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

JAN 26 2010

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REPLY TO THE ATTENTION OF:
WW-16J

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

Dear Mr. Eger:

The U. S. Environmental Protection Agency has conducted a complete review of the final Total Maximum Daily Loads (TMDLs) for the Clearwater River and Clear, Betsy, Scott, Union, Louisa, and Marie Lakes, including supporting documentation and follow up information. The Clearwater River and associated lakes are located in central Minnesota, in Meeker, Sherburne, and Wright Counties. The TMDLs address the Aquatic Recreation Use impairment due to excessive fecal coliform, and the Aquatic Life Use due to excessive nutrients.

The TMDLs meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, EPA hereby approves Minnesota's seven TMDLs for fecal coliform and phosphorus for the Clearwater River and associated lakes. The statutory and regulatory requirements, and EPA's review of Minnesota's compliance with each requirement, are described in the enclosed decision document.

We wish to acknowledge Minnesota's effort in submitting these TMDLs and look forward to future 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: Margaret Leach, MPCA
Dave Johnson, MPCA

wq-iw8-10g

TMDL: Clearwater River and Clear, Betsy, Scott, Union, Louisa, and Marie Lakes TMDLs, Minnesota

Date:

DECISION DOCUMENT FOR CLEAR, BETSY, SCOTT, UNION, LOUISA, AND MARIE LAKES, MINNESOTA PHOSPHORUS TMDLS AND CLEARWATER RIVER, MINNESOTA PATHOGEN TMDL

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

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

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

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

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

(1) the spatial extent of the watershed in which the impaired waterbody is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;

(4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and
(5) an explanation and analytical basis for expressing the TMDL through *surrogate measures*, if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment impairments; chlorophyll *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comments:
Location Description: The Minnesota Pollution Control Agency (MPCA) developed nutrient TMDLs for six lakes in the Upper Clearwater River Watershed (Clear, Betsy, Scott, Union, Louisa, and Marie Lakes) as well as a pathogen TMDL for a portion of the Clearwater River in Meeker, Sherburne, and Wright Counties, Minnesota. By identifying measures to reduce nutrient and pathogen loading, the TMDLs will address impairments of the aquatic recreation beneficial use in the watershed. Table 1 below identifies the waterbody segments covered by the TMDL as they appear on the Minnesota 2008 303(d) list. The six lakes are listed as impaired for aquatic recreation use due to algal blooms and excess aquatic plants impacting the swimming and fishing uses. Minnesota's priority rankings for TMDL waters are reflected by the target dates for start and completion of TMDL studies.

Table 1. 2008 303(d) List Summary

Waterbody	ID number	Listing Year	Affected use	Pollutant or Stressor
Clear Lake	47-0095	2008	Aquatic recreation	Excess nutrients
Lake Betsy	47-0042	2008	Aquatic recreation	Excess nutrients
Union Lake	86-0298	2008	Aquatic recreation	Excess nutrients
Scott Lake	86-0297	2008	Aquatic recreation	Excess nutrients
Lake Louisa	86-0282	2002	Aquatic recreation	Excess nutrients
Lake Marie	73-0014	2008	Aquatic recreation	Excess nutrients
Clearwater River: CD 44 to Lake Betsy	07010203-549	2002	Aquatic recreation	Excess *E. coli*

Lakes: The lakes are located south of the cities of Rockville and St. Augusta. The lakes form a chain of lakes in the headwaters of the Clearwater River. Clear Lake is the furthermost upstream lake, and drains into the Clearwater River. Lake Betsy is the second of the lakes, approximately 10 miles downstream (east) of Clear Lake (Figure 4 of the TMDL). The Clearwater River exits Lake Betsy and flows into Scott Lake a few hundred yards downstream to the east. Union Lake is located southwest of Scott Lake, and discharges via a small tributary to Scott Lake. The Clearwater River exits Scott Lake and flows into Lake Louisa, located a mile downstream. The outlet of Lake Louisa is a small channel connecting to Lake Marie, located at the downstream end of the chain of lakes. See Figure 4 of the TMDL for lake locations and flow directions. The physical details for the lakes are in Table 2 below.

