the restorability of the water body, the technical capability and the willingness of local partners to assist with the TMDL, and the appropriate sequencing of TMDLs within a watershed or basin. Areas within the Diamond Lake watershed are popular locations for aquatic recreation. Water quality degradation has lead to efforts to improve the overall water quality within the Diamond Lake watershed, and to the development of a TMDL.

Pollutant of Concern:
The pollutant of concern is phosphorus.

Source Identification (point and nonpoint sources):
Point Source Identification: The Diamond Lake watershed does not contain any National Pollutant Discharge Elimination System (NPDES) permitted facilities that contribute any portion of a WLA within the boundaries of the watershed. There are no wastewater treatment plants, no Municipal Separate Storm Sewer System (MS4) communities, and no industrial facilities discharging waters to the watershed.

The MPCA explained that there is an ethanol facility located in Atwater, MN, but drainage from this facility does not contribute stormwater runoff to the Diamond Lake watershed. Construction activity is generally limited in the Diamond Lake watershed. The MPCA stated that stormwater derived from construction activities is minimal in the Diamond Lake watershed. Construction stormwater did not receive any portion of the WLA. For the purposes of the Diamond Lake TMDL, the WLA was set to zero (WLA = 0).

Nonpoint Source Identification: The potential nonpoint sources to the Diamond Lake watershed are:

Internal loading: The release of phosphorus from sediment, the release of phosphorus via physical disturbance from benthic fish (rough fish, ex. carp), the release of phosphorus from wind mixing the water column, and the release of phosphorus from decaying pondweeds, may all contribute internal phosphorus loading to Diamond Lake. Phosphorus may build up in the bottom waters of the lake and may be resuspended or mixed into the water column when the thermocline decreases and the lake water mixes.

Atmospheric deposition: Phosphorus may be added via particulate deposition. Particles from the atmosphere may fall onto lake surfaces or other surfaces within the Diamond Lake watershed. Phosphorus can be bound to these particles which may add to the phosphorus inputs to surface water environments.

Forest Sources: Phosphorus may be added to surface waters via runoff from forested areas within the watershed. Runoff for forested areas may include debris from decomposing vegetation and organic soil particles.

Agricultural Sources (Pasture and Open Lands): Phosphorus may be added via surface runoff from upland areas which are being used for Conservation Reserve Program (CRP) lands, grasslands, and agricultural lands used for growing hay. Stormwater runoff may contribute nutrients to surface waters from livestock manure, fertilizers, vegetation and erodible soils.

Livestock Sources(animal feeding operations): Animal feeding operations (AFOs), which fall beneath the animal threshold limits to be given an NPDES permit, may nevertheless transport phosphorus to surface waters during storm events (via stormwater runoff). AFOs may transport phosphorus laden materials from feeding, holding and manure storage areas to surface waters.

Urban/Residential Sources: Nutrients may be added via runoff from homes near Diamond Lake. Runoff from residential properties can include phosphorus derived from fertilizers, leaf and grass litter, pet wastes, and other sources of anthropogenic derived nutrients.

Inadequate Subsurface Sewage Treatment Systems (SSTS): Phosphorus may be added to the surface waters in the Diamond Lake watershed from failing septic systems. Age, construction and use of SSTS can vary throughout a watershed and influence the nutrient contribution from these systems. It is likely that those systems that are sited along the lake shore are more likely to contribute nutrients than those systems sited further away from the lake. Failing SSTS can discharge nutrients directly into surface waters by straight pipe connections (considered point sources) or by effluents leaching into groundwater or ponding at the surface where they can be washed into surface waters via stormwater runoff.

Wetland Sources: Phosphorus may be added to surface waters by stormwater flows through wetland areas in the Diamond Lake watershed. Storm events may mobilize phosphorus through the transport of suspended solids and other organic debris.

Shoreline Erosion: Phosphorus may be added to Diamond Lake by erosional processes impacting lake shoreline areas. Phosphorus may be attached to eroded shoreline materials and may be mobilized through the transport of sediment and suspended solids.

Future Growth:
Significant development is not expected in the Diamond Lake watershed. The land use within the watershed is primarily agricultural and according to the MPCA is expected to remain as agricultural for the foreseeable future. The WLA and LA for the Diamond Lake TMDL were calculated for all current and future sources. Any expansion of point or nonpoint sources will need to comply with the respective WLA and LA values calculated in the Diamond Lake TMDL.

