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

APR - 8 2015

REPLY TO THE ATTENTION OF:
WW-16J

Rebecca Flood, Assistant Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 551555-4194

Dear Ms. Flood:

The U. S. Environmental Protection Agency has reviewed the final Total Maximum Daily Loads (TMDLs) for the impaired waterbodies in the North Fork Crow River watershed, including supporting documentation and follow up information. Minnesota submitted TMDLs for *E. coli*, total suspended solids (TSS) and total phosphorus to address the *E. coli*, turbidity and nutrient/eutrophication impairments contributing to the nonattainment of the recreational and aquatic life uses affecting the impaired waterbodies in the North Fork Crow River watershed. Based on this review, EPA has determined that Minnesota's TMDLs for *E. coli*, TSS and total phosphorus 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 forty one (41) TMDLs for the impaired waterbodies in the North Fork Crow River watershed (Table 1 of the decision document). 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,

fr Tinka G. Hyde
Director, Water Division

Enclosure

cc: Celine Lyman, MPCA
Maggie Leach, MPCA

TMDL: North Fork Crow River watershed, Minnesota
Date: 4/8/2015

DECISION DOCUMENT
NORTH FORK CROW RIVER WATERSHED
BACTERIA, TURBIDITY and NUTRIENT TMDLs

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:

Waterbody Identification Discussion:

The North Fork Crow River watershed is located in eight counties in west-central Minnesota: Wright, Meeker, Kandiyohi, Stearns, Pope, Hennepin, McLeod, and Carver (See Figure 1.1 of the final TMDL report). The North Fork Crow River watershed lies in the North Central Hardwood Forest Ecoregion, and has a watershed area of approximately 950,000 acres. The submitted TMDLs for North Fork Crow River watershed include *E. coli*, Total Suspended Solids (TSS) and Total Phosphorus (TP) TMDLs to address *E. coli*, turbidity and nutrient/eutrophication impairments contributing to the nonattainment of the recreational and aquatic life uses affecting the impaired reaches in the watershed (See Table 1 below; and Table 1.2, Table 1.3, and Figures 2.1, 3.1, 4.3, 4.5, 4.7, 4.10, 4.11, 4.13, 4.15, 4.17, 4.19, 4.21, and 4.23 of the final TMDL report).

Table 1

Assessment Unit (AU) Name	AU ID	Affected Use	Pollutant(s)	Impairment(s) Addressed by TMDL
Grove Creek: Unnamed Creek to North Fork Crow River	07010204-514	Aquatic Recreation	*E. coli* TSS	*E. coli* Turbidity
Mill Creek: Buffalo Lake to North Fork Crow River	07010204-515	Aquatic Life	TSS	Turbidity
Regal Creek: Wetland upstream of CSAH-35 in St. Michael, MN to Crow River	07010204-542	Aquatic Recreation	*E. coli*	*E. coli*
Jewitts Creek (CD 19, 18, 17): Headwaters (Lake Ripley 47-0134-00) to North Fork Crow River	07010204-585	Aquatic Recreation	*E. coli*	*E. coli*
Unnamed Creek: Unnamed ditch to Woodland WMA wetland (86-0085-00)	07010204-667	Aquatic Recreation	*E. coli*	*E. coli*
Unnamed Creek: Unnamed Creek to Unnamed Creek	07010204-668	Aquatic Life	TSS	Turbidity
Hafften (Pioneer/Sarah) Lake	27-0199-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Nest Lake	34-0154-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Hook Lake	43-0073-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Jennie Lake	47-0015-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Spring Lake	47-0032-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Big Swan Lake	47-0038-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Dunns Lake	47-0082-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Richardson Lake	47-0088-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Long Lake	47-0177-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Hope Lake	47-0183-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators

<u>Table 1</u>

Assessment Unit (AU) Name	**AU ID**	**Affected Use**	**Pollutant(s)**	**Impairment(s) Addressed by TMDL**
Foster Lake	86-0001-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Beebe Lake	86-0023-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Pelican Lake	86-0031-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Dean Lake	86-0041-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Constance Lake	86-0051-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Fountain Lake	86-0086-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Buffalo Lake	86-0090-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Little Waverly Lake	86-0106-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Deer Lake	86-0107-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Malardi Lake	86-0112-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Waverly Lake	86-0114-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Ramsey Lake	86-0120-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Light Foot Lake	86-0122-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Albert Lake	86-0127-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Rock Lake	86-0182-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Dutch Lake	86-0184-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Howard Lake	86-0199-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Granite Lake	86-0217-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Camp Lake	86-0221-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Smith Lake	86-0250-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Cokato Lake	86-0263-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Brooks Lake	86-0264-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
French Lake	86-0273-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators
Collinwood Lake	86-0293-00	Aquatic Recreation	TP	Nutrient/ Eutrophication Biological Indicators

** All the AUs/Impairments included above were listed in Minnesota's 2012 303(d) List.

The land use in The North Fork Crow River watershed is primarily composed of agriculture (corn/soybean - 35%, hay/pasture – 32%, grain and other crops – 2%), wetlands/open water (12%), forest/shrub (11%), and urban/roads (8%) (See Table 1.1 of the final TMDL report).

Pollutant(s) of Concern Discussion:

***E. coli* bacteria** are indicator organisms that are usually associated with harmful organisms transmitted by fecal matter contamination. These organisms can be found in the intestines of warm-blooded animals (humans and livestock). The presence of *E. coli* and fecal coliform bacteria in water suggests the presence of fecal matter associated bacteria, viruses, and protozoa that are pathogenic to humans when ingested. Based on bacteria sampling data collected by the Crow River Organization of Water (CROW) and the Minnesota Pollution Control Agency (MPCA) in April through September in 2003, and from the same period in 2007 through 2009 (Table 2.2 and Figure 2.1 of the final TMDL report), *E. coli* exceedances were found for both the monthly geometric mean and acute criteria (Table 2.3 and Figure 2.2 of the final TMDL report), which indicated *E. coli* impairment in the North Fork Crow River watershed.

Turbidity in water is caused by suspended sediment, organic material, dissolved salts, and stains that scatter light in the water column, making the water appear cloudy. Excess turbidity can degrade aesthetic qualities of water bodies, increase the cost of treatment for drinking water or food processing uses, and harm aquatic life. Adverse ecological impacts caused by excessive turbidity include hampering the ability of aquatic organisms to visually locate food, impaired gill function, and smothering of spawning beds and benthic organism habitat. Since turbidity is a measure of light scatter and adsorption, loads need to be developed for a surrogate parameter. **Total suspended solids (TSS)** is a measurement of the amount of sediment and organic matter suspended in water, which is used by MPCA as a turbidity surrogate to define allocations and capacities in terms of daily mass loads. The turbidity, transparency and TSS data collected by MPCA and the CROW from 2001 through 2012 (Table 3.5 of the final TMDL report) suggested than more than 10% of the turbidity, transparency and TSS samples in North Fork Crow River watershed reaches exceeded their standard or assessment threshold.

Total Phosphorus (TP) is an essential nutrient for aquatic life, but elevated concentrations of TP can lead to nuisance algal blooms that negatively impact aquatic life and recreation (swimming, boating, fishing, etc.). Excess algae increases turbidity which degrades aesthetics and causes adverse ecological impacts (see above). Algal decomposition depletes oxygen levels which stress aquatic biota (fish and macroinvertebrate species). Oxygen depletion can cause phosphorus release from bottom sediments (i.e. internal loading), which contributes to increased nutrient levels in the water column. The monitoring data collected by MPCA in June through September from 2000 through 2012, which were used to calculate the growing season averages for nutrient water quality parameters (TP, chlorophyll-*a*, and Secchi depth) (Tables 4.8, 4.9, 4.19, 4.29, 4.30, 4.39, 4.40, 4.50, 4.51, & 4.60 of the final TMDL report), indicated nutrient impairment lake conditions in the North Fork Crow River watershed.

Sources Discussion:

Point sources contributing to the impairments in North Fork Crow River watershed include: four (4) NPDES wastewater dischargers (4 Wastewater Treatment Facilities (WWTFs) (Table 2 below)); six (6) Municipal Separate Storm Sewer Systems (MS4s) (Table 3 below); construction and industrial stormwater (Table 4 below); and three (3) concentrated animal feeding operations (CAFOs) (Table 5 below).

Table 2

Facility Name	Permit #
Faribault Foods – Cokato WWTF	MN0030635
Grove City WWTF	MN0023574
Litchfield WWTF	MN0023973
Belgrade WWTF	MN0051381

Table 3

MS4	Permit #
Buffalo City MS4	MS400238
Monticello City MS4	MS400242
Otsego City MS4	MS400243
St Michael City MS4	MS400246
Litchfield City MS4	MS400253
Albertville City*	MS4 Permit Pending

* Additional municipalities that according to MPCA rules now require NPDES permits since their population exceeded 5,000 in the 2010 census.

Table 4

Stormwater Discharge Type	Permit #
General Stormwater Permit for Construction Activity	MNR100001
Industrial Stormwater Multi-Sector General Permit	MNR050000
General Permit for Construction Sand & Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities	MNG490000

Table 5

Concentrated Animal Feedlot Operations (CAFOs)	Permit #
Jennie-O Turkey Store - Buffalo Run Farm	MNG440104
Sparboe Farms Inc	MNG440447
Woodland Dairy Inc	MN0064041

Nonpoint sources contributing to the impairments in North Fork Crow River watershed include agricultural runoff (from row crops, surface applied manure, over-grazed pastures, and feedlots), non-regulated stormwater runoff, wildlife, failing/nonconforming subsurface sewage treatment systems (SSTS), and streambank erosion.

Runoff from agricultural lands (cropland, pastures and smaller feedlots) can contain significant amounts of pollutants (bacteria, sediments and nutrients). Surface applied manure spread on the land can be a source of bacteria and organic matter load. Tile-drainage lined fields and channelized ditches enable pollutants to move into surface waters. Livestock with access to stream environments can deliver bacteria loads directly to the receiving water. Soil loss from agricultural field erosion, livestock grazing, gully erosion, stormwater from impervious surfaces, and streambank erosion can be a source of sediment to surface waters.

Failing or noncompliant SSTS can be a source of bacteria load. Septic effluents can leach into groundwater, pond at the surface where they can be washed into surface waters via stormwater runoff events, or discharge directly to surface waterbodies.

The sources that contribute ***E. coli*** to the North Fork Crow River watershed were found to vary depending on hydrologic conditions (Section 2.7.5 of the final TMDL report). Livestock sources, specifically those activities associated with land application of manure, are the largest generator of bacteria in the impaired reaches of the watershed. Mobilization of bacteria in runoff from manure spreading activities, which carries recently applied manure to receiving waters, was determined to be the most significant contributor to bacteria impairments during mid, high and very high flow conditions. Over-grazed pastures near streams and waterways and failing septic systems/unsewered communities sources were determined to be the most significant contributors to bacteria impairments during low and dry flow conditions when dilution is minimal and bacteria from these sources are often delivered efficiently to the receiving water (as in the case of straight-pipe connections with septic systems and livestock defecating directly into a stream).

The sources that contribute to the **turbidity** impairments in the North Fork Crow River watershed include external sediment loading sources such as upland field and gully erosion, stormwater from construction sites and impervious surfaces, and internal sediment loading sources such as bank erosion and in-stream algal production.