Table 2. Lake Characteristics (from Table 3.1 of the TMDL Study)

Parameter	Clear Lake	Lake Betsy	Union Lake	Scott Lake	Lake Louisa	Lake Marie
Surface Area (ac)	515	83	92	148	193	140
Average Depth (ft)	9	10	18	12	12	8

Maximum Depth (ft)	17	23	35	29	44	36
Volume (ac-ft)	4504	833	1700	1791	2232	1085
Residence Time (days)	686	33	291	12	17	24
Littoral Area (ac)	463	54	29	88	125	119
Watershed (ac) (cumulative)	6801	43789	4741	51003	53881	59837

Clearwater River: The Clearwater River segment addressed by this TMDL flows east from County Ditch 44/Clear Lake to Lake Betsy. The watershed is approximately 33,800 acres in size, and is approximately 10 miles in length (Section 2.3 of Part II of the TMDL).

Topography and Land Use:
Lakes: The watersheds for the lakes vary only slightly. As seen in Table 3 below, the watersheds average about 50%-55% cropland, and about 10% urban land (Section 3.2 of the TMDL). The lakes have moderate to heavy shoreline development, and the lakes are used for a variety of recreation uses (Section 3.3.1 of the TMDL). Several of the lakes have public boat accesses and are used for boating and fishing.

Table 3 Land Use Characteristics – Lakes (in acres)

Land Use	Clear Lake	Lake Betsy	Union Lake	Scott Lake	Lake Louisa	Lake Marie
Corn	1,854.9	12,330.5	716.5	13,130.6	13,329.8	14,329.1
Soybeans	1,414.0	9,060.1	247.5	9,325.1	9,384.4	10,220.0
Alfalfa	152.1	1,568.7	82.5	1,651.3	1,651.3	1,658.7
Grass/Pasture	544.0	5,600.9	1,145.2	7,651.0	8,308.8	9,677.7
Woodland	633.2	5,139.1	1,222.9	7,473.8	8,837.7	10,411
Barren	0.0	0.0	26.0	26.0	26.0	26.0
Urban/Developed	800.0	4,987.0	416.1	5,528.3	5,810.1	6,352.4
Water	654.7	1,199.5	131.8	1,501.5	1,707.1	2,046.3
Wetlands	724.7	3,728.5	646.1	4,432.3	4,502.2	4,632.1
Other Crops	23.7	174.7	106.3	283.2	323.5	483.6
Total	6,801.3	43,789.1	4,741.0	5,1003.2	53,880.9	59,836.9

All lakes have had fish surveys completed within the last six years except for Scott Lake (Section 3.3.2 of the TMDL). Limited fish stocking has occurred, particularly in Clear Lake. The lakes are managed for largemouth bass and northern pike, but a significant population of carp and other rough fish are present. Carp can increase the impacts of phosphorus on the lakes, as they tend to uproot plants and resuspend phosphorus-rich sediments (Section 3.3.2 of the TMDL). The lakes also have problems with invasive aquatic plants. MPCA noted that excessive nutrients can increase the amount of invasive plants, which in turn reduce the biodiversity in the lake. Curly leaf pond weed is abundant in all of the lakes.

Table 2 above lists the physical characteristics of the lakes. Based upon the physical data, Clear Lake and Lake Marie are classified by MPCA as shallow lakes (having a maximum depth less than 15 feet or more than 80% littoral). The other lakes are classified as deep lakes (Section 3.3.4 of the TMDL).

Clearwater River: The Clearwater River watershed is mainly agricultural in nature (Section 2.2 of Part II of the TMDL). Table 4 below shows the land use of the lands that drain to the impaired section of the Clearwater River. MPCA split the river into three sections based upon channel characteristics (Section 2.3 of Part II of the TMDL). The uppermost section (approximately 2 miles in length) is flat and mainly ditched. Significant wetlands are present, and the riparian land use is pasture and row crop. The next section (approximately 3.5 miles in length) is steeper and has better sinuosity. The sediments are more coarse, and the riparian land is more woody in nature. The lower section (approximately 4 miles in length) has a lower slope, and is ditched. MPCA noted that in 1985, low-flow portions of the river were diverted to a large wetlands complex to reduce phosphorus and sediment entering Lake Betsy.