The 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:

The designated use for Diamond Lake is for aquatic life and recreation (boating, swimming, fishing, hunting, etc.). Diamond Lake is classified as a Class 2B water for the State for Minnesota.

Standards:

The assessment for eutrophic conditions includes a numeric water quality standard and assessment factors from Minnesota Rule 7050. Diamond Lake is within the boundaries of the NCHF ecoregion. The MPCA determined that by meeting the loading capacity values set by the WLA and LA, the total phosphorus (TP), the chlorophyll-a (chl-a) and the Secchi Disk (SD) depth water quality criteria will be attained.

In developing the lake nutrient standards for Minnesota lakes (Minn. Rule 7050), the MPCA evaluated data from a large cross-section of lakes within each of the state's ecoregions. Clear relationships were established between the causal factor, total phosphorus, and the response variables, chlorophyll-a and Secchi disk depth. Based on these relationships, the MPCA assumes that by meeting the TP loading capacity values set by the WLA and the LA, chl-a and SD depth water quality criteria will be attained. The MPCA's lake eutrophication standards for the NCHF ecoregion are found in Table 1 of this Decision Document.

Table 1: Minnesota Eutrophication Standards, North Central Hardwood Forest Ecoregion

Parameter	Eutrophication Standard
Total Phosphorus (µg/L)	TP < 40
Chlorophyll-a (µg/L)	chl-a < 14
Secchi Depth (m)	SD > 1.4

The 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:
The approach utilized by the MPCA to calculate the loading capacity for Diamond Lake is described in Section 5.0 of the final TMDL document. The pollutant sources were identified and estimated based on water quality monitoring data and modeling efforts. The loading capacity of the lake was determined from an in-lake phosphorus model (a modified version of BATHTUB the CNET-Monte Carlo model) and then allocated to the LA and Margin of Safety (MOS).

The MPCA completed a watershed wide water budget to gain a greater understanding of how water moves throughout the Diamond Lake watershed. The water budget was developed with the aid of flow records from the USGS Middle Fork Crow River gage in Spicer, MN (USGS #5278000). The MPCA assumed that runoff in the Diamond Lake watershed behaved in a similar fashion to runoff patterns in the watershed draining to the Middle Fork Crow River USGS gage. The Middle Fork Crow River gage lies outside of the Diamond Lake watershed. The water inputs to Diamond Lake include: precipitation falling directly onto the lake surface, surface runoff from areas adjacent to the lake, groundwater inflows, and flow via streams and

creeks that drain to Diamond Lake. Water outputs are from evaporation, outflow via the fixed crest dam, and groundwater flows.

To understand TP retention in Diamond Lake the MPCA completed a total phosphorus mass balance (see Table 2 of this Decision Document). Water quality data collected in 2008 and 2009 was used to generate the mass balance. The mass balance results showed that Diamond Lake is effective at phosphorus retention, retaining between 86 to 97 percent of the TP inputs to Diamond Lake. The MPCA determined that the main TP inputs were surface water inputs (via runoff and storm event flows from lakes upstream of Diamond Lake), atmospheric deposition, failing SSTS, and internal sources. The mass balance investigation showed that the upstream lakes (ex. Shultz, Wheeler and Hubbard Lakes) within the Diamond Lake watershed are a source of phosphorus to Diamond Lake.

Table 2: Approximations of Total Phosphorus Inputs to Diamond Lake from Mass Balance of 2008 and 2009 water years

Source	Approximations of Total Phosphorus Inputs (2008 & 2009 water years)
	(%)
Surface Water Runoff	≈ 48 to 78
Atmospheric Deposition	≈ 15
Failing Subsurface Treatment Systems (SSTS)	≈ 15
Internal Sources	≈ 3 to 33

The MPCA utilized the Soil and Water Assessment Tool (SWAT) model to estimate TP loading values from the surrounding Diamond Lake watershed. The SWAT model is a physically based model that simulates the impacts of land use practices on soil, agricultural chemical yields, and receiving waters. SWAT simulates the hydrologic cycle by taking into account rainfall, infiltration, groundwater recharge, and discharge to rivers and lakes. Additionally, seasonal variation inputs can be accounted for in loading values in the SWAT model. The SWAT model was also selected because it has the ability to quantify the amount of nutrients leaving a landscape and the ability to prioritize locations for Best Management Practices (BMPs) placement. The SWAT model was helpful in examining implementation strategies, specifically the siting of possible BMPs locations, identifying priority subwatersheds within the Diamond Lake watershed, and quantifying nutrient load reductions to Diamond Lake.

