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

APR 14 2010

REPLY TO THE ATTENTION OF: WW-16J

Paul Eger, Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road N.
St. Paul, MN 551555-4194

Dear Mr. Eger:

The U. S. Environmental Protection Agency has reviewed the final Total Maximum Daily Loads (TMDLs), including supporting documentation and follow up information, for Cedar Island Lake (ID 27-0119-00), Pike Lake (ID 27-0111-02), and Eagle Lake (ID 27-0111-01). Minnesota's submitted TMDLs for total phosphorus address the excess nutrients levels that impair the recreational use in the Cedar Island, Pike and Eagle Lakes. Based on this review, EPA has determined that Minnesota's TMDLs for total phosphorus, addressing excess nutrients, meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, by this letter, EPA hereby approves Minnesota's three TMDLs for Cedar Island, Pike and Eagle Lakes.

The statutory and regulatory requirements, and EPA's review of Minnesota's compliance with each requirement, are described in the enclosed decision document. The list of approved TMDLs, and impairments addressed is included in Table 4 of the enclosed decision document.

We wish to acknowledge Minnesota's effort in the submitted TMDLs, 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 yours,

Tinka G. Hyde
Director, Water Division

Enclosure

cc: Jeff Risberg, MPCA
David L. Johnson, MPCA

TMDL: Cedar Island, Pike and Eagle Lakes, Minnesota
Date: APR 14 2010

DECISION DOCUMENT
CEDAR ISLAND, PIKE, and EAGLE LAKES PHOSPHORUS TMDL

Section 303(d) of the Clean Water Act (CWA) and U.S. 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 U.S. EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and U.S. 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 U.S. 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 U.S. 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 non-point 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 non-point sources, the TMDL should include a description of the natural background. This information is necessary for U.S. 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; chlorophyl *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comments:

Cedar Island, Pike and Eagle Lakes are located within the City of Maple Grove; about half of the Pike Lake drainage area is located within the City of Plymouth (see Figure 3.1 and Figure 3.2 of the final TMDL submitted

report). Cedar Island Lake discharges through a pumped outlet into a storm sewer system to Eagle Lake, while Pike Lake is connected to Eagle Lake by a large wetland through which a short channel has been dredged. Cedar Island, Pike and Eagle Lakes are approximately 79, 60 and 287 acres in size with average depths of 3.6, 8.6 and 10.4 feet, respectively. Cedar Island Lake's surface area is entirely littoral (i.e., less than 15 feet in depth), Pike Lake's surface area is 95% littoral and Eagle Lake's surface area is 68% littoral, therefore the aquatic vegetation has an impact on the water quality of these lakes. There are about 10 storm sewer outfalls discharging into Cedar Island Lake, about 5 storm sewer outfalls discharging into Pike Lake about and 15 storm sewer outfalls discharging into the Eagle Lake or its extensive wetland fringe. Additional details for Cedar Island, Pike and Eagle Lakes are provided in Table 3.1 of the final TMDL submitted report.

Cedar Island Lake (ID 27-0119-00), Pike Lake (ID 27-0111-02), and Eagle Lake (ID 27-0111-01) are identified on Minnesota's 2008 303(d) list as impaired for nutrient/eutrophication biological indicators, which is the impairment contributing to the nonattainment of the recreational uses. This TMDL report addresses the nutrient/eutrophication biological indicators impairment.

The Cedar Island Lake subwatershed is developed with typical suburban low density residential land use dominating, lies within the City of Maple Grove, and includes parts of the drainage system for the I-694/494/94 Fish Lake Interchange. The Pike Lake subwatershed is mostly developed, drained by Pike Creek, and contains several large wetlands. The Eagle Lake subwatershed is almost entirely developed, includes portions of the drainage system for I-94/694, and contains riparian wetlands. For further land use information on these lakes, see Table 3.2 and Figure 3.3 of the final TMDL report.

Point sources contributing to the nutrient/eutrophication impairment in Cedar Island, Pike and Eagle Lakes include four municipal Separate Storm Sewer Systems (MS4s) (Maple Grove – MS400102, Plymouth – MS400112, Hennepin County – MS400138, MnDOT Metro District – MS400170), covered under the Phase II General NPDES Stormwater Permit - MNR040000 (See Section 4.2.2 and Figure 3.1 of final TMDL report). Additional MS4s are located in the Shingle Creek watershed, but do not drain to the Eagle Lake chain and thus are not part of the wasteload allocation.