The sources that contribute the **TP** loading causing the **nutrient/ eutrophication** impairments in the North Fork Crow River watershed include agricultural runoff, non-regulated stormwater runoff, groundwater, atmospheric deposition, SSTS, and internal nutrient recycling from lake bottom sediments. Table 4.4 of the final TMDL report summarizes the nutrient sources to each of the lakes.

Phosphorus internal loading in lakes refers to the phosphorus load that is released from the lake bottom sediments into the water column. This often occurs when anoxic conditions are present at the sediment-water interface (hypolimnion), predominantly due to lake stratification[1] throughout the summer growing season. Under anoxic conditions, weak iron-phosphorus bonds break, releasing phosphorus in a highly available form for algal uptake. Internal loading builds nutrients and algae to very high levels, and reduces water clarity. Overabundance of aquatic plants can limit recreation activities and invasive aquatic species such as curly-leaf pondweed can change the dynamics of internal phosphorus loading. In addition, dense fish populations, particularly carp and other rough fish present in lakes can lead to increased nutrients in the water column as they uproot aquatic macrophytes during feeding and spawning and re-suspend bottom sediments. This can lead to increased phosphorus availability from sediments and eutrophication. Historical impacts, such as WWTF effluent discharge, can also affect internal phosphorus loading.

Priority Ranking:

Minnesota's 2012 303(d) list includes a projected schedule for TMDL completions. This schedule reflects the state's priority ranking of impaired waters. MPCA identified a TMDL completion target date of 2014 for the impaired reaches addressed in the North Fork Crow River watershed TMDLs (Tables 1.2 and 1.3 of the final TMDL report).

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

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1 Lake stratification refers to the separation of lakes into three layers due to a change in the water's density caused by the temperature changes at different depths in the lake. These three layers include the Epilimnion (top of the lake), the Metalimnion or thermocline (middle layer that may change depth throughout the day), and the Hypolimnion (the bottom layer).

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:

The North Fork Crow River watershed is located in the North Central Hardwood Forest Ecoregion. The TMDL targets were chosen to accommodate Class 2 waters, which are the most protective designated beneficial use class in the project area. Class 2 waters include 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 Rules Ch. 7050.0140).

The beneficial use classifications for the impaired reaches in the North Fork Crow River watershed are included in Table 6 below, and Table 1.4 of the final TMDL report. Classification as a 2B water is intended to protect cool and warm water fisheries, while classification as a 2C water is intended to protect indigenous fish and associated aquatic communities. A 3C classification protects water for industrial use and cooling. All surface waters classified as Class 2 are also protected for industrial, agricultural, aesthetics, navigation, and other uses (Classes 3, 4, 5, and 6, respectively).

Table 6

Assessment Unit (AU)	AU ID	Beneficial Use Class
Grove Creek: Unnamed Creek to North Fork Crow River	07010204-514	2B, 3C, 4A, 4B, 5, and 6 *
Mill Creek: Buffalo Lake to North Fork Crow River	07010204-515	2B, 3C, 4A, 4B, 5, and 6 *
Regal Creek: Wetland upstream of CSAH-35 in St. Michael, MN to Crow River	07010204-542	2B, 3C, 4A, 4B, 5, and 6 *
Jewitts Creek (CD 19, 18, 17): Headwaters (Lake Ripley 47-0134-00) to North Fork Crow River	07010204-585	2C **
Unnamed Creek: Unnamed ditch to Woodland WMA wetland (86-0085-00)	07010204-667	2B, 3C, 4A, 4B, 5, and 6 *
Unnamed Creek: Unnamed Creek to Unnamed Creek	07010204-668	2B, 3C, 4A, 4B, 5, and 6 *

Table 6

Assessment Unit (AU)	AU ID	Beneficial Use Class

* Use Classification made according to Minnesota Rule 7050.0430

** Use Classification made according to Minnesota Rule 7050.0470

The impaired lakes in the North Fork Crow River watershed are not listed under Minn. R. Ch. 7050.0470 and therefore are classified as 2B, 3C, 4A, 4B, 5, and 6 beneficial use class waters according to Minn. R. Ch. 7050.0430.

E. coli TMDL Target:

The *E. coli* standard for Class 2 waters (Minn. Rules Ch. 7050.0222 Subp. 5) states that *E. coli* concentrations 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 only between April 1 and October 31."

Because a fecal coliform standard was in effect prior to the most recent rule revision in 2008 which adopted an *E. coli* standard, some of MPCA's earlier bacteria sampling was based on collecting fecal coliform data. In order to evaluate the collected fecal coliform data, MPCA determined that the fecal coliform standard of 200 cfu/100 ml is reasonably equivalent to the *E. coli* concentration standard of 126 cfu/100 ml from a public health protection standpoint. MPCA's rationale is supported by the SONAR (Statement of Need and Reasonableness) prepared for the 2007-2008 revisions of Minnesota Rule Chapter 7050. The SONAR documents MPCA's log plot analysis of the relationship between the fecal coliform and *E. coli* parameters. All fecal coliform data were converted to *E. coli* equivalents using the following regression equation outlined in the SONAR: *E. coli* concentration (equivalents) = 1.80 x (Fecal coliform concentration)$^{0.81}$.

The *E. coli* TMDL target included above is applicable to the North Fork Crow River watershed *E. coli* impaired reaches (AUs 07010204-514, 07010204-542, 07010204-585 and 07010204-667).

TSS TMDL Target:

In May, 2011, the MPCA released a technical support document which developed river/stream TSS standards for the state of Minnesota (Section 3.5 of the final TMDL report). The TSS standards were developed using a combination of biotic sensitivity to TSS concentrations and reference streams/least impacted streams. The TSS standards vary throughout the state of Minnesota based on geographic location (north, central, and southern river region) and the river/stream's beneficial use classification.

The MPCA proposed amendments to portions of Minn. R. Ch. 7050.0222 Subp. 4 to replace the turbidity standards, which were based on Nephelometric Turbidity Units (NTUs), with regionally-based TSS standards. The revised standards went when into effect on January 23, 2015. Prior to the newly developed TSS standards, the MPCA protocol suggested using the relationship between lab turbidity in NTUs and TSS to determine the TSS equivalent to the 25 NTU turbidity standard (Appendix D of the final TMDL report).

At the time of the final TMDL development, completion and submittal for the North Fork Crow River watershed, these proposed amendments to the standards had not yet been in effect. Therefore, the submitted final TMDL report for the North Fork Crow River watershed includes TMDL calculations for both the TSS-surrogate based on the previous turbidity standard and the proposed new TSS standard. Because the turbidity standard is no longer in effect, this decision document will only refer to the portions of the TMDL report associated to the new TSS standards.

All three North Fork Crow River turbidity impaired reaches covered in the final TMDL report are considered class 2B waters in Minnesota's central river region. The TSS standards for the class 2B waters in Minnesota's central river region is 30 mg/L. This standard may be exceeded for no more than ten percent of the time, and applies April 1 through September 30. The TSS TMDL target of 30 mg/L is applicable to the North Fork Crow River watershed turbidity impaired reaches (AUs 07010204-514, 07010204-515 and 07010204-668).

TP TMDL Target:

The impaired lakes in the North Fork Crow River watershed TMDLs include shallow and deep lakes as defined by MPCA. According to Minnesota Rules 7050.0150 and 7050.0222 Subp 4, the numeric eutrophication water quality standards (WQS) applicable to shallow (i.e., ≤15 feet maximum depth or ≥80% littoral area) and deep lakes and reservoirs in the North Central Hardwood Forest Ecoregion are included in Table 7 below and Table 1.5 of the final TMDL report. Lakes and reservoirs are to meet the total phosphorus (TP), the chlorophyll-a, and the Secchi disk transparency targets in order to achieve the WQS. The eutrophication standards are compared to data averaged over the summer season (June through September).

Table 7

Parameter	Shallow Lake WQS	Deep Lake WQS
Total Phosphorus	≤ 60 µg/L	≤ 40 µg/L
Chlorophyll-a	≤ 20 µg/L	≤ 14 µg/L
Secchi disk transparency	≥ 1.0 m	≥ 1.4 m

In developing the lake eutrophication standards (Minn. Rule 7050), the MPCA evaluated data from a large cross-section of lakes within each of the state's ecoregions. Clear relationships were established between the causal factor TP and the response variables chlorophyll-a and Secchi disk. Based on these relationships MPCA believes that by meeting the TP targets of 60 µg/L and 40 µg/L, the respective standards for shallow and deep lakes, the chlorophyll-a and Secchi standards will likewise be met. Therefore, in order to maintain the water quality conditions that provide full support of the designated uses for impaired lakes in the North Fork Crow River watershed, the submitted TMDLs adopted the TP criteria of 60 µg/L and 40 µg/L average concentration over the summer season (June through September) as the primary TMDL targets. EPA concurs with the State's approach to determining the TP targets upon which the TP TMDLs for impaired lakes in the North Fork Crow River watershed have been established.

The TP TMDL targets included above are applicable to the North Fork Crow River watershed nutrient/ eutrophication impaired lakes identified in Table 8 below.

Table 8

Assessment Unit (AU) Name	AU ID	Lake Type
Hafften (Pioneer/Sarah) Lake	27-0199-00	Deep
Nest Lake	34-0154-00	Deep

Table 8

Assessment Unit (AU) Name	AU ID	Lake Type
Hook Lake	43-0073-00	Shallow
Jennie Lake	47-0015-00	Shallow
Spring Lake	47-0032-00	Deep
Big Swan Lake	47-0038-00	Deep
Dunns Lake	47-0082-00	Deep
Richardson Lake	47-0088-00	Deep
Long Lake	47-0177-00	Shallow
Hope Lake	47-0183-00	Shallow
Foster Lake	86-0001-00	Shallow
Beebe Lake	86-0023-00	Deep
Pelican Lake	86-0031-00	Shallow
Dean Lake	86-0041-00	Deep
Constance Lake	86-0051-00	Deep
Fountain Lake	86-0086-00	Shallow
Buffalo Lake	86-0090-00	Deep
Little Waverly Lake	86-0106-00	Shallow
Deer Lake	86-0107-00	Deep
Malardi Lake	86-0112-00	Shallow
Waverly Lake	86-0114-00	Deep
Ramsey Lake	86-0120-00	Deep
Light Foot Lake	86-0122-00	Deep
Albert Lake	86-0127-00	Deep
Rock Lake	86-0182-00	Deep
Dutch Lake	86-0184-00	Deep
Howard Lake	86-0199-00	Deep
Granite Lake	86-0217-00	Deep
Camp Lake	86-0221-00	Deep
Smith Lake	86-0250-00	Shallow
Cokato Lake	86-0263-00	Deep
Brooks Lake	86-0264-00	Deep
French Lake	86-0273-00	Deep
Collinwood Lake	86-0293-00	Deep

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:

E. coli TMDL:

The total loading capacities, i.e. total maximum daily loads, of *E. coli* determined by MPCA for the North Fork Crow River watershed are included in Table 9 below, and Tables 2.6, 2.7, 2.8 and 2.9 of the final TMDL report.