Precipitation data from Willmar, Minnesota was utilized to set the SWAT hydrological conditions. The SWAT model was calibrated (using water quality data from 2009) and validated (using water quality date from 2008) to total seasonal streamflow volume and total phosphorus water quality data. Hydrologic and nutrient loading scenarios were modeled for a 30-year period (1980 to 2009). The SWAT model outputs, specifically the phosphorus loading estimates for surface water runoff and phosphorus loads from upstream lake sources, were used as input values for the CNET modeling efforts and for setting the allocations of the TMDL.

The CNET model, a modified version of BATHTUB, was employed to determine the water quality concentrations necessary to meet the NCHF eutrophication criteria. The CNET model was employed as the main predictive tool to estimate TP, chl-a and SD values. The CNET model completed this task via “Monte Carlo” simulations which presented a statistical distribution of

the average annual (seasonal) TP, chl-a and SD values for meeting the water quality standards (WQS) in Diamond Lake.

To simulate the load reductions and therefore the maximum allowable load (i.e., loading capacity) needed to achieve the State water quality standard in Diamond Lake, a series of model simulations were performed. Each simulation reduced the total amount of TP entering Diamond Lake during the summer season, computing the anticipated response within the Lake. The goal of the modeling was to identify the loading capacity of Diamond Lake (i.e., the maximum allowable load to the system, while allowing it to meet water quality standards) during the June 1 to September 30 summer season. Consistent with recent MPCA guidance, it was assumed that if Diamond Lake meets the State's TP water quality standard that chl-*a* and SD within the system will respond accordingly and eventually also reach the State-defined goals.

The CNET-Monte Carlo simulations were used to calculate the loading capacity for the Diamond Lake TMDL. The loading capacity was the maximum phosphorus load which Diamond Lake can receive over an annual period and still meet the NCHF WQS. The residence time for Diamond Lake is relatively long (estimated at 5 years) and the lake's response to phosphorus loading occurs over a longer time period. The MPCA determined that the water quality in Diamond Lake responds to long term changes, such as changes in annual loads. The MPCA used annual load calculations to determine loading capacity values for Diamond Lake. The loading capacity for Diamond Lake is presented in Table 3 of this Decision Document.

Loading capacities on the annual scale (lbs / year) were calculated to meet the WQS during the growing season (June through September). The time period of June to September was chosen by MPCA as the growing season because it corresponds to the eutrophication criteria, contains the months that the general public typically uses Diamond Lake for aquatic recreation, and is the time of the year when water quality is likely to be impaired by excessive nutrient loading. Loading capacities were divided by 365 to calculate the daily loading capacities.

The current phosphorus load to Diamond Lake was estimated to be 1,941 kg/year (5.318 kg/day). The loading capacity was calculated to be 1,381.5 kg/year (3.785 kg/day), which converts to 8.345 pounds per day (lbs/day). The loading capacity was determined based on the CNET-Monte Carlo simulations. The loading capacity was subdivided among the WLA, LA and MOS components of the TMDL. The MPCA determined that the Diamond Lake watershed does not contain any NPDES permitted facilities that would contribute any portion of a WLA within the boundaries of the watershed, therefore the WLA for the Diamond Lake TMDL was set to zero (WLA = 0.0 lbs/day). The LA accounted for a majority of the loading capacity. Since the WLA was set to 0.0 lbs/day, any load outside of the MOS was assigned to the LA. The LA was calculated to be 1078.5 kg/year (2.955 kg/day) or 6.515 lbs/day. The MOS was calculated to be approximately 21.9 percent of the loading capacity of 303 kg/year (0.83 kg/day) or 1.83 lbs/day.

