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

AUG 16 2017

REPLY TO THE ATTENTION OF

WW-16J

Glenn Skuta, Watershed Division Director
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Dear Mr. Skuta:

The U.S. Environmental Protection Agency has conducted a complete review of the final Total Maximum Daily Loads (TMDL) for the Minnesota portion of the Nemadji River Watershed (NRW), including support documentation and follow up information. The NRW is in northeastern Minnesota and is part of the Lake Superior Basin and crosses Carlton and Pine counties in Minnesota. The NRW TMDLs address impaired aquatic recreation due to excessive nutrients and bacteria, and impaired aquatic life use due to excessive sediment (turbidity).

EPA has determined that the NRW TMDLs meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations set forth at 40 C.F.R. Part 130. Therefore, EPA approves Minnesota's thirteen TMDLs. The statutory and regulatory requirements, and EPA's review of Minnesota's compliance with each requirement, are described in the enclosed decision document.

We wish to acknowledge Minnesota's efforts in submitting 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,

Christopher Korleski
Director, Water Division

Enclosure

cc: Celine Lyman, MPCA

wq-iw10-06g

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TMDL: Nemadji River Watershed TMDL, Carlton and Pine Counties, Minnesota
Date: 08/16/2017

Decision Document for the Approval of the Nemadji River Watershed TMDLs

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

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

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

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

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

(1) The spatial extent of the watershed in which the impaired waterbody is located;
(2) The assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) Population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) Present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and
(5) An explanation and analytical basis for expressing the TMDL through *surrogate measures,* if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment impairments; chlorophyll-a (chl-a) and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comments:

The comments below discuss the waterbodies covered in this TMDL, pollutants of concern in these waterbodies, and Minnesota Pollution Control Agency (MPCA) priority ranking process. This information is found in Sections 1, 3 and 5 of the final Nemadji River Watershed (NRW) TMDL.

Identification of Waterbody

MPCA has submitted a TMDL for the NRW, located in northeastern Minnesota. The NRW spans Minnesota and Wisconsin. The NRW TMDL document outlines the watershed in Sections 1.1, 1.2, and 3 of the TMDL. Figure 1 of the TMDL shows the location of the watershed within Minnesota. The NRW is a predominantly forested watershed, where all subwatersheds have at least 45% of their land area classified as deciduous forest.

The NRW TMDL addresses seventeen impairments (with thirteen TMDLs) two of which are in shallow lakes with no stratification, the remainder are stream segments. Table 1 of the TMDL outlines the assessment units addressed in this TMDL including: assessment unit ID number; designated use; pollutants or stressors; and year listed as impaired. The impaired assessment units are shown in Figure 1 TMDL for *E. coli*, turbidity, aquatic macro invertebrate and fish bioassessments, and eutrophication respectively. See Table 1 below.

Table 1: Nemadji River Watershed Impairments

Impairments Identifed in the Nemadji River Watershed TMDL

Reach Name	Reach Description	Assessment Unit ID or MN DNR Lake #	Year Listed	Affected Designated Use	Stressor	TMDL
Blackhoof River*	Unnamed Creeks to Ellstrom Lake	04010301-519	--	Aquatic Life	Macroinvertebrate Bioassessment	None
			--	Aquatic Life	Fish Bioassessment	None
Clear Creek	T48 R16W S33, West Line to MN/WI Border	04010301-527	2014	Aquatic Life	Fish Bioassessment	TSS
			2014	Aquatic Life	Macroinvertebrate Bioassessment	
			2014	Aquatic Life	Turbidity	
Mud Creek	T47 R16W S33, West Line to MN/WI Border	04010301-537	2014	Aquatic Life	Fish Bioassessment	TSS
			2014	Aquatic Life	Turbidity	
Nemadji River	T46 R17W S6, South Line to Unnamed Creek	04010301-757	2004	Aquatic Life	Turbidity	TSS
	Unnamed Creeks to MN/WI Border	04010301-758	2014	Aquatic Recreation	*Escherichia coli*	*E. coli*
			2014	Aquatic Life	Turbidity	TSS

Reach Name	Reach Description	Assessment Unit ID or MN DNR Lake #	Year Listed	Affected Designated Use	Stressor	TMDL
Nemadji River, South Fork	Stony Brook/Anderson Creek to Net River	04010301-558	2014	Aquatic Recreation	*Escherichia coli*	*E. coli*
			2004	Aquatic Life	Turbidity	TSS
Rock Creek	Unnamed Creek to Nemadji River	04010301-508	2014	Aquatic Life	Macroinvertebrate Bioassessment	TSS
			2014	Aquatic Life	Fish Bioassessment	
		04010301-573	2008	Aquatic Life	Turbidity	TSS
Skunk Creek	Unnamed Creek to Nemadji River	04010301-502	2014	Aquatic Life	Turbidity	TSS
Unnamed Creek	Headwaters to Deer Creek	04010301-532	2014	Aquatic Life	Turbidity	TSS
Unnamed Creek	Elim Creek	04010301-501	2014	Aquatic Life	Fish Bioassessment	None
Net Lake		58-0038-00	2014	Aquatic Recreation	Eutrophication	Total P
Lac La Belle		09-0011-00	2014	Aquatic Recreation	Eutrophication	Total P

*Blackhoof River has been recommended for a beneficial use designation change from 2A to 2B

The NRW TMDL covers the Minnesota portion of the cross state NRW (HUC code 04010301), comprising approximately 219 square miles (the full NRW is 1,928 square miles). For the remainder of this Decision Document the NRW refers only to the Minnesota portion of the watershed. The NRW spans the Northern Lakes and Forest ecoregion. In addition to the previously mentioned deciduous forest, pasture land is the second most common land cover ranging from 0% - 31% (Net Lake and Lac La Belle respectively). Net Lake's second most common land cover is forested wetlands. Unnamed Creek (AUID 04010301-532) and the Nemadji River assessment units all have herbaceous wetlands as the second most common land cover ranging from 12% - 16%. The remaining watersheds second most common land cover is pasture ranging from 16% - 33%.

Pollutants of Concern

MPCA developed thirteen TMDLs to address seventeen stressors in the NRW: two *Escherichia coli* (*E. coli*) TMDLs for aquatic recreation in rivers; nine total suspended solid (TSS) TMDLs to address impaired fish and macroinvertebrate communities in rivers; and two total phosphorus (Total P) TMDLs to address eutrophication-impaired lakes. MPCA noted that the TSS TMDLs will also address preexisting turbidity impairments based on the previous turbidity standard (Section 1.2 of the TMDL).

E. coli

E. coli and fecal coliform 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 *E. coli* sampling data collected June through August in 2010 and 2011, *E. coli* exceedances were found for both the monthly geometric mean (there were not enough samples to assess compliance in July) and the acute criteria for both *E. coli* impaired reaches (Tables 22, 23, 28, and 29 of the TMDL).

Total Suspended Solids (TSS)

TSS is the concentration of suspended material in the water column as measured by the dried weight of solids filtered from a known volume of water. Suspended material can be present in a variety of forms including detritus, algae, organic matter, etc.; however, fine sediment generally comprises most of the suspended material in streams. Adverse ecological impacts caused by excessive TSS include hampering the ability of aquatic organisms to visually locate food, impaired gill function, and smothering of spawning beds and benthic organism habitat. Suspended sediment data were collected from March through October (with a minimum sampling period of April through August for each segment) from 2003 through 2011 (minimum 2 years of data for each segment). All sampling periods exceeded the TSS standard (Tables 10-15 ,18-21, and 24-27 of the TMDL). TSS data are not available for Unnamed Creek (AUID 04010301-532. The creek was originally listed as impaired based upon the previous turbidity criteria (Section 3.4.1 of the TMDL). The creek was shown to have elevated turbidity measured in Formazin Nephelometric Units (FNU). These units are not directly comparable to the former Nephelometric Turbidity Units (NTU) standard, but are relatively similar. When the FNU data are compared to the old NTU standard of 10 all but one of the measurements in the three years of data from March through October (Tables 16-17, and Figure 8 of the TMDL) exceed the old standard. Although there are no existing TSS data, MPCA developed a TMDL based upon the current TSS criteria, and will determine reductions needed as future monitoring is completed.