Table 9

***E. coli* TMDL Allocations (*billions of organisms/day*)**						
Impaired AU	**Name**	Grove Creek				
	ID	07010204-514				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA	Grove City WWTF	0.6	0.6	0.6	0.6	0.6
LA		268.1	104.9	40.1	15.7	8.9
MOS		29.9	11.7	4.5	1.8	1.1
TMDL		**298.6**	**117.2**	**45.2**	**18.1**	**10.6**
Impaired AU	**Name**	Regal Creek				
	ID	07010204-542				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA	Albertville City MS4	19.2	6.7	2.0	0.7	0.4
	Buffalo City MS4	0.4	0.1	< 0.1	< 0.1	< 0.1
	Monticello City MS4	1.0	0.3	0.1	< 0.1	< 0.1
	Ostego City MS4	1.9	0.7	0.2	0.1	< 0.1
	St. Michael City MS4	150.9	52.5	15.9	5.8	3.2
LA		234.0	81.4	24.6	8.9	5.0
MOS		45.3	15.7	4.8	1.7	1.0
TMDL		**452.7**	**157.4**	**47.6**	**17.2**	**9.7**
Impaired AU	**Name**	Jewitts Creek				
	ID	07010204-585				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA	Litchfield WWTF	14.8	14.8	14.8	14.8	*
	Litchfield City MS4	28.4	10.8	3.5	0.8	*
LA		180.4	68.7	22.1	5.2	*
MOS		24.8	10.5	4.5	2.3	1.4
TMDL		**248.4**	**104.7**	**44.9**	**23.2**	**14.4**

Table 9

E. coli TMDL Allocations (*billions of organisms/day*)						
Impaired AU	**Name**	Unnamed Creek				
	ID	07010204-667				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA		0	0	0	0	0
LA		171.73	13.71	0.98	0.13	0.03
MOS		19.08	1.52	0.11	0.01	< 0.01
TMDL		**190.81**	**15.23**	**1.09**	**0.14**	**0.03**

* The WLA for the permitted wastewater discharger (Litchfield WWTF), based on the facility design flow, exceeded the dry flow regime total daily loading capacity. However, facilities typically discharge less than their design flows. Because of this, EPA's position is to consider the TMDL in the dry flow regime to be concentration based in which all allocations are predicated on meeting the water quality criteria targets for *E. coli*. The permitted discharge concentration is expected to be at the WQS. For the dry flow regime, the WLA and LA are determined by the following formula: *Allocation = (flow contribution from a given source) X (E. coli concentration limit or standard).*

The bacteria data used for the development of this TMDL were grab samples collected by CROW and the MPCA during the period of April through September from 2003 and 2007 through 2009. The locations of the monitoring stations at which samples were collected to support these TMDLs are shown in Figure 2.1 of the TMDL report. Samples were analyzed for fecal coliform prior to 2006 and more recently *E. coli*. During some sampling events, both parameters were analyzed (Table 2.2 of the final TMDL report). All data were obtained through MPCA's EQuIS/ STORET online database.

Data from the six monitoring sites in the bacteria impaired reaches of North Fork Crow River were analyzed to help determine spatial and seasonal variability of bacteria exceedances. Since the bacteria standard is now expressed as *E. coli*, all fecal coliform data was converted to *E. coli* "equivalent" values using the following regression equation: *E coli* concentration (equivalents) = 1.80 x (Fecal coliform concentration)$^{0.81}$. These data were combined with *E. coli* data collected since 2006 to develop the database for developing allocations.

Stream flow data was also used for the development of this TMDL. Three of the four impaired reaches (Grove Creek – S000-847, Jewitts Creek – S001-502 and Unnamed Creek – S001-499) have recent continuous flow data (Appendix B of the final TMDL report). These stations were operated during the 2008 through 2010 sampling season from April/March through the middle of November. There is also one long-term USGS flow monitoring station located on the Crow River near Rockford (S000-050). This station began operating in 1906 and has operated year around since the early 1990s. Regression relationships between the three stations for the impaired reaches and the Crow River USGS station show good correlation (R^2 of 0.73-0.85) and the regression equations were used to fill data gaps and predict all winter and non-monitored flows from 2003-2012. The fourth impaired reach (Regal Creek – S002-030) has instantaneous flow measurements collected during the sampling season in 2001. There was not enough data from this site to establish a good regression with the Crow River USGS site at Rockford. Instead, flow was calculated by multiplying the percent watershed coverage of the impaired reach by the total watershed area flowing to the Rockford USGS station.

The load duration curve (LDC) method was used by MPCA to develop the *E. coli* TMDLs for the North Fork Crow River watershed. The LDC method considers how stream flow conditions relate to a variety of pollutant sources (point and nonpoint sources), and can be used to make rough determinations as to what flow conditions result in exceedances of the WQS. The LDC method assimilates flow and pollutant (*E. coli)* data across stream flow regimes, and provides assimilative capacities and load reductions necessary to meet WQSs.

Flow duration curves were developed using the 10 years (2003-2012) of continuous flow records at the furthest downstream flow station in each impaired reach (Figure 2.3 of the final TMDL report). The flow duration curve relates mean daily flow to the percent of time those values have been met or exceeded. The 50% exceedance value is the midpoint or median flow value. The curve is divided into flow zones which include very high (0-10%), high (10- 40%), mid (40-60%), low (60-90%) and dry (90 to 100%) flow conditions. The flow duration curves were transformed to load duration curves by applying water quality criteria values for *E. coli* (126 cfu/100 ml) and appropriate conversion factors (Figures 2.4, 2.5, 2.6 and 2.7 of the final TMDL report). The median load of each flow zone was used to represent the total daily loading capacity (TMDL) of *E. coli* for that flow zone. Plotted values above the curve lines represent exceedances of the *E. coli* standard (red line) while those below the lines are below the *E. coli* standard. Also plotted are the geomean *E. coli* concentrations for each flow regime (blue sphere). The difference between the *E. coli* standard curve and the *E. coli* geomean values provides a general percent reduction in *E. coli* that will be needed to remove each reach from the impaired waters list.

TSS TMDLs:

The total loading capacities, i.e. total maximum daily loads, of total suspended solids (TSS) determined by MPCA for the North Fork Crow River watershed to address turbidity impairment are included in Table 10 below, and Tables 3.9, 3.11 and 3.13 of the final TMDL report.

Table 10

TSS TMDL Allocations (*tons/day*) for TSS standard (30 mg/L)						
Impaired AU	**Name**	Grove Creek				
	ID	07010204-514				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA	Grove City WWTF	0.19	0.19	0.19	0.19	*
	Industrial and Construction Stormwater	0.07	0.03	0.01	< 0.01	< 0.01
LA		4.74	1.69	0.54	0.09	*
MOS		0.17	0.10	0.05	0.03	< 0.01
TMDL		**5.17**	**2.01**	**0.79**	**0.32**	**0.18**
Impaired AU	**Name**	Milk Creek				
	ID	07010204-515				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA	Buffalo City MS4	9.54	1.81	0.36	0.06	0.02
	Industrial and Construction Stormwater	0.93	0.18	0.04	0.01	< 0.01
LA		51.45	9.74	1.94	0.35	0.13
MOS		2.91	1.39	0.20	0.06	0.01
TMDL		**64.83**	**13.12**	**2.54**	**0.48**	**0.16**
Impaired AU	**Name**	Unnamed Creek				
	ID	07010204-668				
Flow Zones		**Very High**	**High**	**Mid-Range**	**Low**	**Dry**
WLA	Industrial and Construction Stormwater	0.04	0.01	< 0.01	< 0.01	0.0
LA		2.60	0.46	0.07	0.01	0.0
MOS		0.21	0.05	< 0.01	< 0.01	0.0
TMDL		**2.85**	**0.52**	**0.07**	**0.01**	**0.0**

Table 10

TSS TMDL Allocations (*tons/day*) for TSS standard (30 mg/L)

* The WLA for the permitted wastewater discharger (Grove City WWTF), based on the facility design flow, exceeded the dry flow regime total daily loading capacity. However, facilities typically discharge less than their design flows. Because of this, EPA's position is to consider the TMDL in the dry flow regime to be concentration based in which all allocations are predicated on meeting the water quality criteria targets for TSS. The permitted discharge concentration is expected to be at the WQS. For the dry flow regime, the WLA and LA are determined by the following formula: *Allocation = (flow contribution from a given source) X (TSS concentration limit or standard).*

Three types of data were collected to assess turbidity in surface waters: turbidity, transparency and TSS. The CROW and MPCA collected turbidity, T-tube and TSS data at thirteen monitoring stations in the Grove Creek impaired reach, three stations in the Mill Creek impaired reach, and one station in the Unnamed Creek impaired reach (Table 3.3 of the final TMDL report). The turbidity, transparency and TSS data collected from 2001 through 2012 suggested more than 10% of samples in each reach exceeded their standard or assessment threshold (Table 3.5 of the final TMDL report).

Stream flow data were also used for the development of the TMDLs. Flow data were used to develop flow regimes so that turbidity exceedances could be characterized based on whether they occurred most often during high, medium, or low flow events. There is one historic flow monitoring station located in each turbidity impaired reach (Table 3.4 of the final TMDL report). While turbidity, transparency and TSS samples were collected in each impaired reach over multiple years, the flow data was only available for three years at each site. The Rockford USGS station (S000-050), located on the North Fork Crow River, has the longest and most complete flow record in the Crow River watershed (Figure 3.1 of the final TMDL report). Flow regression relationships between these stations were used to fill data gaps and create a continuous 10-year flow record for each impaired reach (Appendix B of the final TMDL report).

At the time of the final TMDL development, completion and submittal for the North Fork Crow River watershed, the MPCA proposed amendments to replace the turbidity standards with newly develop TSS standards had not yet been in effect. Therefore, the submitted final TMDL report for the North Fork Crow River watershed includes TMDL calculations for both the TSS-surrogate based on the previous turbidity standard and the proposed new TSS standard. Because the turbidity standard is no longer in effect, this decision document will only refer to the portions of the TMDL report associated to the new TSS standards.

The load duration curve (LDC) method was used by MPCA to develop the turbidity (TSS standard) TMDLs for the North Fork Crow River watershed. The LDC method assimilated flow and TSS data across stream flow regimes and provided assimilative capacities from which reductions can be derived by comparing to measured loads.

Flow duration curves were developed using the flow data discussed above (Figure 3.3 of the final TMDL report). The flow duration curves were transformed to load duration curves by multiplying all average daily flow values by the TSS standard (30 mg/L) to be converted to daily loads (Figures 3.4, 3.5 and 3.6 of the final TMDL report). The median load of each flow zone was used to represent the total daily loading capacity (TMDL) of the TSS standard for that flow zone. Plotted values above the curve lines represent exceedances of the TSS standard (dashed red line) while those below the lines are below the TSS water quality standard. Also plotted are the 90th percentile TSS monitored concentrations for each flow regime (blue circle). The difference between the TSS standard curve and the 90th percentile values provides a general percent reduction in TSS that will be needed to remove each reach from the impaired waters list.

Total Phosphorus (TP) TMDLs:

The total loading capacities, i.e. total maximum daily loads, of TP determined by MPCA for the North Fork Crow River watershed to address the nutrient/eutrophication impairments are included in Table 11 below, and Tables 4.12, 4.13, 4.14, 4.15, 4.16, 4.22, 4.23, 4.24, 4.25, 4.26, 4.33, 4.34, 4.35, 4.36, 4.43, 4.44, 4.45, 4.46, 4.47, 4.54, 4.55, 4.56, 4.63, 4.64, 4.65, 4.66, 4.67, 4.68, 4.69, 4.70, 4.71, 4.72, 4.73, and 4.74 of the final TMDL report.