Table 3: Loading Capacity for the Diamond Lake TMDL

WLA	LA	MOS	TMDL	*(units)*
0.000	1078.500	303.00	**1381.5**	*(kg/year)*
0.000	2.955	0.830	**3.785**	*(kg/day)*
0.000	6.515	1.830	**8.345**	*(lbs./day)*

Current Load: 5.318 kg/day (11.724 lbs./day)

Table 3 in this Decision Document displays the TMDL allocations for the Diamond Lake TMDL. These calculations were based on the critical condition, the summer growing season (June through September), which is typically when the water quality in the lake is degraded and phosphorus loading inputs are the greatest. TMDL allocations assigned during the summer growing season will protect Diamond Lake during the worst water quality conditions of the year. The MPCA assumed that the loading capacities established by the TMDL will be protective of water quality during the remainder of the calendar year (October through May).

The 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:
A load allocation value was calculated for Diamond Lake. The Diamond Lake TMDL assigned the TMDL allocations to the LA (from nonpoint sources) and to the MOS value. The load allocations were recognized as originating from phosphorus loads associated with: SSTS, sources from upstream lakes, lake shoreline erosion, watershed sources (ex. stormwater runoff from properties adjacent to Diamond Lake), atmospheric deposition, and internal sources within Diamond Lake (ex. lake sediments, curly leaf pondweed). The components of the LA were further subdivided among the different potential LA sources (Table 4 of this Decision Document). Estimated percent reductions were calculated for different LA sources. These reductions represent the estimated decreases necessary to meet the NCHF water quality standards.

Table 4: Annual and Daily Loading Reductions for Nonpoint sources

Source	Current Estimated Load		TMDL Allocated Load	
	kg/year	*kg/day*	*kg/year*	*kg/day*
Subsurface Treatment Systems (SSTS)	128	0.351	0.0	0.0000
Upstream Lakes	311	0.852	155.5	0.4260
Watershed	1179	3.230	703.0	1.9260
Atmospheric Deposition	117	0.321	117.0	0.3205
Internal Load	206	0.564	103.0	0.2822

The 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:
The MPCA determined that the Diamond Lake watershed does not contain any permitted facilities that would contribute any portion of a WLA within the boundaries of the watershed. There are no wastewater treatment plants, MS4 communities, or industrial facilities that contribute to a WLA for the Diamond Lake TMDL. There is an industrial ethanol facility, in Atwater, MN, but this facility does not contribute stormwater runoff to Diamond Lake. Construction activity is limited in the Diamond Lake watershed. Stormwater derived from construction activities is minimal in the Diamond Lake watershed and the MPCA did not allocate any portion of a WLA to construction derived stormwater inputs. The WLA for the Diamond Lake TMDL was set at 0 (WLA = 0).

The 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:
Sections 5.3.2 and 5.3.3 of the final TMDL submittal outlines the Margin of Safety used in the Diamond Lake TMDL. The MPCA chose to use the CNET- Monte Carlo simulations based on the 2008-2009 water quality empirical data to calculate the MOS. Utilizing the CNET-Monte Carlo simulations helped to reduce the uncertainty in the model outputs by accounting for annual variability in the amount of: atmospheric load, evaporation, internal load, precipitation, and surface water runoff load. The calibration and validation processes of the CNET-Monte Carlo modeling efforts also functioned to reduce error from erroneous assumptions.

The Diamond Lake phosphorus TMDL set an explicit MOS at approximately 21.9 percent of the loading capacity. The explicit MOS value accounts for annual variability in the modeling outputs. The MOS for the Diamond Lake TMDL was calculated to be 303 kg/year (0.83 kg/day). The MOS represents an additional 21.9 percent load reduction, on top of the load reduction determined necessary to reduce the current loading conditions (1,941 kg/year) to a loading capacity which will attain WQS. The MPCA believes that using a MOS of 303 kg/year will aid to offset the environmental variability in phosphorus loading to Diamond Lake and allow the lake to meet the NCHF eutrophication water quality standards.

The EPA finds that the TMDL document submitted by the MPCA contains an appropriate MOS satisfying 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:
Seasonal variation was considered in this TMDL as described in Section 5.3.5, “Seasonal Variation”. The nutrient targets employed in the Diamond Lake TMDL were developed for average nutrient values collected during the growing season (June to September). The water quality targets were designed to meet the NCHF eutrophication WQS during the period of the year where the frequency and severity of algal growth is the greatest. This period in the State of Minnesota has historically been during the growing season. The loading capacity was calculated to meet the water quality standards during the most critical period (late summer) of the calendar year.