Total Phosphorus (Total P)

Phosphorus is an essential nutrient for aquatic life, but elevated concentrations of Total P 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. Excess phosphorus can alter biological communities by shifting species composition toward organisms better suited to excess levels of phosphorus. Measurements were collected for Total P, chlorophyll α, and secchi disk transparency from June through September for the years of 2009 through 2012 for Net Lake and 2011 through 2012 for Lac La Belle. Values exceeding the Total P, chlorophyll α, and secchi disk standards were found for both lakes. (Tables 30-31 of the TMDL).

Pollutant Sources

The pollutant loads in the NRW are primarily attributed to nonpoint sources, with a minimal amount of loading from construction. There are also “natural” sources of loading identified in the TMDLs. The pollutants and their corresponding sources are broken out below. There are no permitted facilities.

E. coli

MPCA identified several potential sources of *E. coli* that can impact *E. coli* counts within the watershed (see Section 3.5.1 of the NRW TMDL). The majority of risk from the various sources is assumed to be contamination from livestock (Table 37 of the TMDL). The specific concerns are linked to Animal Feeding Operations (AFOs). These concerns are attributed to failed manure containment, runoff from feedlots, and runoff from manure that is land applied. Additional animal related contamination may come from pet waste runoff and from wildlife scat. Human sources from straight pipe/failing septic systems are also a potential source of contamination. MPCA estimated that Subsurface Sewage Treatment System (SSTS) non-compliance rates range from 4% to 11% for Carlton and Pine counties respectively. There are no *E. coli* permitted facilities in the NRW. More details on the specific sources can be found below.

Point sources
Wastewater Treatment Plants (WWTPs) – There are no WWTPs in the NRW.

Municipal Separate Storm Sewer System (MS4) communities – There are no MS4s in the NRW.

Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs) – There are no CSOs or SSOs in NRW.

Concentrated Animal Feeding Operations (CAFOs) – There are no CAFOs in the NRW.

Nonpoint sources
Agriculture – Animal Feeding Operations (AFOs) in close proximity to surface waters can be a source of bacteria to waterbodies in the NRW. These areas may contribute bacteria via the mobilization and transportation of pollutant laden waters from feeding, holding and manure storage sites. These sites are not regulated under the NPDES CAFO permit program. Runoff from agricultural lands may contain significant amounts of bacteria which could lead to impairments in the NRW. Feedlots generate manure which may be spread onto fields as fertilizer. Manure runoff from fields can be exacerbated by tile drainage lines that channelize the stormwater flows and reduce bacteria die-off potential. Additionally, unrestricted livestock access to streams in pasture areas can add bacteria directly to the surfaces waters or resuspend bacteria laden sediment that had settled on the stream bottom. Direct deposition of animal wastes can result in very high localized bacteria counts and may contribute to downstream impairments. Smaller animal facilities may add bacteria to surface waters via wastewater from these facilities or stormwater runoff from near-stream pastures.

SSTS or Unsewered Communities – Failing septic systems are a potential source of bacteria within the NRW. Septic systems generally do not discharge directly into a waterbody, but effluents from SSTS may leach into groundwater or pond at the surface where they can be washed into surface waters via stormwater runoff events. Age, construction, and use of SSTS can vary throughout a watershed and influence the bacteria contribution from these systems. Furthermore, systems which discharge partially treated sewage to the ground surface, road ditches, tile lines, and directly into streams, rivers and lakes are considered an imminent threat to public health and safety (ITPHS). ITPHS systems also include illicit discharges from unsewered communities.

Wildlife and Pets – Wildlife is a known source of bacteria in waterbodies as many animals spend time in or around waterbodies. Deer, geese, ducks, raccoons, and other animals all create potential sources of bacteria. Wildlife contributes to the potential impact of contaminated runoff from animal habitats, such as urban park areas, forest, and rural areas. Animal impact can be exacerbated in urban areas with high pet populations and a lack of sanitary disposal of pet waste. MPCA determined pet waste is more of a concern than wildlife scat in the NRW.

<u>TSS</u>
MPCA specifically identifies several sources of suspended sediment in the NRW (see Section 3.5.2 of the TMDL). These sources include overland erosion of cultivated lands and changes in flow regimes which have increased near channel scour. Tiles play a major role in changing the hydrology of agricultural lands by dewatering the lands which increases overall streamflow. These changes are exacerbated by

instream factors such as log jams that increase channel and bank scour. More details on the specific sources and additional minor sources are identified below.

Point sources
WWTPs – There are no WWTP in the NRW.

Municipal Separate Storm Sewer System (MS4) communities – There are no MS4s in the NRW.

Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs) – There are no CSOs or SSOs in NRW.

Concentrated Animal Feeding Operations (CAFOs) – There are no CAFOs in the NRW.

Stormwater from Construction – Construction sites may contribute sediment runoff during stormwater events. These sites must comply with the requirements of the MPCA's NPDES Stormwater Program. The NPDES program requires construction and industrial sites to create a Stormwater Pollution Prevention Plan (SWPPP) that summarizes how stormwater will be minimized from the site.

Nonpoint sources
Overland Erosion – Runoff from agricultural lands may contain significant amounts of sediment which may lead to impairments in the NRW. Sediment inputs to surface waters can be exacerbated by tile drainage lines, which channelize the stormwater flows. Tile lined fields and channelized ditches enable particles to move more efficiently into surface waters.

Hydrologic Changes – Extensive tile draining in agricultural lands has led to major hydrologic changes in the NRW. Changes in flow patterns may also encourage down-cutting of the streambed and streambanks. Tile draining lands can increase the velocity of flow (via the removal of the sinuosity of a natural channel) and disturb the natural sedimentation processes of the streambed. Heavy beaver activity has also been identified as a source of hydrologic modification. These changes heighten the naturally high erosion rates of NRW from steep near channel slopes created from glacial rebound and the lowering of Lake Superior over geologic time. Additionally, unrestricted livestock access to streams and streambank areas may lead to streambank degradation and sediment additions to stream environments.

Wetland and Forest Sources – Sediment may be added to surface waters by stormwater flows through wetland or forested areas in the NRW. Storm events may mobilize decomposing vegetation and organic soil particles through the transport of suspended solids and other organic debris.

Atmospheric deposition – Sediment may be added via particulate deposition. Particles from the atmosphere may fall onto surface waters within the NRW.

Sediment volcanoes – The NRW contains artesian springs that contribute high levels of sediment to the waterways (Section 3.0 of the TMDL).

<u>Total P</u>
MPCA identified several source categories of phosphorus as contributing to the nutrient impairments of two impaired lakes within the NRW, including: SSTS; wetlands; forest; pasture and cropland; and atmospheric loading. Stormwater from construction sites is the only potential type of point sources discharging phosphorus into the lake subwatersheds; there are no MS4s or WWTPs in the NRW. MPCA attributes the majority of the load to forest, wetlands, and agricultural practices. Lac La Belle has also

identified SSTS as being a major source of phosphorus. Details on these specific sources and others not mentioned directly in the TMDL can be found below.

Point sources
Stormwater from Construction – Erosion from construction sites may contribute sediment to a waterway if the stormwater is untreated. This sediment may have phosphorus sorbed to the sediment particles and in turn be a source of phosphorus in the NRW.

Nonpoint sources
SSTS or Unsewered Communities– Septic systems generally do not discharge directly into a waterbody, but effluents from SSTS may leach into groundwater or pond at the surface where they can be washed into surface waters via stormwater runoff events. Age, construction and use of SSTS can vary throughout a watershed and influence the nutrient contribution from these systems. MPCA estimated that the SSTS non-compliance rate ranges from 4% to 11% for Carlton and Pine counties respectively.