Table 4 Land Use Characteristics – Clearwater River

Land use	Total (ac)	Percent
Corn	10,601.34	31.29%
Soybeans	7,665.40	22.63%
Spring Wheat	73.37	0.22%
Alfalfa	1,269.44	3.75%
Peas	0.49	0.00%
Grass/Pasture	3,932.62	11.61%
Woodland	3,002.73	8.86%
Urban/Developed	3,516.33	10.38%
Water	1,000.65	2.95%
Wetlands	2,813.19	8.30%
Total (acres)	33,875.55	100.00%

Pollutant of concern:

Lakes: The pollutant of concern for these lake TMDLs is phosphorus. Levels of phosphorus are above water quality targets, limiting all types of aquatic recreation, including fishing and swimming. Excess phosphorus stimulates excessive plant growth (algae and nuisance plants/weeds). This enhanced plant growth reduces dissolved oxygen in the water when dead plant material decomposes and can cause other organisms to die. For informational purposes, the TMDL also includes water quality data and information for the nutrient indicators chlorophyll-a and Secchi depth. Chlorophyll-a is a primary pigment in aquatic algae. Chlorophyll-a levels correlate well with algal production. Secchi depth is an indicator for water clarity and quality and is measured by lowering a probe into the water until it can no longer be seen from the surface (Section 2.2 of the TMDL).

The lakes have been sampled periodically for total phosphorus, chlorophyll-a and Secchi depth since 1980 (Section 5 of the TMDL). The annual averages show that all the lakes are exceeding the water quality standards, although some are worse than others. All the lakes except for Clear Lake show a declining trend in phosphorus levels. Chlorophyll-a and Secchi depth also generally exceed the state water quality standards.

Clearwater River: The pollutant of concern for the Clearwater River is *E. coli*. Results of sampling of the river between Clear Lake and Lake Betsy during 2005 and 2006 show that bacteria concentrations are highest in the middle section of the river, and lower at the upstream and downstream portions (Section 2.5 of Part II of the TMDL). Much of the sampling data was

for fecal coliform; however, the Minnesota water quality standards were recently revised to address *E. coli*. Section 3 below discusses how the standards for the two pathogens, *E. coli* and fecal coliform, are considered to have equivalent levels of protection by MPCA.

Pollutant sources:
Lakes: Sources identified by MPCA in the TMDL as contributing to the nutrient impairments include upstream loads, agricultural run-off from the local lake watershed, atmospheric deposition, and internal phosphorus release (Section 4.3 of the TMDL). MPCA determined that much of the phosphorus load in each lake is a result of flow from the upstream lake. Each lake discharges phosphorus-rich water and/or sediment downstream, and often is the dominant source for the more downstream lakes. Run-off from land within the watershed was also reviewed by MPCA. Depending on the hydrology, direct run-off (from agricultural lands or animal operations) is often a significant portion of the overall phosphorus load into the lakes (Table 6.3 of the TMDL). Internal loads of phosphorus are a source for the upstream lakes (Clear Lake and Lake Betsy). Phosphorus-rich sediments often settle out in the lakes, and when dissolved oxygen levels are reduced (often during the summer months) the phosphorus dissolves out of the sediment and into the water column. When the lake mixes during the spring and fall, the phosphorus-rich water is spread throughout the lake, and is available for use by algae and plants.

The only point sources in the watershed are the National Pollutant Discharge Elimination System (NPDES) construction permits in the watershed (Section 1 of the TMDL). No wastewater treatment facilities discharge to waterbodies in the watershed; the wastewater facilities that are located in the watershed are subsurface-discharging facilities, and MPCA believes these facilities do not contribute to the nutrient impairments. No NPDES municipal separate stormwater systems were identified in the watershed.

Clearwater River: Sources identified by MPCA in the TMDL as contributing to the pathogen impairments include livestock and associated land uses such as pasture and feedlots, unregulated stormwater run-off, and natural sources (Section 4.0 of Part II of the TMDL). Field surveys showed that high levels of bacteria were usually observed in locations where livestock had direct access to streams. Pastures and feedlots have been noted by MPCA in close proximity of streams and tributaries; during rain events, these can provide significant amounts of bacteria into the waterbodies and eventually into the Clearwater River (Section 4.2 of Part II of the TMDL). Manure application for fertilizer also occurs in the watershed, and can contribute pathogens.