The Minnesota eutrophication standards state that total phosphorus WQS are defined as the mean concentration of phosphorus values measured during the growing season. In the Diamond Lake phosphorus TMDL, the LA and WLA estimates were calculated from modeling efforts which incorporated mean growing season total phosphorus values. Nutrient loading capacities were set in the TMDL development process to meet the WQS during the most critical period. The mid-

late summer time period is typically when eutrophication standards are exceeded and water quality in Diamond Lake is deficient. By calibrating the modeling efforts to protect these waterbodies during the worst water quality conditions of the year, it is assumed that the loading capacities established by the TMDLs will be protective of water quality during the remainder of the calendar year (October through May).

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

8. Reasonable Assurance

When a TMDL is developed for waters impaired by point sources only, the issuance of a 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:
The Diamond Lake phosphorus TMDL outlines reasonable assurance activities in Section 5.3.6 of the final TMDL document. The reasonable assurance practices discussed in the final TMDL document will be implemented over the next several years. The main partner in ensuring that phosphorus reductions in the Diamond Lake watershed will move forward in the coming years is the Middle Fork Crow River Watershed District (MFCRWD). The MFCRWD will work with the existing Watershed Management Plan (approved in 2007) and the recommendations made in the implementation section of this TMDL. An implementation plan based on the recommendations from the Diamond Lake TMDL will be finalized within one year of the approval of the Diamond Lake TMDL. Elements from the post-TMDL implementation plan will be incorporated into the goals of the overall Watershed Management Plan.

The MFCRWD will complete water quality monitoring in the Diamond Lake watershed throughout the water year to track the success or failure of BMPs designed to reduce nutrient

loading into Diamond Lake. Watershed managers will have the opportunity to reflect on whether watershed management strategies are effective at reducing nutrient inflows to the watershed. The MFCRWD has the ability to raise funding for TMDL implementation efforts through a combination of federal, state and local programs. Federal funding, via the Section 319 grants program, may provide money to implement voluntary nonpoint source programs within the Diamond Lake watershed. State efforts will be via Clean Water Legacy Act grant money and the Clean Water Partnership program.

The MFCRWD has completed stream restoration and stormwater reduction projects in the Green Lake watershed, which is the adjacent watershed, just to the northwest, of the Diamond Lake watershed. In 2009 the MFCRWD worked with the City of Spicer, MN to reduce sediment and nutrient inputs to Green Lake via local stream networks. This was accomplished through stream rehabilitation efforts and funded via MPCA Clean Water Legacy Act and Section 319 grant awards. In 2010, after one growing season, the City and the MFCRWD measured decreases in sediment and nutrient loading to Green Lake in those reaches where restoration work had taken place in 2009. The MPCA expects the MFCRWD to remain active in those watersheds adjacent to the Diamond Lake watershed and to be the main partner in nutrient reduction activities within the Diamond Lake watershed.

Table 5 of this Decision Document shows the current estimated TP load allocated to nonpoint sources, the TMDL allocated load (due to inputs from nonpoint sources) and the reduction required to meet NCHF water quality standards. The CNET model predicted loading reductions from 100 percent reduction for SSTS, to just over 40 percent reduction for nonpoint sources from watershed sources.

Table 5: Annual and Daily Loading Reductions: Diamond Lake TMDL

Source	Current Estimated Load		TMDL Allocated Load		Total Reduction Required		Percent Reduction
	kg/year	*kg/day*	*kg/year*	*kg/day*	*kg/year*	*kg/day*	%
Subsurface Treatment Systems (SSTS)	128	0.351	0	0	128	0.351	100.0
Upstream Lakes	311	0.852	155.5	0.426	155.5	0.426	50.0
Watershed	1179	3.230	703	1.926	476	1.304	40.4
Atmospheric Deposition	117	0.321	117	0.321	0	0.000	0.0
Internal Load	206	0.564	103	0.282	103	0.282	50.0

The Clean Water Legacy Act (CWLA) is a statute passed in Minnesota in 2006 for the purposes of protecting, restoring, and preserving Minnesota's waters. The CWLA provides the process to be used in Minnesota to develop TMDL implementation plans, which detail the restoration activities needed to achieve the allocations in the TMDL. The TMDL implementation plans are required by the State to obtain funding from the Clean Water Fund. These plans are generally developed by third party groups, but may be developed by MPCA. The Act discusses how MPCA and the involved public agencies and private entities will coordinate efforts regarding land use, land management, water management, etc. Cooperation is also expected between agencies and other entities regarding planning efforts, and various local authorities and

responsibilities. These efforts are expected to include informal and formal agreements and joint utilization of technical, educational, and financial resources. These cooperative efforts and coordination activities are to be included in the implementation plans. MPCA expects the implementation plans to be developed within a year of TMDL approval. MPCA reviews and approves all plans.