Nonpoint sources contributing to the nutrient impairment in Cedar Island, Pike and Eagle Lakes include the atmospheric load generated from direct input on the lake surface, and the internal load from nutrient recycling from lake bottom sediments.

Internal phosphorus loading from lake sediments is an important aspect of the phosphorus budgets of lakes, especially in shallow lakes that may mix many times throughout the year. Large internal loads are the result of significant amounts of phosphorus in lake-bottom sediments that are released under specific conditions. Phosphorus can build up in lake-bottom sediments as part of the eutrophication process which can be accelerated and exacerbated by an increase in phosphorus load export from developing watersheds. Internal loading can be a result of sediment anoxia where poorly bound phosphorus is released in a form readily available for phytoplankton production. Internal loading can also result from sediment resuspension that may result from rough fish activity or propeller wash from boat activity. Additionally, curly-leaf pondweed can increase internal loading because it senesces and releases phosphorus during the summer growing season (late June to early July). All of these factors affect internal phosphorus cycling in Cedar Island, Pike and Eagle Lakes.

Minnesota's 2008 303(d) list includes a projected schedule for TMDL completions. This schedule reflects the state's priority ranking of impaired waters. The schedule for nutrients TMDLs for Cedar Island, Pike and Eagle Lakes have a priority ranking within the top 6% of Minnesota's listed waters.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this first element.

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)).
U.S. 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.

Comments:

According to Minnesota Rules, Chapter 7050, the Cedar Island, Pike and Eagle Lakes are classified as Class 2B waters in the North Central Hardwood Forest Ecoregion. The designated beneficial use is described as follows: "*Class 2 waters, aquatic life and recreation.* Aquatic life and recreation includes all waters of the state that support or may support fish, other aquatic life, bathing, boating, or other recreational purposes and for which quality control is or may be necessary to protect aquatic or terrestrial life or their habitats or the public health, safety, or welfare." Minnesota's standards include narrative criteria for nutrients which limit the quantity of nutrients which may enter the waters. Minnesota's rules include narrative standards (Minn. R. Chap. 7050.0150 Subp. 3 & Subp. 5) which state that all Class 2 waters of the state shall be free from any material increase in undesirable slime growths or aquatic plants including algae. Minnesota's rules also include numeric criteria for eutrophication for deep lakes, shallow lakes and reservoirs. The numeric eutrophication standards applicable for Class 2B lakes and reservoirs (Minn. R. Chap. 7050.0222 Subp. 4) in the North Central Hardwood Forest ecoregion include the following:

— For deep lakes and reservoirs, the total phosphorus standard is 40 µg/L, and either the chlorophyll-a standard of 14 µg/L, or the Secchi disk transparency standard not less than 0.9 meters.
— For shallow lakes, the total phosphorus standard is 60 µg/L, and either the chlorophyll-a standard of 20 µg/L, or the Secchi disk transparency standard not less than 1.0 meters.

The TMDL loads calculated for each of the lakes were based on the numeric eutrophication standards applicable for Class 2B lakes and reservoirs based upon depth and ecoregion. Cedar Island and Pike Lakes are shallow lakes subject to the 60 µg/L total phosphorus standard, and either the 20 µg/L chlorophyll-a standard, or the not less than 1.0 meters Secchi disk transparency standard; while Eagle Lake is a deep lake subject to the 40 µg/L total phosphorus standard, and either the 14 µg/L chlorophyll-a standard, or the not less than 0.9 meters Secchi disk transparency standard.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this second element.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a waterbody for the applicable pollutant. U.S. 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. U.S. 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 non-point source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate non-point source loadings, e.g., meteorological conditions and land use distribution.

Comments:

MPCA determine the total loading capacities, i.e., total maximum daily loads, of total phosphorus for the Cedar Island, Pike and Eagle Lakes that are necessary to addressed the nutrient/eutrophication impairments affecting the recreational uses (Table 2 below) (Also see Table 6 and Table 7 of the final TMDL report). An inverted Canfield-Bachmann model was used to calculate the total predicted phosphorus load at the State total phosphorus standard. Hydrologic inputs were derived from P8 (Program for Predicting Polluting Particle Passage through Pits, Puddles, & Ponds) and XP-SWMM (Storm Water Management Model) to determine residence time for each of the lakes. An average runoff year (1999) was selected to determine the loading capacities of the lakes. The watershed load was then calculated as the difference between the total load at goal and the sum of the atmospheric, internal, and upstream loads at goal. For all the lakes, the wasteload, internal load, and atmospheric load allocations were divided by 365.25 days per year (to account for leap year) to convert the annual load to a daily load.