Manure and Fertilizer Application – Runoff from agricultural lands may contain significant amounts of nutrients, organic material and organic-rich sediment which may contribute to impairments in the NRW. Manure spread onto fields is often a source of phosphorus, and can be exacerbated by tile drainage lines, which channelize the stormwater. Tile lined fields and channelized ditches enable particles to move more efficiently into surface waters. Stormwater runoff may contribute nutrients and organic-rich sediment to surface waters from livestock manure, fertilizers, vegetation and erodible soils. This nutrient laden stormwater can also come from urban areas where phosphorus and phosphorus-rich organic matter (grass clippings, etc.) run off into waterways. Furthermore, livestock with direct access to a waterway can directly deposit nutrients via animal wastes into a waterbody, which may result in very high localized nutrient concentrations. This nutrient deposition may also contribute to downstream impairments.

Erosion and Channel Destabilization – Overland erosion of sediment can be a major source of Total P for the above reasons. Furthermore, eroding streambanks and channelization efforts may add nutrients, organic material and organic-rich sediment to local surface waters. Nutrients may be added if there is particulate phosphorus bound with eroding soils. Eroding riparian areas may be linked to soil inputs within the water column and potentially to changes in flow patterns. Changes in flow patterns may also intensify down-cutting of the streambed and streambanks. Down-cutting can be exacerbated by livestock with direct access to stream environments, which may add nutrients directly to the surface waters or resuspend particles that had settled on the stream bottom. MPCA did not directly identify channel erosion as a source of Total P for the lakes.

Internal Loading – The release of phosphorus from lake sediments, the release of phosphorus from lake sediments via physical disturbance from benthic fish (rough fish, ex. carp), the release of phosphorus from wind mixing the water column, and the release of phosphorus from decaying curly-leaf pondweeds, may all contribute internal phosphorus loading to the lakes of the NRW. Phosphorus may build up in the bottom waters of the lake and may be resuspended or mixed into the water column when the thermocline decreases and the lake water mixes. MPCA indicated that internal loading is not a likely source of phosphorus in the two lakes. Furthermore, there are "very low amounts of iron-bound phosphorus" in Lac La Belle indicating that this may not be a source whatsoever.

Atmospheric Deposition – Phosphorus and organic material may be added via particulate deposition. Particles from the atmosphere may fall onto lake surfaces or other surfaces within the NRW. Phosphorus can be bound to these particles which may add to the phosphorus inputs to surface water environments.

Groundwater Discharge – Phosphorus can be added to the lake's water column through groundwater discharge. Phosphorus concentrations in groundwater are usually below the water quality standards for phosphorus. In those instances where significant groundwater discharge into lake environments is occurring, phosphorus inputs can impact the phosphorus budgeting of the waterbody. MPCA did not specifically identify this a potential source of phosphorus.

Wetland and Forest Sources – Phosphorus, organic material and organic-rich sediment may be added to surface waters by stormwater flows through wetland and forested areas in the NRW. Storm events may mobilize phosphorus through the transport of suspended solids and other organic debris. MPCA identified Forests and Wetlands as a major source of Total P in the lake watersheds. The Total P contributions in Net Lake are primarily attributed to these sources (89% of Total P loading).

Wildlife and Pets – Wildlife is a known source of nutrients in waterbodies as many animals spend time in or around waterbodies. Deer, geese, ducks, raccoons, and other animals all create potential sources of nutrients from animal waste. Wildlife contributes to the potential impact of contaminated runoff from animal habitats, such as urban park areas, forest, and rural areas. This impact may be increased in urban areas with high pet populations and improper pet waste disposal.

Upstream Contributions – Upstream lakes may contribute nutrient, organic material and organic-rich sediment loads via water flow between hydrologically connected upstream and downstream lake systems. Upstream lakes may contribute nutrient loads to downstream lakes via non-regulated stormwater runoff into the upstream lakes, nutrient contributions from wetland areas and forested areas into the upstream lakes, internal loading in upstream lakes, etc. These sources can all add nutrients to hydrologically connected downstream lakes and waters.

Priority Ranking

The waterbodies addressed by the NRW TMDLs were given a priority ranking for TMDL development due to: the impairment impacts on public health and aquatic life, the public value of the impaired water resource, the likelihood of completing the TMDL in an expedient manner, the inclusion of a strong base of existing data, the restorability of the waterbody, the technical capability and the willingness of local partners to assist with the TMDL, and the appropriate sequencing of TMDLs within a watershed or basin. Areas within the NRW are popular locations for aquatic recreation. Water quality degradation has led to efforts to improve the overall water quality within the NRW, and to the development of TMDLs for these waterbodies. Additionally, MPCA explained that its TMDL development priorities were prioritized to align with its Statewide watershed monitoring approach and its 10-year Watershed Restoration and Protection Strategies (WRAPS) schedule. The most recent listings in this TMDL are those found in the 2014 draft 303(d) list of impaired waterbodies (Sections 1.2 and 1.3 of the TMDL).

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

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy (40 C.F.R. §130.7(c)(l)). 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 NRW TMDL addresses seventeen stressors with thirteen TMDLs. Four TMDLs for aquatic recreation and nine for aquatic life use (Tables 1 and 2 of the TMDL). Section 2 of the TMDL list the applicable water quality standards (WQS) for the impaired waterbodies. The impaired assessment units are shown in Figure 1 of the TMDL. Table 1 of this Decision Document lists the impairments and their associated pollutants.

Designated Use

WQS are the fundamental benchmarks by which the quality of surface waters is measured. Within the State of Minnesota, WQS are developed pursuant to the Minnesota Statutes Chapter 115, Sections 03 and 44. Authority to adopt rules, regulations, and standards as are necessary and feasible to protect the environment and health of the citizens of the State is vested with the MPCA. Through adoption of WQS into Minnesota's administrative rules (principally Chapters 7050 and 7052), MPCA has identified designated uses to be protected in each of its drainage basins and the criteria necessary to protect these uses. See Section 2 of the TMDL.

Minnesota Rule Chapter 7050 designates uses for waters of the state. The segments addressed by the NRW TMDL are designated as Class 2 waters for aquatic recreation use (fishing, swimming, boating, etc.) and aquatic life use. The Class 2 designated use is as follows:

> "*Aquatic life and recreation includes all waters of the state that support or may support fish, other aquatic life, bathing, boating, or other recreational purposes and for which quality control is or may be necessary to protect aquatic or terrestrial life or their habitats or the public health, safety, or welfare.*"[1]

Narrative Criteria

The streams and rivers are listed as impaired for aquatic recreation and/or aquatic life use. All of the impaired rivers addressed fall under the Class 2A waters designated use. The applicable narrative criteria states:

> *"The quality of class 2A surface waters shall be such as to permit the propagation and maintenance of a healthy community of cold water sport or commercial fish and associated aquatic life, and their habitats. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. This class of surface waters is also protected as a source of drinking water. Abbreviations, acronyms, and symbols are explained in subpart 1."*[2]

[1] Use classification 2 waters (Minn. R. 7050.0140, Subp 3)

[2] Narrative criteria class 2A waters (Minn. R. 7050.0222, subp. 2.)