The CWLA also provides details on public and stakeholder participation in development and implementation of TMDLs and implementation plans, and how the funding will be used. The implementation plans are required to contain ranges of cost estimates for both point and nonpoint source load reductions, as well as for monitoring efforts to determine effectiveness of implementation efforts. MPCA has developed guidance on what is required in the implementation plans (Implementation Plan Review Combined Checklist and Comment, MPCA). To be eligible for CWLA funding, plans must include cost estimates, general timelines for implementation, and interim milestones and measures. The Minnesota Board of Soil and Water Resources administers the Clean Water Fund, and has developed a detailed grants policy explaining what is required to be eligible to receive Clean Water Fund money (FY '11 Clean Water Fund Competitive Grants Policy; Minnesota Board of Soil and Water Resources, 2011).

The 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:
Section 7.0 of the TMDL submittal outlines the planned water monitoring efforts by the MFCRWD. The MFCRWD is expected to continue to monitor water quality in Diamond Lake on an annual basis between the months of May through September. The MFCRWD will complete water quality measurements for: Secchi Disk transparency, temperature, dissolved oxygen, pH, specific conductance, and near surface measurements for total phosphorus, dissolved phosphorus and chlorophyll-a. The MFCRWD may also complete vertical profile measurements in Diamond Lake to assess the water quality conditions at 1-meter intervals throughout the water column. It is expected that the MFCRWD will handle the bulk of the water quality sampling in the near future but may need assistance in measuring water quality from volunteers.

The MFCRWD will also measure the efficiency of BMP nutrient removal strategies. These will be tested by monitoring water quality throughout the Diamond Lake watershed (ex. sampling

other lakes within the watershed and stream sites that drain to Diamond Lake). It is anticipated that the MFCRWD will complete stream site sampling between March through September in the Diamond Lake watershed. These sampling events will measure surface waters for: total phosphorus, dissolved phosphorus, total and volatile suspended solids, and turbidity. This information will aid watershed managers in understanding how BMP phosphorus removal efforts are impacting water quality within Diamond Lake.

The MFCRWD may also, from time to time, visit BMP structures to ensure that they are functioning properly. Water quality monitoring combined with an annual review of BMP efficiency will provide information on the success or failure of BMP systems designed to reduce nutrient loading into Diamond Lake. Watershed managers will have the opportunity to reflect on the progress or lack of progress, and will have the opportunity to change course if progress is unsatisfactory.

The 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:
Implementation strategies are outlined in Section 6.0 of the final TMDL. The MPCA presented a variety of possible implementation activities which could be undertaken within the Diamond Lake watershed. Since the Diamond Lake TMDL does not have a portion of the TMDL allocated to WLA, the implementation activities will focus on reducing nonpoint source contributions. Reductions to nonpoint contributions will be related to external nonpoint and internal nonpoint sources.

The MPCA expects that it will take approximately ten years to install BMP structures, measure the efficiency of BMP structures, and fine-tune the BMPs designed to reduce nutrient influxes to Diamond Lake. The MPCA expects that the MFCRWD and the Kandiyohi County Soil and Water Conservation District (SWCD) will function as local partners and will have more of a leadership role in soliciting help from local stakeholders. Potential phosphorus reduction efforts involve the following efforts:

Urban/Residential Nutrient Reduction Strategies: These strategies involve reducing stormwater runoff from lakeshore homes and other residences within the Diamond Lake watershed. These practices would include: rain gardens, lawn fertilizer reduction, lake shore buffer strips, vegetation management and replacement of failing SSTS. The MPCA also discussed the

possibility of connecting lakeshore residences, currently using SSTS, to a sanitary sewer line in the Green Lake Sanitary Sewer District. Water quality educational programs could also be utilized to inform the general public on nutrient reduction efforts and their impact on water quality.