No point sources of bacteria were determined in the watershed (Section 4.2 of Part II of the TMDL). No MS4 permits are in the watershed, but MPCA noted that there are some impacts from unregulated stormwater from the City of Watkins. (Section 4.1.6 of Part II of the TMDL). Sample results show that stormwater from portions of the city were high in bacteria levels immediately following a rain event.

Future growth trends: As stated in Sections 7.5, and 5.6 of Part II of the TMDL, future growth will not affect these TMDLs. No significant growth is expected by MPCA.

EPA finds that the TMDL submitted by MPCA satisfies all requirements of 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)). 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:
Lakes: Section 2.0 of the TMDL describes designated uses and numeric criteria applicable to this watershed.

Use Designation: All six lakes are classified as Class 2B waters (MN. R. 7050.0430). The designated use addressed by this TMDL is aquatic recreation for 2B waters. Class 2 waters include waters which "do or may support fish, other aquatic life, bathing, boating, or other recreational purposes..." (MN R. 7050.0150(3)).

Numeric Standards: Minnesota has numeric criteria for nutrients that limit the quantity of nutrients entering waters (Table 5 below). MN R. 7050.0222(4) defines the numeric criteria, based upon ecoregions. Lake Betsy, Union Lake, Scott Lake, Lake Louisa are classified by MPCA as deep lakes and Clear Lake and Lake Marie are classified as shallow lakes, all in the North Central Hardwood Forest ecoregion (Section 2.2.2 of the TMDL). Lakes are to meet either the phosphorus target or the chlorophyll-a and Secchi disk target. The applicable criteria are in Table 5 below.

Table 5. Applicable numeric criteria

	Total Phosphorus standard (µg/L)	chlorophyll-a standard (µg/L)	Secchi Disk depth (meters)
Lake Betsy Union Lake Scott Lake Lake Louisa	≤ 40	≤ 14	≥1.4
Clear Lake Lake Marie	≤ 60	≤ 20	≥ 1

Targets:
To achieve the designated use and the applicable eutrophication criteria, MPCA selected the total phosphorus criterion (40 µg/L or 60 µg/L) as the primary target of the TMDL (Section 2.0 of the TMDL).

Clearwater River: Section 3.0 of Part II of the TMDL describes designated uses and numeric criteria applicable to this watershed.

Use Designation: The Clearwater River is classified as Class 2B waters (MN. R. 7050.0430). The designated use addressed by this TMDL is aquatic recreation for 2B waters. Class 2 waters include waters which "do or may support fish, other aquatic life, bathing, boating, or other recreational purposes..." (MN R. 7050.0150(3)).

Numeric Standards: For *E. coli*, the water quality standard (WQS) is found in MN R. 7050.0222. *E. coli*, between April 1 and October 31 shall:

- not exceed 126 organisms per 100 milliliters as a geometric mean of not less than five samples in any calendar month,
- nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies between April 1 and October 31.

The WQS was revised in 2008. Previously, the WQS was for fecal coliform. The standard was applicable between April 1 and October 31 and stated:

- Fecal coliform shall not exceed 200 organisms/100ml geometric mean of not less than five samples in any given calendar month,
- nor shall be more than 10% of all samples taken during any calendar month individually exceed 2000 organisms/100ml.

MPCA believes that the levels of protection set by the WQS for fecal coliform and *E. coli* are equally protective, and thus converted the fecal coliform data to *E. coli* by a simple proportion. MPCA believes this is appropriate given the data available, and follows the *Protocol for Developing Pathogen TMDLs* (USEPA, 2001). MPCA believes that load reductions applicable to fecal coliform will result in similar load reductions for *E. coli*.

Targets:
To achieve the designated use and the applicable criteria, MPCA selected the geometric mean portion of the *E. coli* WQS, not to exceed 126 organisms per 100 milliliters as a geometric mean of not less than five samples in any calendar month (Section 2.0 of the TMDL).

EPA finds that the TMDL submitted by MPCA satisfies all requirements of 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. 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.