Table 2. Total Phosphorus (TP) TMDL allocations for Cedar Island, Pike, and Eagle Lakes.

Lake Name	TP WLA (kg/day)	TP LA (kg/day)	MOS	TP TMDL (kg/day)
Cedar Island Lake	0.133	0.075	Implicit	0.208
Pike Lake	0.35	0.052	Implicit	0.402
Eagle Lake	0.81	0.099	Implicit	0.909

Table 3. TMDL total phosphorus (TP) loads partitioned among the major sources.

Lake Name	Allocation	Source	Existing TP Load		TP TMDL		Load Reduction
			(kg/day)	(kg/year)	(kg/day)	(kg/year)	(kg/year)
Cedar Island Lake	WLA	Watershed	0.304	111	0.133	48.5	62.5
	LA	Atmospheric	0.024	8.6	0.024	8.6	--
		Internal	0.31	113.1	0.051	18.9	94.2
	Total		**0.638**	**232.7**	**0.208**	**76**	**156.7**
Pike Lake	WLA	Watershed	0.554	202.5	0.35	127.7	74.8
	LA	Atmospheric	0.017	6.5	0.017	6.5	--
		Internal	0.211	77	0.035	12.8	64.2
	Total		**0.782**	**286**	**0.402**	**147**	**139**

Table 3. TMDL total phosphorus (TP) loads partitioned among the major sources.

Lake Name	Allocation	Source	Existing TP Load		TP TMDL		Load Reduction
			(kg/day)	(kg/year)	(kg/day)	(kg/year)	(kg/year)
Eagle Lake	WLA	Watershed	0.839	306.6	0.511	186.8	119.8
		Upstream Load	0.574	209.5	0.299	109.1	100.4
	LA	Atmospheric	0.085	31.1	0.085	31.1	--
		Internal	--	--	0.014	5	--
	Total		**1.498**	**547.2**	**0.909**	**332**	**220.2**

The three independent modeling platforms that were used to develop the Cedar Island, Pike and Eagle Lakes TMDLs include SWMM, P8, and model equations extracted from BATHTUB. SWMM is a dynamic rainfall-runoff simulation model used for single event or long-term (continuous) simulation of runoff quantity and quality from primarily urban areas. SWMM calculates stormwater runoff by catchment area, and routes it through pipes, channels, and storage/treatment devices, tracking the quantity and quality of runoff generated within each subcatchment. P8 is a public domain industry standard model developed to assess pollutant loading in urban watersheds. P8 was developed using the National Urban Runoff Program (NURP)[1] data and provides loading estimates based on data collected as a part of the NURP program. The U.S. Army Corps of Engineers' BATHTUB model predicts eutrophication-related water quality conditions (e.g., phosphorus, nitrogen, chlorophyll- a, and transparency) using empirical relationships previously developed and tested for reservoir applications. The Canfield-Bachmann natural lake model, which was developed for northern temperate lakes, was selected from the suite of BATHTUB relationships to model lake phosphorus concentration response. Model 1 from the suite of BATHTUB, which accounts for nitrogen, phosphorus, light, and flushing rate was used to model lake chlorophyll-a response. The VS, CHLA & TURBIDITY equation from the suite of BATHTUB was used to predict Secchi transparency.