The lakes are listed as impaired aquatic recreation. All of the impaired lakes fall under the Class 2B waters designated use, the applicable narrative criteria states:

> "The quality of class 2Bd surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life and their habitats. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. This class of surface waters is also protected as a source of drinking water. The applicable standards are given below. Abbreviations, acronyms, and symbols are explained in subpart 1."[3]

Numeric Criterion

Table 2: Minnesota Water Quality Standards

Applicable Water Quality Standards				
Parameter	**Water Quality Standard**	**Units**	**Criteria**	**Applicable Time Period**
Escherichia coli - Class 2 A waters	Not to exceed 126	org/100 mL	Monthly geometric mean of a least 5 samples within one calendar year	April 1st – October 31st
	Not to exceed 1,260	org/100 mL	Monthly upper 10th percentile	
TSS Class 2 A Waters	Not to Exceed 10	TSS mg/L	No more than 10% of total samples	April 1st – September 30ith
Total P - Northern Lakes and Forests Shallow Lakes 2B Waters	Less than 30	P µg/L	Concentration should not exceed	June 1st – September 30ith
	Less than 9	Chlorophyll-α µg/L	Concentration should not exceed	
	Greater than 2	meters	Secci depth measurement should exceed	

<u>*E. coli*</u>

The applicable numeric criteria for the waters of the NRW are in Table 2 of this Decision Document. The focus of this TMDL is on the 126 organisms (orgs) per 100 mL (126 orgs/100 mL) geometric mean portion of the standard. MPCA believes that using the 126 orgs/100 mL portion of the standard for TMDL calculations will result in the greatest bacteria reductions within the NRW, and will result in the attainment of the 1,260 orgs/100 mL portion of the standard. While the bacteria TMDLs will focus on the geometric mean portion of the water quality standard, attainment of both criteria of the water quality standard is required.

<u>TSS</u>

When the NRW was assessed the applicable water quality standard was the statewide criterion of 25 nephelometric turbidity units (NTUs). On January 23, 2015, EPA approved MPCA's regionally-based TSS criteria for rivers and streams to replace the NTU standard. The old standard measured light scatter and

[3] Narrative criteria class 2B waters (Minn. R. 7050.0222, subp. 3.)

absorption, and therefore could not be applied as a daily load target. To compensate regional TSS criteria were developed to more accurately address the turbidity impairments.[4] The northern Minnesota criterion is a maximum of 10 mg/L not to be exceeded more than 10% of the time over a multiyear period. The 10 mg/L criterion applies to all of the TSS TMDLs in the NRW (Table 4 of this Decision Document).

Total P

Numeric criteria for Total P, chlorophyll-*a*, and Secchi Disk (SD) depth in lakes are set forth in Minnesota Rules 7050.0222. These three parameters form MPCA eutrophication standard that must be achieved to attain the aquatic recreation designated use. The numeric eutrophication standards which are applicable to the NRW lake TMDLs are found in Table 4 of this Decision Document. By evaluating multiple lakes in multiple ecoregions MPCA has stated that achieving these phosphorus targets will also achieve the targets for SD depth and chlorophyll-*a*.[5]

In developing the lake nutrient standards for Minnesota lakes, MPCA evaluated data from a large cross-section of lakes within each of the State's ecoregions. Clear relationships were established between the causal factor, Total P, and the response variables, chl-*a* and SD depth. MPCA anticipates that by meeting the Total P concentration of 30 µg/L the response variables chl-*a* and SD will be attained and the lakes addressed by the NRW lake TMDLs will achieve their designated beneficial uses. For lakes to achieve their designated beneficial use, the lake must not exhibit signs of eutrophication and must allow water-related recreation, fishing and aesthetic enjoyment. MPCA views the control of eutrophication as the lake experiencing minimal nuisance algal blooms and exhibiting desirable water clarity.

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

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a waterbody for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

The TMDL submittal should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling. EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

TMDLs must take into account critical conditions for steam flow, loading, and water quality parameters as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(l)). TMDLs should define applicable critical

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[4] MPCA's Aquatic Life Water Quality Standard Draft Technical Support Document for Total Suspended Solids (Turbidity) (May 2011) – https://www.pca.state.mn.us/sites/default/files/wq-s6-11.pdf

[5] Minnesota Lake Water Quality Assessment report: Developing Nutrient Criteria (September 2005) – https://www.pca.state.mn.us/sites/default/files/lwq-a-nutrientcriteria.pdf

conditions and describe their approach to estimating both point and nonpoint source loadings under such critical conditions. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

Comment:
Functionally a TMDL is represented by the equation:

$$TMDL = LC = \Sigma WLA + \Sigma LA + MOS + RC,$$

where: LC is the loading capacity; WLA is the wasteload allocation; LA is the load allocation; MOS is the margin of safety; and (pursuant to MPCA rules) RC is any reserve capacity set aside for future growth. In the NRW TMDL MPCA did not set aside any RC as they do not anticipate future growth in the NRW. MPCA calculated a countywide population change of only a half percent over the last five years. The TMDLs for the NRW can be broken down into two different approaches both of which utilize a Hydrologic Simulation Program FORTRAN (HSPF) model to determine flow: (1) A load duration curve (LDC) for the stream segment TMDLs (to determine TSS and *E. coli* loads); (2) a conventional daily load mass balance for the lake (Total P) TMDLs. These lake TMDLs apply the BATHTUB model approach using the HSPF spatially relevant hydrologic response units (HRU) model output as the inflow values. Details on these models, the LDC process, and specifics related to pollutants of concern (including the TMDL tables) can be found in the sections below and in Section 4 and Appendices A-D of the TMDL.

HSPF
HSPF is a comprehensive modeling package used to simulate watershed hydrology and water quality on a basin scale. The package includes both an Agricultural Runoff Model and a more general nonpoint source model. HSPF parametrizes numerous hydrologic and hydrodynamic processes to determine flow rate, sediment, and nutrient loads. HSPF uses continuous meteorological records to create hydrographs and to estimate time series pollution concentrations.6,7 The output of the HSPF process is a model of multiple HRUs, or subwatersheds of the overall NRW. The flow from these HRUs were calibrated to eight different gage sites with data records up to twelve years long (2000 through 2012). The model was validated with seven years of data (1993 through 2000) to a gage site (HYDSTRA 05011002 and USGS 04024430) downstream of the project area near the point the NRW discharges into Lake Superior.[8]

BATHTUB
MPCA used the U.S. Army Corps of Engineers (USACE) BATHTUB model to calculate the loading capacities for lake TMDLs. BATHTUB is a model for lakes and reservoirs (surficial depressions with retention times greater than two weeks) to determine “steady-state water and nutrient mass balances in a spatially segmented hydraulic network”. BATHTUB uses empirical relationships to determine “eutrophication-related water quality conditions”.[9] This TMDL uses the BATHTUB model to link observed phosphorus water quality conditions and modeled phosphorus loading to in-lake water quality estimates. BATHTUB can be a steady-state annual or seasonal model that predicts a lake’s water quality. BATHTUB utilizes annual or seasonal time-scales which are appropriate because watershed Total P loads are normally impacted by

[6] HSPF User’s Manual - https://water.usgs.gov/software/HSPF/code/doc/hspfhelp.zip
[7] EPA TMDL Models Webpage - https://www.epa.gov/exposure-assessment-models/tmdl-models-and-tools
[8] St. Louis, Cloquet, and Nemadji River Basin Models Volume 1: Hydrology and Sediment Model Calibration - https://www.pca.state.mn.us/sites/default/files/wq-iw10-06n.pdf
[9] BATHTUB Manual - http://www.wwwalker.net/bathtub/help/bathtubWebMain.html

seasonal conditions.

BATHTUB has built-in statistical calculations which account for data variability and provide a means for estimating confidence in model predictions. BATHTUB employs a mass-balance Total P model that accounts for water and Total P inputs from tributaries, direct watershed runoff, the atmosphere, sources internal to the lake, outputs through the lake outlet, water loss via evaporation, and Total P sedimentation and retention in the lake sediments. BATHTUB allows the user the choice of several different mass-balance Total P models for estimating loading capacity. BATHTUB provides flexibility to tailor model inputs to specific lake morphometry, watershed characteristics and watershed inputs. The BATHTUB model also allows MPCA to assess impacts of changes in nutrient loading from the various sources.