Table 11

AU Name/ ID	Allocation - Source Type		Total Phosphorus (TP) TMDL					
			Existing Load		Load Allocations		Load Reduction	
			(lbs/year)	(lbs/day)	(lbs/year)	(lbs/day)	(lbs/year)	%
Hook Lake (43-0073-00)	WLA	Industrial & Construction Stormwater	3	0.01	3	0.01	0	0
	LA	Drainage Areas	338	0.9	298	0.8	41	12
		SSTS	69	0.2	0	0	69	100
		Atmospheric Deposition	73	0.2	73	0.2	0	0
		Internal Load	1,750	4.8	339	0.9	1,411	81
	MOS				38	0.1		
	Total		2,233	6.11	**751**	**2.01**	1,521	66
Jennie Lake (47-0015-00)	WLA	Industrial & Construction Stormwater	14	0.04	14	0.04	0	0
	LA	Drainage Areas	1,402	3.8	1,271	3.5	131	9
		SSTS	245	0.7	0	0	245	100
		Upstream Lakes	193	0.5	96	0.3	98	50
		Atmospheric Deposition	254	0.7	254	0.7	0	0
		Internal Load	851	2.3	851	2.3	0	0
	MOS				131	0.4		
	Total		2,959	8.04	**2,617**	**7.24**	474	12
Collinwood Lake (86-0293-00)	WLA	Industrial & Construction Stormwater	47	0.1	47	0.1	0	0
	LA	Drainage Areas	4,702	12.9	1,531	4.2	3,171	67
		SSTS	663	1.8	0	0	663	100
		Upstream Lakes	478	1.3	478	1.3	0	0
		Atmospheric Deposition	152	0.4	152	0.4	0	0
		Internal Load	2,837	7.8	147	0.4	2,690	95
	MOS				124	0.3		
	Total		8,879	24.3	**2,479**	**6.7**	6,524	72
Spring Lake (47-0032-00)	WLA	Industrial & Construction Stormwater	0.9	0.002	0.9	0.002	0	0
	LA	Drainage Areas	87	0.2	62	0.2	26	29
		SSTS	126	0.3	0	0	126	100
		Upstream Lakes	38	0.1	38	0.1	0	0
		Atmospheric Deposition	52	0.1	52	0.1	0	0
		Internal Load	474	1.3	166	0.5	308	65
	MOS				17	0.05		
	Total		777.9	2.002	**335.9**	**0.952**	460	57

Table 11

AU Name/ ID	Allocation - Source Type		Total Phosphorus (TP) TMDL					
			Existing Load		Load Allocations		Load Reduction	
			(lbs/year)	(lbs/day)	(lbs/year)	(lbs/day)	(lbs/year)	%
Big Swan Lake (47-0038-00)	WLA	Industrial & Construction Stormwater	38	0.1	38	0.1	0	0
	LA	Drainage Areas	3,750	10.3	1,194	3.3	2,556	68
		SSTS	306	0.8	0	0	306	100
		Upstream Lakes	2,526	6.9	1,059	2.9	0	0
		Atmospheric Deposition	166	0.5	166	0.5	0	0
		Internal Load	436	1.2	58	0.2	378	87
	MOS				132	0.4		
	Total		7,222	19.8	**2,647**	**7.4**	4,706	63
Ramsey Lake (86-0120-00)	WLA	Industrial & Construction Stormwater	12	0.03	12	0.03	0	0
	LA	Drainage Areas	1,142	3.1	756	2.1	386	34
		SSTS	503	1.4	0	0	503	100
		Upstream Lakes	72	0..2	72	0.2	0	0
		Atmospheric Deposition	74	0.2	74	0.2	0	0
		Internal Load	351	1	180	0.5	171	49
	MOS				58	0.2		
	Total		2,154	5.93	**1,152**	**3.23**	1,060	47
Albert Lake (86-0127-00)	WLA	Industrial & Construction Stormwater	1	0.002	1	0.002	0	0
	LA	Drainage Areas	77	0.2	32	0.1	45	58
		SSTS	24	0.1	0	0	24	100
		Atmospheric Deposition	14	0.04	14	0.04	0	0
		Internal Load	434	1.2	22	0.1	412	95
	MOS				4	0.01		
	Total		550	1.542	**73**	**0.252**	481	87
Light Foot Lake (86-0122-00)	WLA	Industrial & Construction Stormwater	27	0.1	27	0.1	0	0
	LA	Drainage Areas	2,651	7.3	411	1.1	2,240	84
		SSTS	679	1.9	0	0	679	100
		Upstream Lakes	259	0.7	171	0.5	88	34
		Atmospheric Deposition	15	0.01	15	0.01	0	0
		Internal Load	578	16	21	0.1	557	96
	MOS				33	0.1		
	Total		4,209	11.61	**678**	**1.91**	3,564	84
Buffalo Lake (86-0090-00)	WLA	Industrial & Construction Stormwater	19	0.1	19	0.1	0	0
		Buffalo City MS4	483	1.3	274	0.7	209	43
	LA	Drainage Areas	1,390	3.8	779	2.1	611	44
		SSTS	613	1.7	0	0	613	100
		Upstream Lakes	4,421	12.1	1,445	4	2,976	67
		Atmospheric Deposition	371	1	371	1	0	0
		Internal Load	3,732	10.2	643	1.8	3,090	83
	MOS				186	0.5		
	Total		11,029	30.2	**3,717**	**10.2**	7,499	66

Table 11

AU Name/ ID	Allocation - Source Type		Total Phosphorus (TP) TMDL					
			Existing Load		Load Allocations		Load Reduction	
			(lbs/year)	(lbs/day)	(lbs/year)	(lbs/day)	(lbs/year)	%
Deer Lake (86-0107-00)	WLA	Industrial & Construction Stormwater	1.6	0.004	1.6	0.004	0	0
	LA	Drainage Areas	153	0.4	143	0.4	11	7
		SSTS	80	0.2	0	0	80	100
		Upstream Lakes	3,911	10.7	1,793	4.9	2,118	54
		Atmospheric Deposition	39	0.1	39	0.1	0	0
		Internal Load	1,011	2.8	220	0.6	791	78
	MOS				116	0.3		
	Total		5,195.6	14.204	**2,312.6**	**6.304**	3,000	55
Howard Lake (86-0199-00)	WLA	Industrial & Construction Stormwater	13	0.03	13	0.03	0	0
	LA	Drainage Areas	1,262	3.5	676	1.9	586	46
		SSTS	166	0.5	0	0	166	100
		Atmospheric Deposition	176	0.5	176	0.5	0	0
		Internal Load	3,358	9.2	622	1.7	2,736	81
	MOS				31	0.1		
	Total		4,975	13.73	**1,518**	**4.23**	3,488	69
Dutch Lake (86-0184-00)	WLA	Industrial & Construction Stormwater	7	0.02	7	0.02	0	0
	LA	Drainage Areas	719	2	75	0.2	644	90
		Upstream Lakes	166	0.5	90	0.2	76	46
		SSTS	16	0.04	0	0	16	100
		Atmospheric Deposition	39	0.1	39	0.1	0	0
		Internal Load	1,234	3.4	48	0.1	1,187	96
	MOS				14	0.4		
	Total		2181	6.06	**273**	**0.66**	1,923	87
Waverly Lake (86-0114-00)	WLA	Industrial & Construction Stormwater	5	0.01	5	0.01	0	0
	LA	Drainage Areas	513	1.4	444	1.2	64	13
		Upstream Lakes	204	0.6	123	0.3	82	40
		SSTS	39	0.1	0	0	39	100
		Atmospheric Deposition	116	0.3	116	0.3	0	0
		Internal Load	534	1.5	534	1.5	0	0
	MOS				64	0.2		
	Total		1,411	3.91	**1,286**	**3.51**	185	9
Little Waverly Lake (86-0106-00)	WLA	Industrial & Construction Stormwater	33	0.1	33	0.1	0	0
	LA	Drainage Areas	3,245	9	420	1.1	2,825	86
		Upstream Lakes	3,484	9.5	1,478	4	2,006	58
		SSTS	252	0.7	0	0	252	100
		Atmospheric Deposition	79	0.2	79	0.2	0	0
		Internal Load	7,903	21.6	120	0.3	7,784	98
	MOS				112	0.3		
	Total		14,996	41	**2,242**	**6**	12,867	85

Table 11

AU Name/ ID	Allocation - Source Type		Total Phosphorus (TP) TMDL					
			Existing Load		Load Allocations		Load Reduction	
			(lbs/year)	(lbs/day)	(lbs/year)	(lbs/day)	(lbs/year)	%
Richardson Lake (47-0088-00)	WLA	Industrial & Construction Stormwater	12	0.03	12	0.03	0	0
	LA	Drainage Areas	1,180	3.2	452	1.2	728	62
		SSTS	84	0.2	0	0	84	100
		Atmospheric Deposition	26	0.1	26	0.1	0	0
		Internal Load	61	0.2	61	0.2	0	0
	MOS				29	0.1		
	Total		1,363	3.73	**580**	**1.63**	812	57
Dunns Lake (47-0082-00)	WLA	Industrial & Construction Stormwater	0.3	0.001	0.3	0.001	0	0
	LA	Drainage Areas	25	0.1	17	0.1	8	33
		SSTS	282	0.8	0	0	282	100
		Upstream Lakes	354	1	113	0.3	241	68
		Atmospheric Deposition	34	0.1	34	0.1	0	0
		Internal Load	581	1.6	157	0.4	423	73
	MOS				17	0.05		
	Total		1,276.3	3.601	**338.3**	**0.951**	954	73
Long Lake (47-0177-00)	WLA	Industrial & Construction Stormwater	152	0.4	152	0.4	0	0
	LA	Drainage Areas	15,029	41.1	1,936	5.3	13,093	86
		SSTS	354	1	0	0	354	100
		Upstream Lakes	1,546	4.2	361	1	1,185	77
		Atmospheric Deposition	184	0.5	184	0.5	0	0
		Internal Load	11,886	32.5	276	0.8	11,610	98
	MOS				153	0.4		
	Total		29,151	79.1	**3,062**	**8.4**	26,242	89
Hope Lake (47-0183-00)	WLA	Industrial & Construction Stormwater	165	0.5	165	0.5	0	0
	LA	Drainage Areas	1,483	4.1	250	0.7	1,233	83
		SSTS	61	0.2	0	0	61	100
		Atmospheric Deposition	60	0.2	60	0.2	0	0
		Internal Load	2,587	7.1	147	0.4	2,440	94
	MOS				33	0.1		
	Total		4,356	13.2	**655**	**1.9**	3,734	85
Nest Lake (34-0154-00)	WLA	Industrial & Construction Stormwater	14	0.04	14	0.04	0	0
		Belgrade WWTF	1,017	2.8	1,017	2.8	0	0
	LA	Drainage Areas	1,430	3.9	1,1280	3.5	150	10
		SSTS	368	1	0	0	368	0
		Upstream Lakes	2,389	6.5	2,389	6.5	0	0
		Atmospheric Deposition	241	0.7	241	0.7	0	0
		Internal Load	1,444	4	747	2	697	48
	MOS				299	0.8		
	Total		6,903	18.94	**5,987**	**16.34**	1,215	13