The calibrated XP-SWMM model developed by the Shingle Creek Watershed Management Commission for the Shingle Creek Chloride TMDL was used to predict annual runoff volumes for each of the lake watersheds. SWMM was used to develop watershed hydraulics and runoff volumes through calibration to collected data. The P8 model was subsequently calibrated to match the watershed runoff volumes developed from the SWMM model. P8 modeling was performed for the period 1992 - 2003. The years 2001 and 2003 were used to calibrate the water quality response model. The P8 values were used in the existing conditions models and in establishing the TMDLs. Watershed loads were calculated using P8 (50th percentile particle file) for each of the subwatersheds. Watershed loads were entered into the BATHTUB model equations in a spreadsheet to predict lake effects and exchange between the tributary lakes and Eagle Lake. Spreadsheet models using the Canfield Bachmann natural lakes equation and other equations from the BATHTUB model were used to estimate phosphorus sedimentation and phosphorus outflow. Inverted Canfield Bachmann equations were used to calculate the TMDL. This reverse calculates the load under existing conditions and at the appropriate total phosphorus standard. The TMDLs were established using the 1999 flow conditions, representative of an average precipitation year. The total phosphorus TMDL for each of the lakes was partitioned by difference. The atmospheric load, internal load, and for Eagle Lake the upstream load were subtracted from the TMDL to obtain the watershed load. For further information on modeling and loading calculations refer to Chapter 6, Chapter 7 and Appendix A of the final TMDL report.

The critical condition for the nutrient/eutrophication impairments in Cedar Island, Pike and Eagle Lakes corresponds to the summer growing season. Minnesota lakes typically demonstrate impacts from excessive nutrients such as excessive algal blooms and fish kills during the summer recreation season (June 1 through

[1] Research project conducted by the U.S. EPA between 1979 and 1983. It was the first comprehensive study of urban stormwater pollution across the US. The principal focus areas of the study consisted of: an examination of the water quality aspects of urban runoff, a comparison of results across various urban sites assessing the impact of urban runoff on the nation's water quality overall, and the performance of various stormwater management practices.

September 31). Nutrients can be transported into the lake via surface runoff during summer rain events. Nutrients can also be internally loaded to the lake during summer mixing events. The lake response models that were used to calculate the Cedar Island, Pike and Eagle Lakes TMDLs focused on the summer-mean total phosphorus, chlorophyll-a concentrations and Secchi transparency during the summer growing season as the critical condition.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this third element.

4. Load Allocations (LAs)

U.S. EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future non-point 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 non-point sources.

Comments:

MPCA determined the total load allocations (LAs) of total phosphorus for the Cedar Island, Pike and Eagle Lakes (see Table 2 and Table 3 above, and Table 7.3 and Table 7.4 of the final TMDL report). The existing nonpoint sources contributing to the LAs include the atmospheric load generated from direct input on the lake surface, and the internal load from nutrient recycling from lake bottom sediments. For all the lakes, the load allocations (internal load and atmospheric load) were divided by 365.25 days per year to convert the annual load to a daily load.

Precipitation contains phosphorus that can ultimately end up in the lakes as a result of direct input on the lake surface. The atmospheric load (kg/year) for each lake was calculated by multiplying the lake area (km^2) by the atmospheric deposition rate (kg/km^2-year). See Table 6.1 of the final TMDL report for atmospheric load calculations for the Cedar Island, Pike and Eagle Lakes TMDLs.

Large internal loads are the result of significant amounts of phosphorus in lake-bottom sediments that are released under specific conditions. Two methods were used to calculate internal loads for the lakes. The first method applied was to calculate a mass balance change at fall turnover. The change in the total phosphorus concentration was assumed to be a direct result of hypolimnetic[2] phosphorus mixing with epilimnetic[3] water at turnover. The second method applies an anoxic factor, which estimates the period where anoxic conditions exist over the sediments. In the case of shallow lakes, this can be estimated from lake geomorphology and lake total phosphorus concentrations. The anoxic factor is expressed in days but is normalized over the area of the lake. For example, if the depth of oxygen depletion (<2 mg/L D.O.) was 6 meters, then the number of days was multiplied by the anoxic area at that depth and divided by the entire area of the lake. A release rate was then selected based upon the eutrophic state of the lake. The selected release rates were a range based on previous lake studies. See Table 7.1 of the final TMDL report for internal load calculations for the Cedar Island, Pike and Eagle Lakes TMDLs.

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[2] Hypolimnion: layer of water in a thermally stratified lake that lies below the thermocline (transition layer between the mixed layer at the surface and the deep water layer), is noncirculating, and remains perpetually cold.

[3] Epilimnion: The layer of water above the thermocline.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this fourth element.

5. Wasteload Allocations (WLAs)

U.S. 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. U.S. 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.