The model equations were originally developed US Army Corps of Engineers (USACE) from data taken from over 40 lakes. The model estimates in-lake phosphorus concentration by calculating net phosphorus loss (phosphorus sedimentation) from annual phosphorus loads as functions of inflows to the lake, lake depth, and hydraulic flushing rate. To estimate loading capacity the model is rerun, reducing current loading to the lake until the modeled result shows that in-lake total phosphorus would meet the applicable WQS.[10]

For the NRW Total P TMDLs the BATHTUB modeling efforts were used to calculate the loading capacity for each lake. The loading capacity is the maximum phosphorus load which each of these waterbodies can receive over an annual period and still meet the shallow and general lake nutrient WQS. Loading capacities were calculated to meet the WQS during the growing season (June 1 through September 30). This time period contains the months that the general public typically use lakes in the NRW for aquatic recreation. This time of the year also corresponds to the growing season when water quality is likely to be impaired by excessive nutrient loading.

The appropriate loading capacities for the watershed and internal loading are determined by the HSPF model input load and observed in lake data. The watershed input and internal loading portions of the BATHTUB model are then adjusted until the in lake WQS target is achieved. This finalized BATHTUB model is then used to determine the WLA, LA, and MOS portions of the TMDL. As the mode developed is on an annual basis loading capacities were divided by 365 to calculate the daily loading capacities.

EPA concurs with use of HSPF and BATHTUB to determine loading capacities, wasteload allocations, load allocations and the margin of safety for the Total P TMDLs.

LDC

Flow Duration Curve (FDC) graphs have flow duration interval (percentage of time flow exceeded) on the X-axis and discharge (flow per unit time) on the Y-axis. For the NRW TMDLs FDCs were generated from the spatially relevant flow generated by their HSPF HRUs. The FDC were transformed into LDC by multiplying individual flow values by the WQS and then multiplying that value by a conversion factor. The resulting points are plotted onto a LDC graph. LDC graphs, have flow duration interval (percentage of time flow exceeded) on the X-axis and the pollutant load (or count of colonies for *E. coli*) on the Y-axis. The curved line on a LDC graph represents the TMDL of the respective flow conditions observed at that location.

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[10] BATHTUB Manual - http://www.wwwalker.net/bathtub/help/bathtubWebMain.html

Water quality monitoring was completed in the NRW and measured pollutant concentrations were converted to individual sampling loads by multiplying the sample concentration by the instantaneous flow measurement observed/estimated at the time of sample collection. The individual sampling loads were plotted on the same figure with the created LDC. Individual LDCs are found in Sections 4.1.2, 4.2.2, and 4.3.2 of the TMDL document, for *E. coli*, TSS, and Total P respectively.

The LDC plots were subdivided into five flow regimes; very high flow conditions (exceeded 0–10% of the time), high flow conditions (exceeded 10–40% of the time), mid-range flow conditions (exceeded 40–60% of the time), low flow conditions (exceeded 60–90% of the time), and very low flow conditions (exceeded 90–100% of the time). LDC plots can be organized to display individual sampling loads with the calculated LDC. Watershed managers can interpret LDC graphs with individual sampling points plotted alongside the LDC to understand the relationship between flow conditions and water quality exceedances within the watershed. Individual sampling loads that plot above the LDC represent violations of the WQS for those flow conditions. The difference between individual sampling loads plotted above the LDC and the LDC, measured at the same flow, is the amount of reduction necessary to meet WQS.

The LDC TMDL tables in this Decision Document report five points (the midpoints of the designated flow regime) on the loading capacity curve. However, it should be understood that the components of the TMDL equation could be illustrated for any point on the entire loading capacity curve. The LDC method can be used to display pollutant monitoring data and allows for the estimation of load reductions necessary for attainment of the appropriate WQS. Using this method, daily loads were developed based upon the flow in the waterbody. Loading capacities were determined for the segment from multiple flow regimes. This creates a TMDL that represents the allowable daily load across all flow conditions. The TMDL tables identify the loading capacity for the waterbody at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved as a TMDL.

The strengths of using the LDC method are that critical conditions and seasonal variation are considered in the creation of the FDC by plotting hydrologic conditions over the flows measured during the recreation season. Additionally, the LDC methodology is relatively easy to use and cost-effective. The weaknesses of the LDC method are that nonpoint source allocations cannot be assigned to specific sources, and specific source reductions are not quantified.

Overall, MPCA believes and EPA concurs that the strengths outweigh the weaknesses for the LDC method. The LDC approach is useful in determining loading capacities, wasteload allocations, load allocations and the margin of safety for *E. coli* and TSS TMDLs. The methods used are consistent with U.S. EPA technical memos.[11]

E. coli

Typically loading capacities are expressed as a mass per time (e.g. pounds per day). However, for *E. coli* loading capacity calculations, mass is not always an appropriate measure because *E. coli* is expressed in terms of organism counts. This approach is consistent with the EPA's regulations which define "load" as "an amount of matter that is introduced into a receiving water".[12] To establish the loading capacities for the NRW *E. coli* TMDLs, MPCA used Minnesota's WQS for *E. coli* (in orgs/mL). A loading capacity is, "the

[11] An Approach for Using Load Duration Curves in the Development of TMDLs https://www.epa.gov/sites/production/files/2015-07/documents/2007_08_23_tmdl_duration_curve_guide_aug2007.pdf

[12] 40 CFR §130.2

greatest amount of loading that a water can receive without violating water quality standards."[13] Therefore, a loading capacity set at the WQS will assure that the water does not violate WQS. MPCA's *E. coli* TMDL approach is based upon the premise that all discharges (point and nonpoint) must meet the WQS when entering the waterbody. If all sources meet the WQS at discharge, then the waterbody should meet the WQS and the designated use.

MPCA uses the geometric mean for *E. coli* counts to calculate loading capacity values for the *E. coli* TMDLs (126 orgs/100 mL). MPCA believes the geometric mean of the WQS provides the best overall characterization of the status of the watershed. EPA agrees with this assertion, as stated in the preamble of, "The WQS for Coastal and Great Lakes Recreation Waters Final Rule", "…the geometric mean is the more relevant value for ensuring that appropriate actions are taken to protect and improve water quality because it is a more reliable measure, being less subject to random variation, and more directly linked to the underlying studies on which the 1986 bacteria criteria were based."[14] MPCA stated that the *E. coli* TMDLs will focus on the geometric mean portion of the WQS (126 orgs/100 mL) and that it expects that by attaining the 126 orgs/100 mL portion of the *E. coli* WQS the 1,260 orgs/100 mL portion of the *E. coli* WQS will also be attained. EPA finds these assumptions to be reasonable.

In addition, to using the geometric mean MPCA structures its WQS to reflect when the highest potential for contact occurs (spring though summer). By targeting this critical exposure period MPCA can achieve the greatest overall protection. Review of the historical data indicates that the critical periods *E. coli* loading range from the upper middle of the flow regime though the very high flows. At the high end of the flow regime there is an increased exceedance of WQS. This is true for both the *E. coli* impaired assessment units the South Fork Nemadji River (AUID 04010301-558) and the Nemadji River (AUID 04010301-758).

EPA supports the data analysis and modeling approach used by MPCA in its calculation of wasteload allocations, load allocations and the margin of safety for the NRW *E. coli* TMDLs. Additionally, EPA concurs with the loading capacities calculated by MPCA in the two *E. coli* TMDLs. EPA finds MPCA's approach for calculating the loading capacity to be reasonable and consistent with EPA guidance.

The TMDL tables for all of the *E. coli* TMDLs are found below and in Section 4.1.2 of the TMDL.