Table 11

AU Name/ ID	Allocation - Source Type		Total Phosphorus (TP) TMDL					
			Existing Load		Load Allocations		Load Reduction	
			(lbs/year)	(lbs/day)	(lbs/year)	(lbs/day)	(lbs/year)	%
Brooks Lake (86-0264-00)	WLA	Industrial & Construction Stormwater	0.2	0.001	0.2	0.001	0	0
	LA	Drainage Areas	18	0.05	7	0.02	11	61
		SSTS	20	0.1	0	0	20	100
		Atmospheric Deposition	21	0.1	21	0.1	0	0
		Internal Load	177	0.5	69	0.2	108	61
	MOS				5	0.01		
	Total		236.2	0.751	**102.2**	**0.331**	139	57
Smith Lake (86-0250-00)	WLA	Industrial & Construction Stormwater	3	0.01	3	0.01	0	0
	LA	Drainage Areas	261	0.7	87	0.2	174	67
		SSTS	18	0.1	0	0	18	100
		Atmospheric Deposition	50	0.1	50	0.1	0	0
		Internal Load	1,764	4.8	133	0.4	1,631	92
	MOS				14	0.04		
	Total		2,096	5.71	**287**	**0.75**	1,823	86
Cokato Lake (86-0263-00)	WLA	Industrial & Construction Stormwater	46	0.1	46	0.1	0	0
		Fairbault Food	884	2.4	794	2.2	90	10
	LA	Drainage Areas	4,149	11.4	2,800	7.7	1,348	32
		SSTS	799	2.2	0	0	799	100
		Upstream Lakes	97	0.3	30	0.1	66	69
		Atmospheric Deposition	130	0.4	130	0.4	0	0
		Internal Load	77	0.2	77	0.2	0	0
	MOS				204	0.6		
	Total		6,182	17	**4,081**	**11.3**	2,303	34
Constance Lake (86-0051-00)	WLA	Industrial & Construction Stormwater	0.9	0.003	0.9	0.003	0	0
		Buffalo City MS4	0.5	0.001	0.34	0.001	0.1	29
	LA	Drainage Areas	93	0.3	54.3	0.1	39	42
		SSTS	86	0.2	0	0	86	100
		Atmospheric Deposition	39	0.1	39	0.1	0	0
		Internal Load	703	1.9	125	0.3	578	82
	MOS				11	0.03		
	Total		922.4	2.504	**230.54**	**0.534**	703.1	75
Pelican Lake (86-031-00)	WLA	Industrial & Construction Stormwater	29	0.08	29	0.08	0	0
		Monticello City MS4	9.8	0.03	4.6	0.01	5	53
		Michael City MS4	505	1.4	237	0.7	257	53
		Buffalo City MS4	3	0.01	1	<0.01	2	53
	LA	Drainage Areas	2,399	8	1,129	3.8	1,270	53
		SSTS	1,170	3.2	0	0	1,170	100
		Upstream Lakes	104	0.3	69	0.2	36	34
		Atmospheric Deposition	827	2.3	827	2.3	0	0
		Internal Load	15,016	41	2,678	7	12,338	82
	MOS				260	0.7		
	Total		20,062.7	56.32	**5,235**	**14.79**	15,088	74

Table 11

AU Name/ ID	Allocation - Source Type		Total Phosphorus (TP) TMDL					
			Existing Load		Load Allocations		Load Reduction	
			(lbs/year)	(lbs/day)	(lbs/year)	(lbs/day)	(lbs/year)	%
Beebe Lake (86-023-00)	WLA	Industrial & Construction Stormwater	2	0.005	2	0.005	0	0
		Michael City MS4	180	0.5	78	0.2	103	57
	LA	SSTS	80	0.2	0	0	80	100
		Atmospheric Deposition	66	0.2	66	0.2	0	0
		Internal Load	400	1.1	214	0.6	186	46
	MOS				19	0.1		
	Total		728	2.005	**379**	**1.105**	369	48
Hafften Lake (27-0199-00)	WLA	Industrial & Construction Stormwater	0.2	0.001	0.2	0.001	0	0
	LA	Drainage Areas	17	0.05	12	0.03	4	25
		SSTS	3	0	0	0	3	100
		Upstream Lakes	101	0.3	101	0.3	0	0
		Atmospheric Deposition	10	0	10	0	0	0
		Internal Load	125	0.3	38	0.1	87	70
	MOS				9	0.02		
	Total		256.2	0.651	**170.2**	**0.451**	94	34
Granite Lake (86-0217-00)	WLA	Industrial & Construction Stormwater	4	0.01	4	0.01	0	0
	LA	Drainage Areas	414	1.1	357	1	57	14
		SSTS	85	0.2	0	0	85	100
		Atmospheric Deposition	78	0.2	78	0.2	0	0
		Internal Load	920	2.5	296	0.8	624	68
	MOS				15	0.04		
	Total		1,501	4.01	**750**	**2.05**	766	50
French Lake (86-0273-00)	WLA	Industrial & Construction Stormwater	7	0.02	7	0.02	0	0
	LA	Drainage Areas	720	2	674	1.8	46	6
		SSTS	142	0.4	0	0	142	100
		Atmospheric Deposition	83	0.2	83	0.2	0	0
		Internal Load	105	0.3	105	0.3	0	0
	MOS				46	0.1		
	Total		1,057	2.92	**915**	**2.42**	188	13
Camp Lake (86-0221-00)	WLA	Industrial & Construction Stormwater	3	0.01	3	0.01	0	0
	LA	Drainage Areas	336	0.9	128	0.3	209	62
		SSTS	16	0	0	0	16	100
		Atmospheric Deposition	26	0.1	26	0.1	0	0
		Internal Load	1,030	2.8	248	0.7	781	76
	MOS				12	0.03		
	Total		1,411	3.81	**417**	**1.14**	1,006	70

Table 11

AU Name/ ID	Allocation - Source Type		Total Phosphorus (TP) TMDL					
			Existing Load		Load Allocations		Load Reduction	
			(lbs/year)	(lbs/day)	(lbs/year)	(lbs/day)	(lbs/year)	%
Rock Lake (86-0182-00)	WLA	Industrial & Construction Stormwater	1	0.002	1	0.002	0	0
	LA	Drainage Areas	81	0.2	66	0.2	16	19
		SSTS	93	0.3	0	0	93	100
		Atmospheric Deposition	41	0.1	41	0.1	0	0
		Internal Load	253	0.7	148	0.4	105	41
	MOS				7	0.03		
	Total		469	1.302	**263**	**0.732**	214	44
Dean Lake (86-0041-00)	WLA	Industrial & Construction Stormwater	8	0.02	8	0.02	0	0
	LA	Drainage Areas	773	2.1	75	0.2	698	90
		SSTS	146	0.4	0	0	146	100
		Atmospheric Deposition	42	0.1	42	0.1	0	0
		Internal Load	1,083	3	47	0.1	1,036	96
	MOS				9	0.02		
	Total		2,052	5.62	**181**	**0.44**	1,880	91
Fountain Lake (86-0086-00)	WLA	Industrial & Construction Stormwater	18	0.1	18	0.1	0	0
	LA	Drainage Areas	1,820	5	130	0.4	1,690	93
		SSTS	86	0.2	0	0	86	100
		Atmospheric Deposition	102	0.3	102	0.3	0	0
		Internal Load	2,769	7.6	362	1	2,407	87
	MOS				32	0.1		
	Total		4,795	13.2	**644**	**1.9**	4,183	87
Foster Lake (86-0001-00)	WLA	Industrial & Construction Stormwater	8.5	0.02	8.5	0.02	0	0
		Otsego City MS4	547	1.5	143	0.4	404	74
		St. Michael City MS4	294	0.8	77	0.2	217	74
	LA	SSTS	1	0	0	0	1	100
		Atmospheric Deposition	27	0.1	27	0.1	0	0
		Internal Load	2,312	6.3	135	0.4	2,177	94
	MOS				20	0.1		
	Total		3,189.5	8.72	**410.5**	**1.22**	2,799	88
Malardi Lake (86-0112-00)	WLA	Industrial & Construction Stormwater	2.7	0.01	2.7	0.01	0	0
	LA	Drainage Areas	263	0.7	53	0.1	210	80
		SSTS	176	0.5	0	0	176	100
		Atmospheric Deposition	26	0.1	26	0.1	0	0
		Internal Load	2,138	5.9	43	0.1	2,095	98
	MOS				7	0.02		
	Total		2,605.7	7.21	**131.7**	**0.3**	2481	95

Modeling for TP TMDLs

The following two modeling applications were used to develop the nutrient TMDLs for the North Fork Crow River watershed impaired lakes: Hydrologic Simulation Program Fortran (HSPF) and BATHTUB (Sections 4.2.2.1 and 4.2.3 of the final TMDL report). An HSPF model was developed by the MPCA to calculate the nutrient loading for each of the impaired lakes. The calculated nutrient loading for each lake was inputted into the BATHTUB models that were used to establish the lake response to nutrient loading. In the cases where watershed water quality data were available and were significantly different from model results, these data were used rather than model outputs. In all other cases, HSPF model output was used to estimate watershed loading.

HSPF is a continuous simulation watershed model that can handle long-term simulations for a wide variety of water quality constituents, including nutrients, and associated water quality processes from various sources and land uses. The HSPF model uses loading rates based on hydrozones and not individual lakesheds, meaning that some resolution is lost for each of the individual lakes. For example, the same land use loading rates are used for all of the lakes in the Big Swan Lake chain even though there are large differences in animal units among the lakesheds. These differences were assessed in the TP TMDLs where data were available.

BATHTUB is a series of empirical eutrophication models that predict the response to phosphorus inputs for morphologically complex lakes and reservoirs. Several models (subroutines) are available for use within the BATHTUB model, and the Canfield-Bachmann model was used to predict the lake response to total phosphorus loads. The Canfield-Bachmann model estimates the lake phosphorus sedimentation rate, which is needed to predict the relationship between in-lake phosphorus concentrations and phosphorus load inputs. The phosphorus sedimentation rate is an estimate of net phosphorus loss from the water column through sedimentation to the lake bottom, and is used in concert with lake-specific characteristics such as annual phosphorus loading, mean depth, and hydraulic flushing rate to predict inlake phosphorus concentrations. These model predictions are compared to measured data to evaluate how well the model describes the lake system. Once a model is well calibrated, the resulting relationship between phosphorus load and in-lake water quality is used to determine the assimilative capacity.

To set the TMDL for each impaired lake in the study, the nutrient inputs partitioned between sources in the lake response model were then systematically reduced until the model predicted that each lake met the current total phosphorus standard of 60 µg/L as a growing season mean for shallow lakes and 40 µg/L for deep lakes. Lake response model results are included in <u>Appendix E</u> of the final TMDL report.

EPA has reviewed the information provided by MPCA and agrees that the HSPF and BATHTUB models used for the TMDL calculations have been appropriately calibrated and validated, and reasonably represent watershed processes. Model selection and development are consistent with EPA guidance[2], and the State has submitted sufficient documentation in the final TMDL Report to demonstrate that the model is capable of being a reasonable predictor of conditions in the watershed.