Comments:

MPCA determined that the total waste load allocations (WLAs) of total phosphorus for the Cedar Island, Pike and Eagle Lakes (see Table 2 and Table 3 above, and Table 7.3 and Table 7.4 of the final TMDL report). The existing point sources contributing to the WLAs include include four Municipal Separate Storm Sewer Systems (MS4s) (Maple Grove – MS400102, Plymouth – MS400112, Hennepin County – MS400138, MnDOT Metro District – MS400170), covered under the Phase II General NPDES Stormwater Permit - MNR040000 (See Section 4.2.2 and Figure 3.1 of final TMDL report). For all the lakes, the wasteload allocations were divided by 365.25 days per year to convert the annual load to a daily load.

The tributary or watershed load from stormwater runoff from the watershed was developed using the P8 model calibrated to the SWMM runoff volumes. Particle data that represents the median for particle sedimentation developed during the NURP studies was used for development of the loads.

According to MPCA, there was not enough information available to assign loads to individual stormwater discharge permit holders, so the Wasteload Allocations in the Cedar Island, Pike and Eagle Lakes TMDLs were combined as Gross Wasteload Allocations. Each MS4 permittee has committed to implement Best Management Practices (BMPs) to reduce nutrient loading to each lake. MPCA believes that the collective approach used for the MS4s allows for greater reductions for permit holders with more opportunities and less for those with greater constraints. The collective approach will be outlined in an implementation plan.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this fifth element.

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)). U.S. 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.

Comments:

The TMDLs for the Cedar Island, Pike and Eagle Lakes incorporated an implicit margin of safety (MOS) in the allowable pollutant load calculation. An implicit MOS was incorporated by using conservative assumptions. Conservative assumptions were included in the modeling by applying sedimentation rates from the Canfield-Bachmann model that likely under-predict the sedimentation rate for shallow lakes. The sedimentation rate refers to the loss of phosphorus from the water column as a result of settling, which can occur as algae die and settle, as organic material settles, or as algae are grazed by the zooplankton. The Canfield-Bachmann equation does not account for the expected higher sedimentation rates expected in healthy shallow lake systems as a result of increased zooplankton grazing. Consequently, the model-predicted phosphorus concentrations will be higher than expected because they do not account for the additional loss of phosphorus from the water column from that grazing. Secondly, the Canfield-Bachmann model was used to match data by only adjusting the loads and not applying calibration factors. It is likely that the sedimentation rates used in the model are conservatively low for most Minnesota lakes, because of the relatively shallow nature of those lakes. Finally, the Eagle Lake model assumed that the entire annual modeled outflow from Cedar Island Lake would be transported by storm sewer downstream to Eagle Lake, although the records from the outlet pumping indicate that in some years the actual pumped outflow is less than the modeled volume. This assumption provides an additional margin of safety for calculating reductions necessary for Eagle Lake, because the Eagle Lake model thus likely overpredicts the lake exchange load from Cedar Island Lake.

U.S. EPA finds that the TMDL document submitted by MPCA contains an appropriate MOS satisfying all requirements concerning this sixth element.

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)).

Comments:

The TMDLs for Cedar Island, Pike and Eagle Lakes accounted for seasonal variation in the calculation of the total phosphorus loads. The daily load reduction targets in the TMDLs were calculated from an average of two years of monitoring data, a wet and a dry year. Averaging across modeled years addresses annual variability in lake loading. In addition, setting the TMDLs to meet targets established for the most critical period (summer) will be inherently protective of water quality during all the other seasons. Therefore, seasonal variation is accounted for through the use of annual loads and developing targets for the summer period when the frequency and severity of nuisance algal growth will be the greatest.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning this seventh element.

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 non-point sources, and the WLA is based on an assumption that non-point source load reductions will occur, U.S. EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that non-point source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for U.S. EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

U.S. EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by non-point sources. However, U.S. EPA cannot disapprove a TMDL for non-point 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.

Comments:

Chapter 10 of the final TMDL report presents reasonable assurances for resolving the water quality problems associated with the total phosphorus in Cedar Island, Pike and Eagle Lakes.

Reasonable assurances for achieving the necessary WLAs will be through the state NPDES permit process. NPDES Phase II stormwater permits are in place for each of the member cities in the watershed as well as Hennepin County and MnDOT. Under the stormwater program, permit holders are required to develop and implement a Stormwater Pollution Prevention Program (SWPPP) which should identify BMPs and measurable goals associated with each of six specified minimum control measures. Permit conditions will need to be consistent with the assumptions and requirements used to establish the approved wasteload allocations.