Comments:
Loading Capacity:
Lakes: The loading capacity developed to meet the phosphorus criteria for the lakes is presented in Table 6 below. The loading capacity is the combination of the wasteload allocation (WLA), load allocation (LA), and margin of safety (MOS). Thus, the loading capacity is equal to the TMDL assigned for the waterbody. The WLAs are for the construction permits within each lake's watershed (Section 5 below).

Table 6. TMDLs for Total Phosphorus Expressed as Daily Loads

Lake	Total Phosphorus TMDL (lbs/day)	Wasteload Allocation (lbs/day)	Load Allocation (lbs/day)	Margin of Safety
Clear Lake	3.42	0.03	3.39	implicit
Lake Betsy	7.85	0.08	7.77	implicit
Union Lake	1.57	0.02	1.55	implicit
Scott Lake	6.94	0.07	6.87	implicit
Lake Louisa	9.01	0.09	8.92	implicit
Lake Marie	12.48	0.12	12.36	implicit

Clearwater River: The loading capacity developed to meet the *E. coli* criteria for the Clearwater River is presented in Table 7 below. The loading capacity is the combination of the wasteload

allocation (WLA), load allocation (LA), and margin of safety (MOS). Thus, the loading capacity is equal to the TMDL assigned for the waterbody.

Table 7. TMDL for *E. coli* Expressed as Daily Loads

Reach	Flow Condition	**TMDL** (10^9 org.)	WLA (10^9 org.)	Load Allocation (10^9 org.)	Margin of Safety (10^9 org.)
Clearwater River	High	329.65	0	237.9	91.75
	Wet	124.47	0	63.25	61.22
	Mid-Range	38.51	0	28.74	9.77
	Dry	12.32	0	3.10	9.21
	Low	1.54	0	0.03	1.51

Modeling summary:
Lakes: The loading capacity determinations for the six lakes are based on spreadsheet calculations for the phosphorus loads and the BATHTUB lake response model (Section 6 and Appendix B of the TMDL). Results from the spreadsheet calculations were incorporated into the BATHTUB model to determine the final loading results. For this study, MPCA used an average runoff year to calculate the current phosphorus budget (Section 6.1 of the TMDL).

Spreadsheet calculations: MPCA used spreadsheet calculations to determine the phosphorus loads based on the flow records at the Fairhaven dam and the data collection efforts from the Clearwater River Watershed District (CRWD). MPCA used literature values to determine unit area loading rates, and flow data to determine the run-off rates. Loads were then calculated based upon the water quality sampling data.

BATHTUB: After the loading rates were determined, the BATHTUB model was applied by MPCA to each lake. The BATHTUB model applies a series of empirical equations derived from assessments of lake data and performs steady state water and nutrient calculations based on lake morphometry and tributary inputs. The BATHTUB model requires fairly simple inputs to predict phosphorus loading. The model accounts for pollutant transport, sedimentation, and nutrient cycling. The Canfield-Bachmann submodel was used to estimate the lake response. The BATHTUB model was modified to account for the internal loading of phosphorus in the lakes.

Clearwater River: The loading capacities for *E. coli* for the Clearwater River were determined by MPCA using the load duration curve method (LDC) (Sections 4 and 5 of Part II of the TMDL). Bacteria concentrations were measured at water quality monitoring stations in the watershed (Appendices A and B of the TMDL). A very simplified explanation is provided below.

1. Flow data - First, flow data are required. There is one long-term flow gage on the Clearwater River, the MPCA gage located at river mile 28.2 (Section 4.3 of the TMDL). The gage collects monthly flow measurements dating back to 1981. To determine if the monthly flow measurements were an acceptable alternative to continuous flow measurements, MPCA compared the monthly flow data to continuous data gathered further downstream at the Fairhaven dam. The resulting comparison showed that while the continuous data graph was smoother, the shapes were very similar except at the lowest flows. At low flows, the continuous data

produced a more flattened curve, as more flow events were captured. As discussed in Section 6 (MOS), this in effect lowers the load at low flows, thus providing margin of safety.