<u>*Critical Conditions for E. coli TMDLs*</u>:

The critical conditions for the *E. coli* TMDLs in the North Fork Crow River watershed are summer - fall flow related conditions. Data analysis showed that *E. coli* WQS exceedences mainly occur during summer and fall months under all flow regimes, indicating that the *E. coli* impairment is due to a variety of sources and conditions. High flows can deliver great amounts of pollutants into the streams in runoff conditions. Low flows can concentrate pollutants because the stream's assimilative capacity

[2] Protocol for Developing Nutrient TMDLs, 1999; and Compendium of Tools for Watershed Assessment and TMDL Development, 1997

is being exceeded and the potential for dilution is the lowest. During wet conditions, surface applied manure, over-grazed pastures, and feedlots without runoff controls were found to be the largest source contributors. During dry conditions, over-grazed riparian pasture and failing septic systems were determined to be the largest sources of bacteria.

The North Fork Crow River watershed TMDLs accounted for the critical conditions by using the load duration curve approach to develop the *E. coli* TMDLs. The load duration curve approach directly accounts for flow and allows for the evaluation of the flow zones for which the largest load reductions are needed.

Critical Conditions for TSS TMDLs:

The critical conditions for the TSS TMDLs in the North Fork Crow River watershed are flow related conditions. The data showed TSS exceedances were recorded across various flow regimes, indicating that the impairment is due to a variety of sources and conditions. High flows can deliver great amounts of pollutants into the streams in runoff conditions. Low flows can concentrate pollutants because the stream's assimilative capacity is being exceeded and the potential for dilution is the lowest. During high flows, soil loss from upland field and streambank erosion were found to be the primary contributing sources to the turbidity impairments. During low flow conditions algal turbidity was found to be the primary contributing source to the turbidity impairments.

The North Fork Crow River watershed TMDLs accounted for the critical conditions by using the load duration curve approach to develop the TSS TMDLs. The load duration curve approach directly accounts for flow and allows for the evaluation of the flow zones for which the largest load reductions are needed.

Critical Conditions for TP TMDLs:

The critical conditions for the nutrient/eutrophication impairments in the North Fork Crow River watershed correspond to the summer growing season (June through September), when the symptoms of nutrient enrichment normally are the most severe. Surface runoff contains nutrients which are transported into the lake during summer rain events. Nutrients can also be internally loaded to the lake, resulting from aquatic plant senescence or direct sediment release from hypolimnetic water during summer mixing events.

The North Fork Crow River watershed TP TMDLs accounted for the critical conditions because they were calculated using lake response models which focused on the mean total phosphorus, chlorophyll-a concentrations and Secchi transparency during the summer growing season.

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:

E. coli LAs:

The load allocations (LAs) of *E. coli* determined by MPCA for the North Fork Crow River watershed are included in Table 9 above, and Tables 2.6, 2.7, 2.8 and 2.9 of the final TMDL report. The existing nonpoint sources contributing to the *E. coli* LA include agricultural runoff (from surface application of manure, over-grazed pastures, cattle access to streams, and feedlots), non-regulated stormwater runoff, wildlife, and failing/nonconforming subsurface sewage treatment systems (SSTS) (Sections 2.7.4.1, 2.7.4.2, 2.7.4.3, 2.7.4.4, and 2.7.4.5 of the final TMDL report).

TSS LAs:

The load allocations (LAs) of TSS determined by MPCA for the North Fork Crow River watershed to address turbidity impairment are included in Tables 10 above, and Tables 3.9, 3.11 and 3.13 of the final TMDL report. The existing nonpoint sources contributing to the TSS LA include sediment load from upland field, streambank and gully erosion, and turbidity from in-stream algal production (Sections 3.9.2, 3.9.3, and 3.9.4 of the final TMDL report).

TP LAs:

The load allocations (LAs) of TP determined by MPCA for the North Fork Crow River watershed to address the nutrient/eutrophication impairments are included in Table 11 above, and Tables 4.12, 4.13, 4.14, 4.15, 4.16, 4.22, 4.23, 4.24, 4.25, 4.26, 4.33, 4.34, 4.35, 4.36, 4.43, 4.44, 4.45, 4.46, 4.47, 4.54, 4.55, 4.56, 4.63, 4.64, 4.65, 4.66, 4.67, 4.68, 4.69, 4.70, 4.71, 4.72, 4.73, and 4.74 of the final TMDL report. The existing nonpoint sources contributing to the TP LA include agricultural runoff, non-regulated stormwater runoff, groundwater, atmospheric deposition, SSTS, and internal nutrient recycling from the lake bottom sediments.

TP Direct Watershed Runoff Loading

Watershed loads for each of the lakes were estimated from the HSPF and BATHTUB models developed by MPCA. In the cases where watershed water quality data were available and were significantly different from model results, these data were used rather than model outputs. In all other cases, model output was used to estimate watershed loading.

TP Loading from Subsurface Sewage Treatment Systems (SSTS)

Phosphorus loading attributed to failing SSTS contribution was calculated using data provided in the 2004 MPCA report (Section 4.2.2.2 of final TMDL report). The number of SSTSs contributing to each stream/lake was developed by applying equal distribution of septic systems across each county based on the SSTS numbers provided in the 2004 MPCA report. For counties with no SSTS estimates in the 2004 report, septics were estimated by calculating rural population in GIS using 2010 Census population data. Rural population that falls outside the boundaries of municipalities with wastewater treatment facilities was calculated and divided by 3 people per household to estimate the total number of SSTS for each lake watershed. Loading from all failing SSTSs was assumed to contribute a constant per person flow of 50 gallons/day and nitrogen, phosphorus and CBOD pollutant concentrations of 53 mg/L, 10 mg/L and 175 mg/L, respectively. County failure rates from the 2004 MPCA report are presented in Table 4.3 of the final TMDL report.

TP Loading from Upstream Waters

Upstream lake outflow loads were routed directly into the downstream lake and were estimated using monitored lake water quality.

TP Loading from Atmospheric deposition

Atmospheric deposition loading represents the phosphorus that is bound to particulates in the atmosphere and is deposited directly onto surface waters as the particulates settle out of the atmosphere. An annual atmospheric deposition rate of 26.8 kg/km^2 for average precipitation years, which was based on a 2004 study conducted for the MPCA that estimated the atmospheric inputs of phosphorus from deposition for different regions of Minnesota, was used to calculate annual atmospheric deposition load for these lakes (Section 4.2.2.4 of the final TMDL report).

TP Internal loading

Internal loading represents the phosphorus that is released from organic bottom sediments to the water column. For deep lakes, temperature and dissolved oxygen (DO) profiles were used to determine the volume of lake water under anoxic conditions throughout the summer growing season. This volume was then used to calculate an anoxic factor normalized over the lake basin and reported as number of days. For deep lakes where temperature and DO data have not been collected, a regression equation relating measured anoxic factors and lake morphometry was used to predict the anoxic factor:

$$AF_{deep} = -0.11\ (F/Z_{max}) + 48.49$$

Where F is fetch (ft) and Z_{max} (ft) is the maximum depth of the lake. This relationship ($R^2 = 0.61$) was developed by Wenck Associates using calculated anoxic factors for 13 deep lakes in the North Fork Crow watershed with good temperature and oxygen profile data.

For shallow lakes which can often demonstrate short periods of anoxia due to instability of stratification that can last a few days or even a few hours that are often missed by periodic field measurements, a different equation was used to estimate the anoxic factor:

$$AF_{shallow} = -35.4 + 44.2 \log (TP) + 0.95\ z/A^{0.5}$$

Where TP is the average summer phosphorus concentration of the lake, z is the mean depth (m) and A is the lake surface area (km^2).

In order to calculate total internal load for a lake, the anoxic factor (days) is multiplied by an estimated or measured phosphorus release rate ($mg/m^2/day$) (Section 4.2.2.5 of the final TMDL report). Release rates can be obtained by collecting sediment cores in the field and incubating them in the lab under oxic and/or anoxic conditions to measure phosphorus release over time. For this project, lab determined release rates were available for Buffalo, Dean and Fountain Lakes. Literature values (Nürnberg 1997) and model residuals were used to determine appropriate release rates for all other lakes with no lab measurements. Selected release rates and calculated anoxic factors are provided in Appendix E of the final TMDL report.

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:

E. coli WLAs:

The wasteload allocations (WLAs) of *E. coli* determined by MPCA for the North Fork Crow River watershed are included in Table 9 above, and Tables 2.6, 2.7, 2.8 and 2.9 of the final TMDL report. The point sources contributing to the *E. coli* WLAs in the North Fork Crow River watershed include: two (2) NPDES wastewater dischargers (Table 12 below, and Table 2.4 of the final TMDL report); and five (5) MS4s and one future MS4 municipality (Table 13 below, and Table 2.5 of the final TMDL report). The potential future growth impact on the *E. coli* WLAs for wastewater discharge facilities and MS4s in the North Fork Crow River watershed is discussed in Sections 1.8.1 and 1.8.2 of the final TMDL report.

Table 12

NPDES Facilities – *E. coli* WLA Allocations (*billions of organisms/day*)				
Facility Name	**Permit #**	**Facility Type**	**Effluent Design Flow (MGD)**	**WLA**
Grove City WWTF	MN0023574	pond	0.13	0.6
Litchfield WWTF	MN0023973	continuous	3.10	14.8

Table 13

MS4 – *E. coli* WLA Allocations (*billions of organisms/day*)							
MS4 Name	**Permit #**	**Area (Acres)**	**Flow Zones**				
			Very High	**High**	**Mid**	**Low**	**Dry**
Buffalo City MS4	MS400238	32	0.4	0.1	< 0.1	< 0.1	< 0.1
Monticello City MS4	MS400242	77	1.0	0.3	0.1	< 0.1	< 0.1
Otsego City MS4	MS400243	149	1.9	0.7	0.2	0.1	< 0.1
St Michael City MS4	MS400246	11,704	150.9	52.5	15.9	5.8	3.2
Litchfield City MS4	MS400253	3,435	28.8	11.3	4.0	1.3	0.2

Table 13

MS4 – *E. coli* WLA Allocations (*billions of organisms/day*)							
MS4 Name	**Permit #**	**Area (Acres)**	**Flow Zones**				
			Very High	**High**	**Mid**	**Low**	**Dry**
Albertville City*	Permit Pending	1,486	19.2	6.7	2.0	0.7	0.4

* Additional municipality that according to MPCA rules now require NPDES permits since their population exceeded 5,000 in the 2010 census.

The *E. coli* WLAs for wastewater dischargers were calculated by multiplying the facility's design flow by the *E. coli* standard (126 cfu/100 ml). The NPDES facility dischargers permit limits for bacteria are currently expressed in fecal coliform concentrations, not *E. coli*. However, the fecal coliform permit limit for each wastewater treatment facility (200 cfu/100 mL) is believed to be equivalent to the 126 cfu/100 mL *E. coli* criterion.

The *E. coli* WLAs for MS4s were calculated by multiplying the municipalities' percent watershed coverage by the total watershed loading capacity after the MOS and wasteload allocation were subtracted.

The CAFO permitted operations are not allowed by law to discharge to waters of the state (Minn. R. 7020.2003), except as related to process wastewater and production area wastewater and/or manure, silage leachate and runoff which shall comply with effluent limitation requirements in accordance with the permits, which may not cause or contribute to a violation of WQS. All CAFO structures must be properly designed, constructed, and maintained.