[13] 40 CFR §130.2

[14] 69 FR 67218-67243 (November 16, 2004) – https://www.gpo.gov/fdsys/pkg/FR-2004-11-16/html/04-25303.htm

E. coli TMDL Tables

Table 3: Bacteria (*E. coli*) TMDLs for the Nemadji River Watershed

Allocation	Source	Very High	High	Mid	Low	Very Low
		E. coli (billions of organisms/day)				
TMDL for Nemadji River, South Fork (04010301-558)						
Wasteload Allocation	***WLA Totals***	0.0	0.0	0.0	0.0	0.0
Load Allocation	Watershed load	233.0	60.0	22.0	8.0	2.7
	LA Totals	233.0	60.0	22.0	8.0	2.7
Margin of Safety (10%)		26.0	7.0	2.0	1.0	0.3
Loading Capacity (TMDL)†		**259**	**67**	**24**	**9**	**3**
Existing Load		**705**	**73**	**27**	**-**	**-**
Percent Load Reduction		**63%**	**8%**	**11%**	**-**	**-**
TMDL for Nemadji River (04010301-758)						
Wasteload Allocation	***WLA Totals***	0.0	0.0	0.0	0.0	0.0
Load Allocation	Watershed load	985.0	297.0	126.0	51.0	25.0
	LA Totals	985.0	297.0	126.0	51.0	25.0
Margin of Safety (10%)		109.0	33.0	14.0	6.0	3.0
Loading Capacity (TMDL)†		**1,094**	**330**	**140**	**57**	**28**
Existing Load		**4,058**	**326**	**151**	**-**	**-**
Percent Load Reduction		**73%**	**0%**	**7%**	**-**	**-**

†Loading capacity rounded to nearest whole number

TSS

MPCA developed LDCs to calculate the TSS TMDLs for the NRW. The same LDC development strategies were employed for the sediment as those for the *E. coli* TMDLs. The FDCs were transformed into LDCs by multiplying individual flow values by the numeric criteria (10 mg/L) and then multiplying that value by a conversion factor.

The LDC method can be used to display collected sediment monitoring data and allows for the estimation of load reductions necessary for attainment of the Class 2A TSS WQS. Using this method, daily loads were developed based upon the flow in the waterbody. Loading capacities were determined for each segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. The tables at the end of this section show the loading capacity for each segment across all flow regimes. Although there are numeric loads for each flow regime, the LDC is what is being approved as a TMDL.

MPCA's loading reduction estimates for each TSS TMDL can be seen at the end of this section. These loading reductions were calculated from field data collected in the NRW. MPCA explained that its load reduction estimates are likely conservative since they are based on a limited water quality dataset.

MPCA determined that the TSS LDCs also show that the main concern for TSS is loading during higher flows. This loading is attributed to mass wasting events and artesian discharges of sediment from springs. The NRW TMDL LDCs show that all of the assessment units for which there are historical data show exceedances at mid-range flows and above. In addition, Rock Creek's (AUID 04010301-573) LDC indicated that exceedances are a regular occurrence during historical low flow events.

EPA supports the data analysis and modeling approach utilized by MPCA in its calculation of wasteload allocations, load allocations, and the margin of safety for the TSS TMDLs. Additionally, EPA concurs with the loading capacities calculated by MPCA in the TSS TMDLs. EPA finds MPCA's approach for calculating the loading capacity for the TSS TMDLs to be reasonable and consistent with EPA guidance.

The TMDL tables for all of the TSS TMDLs are found below and in Section 4.2.2 of the TMDL document.

TSS TMDL Tables

Table 4: Total Suspended Solids (TSS) TMDLs for the Nemadji River Watershed

Allocation	**Source**	**Very High**	**High**	**Mid**	**Low**	**Very Low**
		TSS (lbs/day)				
TMDL for Skunk Creek (04010301-502)						
Wasteload Allocation	Construction Stormwater (MNR100001)	0.3700	0.0940	0.0350	0.0130	0.0048
	WLA Totals	0.3700	0.0940	0.0006	0.0130	0.0048
Load Allocation	Watershed Load	1600.0000	400.0000	149.0000	57.0000	20.0000
	LA Totals	1600.0000	400.0000	149.0000	57.0000	20.0000
	Margin of Safety (10%)	178.0000	44.0000	17.0000	6.4000	2.3000
	Loading Capacity (TMDL)†	**1,778**	**444**	**166**	**63**	**22**
	Existing Load	**202,354**	**5,270**	**444**	**102**	**14**
	Percent Load Reduction	**99.12%**	**91.57%**	**62.61%**	**37.83%**	**0%**

†Loading capacity rounded to nearest whole number

Allocation	Source	Very High	High	Mid	Low	Very Low
		TSS (lbs/day)				
TMDL for Rock Creek (04010301-508)						
Wasteload Allocation	Construction Stormwater (MNR100001)	0.2200	0.0490	0.0180	0.0066	0.0022
	WLA Totals	0.2200	0.0490	0.0006	0.0066	0.0022
Load Allocation	Watershed Load	941.0000	210.0000	75.0000	28.0000	9.3000
	LA Totals	941.0000	210.0000	75.0000	28.0000	9.3000
Margin of Safety (10%)		105.0000	23.0000	8.4000	3.1000	1.0000
Loading Capacity (TMDL)†		**1046**	**233**	**83**	**31**	**10**
Existing Load		**81,447**	**5,485**	**824**	**93**	**20**
Percent Load Reduction		**98.72%**	**95.75%**	**89.88%**	**66.55%**	**48.49%**
TMDL for Clear Creek (04010301-527)						
Wasteload Allocation	Construction Stormwater (MNR100001)	0.4200	0.1300	0.0570	0.0230	0.0110
	WLA Totals	0.4200	0.1300	0.0570	0.0230	0.0110
Load Allocation	Watershed Load	1782.0000	572.0000	243.0000	98.0000	46.0000
	LA Totals	1782.0000	572.0000	243.0000	98.0000	46.0000
Margin of Safety (10%)		198.0000	64.0000	27.0000	11.0000	5.1000
Loading Capacity (TMDL)†		**1980**	**636**	**270**	**109**	**51**
Existing Load		**49,706**	**4,143**	**796**	**170**	**-**
Percent Load Reduction		**96.02%**	**84.65%**	**66.07%**	**35.87%**	**-**
TMDL for Unnamed Creek (04010301-532)						
Wasteload Allocation	Construction Stormwater (MNR100001)	0.0520	0.0130	0.0052	0.0021	0.0009
	WLA Totals	0.0520	0.0130	0.0052	0.0021	0.0009
Load Allocation	Watershed Load	222.0000	55.0000	22.0000	9.0000	3.6000
	LA Totals	222.0000	55.0000	22.0000	9.0000	3.6000
Margin of Safety (10%)		25.0000	6.1000	2.5000	1.0000	0.4000
Loading Capacity (TMDL)†		**247**	**61**	**25**	**10**	**4**
Existing Load		**-**	**-**	**-**	**-**	**-**
Percent Load Reduction		**-**	**-**	**-**	**-**	**-**