2. Water Quality data - This dataset is the monitored pollutant data from 2005-2006.
3. Load Duration Curve - The plot is derived from the flow data and water quality data described above. Existing monitored water pollutant loads are compared to target loads, the water quality standard line. If the existing loads are below (less than) the target line, no reduction needs to occur. Conversely, if the existing loads are above (greater than) the target load, a reduction is necessary to reach the target.
4. Analysis - The final step is to link the geographic locations of load reductions needed to the flow conditions under which the exceedences occur. Specific flow regimes contributing to pollutant loads, can be identified to determine under what flow conditions the pollutant exceedences are occurring. By knowing the flow conditions under which exceedences are occurring, MPCA can focus implementation activities on those sources most likely to contribute loads.

Using the load duration curve approach allows MPCA to determine which implementation practices are most effective for reducing pollutant loads based on flow magnitude. For example, if loads are significant during storm events, implementation efforts can target those best management practices (BMPs) that will most effectively reduce runoff. This allows for a more efficient implementation effort. These TMDLs are concentration-based, and tie directly into Minnesota's water quality standard for the pollutants. The target for these TMDLs is the water quality standard, and therefore meeting this loading capacity should result in attainment of water quality standards. The load duration curve is a cost-effective TMDL approach, to address the reductions necessary to meet WQS for these pollutants.

Weaknesses of the TMDL analysis are that the identified sources of the pollutants were assumed based on the data collected in the watershed, rather than determined by detailed monitoring and sampling efforts, and specific source reductions were not quantified. However, EPA believes the strengths of the State's proposed TMDL approach outweigh the weaknesses and that this methodology is appropriate based upon the information available. In the event that the pollutant levels do not meet WQSs in response to implementation efforts described in the TMDL submittal, the TMDL implementation strategy may be amended as new information on the watershed is developed, to better account for contributing sources of the impairment and to determine where reductions in the Clearwater River watershed are most appropriate.

Results:
Lakes: The results of the BATHTUB model indicate that the watershed load is the significant factor for the several of the lakes (Table 6.3 of the TMDL). Reductions in phosphorus loads are relatively high for Clear Lake (85%), and close to 35% for Lake Marie. For the deep lakes, the reductions rage from 20% in Union Lake to over 80% for Lake Betsy and Scott Lake (Appendix B of the TMDL).

Clearwater River: The results of the LDC process for Clearwater River indicate that run-off from riparian livestock and applied manure are the greatest sources of bacteria in the watershed (Section 4.4.2 of Part II of the TMDL). Both wet and dry loads occur in the watershed. Reductions across the river range from 35% to 92%.

Critical conditions: MPCA determined the critical condition for these lakes is the summer growing season for an average precipitation year (Section 7.1.2 of the TMDL). Excessive nutrient problems such as algal blooms and fish kills are most prevalent in Minnesota during the summer recreational season (June through September). The numeric targets developed by MPCA focused on summer season as the critical condition. MPCA noted that the relatively short residence time indicates that these lakes respond to short-term spring/summer loads. MPCA determined the critical condition for the Clearwater River is the summer recreational season, when flows are lower and exceedences are higher (Section 5 of Part II of the TMDL).

EPA finds that the TMDL submitted by MPCA satisfies all requirements of this third element.

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.

Comments:
Lakes: LAs for the lakes are in Table 8 below. To determine the LA, MPCA calculated the load for the point sources (Section 5 below) and subtracted that from the total loading capacity as calculated in Section 3 above (Section 7.1.1 of the TMDL).

MPCA did refine the LA further. The LA was further calculated for direct watershed run-off, load from upstream lakes, failing septic systems (the Sate will be eliminating this source as discovered), atmospheric/groundwater loads, and internal loads. These calculations are based upon the BATHTUB model and the spreadsheet calculations (Section 7.1.3 of the TMDL).

Table 8 Phosphorus Load Allocations for Lakes (lb/day)

Lake	Phosphorus TMDL	Direct Watershed	Upstream Lakes	Septic Systems	Atmospheric + Groundwater	Internal
Clear Lake	3.4	2.3	0.0	0.0	1.0	0.1
Lake Betsy	7.9	4.2	2.0	0.0	0.6	1.0
Union Lake	1.6	0.9	0.0	0.0	0.5	0.2
Scott Lake	6.9	0.5	5.7	0.0	0.5	0.2
Lake Louisa	9.0	0.6	4.1	0.0	2.5	1.7
Lake Marie	12.5	1.3	7.9	0.0	2.4	0.6

Clearwater River: The LA for *E. coli* in the Clearwater River TMDL is Table 7 above. MPCA did not subdivide the LA based upon land use. However, MPCA did estimate the monthly loading of bacteria available during run-off events (Table 4.4 of Part II of the TMDL). MPCA believes this this estimate suggests that riparian livestock and surface-applied manure are the largest source of bacteria to the Clearwater River.