TSS WLAs:

The wasteload allocations (WLAs) of TSS determined by MPCA for the North Fork Crow River watershed to address the turbidity impairments are included in Tables 10 above, and Tables 3.9, 3.11 and 3.13 of the final TMDL report. The point sources contributing to the TSS WLAs in the North Fork Crow River watershed include: one (1) NPDES wastewater discharger (Table 14 below, and Table 3.6 of the final TMDL report); one (1) MS4 (Table 15 below, and Table 3.7 of the final TMDL report)); and stormwater from industrial activity (General Permit# MNR50000 and MNG490000), and construction activity (General Permit# MNR100001). The potential future growth impact on the TSS WLAs for wastewater discharge facilities and MS4s in the North Fork Crow River watershed is discussed in Sections 1.8.1 and 1.8.2 of the final TMDL report.

Table 14

NPDES Facilities – TSS WLA Allocations (*tons/day*)				
Facility Name	**Permit #**	**Facility Type**	**Effluent Design Flow (MGD)**	**WLA**
Grove City WWTF	MN0023574	pond	0.13	0.193

Table 15

MS4 – TSS WLA Allocations (*tons/day*)								
MS4 Name	**Permit #**	**Area (Acres)**	**TSS Standard**	**Flow Zones**				
				Very High	**High**	**Mid**	**Low**	**Dry**
Buffalo City MS4	MS400238	5,427	30 mg/L	9.54	1.81	0.36	0.06	0.02

The TSS WLA for Grove Creek wastewater discharger was calculated by multiplying the facility's influent design flow by the permitted TSS concentration limit (45 mg/L). The TSS WLAs for the Buffalo City MS4 were calculated by multiplying the municipalities' percent watershed coverage by the total watershed loading capacity after the MOS and wasteload allocation were subtracted.

The TSS WLA for construction and industrial stormwater were established based on estimated percentage of land in the watershed that is currently under construction or permitted for industrial use. A permit review across the entire North Fork Crow River watershed showed minimal construction (<1% of watershed area) and industrial activities (<0.5% of the watershed area). To account for future growth (reserve capacity), WLAs in the TMDL were rounded up to 1% for construction stormwater and 0.5% for industrial stormwater.

TP WLAs:

The waste load allocations (WLAs) of TP determined by MPCA for the North Fork Crow River watershed to address nutrient/eutrophication impairments are included in Table 11 above, and Tables 4.12, 4.13, 4.14, 4.15, 4.16, 4.22, 4.23, 4.24, 4.25, 4.26, 4.33, 4.34, 4.35, 4.36, 4.43, 4.44, 4.45, 4.46, 4.47, 4.54, 4.55, 4.56, 4.63, 4.64, 4.65, 4.66, 4.67, 4.68, 4.69, 4.70, 4.71, 4.72, 4.73, and 4.74 of the final TMDL report. The point sources contributing to the TP WLAs in the North Fork Crow River watershed include: two (2) NPDES wastewater dischargers (Table 16 below); four (4) MS4s (Table 17 below and Table 4.5 of the final TMDL report); and stormwater from industrial activity (General Permit# MNR50000 and MNG490000), and construction activity (General Permit# MNR100001). The potential future growth impact on the TP WLAs for wastewater discharge facilities and MS4s in the North Fork Crow River watershed is discussed in Sections 1.8.1 and 1.8.2 of the final TMDL report.

Table 16

NPDES Facilities – TP WLA Allocations			
Facility Name	**Permit#**	**WLA**	
		lbs/year	***lbs/day***
Faribault Foods	MN0030635	794	2.2
Belgrade WWTF	MN0051381	1,017	2.8

Table 17

MS4 – TP WLA Allocations					
Lake Name	**Lake ID**	**MS4 Name**	**MS4 Permit#**	**WLA**	
				lbs/year	***lbs/day***
Foster	86-001-00	St. Michael City	MS400246	77	0.2
		Otsego City	MS400243	143	0.4
Beebe	86-023-00	St. Michael City	MS400246	78	0.2
Pelican	86-031-00	Buffalo City	MS400238	1	<0.01
		Monticello City	MS400242	4.6	0.01
		St. Michael City	MS400246	237	0.7
Constance	86-051-00	Buffalo City	MS400238	0.34	0.001
Buffalo	86-090-00	Buffalo City	MS400238	274	0.7
Deer	86-107-00	Buffalo City	MS400238	*	*

* The Buffalo MS4 allocation is based on the Buffalo Lake allocation included in the upstream lake load allocation. In other words, as long as Buffalo MS4 meets the WLA for Buffalo Lake, that will also meet the requirements for Deer Lake.

The TP WLAs for the four MS4s that are completely within or have a portion of their municipal boundary in the impaired lake watersheds were calculated by dividing HSPF model predicted MS4 average annual phosphorus load by each lake's average annual watershed (MS4 plus non-MS4 total) load. The MS4 proportion of the total watershed load was used to set both the existing MS4 load as well as the TMDL load allocation. TMDL reductions for MS4 and non-MS4 runoff were similar since land use classification loading rates were the same.

The TP WLA for construction and industrial stormwater were established based on estimated percentage of land in the watershed that is currently under construction or permitted for industrial use. A permit review across the entire North Fork Crow River watershed showed minimal construction (<1% of watershed area) and industrial activities (<0.5% of the watershed area). To account for future growth (reserve capacity), WLAs in the TMDL were rounded up to 1% for construction stormwater and 0.5% for industrial stormwater.

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:

MOS for the E. coli TMDLs:

The MOS incorporated into the *E. coli* TMDLs for the North Fork Crow River watershed are included in Table 9 above, and Tables 2.6, 2.7, 2.8 and 2.9 of the final TMDL report. An explicit MOS equal to 10% of the loading capacity for each flow regime was subtracted before allocations were made among wasteload and non-point sources. A 10% MOS was considered appropriate based on the use of load duration curves in the development of the *E. coli* TMDLs. The LDC approach minimized variability because the calculation of the loading capacity was a function of flow multiplied by the target value. Most of the uncertainty was associated with the estimated flows in each assessed segment which were based on simulating a portion of the 10 year flow record at the most down-stream monitoring station. Additionally, certain conservative assumptions were included in the development of the *E. coli* TMDLs. No rate of decay, or die-off rate of pathogen species, was incorporated in the calculation of the load duration curves for *E. coli*. Bacteria have a limited capability of surviving outside their hosts, and normally a rate of decay would be incorporated.

MOS for the TSS TMDLs:

The MOS incorporated into the TSS TMDLs for the North Fork Crow River watershed to address turbidity impairment are included in Tables 10 above, and Tables 3.9, 3.11 and 3.13 of the final TMDL report. An explicit MOS was determined as the difference between the median flow of each flow regime and the 45th percentile flow in each zone. The resulting value was converted to a daily load by multiplying by the TSS-surrogate and proposed-TSS concentration standards and set as the MOS for each flow category. The explicit MOS incorporated into the TSS TMDLs were considered appropriate based on the methodology used to calculate the MOS, which accounted for the variability in the data set without over protecting the high end of the flow zone and under-protecting the low end of the flow zone. The data in each flow zone were treated as a distribution and reduction efforts were assumed to affect the entire distribution.

MOS for the TP TMDLs:

The MOS incorporated into the TP TMDLs for the North Fork Crow River watershed to address nutrient/ eutrophication impairment are included in Table 11 above, and Tables 4.12, 4.13, 4.14, 4.15, 4.16, 4.22, 4.23, 4.24, 4.25, 4.26, 4.33, 4.34, 4.35, 4.36, 4.43, 4.44, 4.45, 4.46, 4.47, 4.54, 4.55, 4.56, 4.63, 4.64, 4.65, 4.66, 4.67, 4.68, 4.69, 4.70, 4.71, 4.72, 4.73, and 4.74 of the final TMDL report. An explicit MOS equal to 5% of the loading capacity was set aside to account for the uncertainty in the lake response models that were used to predict the TP loads. A 5% MOS was considered appropriate based upon the quantity of watershed and in-lake monitoring data available. Watershed monitoring data collected over a seven (7) year period (2005 to 2011) was used for the majority of the lake modeling. In-lake monitoring data collected during the same seven year period was also available for the majority of the lakes.

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:

Seasonal Variation for E. coli TMDLs:

The *E. coli* impairments in the North Fork Crow River watershed varied seasonally. The majority of *E. coli* exceedances occur during the summer and fall months, and occasionally in the spring (Figures 2.8, 2.9, 2.10 and 2.11 of the final TMDL report). Seasonality of bacteria concentrations are also influenced by stream water temperature. Fecal bacteria are most productive when stream temperatures are highest, at temperatures similar to their origination environment in animal digestive tracts.

Seasonal variation in the *E. coli* TMDLs is addressed by establishing load allocations based on the *E. coli* standard, which is applicable to the aquatic recreational period of April 1 through October 31. Seasonal variation was also considered in the *E. coli* TMDLs through the use of the LDC to establish the TMDLs. The development of the LDCs utilized flow measurements (i.e. continuous flow data collected from local USGS gage and instantaneous flow data) which represented a range of flow conditions within the watershed and thereby accounted for seasonal variability. The LDC approach captures the variation in pollutant concentrations occurring over a range of flow regime conditions in each waterbody reach.

Seasonal Variation for TSS TMDLs:

The turbidity impairments in the North Fork Crow River watershed varied seasonally. Exceedances in the North Fork Crow impaired reaches were most common during spring (February through May) and summer (June through August), and during high, mid and low flow conditions (Figures 3.7, 3.8 and 3.9 of the final TMDL report). Data analysis suggested that high flow conditions (i.e. summer storms and spring snowmelt) may be driving streambank or field erosion as a source of turbidity in the Grove and Unnamed Creek impaired reaches, while low flow conditions during warm summer months may be driving stream algae production as a source of turbidity in the Mill and Unnamed Creek impaired reaches.

Seasonal variation was considered in the TSS TMDLs through the use of the LDCs to establish the TMDLs. The development of the LDCs utilized flow measurements (i.e. continuous flow data collected from local USGS gage) which represented a range of flow conditions within the watershed and thereby accounted for seasonal variability. The LDC approach captures the variation in pollutant concentrations occurring over a range of flow regime conditions in each waterbody reach.

Seasonal Variation for TP TMDLs:

The TP impairments in the North Crow River watershed varied seasonally. Seasonal variation was accounted for in the TP TMDLs through the use of annual loads and developing targets for the summer period, where the frequency and severity of nuisance algal growth tend to be the greatest. Although the critical period is the summer, lakes are not sensitive to short term changes in water quality, rather lakes respond to long-term changes such as changes in the annual load. Additionally, by setting the TMDL to meet targets established for the most critical period (summer), the TMDL will inherently be protective of water quality during the other seasons.

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:

Section 6 of the final TMDL report contains a list of several factors at the local, state and federal level that MPCA considers could provide reasonable assurances that the North Fork Crow River watershed TMDLs will be successfully implemented. These factors include:

Regulatory programs:

Existing regulatory programs such as those under NDPES will continue to be administered to control discharges from industrial, municipal, and construction sources as well as large animal feedlots that meet the thresholds identified in those regulations (Section 6.2 of the final TMDL report).