†Loading capacity rounded to nearest whole number

Allocation	Source	Very High	High	Mid	Low	Very Low
		TSS (lbs/day)				
TMDL for Unnamed Creek (04010301-532)						
Wasteload Allocation	Construction Stormwater (MNR100001)	0.0520	0.0130	0.0052	0.0021	0.0009
	WLA Totals	0.0520	0.0130	0.0052	0.0021	0.0009
Load Allocation	Watershed Load	222.0000	55.0000	22.0000	9.0000	3.6000
	LA Totals	222.0000	55.0000	22.0000	9.0000	3.6000
	Margin of Safety (10%)	25.0000	6.1000	2.5000	1.0000	0.4000
	Loading Capacity (TMDL)†	**247**	**61**	**25**	**10**	**4**
	Existing Load	**-**	**-**	**-**	**-**	**-**
	Percent Load Reduction	**-**	**-**	**-**	**-**	**-**
TMDL for Mud Creek (04010301-537)						
Wasteload Allocation	Construction Stormwater (MNR100001)	0.4800	0.1100	0.0400	0.0160	0.0051
	WLA Totals	0.4800	0.1100	0.0400	0.0160	0.0051
Load Allocation	Watershed Load	2046.00	476.00	170.00	68.00	22.00
	LA Totals	2046.00	476.00	170.00	68.00	22.00
	Margin of Safety (10%)	227.00	53.00	19.00	7.60	2.40
	Loading Capacity (TMDL)†	**2273**	**529**	**189**	**76**	**24**
	Existing Load	**31,168**	**1,792**	**260**	**114**	**-**
	Percent Load Reduction	**92.71%**	**70.47%**	**27.29%**	**33.67%**	**-**
TMDL for Nemadji River, South Fork (04010301-558)						
Wasteload Allocation	Construction Stormwater (MNR100001)	0.9500	0.2500	0.0910	0.0340	0.0120
	WLA Totals	0.9500	0.2500	0.0006	0.0340	0.0120
Load Allocation	Watershed Load	4068.0000	1048.0000	389.0000	147.0000	52.0000
	LA Totals	4068.0000	1048.0000	389.0000	147.0000	52.0000
	Margin of Safety (10%)	452.0000	116.0000	43.0000	16.0000	5.8000
	Loading Capacity (TMDL)†	**4521**	**1164**	**432**	**163**	**58**
	Existing Load	**3,077,901**	**12,552**	**647**	**157**	**40**
	Percent Load Reduction	**99.85%**	**90.72%**	**33.23%**	**0%**	**0%**

†Loading capacity rounded to nearest whole number

Allocation	Source	Very High	High	Mid	Low	Very Low
		TSS (lbs/day)				
TMDL for Rock Creek (04010301-573)						
Wasteload Allocation	Construction Stormwater (MNR100001)	0.1700	0.0370	0.0130	0.0050	0.0016
	WLA Totals	0.1700	0.0370	0.0130	0.0050	0.0016
Load Allocation	Watershed Load	706.0000	157.0000	57.0000	21.0000	7.0000
	LA Totals	706.0000	157.0000	57.0000	21.0000	7.0000
Margin of Safety (10%)		78.0000	17.0000	6.3000	2.4000	0.7700
Loading Capacity (TMDL)†		**784**	**174**	**63**	**23**	**8**
Existing Load		**61,107**	**4,115**	**618**	**70**	**15**
Percent Load Reduction		**98.72%**	**95.77%**	**89.76%**	**66.56%**	**48.19%**
TMDL for Nemadji River (04010301-757)						
Wasteload Allocation	Construction Stormwater (MNR100001)	1.9000	0.5200	0.2000	0.0800	0.0340
	WLA Totals	1.9000	0.5200	0.2000	0.0800	0.0340
Load Allocation	Watershed Load	8658.0000	2316.0000	901.0000	351.0000	152.0000
	LA Totals	8658.0000	2316.0000	901.0000	351.0000	152.0000
Margin of Safety (10%)		962.0000	257.0000	100.0000	39.0000	17.0000
Loading Capacity (TMDL)†		**9,622**	**2,574**	**1,001**	**390**	**169**
Existing Load		**752,134**	**41,517**	**5,280**	**714**	**148**
Percent Load Reduction		**98.72%**	**93.80%**	**81.04%**	**45.37%**	**0%**
TMDL for Nemadji River (04010301-758)						
Wasteload Allocation	Construction Stormwater (MNR100001)	3.9000	1.2000	0.5000	0.2100	0.1000
	WLA Totals	3.9000	1.2000	0.5000	0.2100	0.1000
Load Allocation	Watershed Load	17225.0000	5199.0000	2202.0000	900.0000	443.0000
	LA Totals	17225.0000	5199.0000	2202.0000	900.0000	443.0000
Margin of Safety (10%)		1914.0000	578.0000	245.0000	100.0000	49.0000
Loading Capacity (TMDL)†		**19,143**	**5,778**	**2,448**	**1,000**	**492**
Existing Load		**16,618,086**	**126,155**	**90,818**	**1,215**	**640**
Percent Load Reduction		**99.88%**	**95.42%**	**97.31%**	**17.68%**	**23.11%**

†Loading capacity rounded to nearest whole number

Total P

MPCA divided Total P loading capacity by WLA, LA (including subparts), and MOS components of the TMDL. These calculations were done for the lakes critical conditions, the summer growing season, when water quality in each lake is most likely to be degraded and phosphorus loading inputs are the greatest. Therefore, the resulting allocations will protect the NRW lakes during the time of the year with the highest potential for degraded water quality. MPCA also assumes that the loading capacities established by the TMDL will be protective of water quality during the remainder of the calendar year (October through May). Minnesota reflects this assumption with its targeted WQS approach for the months of June through September. In addition to the allocations being set for the summer months and Minnesota's WQS reflecting this period, the BATHTUB model is calibrated to the summer growing season.

MPCA calibrated the BATHTUB models with a minimum of two years in lake data (2011 through 2012). See Tables 30 and 31 of the TMDL for summaries of the calibration data. MPCA then loaded these calibrated models with the HSPF model to determine the proportional loading for the NRW Total P TMDLs. Using the HSPF models for loading facilitates a more comprehensive picture of the natural system as the HSPF model generates a continuous dataset and serves as a proxy for field measurements.

EPA supports the data analysis and modeling approach utilized by MPCA in its calculation of wasteload allocations, load allocations, and the margin of safety for the NRW phosphorus TMDLs. Additionally, EPA concurs with the loading capacities calculated by MPCA in these two Total P TMDLs. EPA finds

MPCA's approach for calculating the loading capacity to be reasonable and consistent with EPA guidance.

The TMDL tables for all of the Total P TMDLs are found below and in Section 4.3.2 of the TMDL.

Total P TMDL Tables

Table 5: Total Phosphorus TMDLs for the Nemadji River Watershed

Allocation	**Source**	**Total P Load**	
		(lbs/yr)	***(lbs/day)***
TMDL for Net Lake (58-0038-00)			
Wasteload Allocation	Construction Stormwater (MNR100001)	0.25000	0.00069
	WLA Totals	***0.25000***	***0.00069***
Load Allocation	Watershed Runoff	1026.00000	2.80000
	SSTS	25.00000	0.06900
	Atmospheric Deposition	25.00000	0.06900
	LA Totals	***1076.00000***	***2.93800***
Margin of Safety (10%)		120.00000	0.33000
Loading Capacity (TMDL)		**1,196.25000**	**3.26869**
Existing Load		**1,561.0**	**4.3**
Percent Load Reduction†		**33%**	**33%**

TMDL for Lac La Belle (09-0011-00)			
Wasteload Allocation	Construction Stormwater (MNR100001)	0.009700	0.000027
	WLA Totals	***0.009700***	***0.000027***
Load Allocation	Watershed Runoff	15.900000	0.043000
	SSTS	19.300000	0.053000
	Atmospheric Deposition	6.400000	0.018000
	LA Totals	***41.600000***	***0.114000***
Margin of Safety (10%)		4.600000	0.013000
Loading Capacity (TMDL)		**46.209700**	**0.127027**
Existing Load		**115.000**	**0.315**
Percent Load Reduction†		**69%**	**70%**

†Percentages do not include reductions from atmospheric loading

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

4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R.§130.2(g)). Where possible, load allocations should be described separately for natural background and nonpoint sources.

Comment:

MPCA determined the LA calculations for each of the TMDLs based on the applicable WQS. MPCA recognized that LAs for each of the individual TMDLs addressed by the NRW TMDLs can be attributed to various nonpoint sources. MPCAs' LA methodology in the NRW was to address nonpoint sources by their pollutant of concern, and not by individual source. The LA for the TMDLs was calculated by summing the WLA and MOS, and assigning the remaining concentrations to the LA.