In addition, the Shingle Creek Watershed Management Commission will be using the developed TMDLs as guiding documents for updating the Capital Improvement Program and Work Plan, and developing appropriate water quality goals, policies and strategies require for preparing watershed management plans within the Twin Cities Metropolitan Area. The SCWMC will evaluate progress toward meeting the goals and policies outlined in the Second Generation Plan in their Annual Report. Success will be measured by completion of policies and strategies, or progress toward completion of policies and strategies. The Annual Report will then be presented to the public at the Commission's annual public meeting. The findings of the Annual Report and the comments received from the member cities and the public will then be used to formulate the work plan, budget, CIP and specific measurable goals and objectives for the coming year as well as to propose modifications or additions to the management goals, policies, and strategies. At the end of each five year period the Commission will evaluate the success of BMP implementation in reducing the total phosphorus concentration in the Eagle Lake

chain and will reconvene the Technical Advisory Committee to determine if adjustments to the Implementation Plan are necessary.

U.S. EPA finds that the TMDL document submitted by MPCA adequately addresses this eighth element.

9. Monitoring Plan to Track TMDL Effectiveness

U.S. EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (U.S. EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and non-point sources, and the WLA is based on an assumption that non-point source load reductions will occur. Such a TMDL should provide assurances that non-point 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.

Comments:

The Shingle Creek Watershed Management Commission (SCWMC) periodically monitors these lakes and will continue to do so through the implementation period. The SCWMC monitors water quality in local lakes through the funding of special studies and citizen volunteer efforts. Additional monitoring is proposed in the Commission's Water Quality Plan in an effort to ensure the quality of data. Schedules of monitoring activities are identified in the Shingle Creek Water Quality Plan. Results of all monitoring will be included in their annual water quality monitoring report. These three lakes will be periodically monitored by the CAMP program through the SCWMC. The CAMP program is operated by Metropolitan Council Environmental Services and is a volunteer monitoring program. Citizen volunteers collect data and samples biweekly.

U.S. EPA finds that this ninth element has been adequately addressed in the TMDL document submitted by MPCA, although U.S. EPA is not approving these recommendations for monitoring or any other aspect of Minnesota's monitoring program through this decision.

10. Implementation

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

Comments:

Chapter 9 of final TMDL report presents some implementation alternatives for resolving the water quality problems associated with total phosphorus in Cedar Island, Pike and Eagle Lakes.

TMDL implementation will be carried out on an iterative basis so that implementation course corrections based on periodic monitoring and reevaluation can adjust the strategy to meet the standard. After the first phase of nutrient reduction efforts, reevaluation will identify those activities that need to be strengthened or other

activities that need to be implemented to reach the standards. Implementation will also address inlake problems such as invasive plant species (curly-leaf pondweed) and invasive fish (carp and rough fish). These practices go beyond the traditional nutrient controls and provide additional protection for lake water quality.

Implementation alternatives for nutrient reductions include:

External load reductions

- Retrofit Best Management Practices (BMPs) where possible — Retrofit water quality treatment through a variety of Best Management Practices including detention ponds, native plantings, sump manholes, swirl separators, and trash collectors.
- Increase infiltration and filtration in the lakeshed — Encourage the use of rain gardens, native plantings, and reforestation as a means to increase infiltration and evapotranspiration and reduce runoff conveying pollutant loads to the lake.
- Target street sweeping — Identify key areas and target those areas for more frequent street sweeping and consider replacing mechanical street sweepers with more efficient regenerative air sweepers.
- Encourage shoreline restoration — Encourage property owners to restore their shoreline with native plants to reduce erosion and capture direct runoff.
- Improve upstream lakes — Reduction in in-lake phosphorus concentrations in Pike and Cedar Island Lakes would reduce the phosphorus load exported to Eagle Lake.
- Conduct education and outreach awareness programs — Educate property owners in the subwatershed about proper fertilizer use, low-impact lawn care practices, and other topics to increase awareness of sources of pollutant loadings to the lakes and encourage the adoption of good individual property management practices.

Internal load reductions

- Chemical treatment — Chemically treat Eagle Lake with alum to remove phosphorus from the water column and bind it to sediments.
- Vegetation management — Chemical treatments applied in Cedar Island Lake for at least three to five years in a row may be necessary to limit growth of this phosphorus source.
- Fishery management — In partnership with the DNR, Pike and Cedar Island Lakes should be considered for rough fish removal.
- Drawdown — Cedar Island Lake may be a good candidate for a water level drawdown.