Agricultural Reduction Strategies: These strategies involve reducing nutrient transport from fields and minimizing soil loss. Specific practices would include: stream buffer strips, lake shore buffer strips, streambank stabilization practices (gully stabilization and installation of fencing near streams), wetland restoration, and nutrient management planning.

Internal Loading Reduction Strategies: The main strategy for improving internal phosphorus loads requires reducing external nonpoint sources to Diamond Lake. The following strategies may be employed to reduce external nutrient inputs.

Improved management of fisheries in the lakes above Diamond Lake (Schultz, Wheeler and Hubbard Lakes) in order to maintain healthy game fish populations and reduce rough fish (i.e. carp, bullheads, fathead minnows) populations. Controlling the vitality of curly leaf pond weeds via herbicide applications and phosphorus sequestration in lake bottom sediments by aluminum sulfate treatments. Reducing phosphorus loads from external nonpoint sources will aid in the reduction of nutrient inputs.

Septic Field Maintenance: Local septic management programs and educational opportunities can aid in the reduction of septic pollution. Educating the public on proper septic maintenance, finding and eliminating illicit discharges and repairing failing systems could lessen the impacts of septic derived nutrients inputs into the Diamond Lake watershed.

Public Education Efforts: Public programs will be developed to provide guidance to the general public on nutrient reduction efforts and their impact on water quality. These educational efforts could also be used to inform the general public on what they can do to protect the overall health of Diamond Lake. The MFCRWD suggested mailing annual newsletters to local property owners encouraging them to visit the MFCRWD website or to consult information within the newsletter which would outline nutrient reduction strategies.

The EPA finds that this criterion has been adequately addressed. The EPA reviews but does not approve implementation plans.

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:
The public participation section of the TMDL submittal is found in Section 6.5 of the final TMDL document. Through the development of the Diamond Lake TMDL the public was given various opportunities to participate in the TMDL process. The MPCA encouraged public participation through public meetings, small group discussions and surveys. The MPCA reported that attendance at public meetings was positive and members of the public submitted suggestions for implementation strategies. These comments were shared with the MFCRWD and taken under advisement by the MPCA.

The MPCA played an important role in distributing information and organizing public meetings to discuss the progress of the Diamond Lake TMDL. The MPCA created a website to communicate background information on the TMDL process, TMDL project updates, and public meeting information (dates, times and locations). The MPCA hosted a public notice meeting in December of 2008, in order to share information, solicit input from local stakeholders and encourage public participation in the project. Additional meetings were held in June and July of 2010, where the MPCA informed those in attendance of the progress of the project, shared preliminary water quality results and answered questions.

The draft TMDL was posted online by the MPCA at (http://www.pca.state.mn.us/water/tmdl). The 30-day public comment period was started on May 23, 2011 and ended on June 22, 2011. The MPCA received 1 public comment and adequately addressed this comment. The MPCA submitted all of the public comments and responses in the final TMDL submittal packet received by the EPA on August 31, 2011.

The 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:
The EPA received the final Diamond Lake phosphorus TMDL document, submittal letter and accompanying documentation from the MPCA on August 31, 2011. The transmittal letter explicitly stated that the final Diamond Lake (DNR ID 34-0044-00) TMDL for excess nutrients was being submitted to EPA pursuant to Section 303(d) of the Clean Water Act for EPA review and approval. The letter clearly stated that this was a final TMDL submittal under Section 303(d) of CWA. The letter also contained the name of the watershed as it appears on Minnesota's 303(d) list, and the causes/pollutants of concern. This TMDL was submitted per the requirements under Section 303(d) of the Clean Water Act and 40 CFR 130.

The EPA finds that the TMDL transmittal letter submitted for Diamond Lake by the MPCA satisfies the requirements of this twelfth element.

13. Conclusion

After a full and complete review, the EPA finds that the TMDL for Diamond Lake satisfies all of the elements of an approvable TMDL. This approval is for one TMDL, addressing one waterbody for recreational use impairments, for Diamond Lake (DNR ID 34-0044-00).

The EPA's approval of this TMDL extends to the water bodies which are identified as Diamond Lake (DNR ID 34-0044-00), 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.