Local Management:

The CROW, which includes representatives from Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Renville, Sibley, Stearns and Wright Counties, focuses on identifying and promoting the following: Protecting water quality and quantity; Protecting and enhancing fish and wildlife habitat and water recreation facilities; Public education and awareness; and BMP implementation. The CROW is working with the MPCA's Watershed Restoration and Protection Strategy (WRAPS) approach in the North Fork Crow River Watershed. The idea behind the watershed approach is to provide a more complete assessment of water quality and facilitate data collection for the development of TMDLs and protection strategies. In the watershed approach, the streams and lakes within a major watershed are intensively monitored to determine the overall health of the water resources, identify impaired waters, and identify those waters in need of additional protection efforts to prevent impairments. The WRAPS approach process provides a communication tool that can inform stakeholders, engage volunteers, and help coordinate local/state/federal monitoring efforts so the data necessary for effective water resources planning is available, citizens and stakeholders are engaged in the process, and citizens and governments across Minnesota can evaluate the progress.

Water Management Plans:

The North Fork TMDL project area is comprised of areas of Meeker, Wright and Hennepin Counties. Meeker and Wright Counties have each adopted a county water plan that articulates goals and objectives for water and land-related resource management initiatives. Meeker County's Water Plan runs from 2003 through 2012. The Wright County Water Plan runs from 2006 through 2015. The area of Hennepin County that impacts the project area for this TMDL project is covered by the Pioneer Sarah Water Management Commission. The Pioneer Sarah WMC has adopted a watershed management plan for the Pioneer-Sarah Creek Watershed, and is currently undergoing an amendment process for the plan. All these plans provide the watershed management framework for addressing water quality issues, and for TMDL projects to restore impaired waters to a non-impaired status.

Additionally, the stakeholder processes associated with this TMDL effort, as well as the broader planning efforts mentioned above have generated commitment and support from the local government units affected by this TMDL, and will help ensure that this TMDL project is carried successfully through implementation. Various sources of technical assistance and funding will be used to execute measures detailed in the implementation plan scheduled to be developed within one year of approval of this TMDL. Funding resources include a mixture of state and federal programs, including (but not limited to) the following: Federal Section 319 Grants for watershed improvements; Funds ear-marked to support TMDL implementation from the Clean Water, Land, and Legacy constitutional amendment, approved by the state's citizens in November 2008; Local government cost-share funds; Soil and Water Conservation Districts cost-share funds; and NRCS cost-share funds.

Clean Water Legacy Act (CWLA):

The CWLA was passed in Minnesota in 2006 for the purposes of protecting, restoring, and preserving Minnesota water. The CWLA provides the protocols and practices to be followed in order to develop TMDL implementation plans. TMDL implementation plans are expected to be developed within a year of TMDL approval and are required in order for local entities to apply for funding from the State. The CWLA outlines how MPCA, public agencies and private entities should coordinate in their efforts toward improving land use management practices and water management. The CWLA anticipates that all agencies (i.e., MPCA, public agencies, local authorities and private entities, etc.) will cooperate regarding planning and restoration efforts. Cooperative efforts would likely include informal and formal agreements to jointly use technical, educational, and financial resources.

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

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:

Two types of monitoring will track the progress toward achieving the load reductions required in the North Fork Crow River watershed TMDLs, and the attainment of WQS: (1) tracking implementation of Best Management Practices (BMPs) on the ground; and (2) physical and chemical monitoring of the waterbody resource. The CROW and the Soil and Water Conservation Districts (SWCDs) will track the implementation of North Fork - Lower Crow River watershed projects annually. The CROW also plans to monitor the affected resources on a ten year cycle in conjunction with the North Fork Crow River WRAPS process.

Periodic monitoring is necessary for the adaptive management approach that will be utilized to efficiently meet the TMDL, in which management strategies/activities will be re-evaluated, changed or refined as the water quality dynamics within the watershed are better understood. The results of the monitoring will identify progress toward benchmarks as well as shape the next course of action for implementation of the TMDLs.

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:

Section 5 of the final TMDL report presents implementation alternatives for resolving the water quality problems associated with the North Fork Crow River watershed TMDLs. A brief summary of the recommended implementation alternatives is included in Table 18 below. A separate document following this TMDL report will contain the formal TMDL Implementation Plans. Since the impairments of bacteria, turbidity and nutrient/eutrophication have several sources and some common delivery pathways, most of the recommended implementation strategies will have multiple water quality benefits in terms of load reductions through implementation. The selection of appropriate management practices for the pollutant(s) of concern will depend on site-specific conditions, economic factors, and stakeholder attitudes and knowledge.

Table 18

List of Management Practices/ Recommended Specific BMPs	
Vegetative Practices: To minimize sediment mobilization from agricultural lands and decrease sediment transport to receiving waters.	• Contour farming • Strip cropping • Grassed waterways • Grass filter strip for feedlot runoff • Forest management practices • Alternative crop in rotation • Field windbreak • Pasture management, intensive rotation grazing (IRG) • Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program–II (CREP–II), or Re-Invest in Minnesota (RIM) Reserve Program
Primary Tillage Practices: To reduce the generation and transport of soil from fields.	• Chisel Plow • One pass tillage • Ridge till • Sustain surface roughness

Table 18

List of Management Practices/ Recommended Specific BMPs	
Structural Practices: To make watershed improvements to decrease sediment loading to the receiving water.	• Wetland restoration • Livestock exclusion • Liquid manure waste facilities
Feedlot Runoff Reduction	• Move Fences/Change Lot Area • Eliminate Open Tile Intakes and/or Feedlot Runoff to the Intake • Install Clean Water Diversions and Rain Gutters • Install Grass Buffers • Maintain Buffer Areas • Construct a Solids Settling Area(s) • Prevent Manure Accumulations • Manage Feed Storage • Manage Watering Devices • Total Runoff Control and Storage • Roofs • Runoff Containment with Irrigation onto Cropland/Grassland • Vegetated Infiltration Area • Tile-Drained Vegetated Infiltration Area with Secondary Vegetated Filter Strip • Sunny Day Release on to Vegetated Infiltration Area or Filter Strip • Vegetated Filter Strip
Manure Management Planning	• County Feedlot Program that ensures feedlot owners get assistance to remain compliant with their permits. • Cost-share programs (i.e. Environmental Quality Incentives Program (EQIP)), sponsor by Soil and Water Conservation Districts or the Natural Resources Conservation Service offices, to put BMPs into place.
Waste Water Treatment Facilities Runoff Reduction	• Counties, Regional Development Commissions and MPCA staff will work with Waste Water Treatment Facilities to ensure continued compliance.
Subsurface Sewage Treatment Systems (SSTS) Runoff Reduction	• Low interest loan dollars are available to aid landowners in upgrading SSTS.
Watershed Restoration and Protection Plan	The CROW, the North Fork Crow Watershed District, and the Middle Fork Crow Watershed District have partnered with the MPCA to develop the North Fork Crow River Watershed Restoration and Protection Strategy (NFC-WRAPS). MPCA expects that the goals and implementation plans presented in the NFC-WRAPS will help reduce total phosphorus, chlorophyll-a (algal turbidity) and $CBOD_5$ in the turbidity impaired reaches addressed in this TMDL study, as well as the dissolved oxygen impaired reaches that were addressed in other TMDL studies.
Internal Loading Reduction Strategies: Potential options to manage internal nutrient load inputs from the internal nutrient load sources for each of the impaired lakes in the North Fork Crow River watershed that are identified in Table 4.4 of the final TMDL report.	• *Chemical treatment*: The addition of chemical reactants (ex. aluminum sulfate), to permanently bind phosphorus into the lake bottom sediments, could decrease phosphorus releases from sediment into the lake water column during anoxic conditions. • *Redesigning boating traffic patterns*: To limit boat operation in shallow or vegetated areas which may resuspend phosphorus from lake bottom sediments. • *Management of fish populations*: Monitor and manage fish populations to maintain healthy game fish populations and reduce rough fish (i.e. carp, bullheads, fathead minnows) populations. • *Vegetation management*: Improved management of in-lake vegetation in order to limit phosphorus loading and to increase water clarity. Controlling the vitality of curly-leaf pondweeds via chemical treatments (herbicide applications) will reduce one of the significant sources of internal loading, the senescence of curly-leaf plants in the summer months.

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:

Public participation opportunities for the North Fork Crow River watershed TMDLs were provided in the form of public meetings (Sections 7.2 and 7.2.1 of the TMDL report), electronic newsletters and CROW's website. MN DNR created a display board ("Our Waters Our Choice") to be taken to county fairs and other presentations in counties in the watershed. CROW staff attended local partner meetings to review the TMDL process and receive input on the project. The CROW's Technical Committee and citizens reviewed project activities and provided comments. The CROW's Technical Committee is comprised of ten counties within the Crow River Watershed and the following local agencies: Soil and Water Conservation District (SWCD), Natural Resource Conservation District (NRCS), Water Planners, Minnesota Board of Water and Soil Resources, Minnesota Department of Natural Resources (MNDNR), U.S. Fish and Wildlife Service (USFWS), Metropolitan Council and Cities. The CROW also presented information regarding the TMDL project during its regular scheduled Joint Powers Board and Technical Committee meetings.

The North Fork Crow River watershed TMDLs were public noticed from August 11 to September 10, 2014. Copies of the draft TMDL Report for North Fork Crow River watershed were available to the public upon request and on the MPCA website at http://www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesotas-impaired-waters-and-tmdls/tmdl-projects/tmdl-projects-and-staff-contacts.html.

As part of the final TMDL submittal to EPA, the state provided copies of the press releases of public notice, letters of invitation to interested parties, the mailing list of interested parties, and copies of the written comments received during the public comment period and the state responses to these comments.

MPCA received comments from various parties (i.e. MnDOT Metro District, City of Otsego, MN Department of Agriculture, MN Milk Producers Association, MN Corn Growers Association, MN

Soybean Growers Association, and U.S. EPA) during the North Fork Crow River watershed TMDL public comment period. Most of the comments were in regards to sources and implementation, although there were a few comments on TMDL allocations. All comments received were adequately addressed by MPCA.

One comment in particular sent by MnDOT pointed out that MPCA did not assigned a WLA to MnDOT Metro District for Foster Lake which MnDOT believed included a small portion of its stormwater drainage boundary. While MPCA was willing to make this adjustment, it was later corroborated that MnDOT does not have any drainage boundary within Foster Lake, and MnDOT concurred. As a result, the Foster Lake WLA presented under Table 4.73 of the TMDL report was determined to be correct as public noticed and no changes were included in the final TMDL submittal.

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:

The U.S. EPA received the formal submission of the final North Fork Crow River watershed TMDLs on January 7, 2015 along with a cover letter from Rebecca J. Flood, Assistant Commissioner, MPCA dated January 5, 2015. The letter stated that the North Fork Crow River watershed TMDLs were final TMDLs submitted under Section 303(d) of CWA for EPA review and approval. The letter also contained the waterbody segment names, and the causes/pollutants of concern for the TMDLs submitted.

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 the North Fork Crow River watershed satisfy the elements of approvable TMDLs. These approvals address forty (40) segments for three (3) pollutants for a total of forty one (41) TMDLs addressing forty one (41) impairments (See Table 1 above).

U.S. EPA's approval of the North Fork Crow River watershed TMDLs extend 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 TMDLs 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.