Other strategies

- Conduct aquatic plant surveys and prepare vegetation management plans — Aquatic plants should periodically be surveyed on the three lakes to track changes in the plant community and monitor growth and extent of nuisance species such as Eurasian water milfoil and curly-leaf pondweed.
- Manage fish populations — Partner with the DNR to monitor and manage the fish population to maintain a beneficial community.

Although a formal implementation plan is not required as a condition for TMDL approval under the current U.S. EPA regulations, U.S. EPA finds that the TMDL document submitted by MPCA adequately addresses this tenth element.

11. Public Participation

U.S. 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, U.S. EPA has explained that final TMDLs submitted to U.S. 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 U.S. EPA establishes a TMDL, U.S. EPA regulations require U.S. 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 U.S. EPA determines that a State/Tribe has not provided adequate public participation, U.S. EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by U.S. EPA.

Comments:

MPCA established a technical advisory committee so that interested stakeholders could be involved in key decisions involved in developing the TMDL. Stakeholders invited to the Technical Advisory Committee include local cities and counties, Minnesota DNR, the Metropolitan Council, the USGS and the Minnesota Pollution Control Agency. Technical Advisory Committee meetings to review the TMDLs in the watershed were held on December 8, 2005, February 9, 2006, March 9, 2006 and June 27, 2007. All meetings were open to interested individuals and organizations. The preliminary results of the TMDL were presented to the City of Plymouth Environmental Quality Board on March 8, 2006. In addition, the draft findings of the TMDL and the preliminary Implementation Plan were presented to the City of Maple Grove Lake Quality Commission on May 21, 2008 and on October 15, 2008.

The Cedar Island, Pike and Eagle Lakes TMDL report was public noticed from September 28 to October 28, 2009. Copies of the draft TMDL Report for Cedar Island, Pike and Eagle Lakes, and fact sheet were available to the public for review at the MPCA office in St. Paul, MN and the MPCA website http://www.pca.state.mn.us/water/tmdl/index.html. As part of the final TMDL submittal, the state also provided copies of the following (See Enclosures 2 – 4 of the TMDL final submittal package):

- The public comment notices as posted by MPCA on news release, state register, and mailed letters with attached mailing list of interested parties;
- The Cedar Island, Pike and Eagle Lakes fact sheet distributed by MPCA
- The written public comment letters received during public comment period and the state responses to these comments. MPCA received four public comments during the TMDLs public comment period, and all of these comments were adequately addressed by MPCA.

U.S. EPA finds that the TMDL document submitted by MPCA satisfies all requirements concerning 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 U.S. 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 U.S. EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and U.S. 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.

Comments:

A transmittal letter submitting the final TMDLs to USEPA was dated March 24, 2010 and received by the Watersheds & Wetlands Branch, Water Division, USEPA, R5 on March 25, 2010. The transmittal letter explicitly states that the final Total Maximum Daily Loads for excess nutrients are being submitted to USEPA pursuant to Section 303(d) of the Clean Water Act for USEPA review and approval. The letter also contained identifying information such as the name and location of the impaired waterbodies, and the causes/pollutants of concern.

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

13. Conclusion

After a full and complete review, U.S. EPA finds that the TMDLs for Cedar Island Lake (ID 27-0119-00), Pike Lake (ID 27-0111-02), and Eagle Lake (ID 27-0111-01) satisfy the elements of approvable TMDLs. This approval addresses three (3) segments for one (1) pollutant for a total of three (3) TMDLs addressing one (1) impairment (see Table 4 below).

Table 4

Impaired Lake Name	Assessment Unit ID	Pollutant	Impairment (s) Addressed by TMDL
Cedar Island Lake	27-0119-00	Total phosphorus	Nutrients/eutrophication
Pike Lake	27-0111-02		
Eagle Lake	27-0111-01		

U.S. EPA's approval of the TMDLs for Cedar Island, Pike and Eagle Lakes extends to the waterbodies which are identified in this decision document and the TMDL study with the exception of any portions of the waterbodies that are within Indian Country, as defined in 18 U.S.C. Section 1151. U.S. EPA is taking no action to approve or disapprove the State's TMDL with respect to those portions of the waters at this time. U.S. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under Section 303(d) for those waters.