EPA finds that the TMDL submitted by MPCA satisfies all requirements of this fourth element.

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.

Comments:
Lakes: The WLAs are discussed in Section 4.2 and 7.1.1 of the TMDL and found in Table 6 above. The only point sources identified in the watershed are those related to the National Pollutant Discharge Elimination System (NPDES) construction general permit (MNR100001). The WLA is based upon an estimate of the ongoing construction activities in the watershed. The WLA is a gross allocation for each of the lakes.

Clearwater River: MPCA determined that no point sources contribute pathogens to the Clearwater River, so the WLA = 0.

EPA finds that the TMDL submitted by MPCA satisfies all requirements of 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)). 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:
Lakes: The TMDLs for the six lakes use an implicit MOS, based on conservative modeling assumptions (e-mail from Margret Leach, MPCA, 1/11/10). The main assumption was the use of a sedimentation rate in the Canfield-Bachman model that is lower than that expected for the lakes addressed by these TMDLs. As a result, MPCA believes that the loss of phosphorus from the water column as a result of settling is modeled at a lower rate than is found in most Minnesota lakes. This serves to remove phosphorus from the system, making it unavailable for use by algae. The model therefore overestimates the phosphorus concentration in the lake, and correspondingly overestimates the reductions needed to achieve the WQS.

Clearwater River: The MOS for the Clearwater River is shown in Table 7. The MOS is calculated for each flow regime and is the difference between the median flow and minimum flow in each of the flow zones. For example, the MOS for the high flow zone is the 95th percentile flow value subtracted from the 100th percentile flow value (the entire flow zone is from 100th percentile to the 90th). The resulting value was converted to a load and used as the MOS. This methodology, taking the difference between the median flow and minimum flow per zone, was repeated in each of the remaining four flow zones.

EPA finds that the TMDL submitted by MPCA satisfies all requirements of 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:
Seasonal variation was accounted for by MPCA in the lake TMDLs by using several years of water quality data in the models and including wet and dry years (based upon precipitation records) (Section 7.3 of the TMDL). This ensures that the loadings account for the higher loads from storm events as well as the greater impacts on the lake systems during low flow events. The implementation activities discussed by MPCA include best management practices (BMPs) that will address conditions that the modeling efforts considered the most significant in adding phosphorus loads to the lake (Sections 7.3 and 9 of the TMDL). Seasonal variation was accounted for in the *E. coli* TMDL by the use of the LDC method, which uses flow data gathered over a number of years. This assures that the effects of seasonal variations are captured and accounted for in the load calculations.

EPA finds that the TMDL submitted by MPCA satisfies all requirements of 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 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.

Comments:
Reasonable Assurance is discussed in Section 10 of the lakes TMDL, in Section 7 of Part II of the Clearwater River TMDL, and in material from the Clearwater River Watershed District (CRWD) website. A summary is provided below:

Watershed Management: The CRWD was formed in 1975 using a Joint Powers Agreement developed under Minnesota State authority. The CRWD is composed of the three counties and several cities having land in the watershed. The CRWD works with the local governments to determine capital improvements, set targets/standards for various activities, and assess funding needs. The District has developed a Watershed Management Plan that includes a Water Quality Plan, revised Capital Improvement Program, and a Cost Sharing Policy to work towards achieving the watershed goals. Funding is supplied by grants from the MPCA, Board of Water and Soil Resources, and the Minnesota Department of Natural Resources.

EPA finds that the TMDL submitted by MPCA satisfies all requirements of this eighth element.

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.

Comments:
The CRWD will evaluate progress towards meeting the TMDL goals in their Annual Report (Section 11 of the lakes TMDL; Section 8 of Part II of the Clearwater River TMDL). The

Annual Report will be used to formulate the work plan, budget, and measurable goals for the next year. Every five years, the CRWD will evaluate the implementation measures and determine if the Implementation Plan needs to be adjusted. Regular monitoring of the lakes from April-October will continue as identified in the CRWD Comprehensive Plan.

EPA finds that the TMDL submitted by MPCA satisfies all requirements of this ninth element.

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.

Comments:
The TMDL contains a section on implementation that includes an implementation framework and a summary of planned activities (Section 9 of the TMDL). The formal TMDL Implementation Plan will be developed and finalized by MPCA upon approval of the TMDLs. Development of the implementation plan will involve meeting with stakeholders and public notice of the draft plan. Based on the phosphorus loading reduction estimates provided in Section 7 of the TMDL, the final TMDL Implementation Plan will provide detailed plans for nutrient reductions. Potential activities and estimated costs identified by MPCA for controlling nutrients in the lakes are in Table 9.2 of the TMDL. For the Clearwater River TMDL, potential activities are identified in Table 9.1 of Part II of the TMDL.

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

11. Public Participation

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

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

Comments:
The Clearwater River Watershed TMDL project was administered locally through the CRWD (Section 8 of the TMDL). A technical advisory committee was established for the TMDL in order to involve interested stakeholders. The committee included MPCA technical staff, the CRWD, and the project consultant. The project initially focused on the Clearwater River, Lake Louisa and Lake Marie; the project was expanded to include the other lakes after they were listed as impaired on the 2008 303d list. Several public meetings were held from 2003—2008, to present data and information to the stakeholders and public, and to receive input.

MPCA placed the draft Clearwater River Watershed TMDLs on public notice from August 17, 2009 to September 16, 2009 to provide an opportunity for public comment. The draft TMDL was posted at: http://www.pca.state.mn.us/water/tmdl/tmdl-draft.html, the MPCA's TMDL web site. EPA sent MPCA comments on the draft TMDL, and the comments were adequately addressed in the final TMDL. Several sets of comments were received during the TMDL public notice period. Public comments were addressed appropriately by MPCA.

EPA finds that the TMDL submitted by MPCA satisfies all 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.

Comments:
On December 9, 2009, EPA received the Clearwater River Watershed TMDLs and a submittal letter dated November 23, 2009 signed by Paul Eger, Commissioner, addressed to Tinka Hyde, U.S. EPA, Region 5, Water Division. In the submittal letter, MPCA stated "I am pleased to submit the Clearwater River Total Maximum Daily Load (TMDL) for dissolved oxygen, fecal coliform and nutrient impairments to the U.S. Environmental Protection Agency (EPA) for final approval." The submittal letter included the names and locations of the waterbodies and the pollutants of concern. MPCA noted that the Clearwater River is listed as impaired for low dissolved oxygen (DO) on the 2008 303(d) list. No TMDL was submitted regarding the low DO, as the State believes the low DO is due to natural conditions (flow through a wetlands), and will be reviewing the list status of the river during the next list cycle.

EPA finds that the TMDL submitted by MPCA satisfies all requirements of this twelfth element.

13. Conclusion

After a full and complete review, EPA finds that the TMDLs for the Clearwater River, Clear Lake, Lake Betsy, Scott Lake, Lake Louisa, and Lake Marie satisfy all of the elements of an approvable TMDL. This decision document addresses 7 TMDLs for the listed waterbodies as identified on Minnesota's 2008 303(d) list (see table below).

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

Table 7. Approved TMDLs

Waterbody	ID number	Listing Year	Affected use	Pollutant or Stressor
Clear Lake	47-0095	2008	Aquatic recreation	Excess nutrients
Lake Betsy	47-0042	2008	Aquatic recreation	Excess nutrients
Union Lake	86-0298	2008	Aquatic recreation	Excess nutrients
Scott Lake	86-0297	2008	Aquatic recreation	Excess nutrients
Lake Louisa	86-0282	2002	Aquatic recreation	Excess nutrients
Lake Marie	73-0014	2008	Aquatic recreation	Excess nutrients
Clearwater River: CD 44 to Lake Betsy	07010203-549	2002	Aquatic recreation	Excess *E. coli*