E. coli

The calculated LA values for the *E. coli* TMDLs are applicable across all flow conditions in the NRW. MPCA identified several nonpoint sources which contribute bacteria loads to the surface waters of the NRW, including: non-regulated urban stormwater runoff; stormwater from agricultural and feedlot areas; failing septic systems; wildlife and pets. A weight of evidence approach was used to estimate loading from various animal sources though a combination of the Board of Water and Soil Resources (BWSR) Ecological Ranking Tool and land use data. Table 32 of the TMDL shows the various delivery factors developed. Source loading estimates by animal type can be found in Tables 34, 35, and 36 of the TMDL for livestock, wildlife, and domestic pets respectively. Human loading sources were estimated by area weighting number of SSTS that are an ITPHS and multiplying this average by the number of people per household. This was then multiplied by values from EPA's Protocol for Developing Pathogen TMDLs. The ITPHS data were gathered from county surveys. Table 33 of the TMDL shows the values used to estimate loading. MPCA shows a relative loading by source that identifies livestock as being the main contributor of *E. coli* (Table 37 of the TMDL).

MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations, but aggregated the nonpoint sources into a categorical LA value. Additionally, MPCA acknowledged that there are likely background *E. coli* levels attributed to naturalized populations, but did not separately calculate a value for this loading.

TSS

The calculated LA values for the TSS TMDLs are applicable across all flow conditions. MPCA identified several nonpoint sources which contribute sediment loads to the surface waters in the NRW. Load allocations were recognized as originating from many diverse nonpoint sources including: stormwater contributions from overland erosion (typically agricultural sources); hydromodification (stream channelization, draining of wetlands, tile draining of fields); streambank erosion; natural sources from wetlands and forest; and atmospheric deposition. MPCA identified mass wasting events as being the main source of TSS in the impaired streams. Additionally, MPCA indicated that sediment loading from artesian springs (deemed sediment volcanoes) is a major source of TSS in the NRW. Figure 19 in the TMDL is a conceptual schematic of the HSPF watershed loading model. MPCA's estimates for upland loading rates of TSS can be found in Table 38 of the TMDL. Furthermore, MPCA has identified near channel sources as the primary contributor for TSS loading in all but two of the assessment units the Rock Creek Headwaters (AUID 04010301-573) and the downstream impaired Rock Creek assessment unit (AUID 04010301-508). MPCA attributes this to the Rock Creek Headwaters being primarily agricultural.

MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations, but aggregated the nonpoint sources into one LA value ('Watershed Runoff').

Total P

The calculated LA values for the Total P TMDLs are applicable to the corresponding summer growing season. MPCA identified several nonpoint sources which contribute Total P loads to the surface waters in the NRW. Load allocations were recognized as originating from: failing septic systems; stormwater from agricultural and feedlot areas (manure, fertilizer, erosion of soils); streambank erosion; and atmospheric deposition.

MPCA estimated watershed loads, loading from SSTS, and atmospheric loading separately for the LA portions of the Total P TMDLs. MPCA did not quantify any internal loading for the two lakes, indicating that this is not a primary concern. Furthermore, MPCA states that the implicit internal loading built into the BATHTUB model will account for any contributing internal P loading source. For the Total P loading calculations MPCA calculated these LA sources and reduced the watershed and SSTS components to achieve WQS, then further reduced these loads by the MOS and the general construction permit loading. The resulting calculation is the TMDL with necessary LA targets.

MPCA subset the LA for the NRW Total P loads by watershed, SSTS, and atmospheric deposition, which in turn provides more descriptive representation of the LA portion for these TMDLs.

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

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to individual existing and future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit.

The individual WLAs may take the form of uniform percentage reductions or individual mass based limitations for dischargers where it can be shown that this solution meets WQSs and does not result in localized impairments. These individual WLAs may be adjusted during the NPDES permitting process. If the WLAs are adjusted, the individual effluent limits for each permit issued to a discharger on the impaired water must be consistent with the assumptions and requirements of the adjusted WLAs in the TMDL. If the WLAs are not adjusted, effluent limits contained in the permit must be consistent with the individual WLAs specified in the TMDL. If a draft permit provides for a higher load for a discharger than the corresponding individual WLA in the TMDL, the State/Tribe must demonstrate that the total WLA in the TMDL will be achieved through reductions in the remaining individual WLAs and that localized impairments will not result. All permittees should be notified of any deviations from the initial individual WLAs contained in the TMDL. EPA does not require the establishment of a new TMDL to reflect these revised allocations as long as the total WLA, as expressed in the TMDL, remains the same or decreases, and there is no reallocation between the total WLA and the total LA.

Comment:

MPCA has indicated that the NRW is almost solely impaired due to contributions from nonregulated sources. In fact, MPCA has identified no permanent permitted sources of *E. coli* in the NRW. The only permitted sources are construction stormwater permits, which only apply to minute portions of the watershed at a given time. In addition to minimal permits, MPCA has indicated that there are no registered feedlots in the impaired lakes watersheds.

E. coli

There are no permitted sources of *E. coli* in the NRW.

TSS

Stormwater from construction is the only regulated source of sediment in the NRW. MPCA has indicated that stormwater from construction is not considered a significant source of loading as approximately 0.02% of the watershed is permitted at a time based off historical records (averaged from 2003 through 2014). The WLAs for TSS are in Table 4 of this Decision Document.

Total P

Stormwater from construction is the only regulated source of phosphorus in the NRW impaired lakes watersheds. MPCA has indicated that stormwater from construction is not considered a significant source of loading as approximately 0.02% of the watershed is permitted at a time based off historical records (averaged from 2003 through 2014). The WLAs for phosphorus are in Table 5 of this Decision Document.

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

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(l)(C), 40 C.F.R. §130.7(c)(1)). EPA's 1991 TMDL Guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

Comments:

MPCA applies an explicit MOS to their TMDLs. See Sections 4.1, 4.2, and 4.3, Margin of Safety, in the TMDL.

E. coli

A 10% explicit margin of safety was established for the NRW *E. coli* TMDLs. MPCA states that while the HSPF model may have error in the 50% low flows and 10% high flows there is good accountability for total flow. MPCA further explains that while the simulated flows are only fair, this likely reflects uncertainty introduced when estimations were made during ice jam conditions. MPCA also clarifies that where flow was determined by area-weighting modeled segments, the added uncertainty may have increased, but error in the simulated flow remains minimally impacted. For these reasons MPCA has indicated that a 10% MOS should provide an accurate protection. EPA agrees with this MOS due to MPCAs explanation above.

Challenges associated with quantifying *E. coli* loads include the dynamics and complexity of bacteria in stream environments. Factors such as die-off and re-growth contribute to general uncertainty that make quantifying stormwater bacteria loads particularly difficult. The MOS for the NRW bacteria TMDLs also incorporated certain conservative assumptions in the calculation of the TMDLs. No rate of decay, or die-off rate of pathogen species, were used in the TMDL calculations or in the creation of 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. MPCA determined that it was more conservative to use the WQS (126 orgs/100 mL) and not to apply a rate of decay, which could result in a discharge limit greater than the WQS.

As stated in *EPA's Protocol for Developing Pathogen TMDLs*[15], many different factors affect the survival of pathogens, including the physical condition of the water. These factors include, but are not limited to sunlight, temperature, salinity, and nutrient deficiencies. These factors vary depending on the environmental conditions of the water. It would be difficult to assert that the rate of decay caused by any given combination of these environmental variables was sufficient to meet the WQS of 126 orgs/100 mL. Therefore, it is more conservative to apply the State's WQS as the bacteria target value, because this standard must be met at all times under all environmental conditions.

TSS

A 10% explicit margin of safety was established for the NRW TSS TMDLs. MPCA states that while the HSPF model may have error in the 50% low flows and 10% high flows there is good accountability for total flow. MPCA further explains that while the simulated flows are only fair, this likely reflects uncertainty introduced when estimations were made during ice jam conditions. MPCA also clarifies that where flow was determined by area-weighting modeled segments, the added uncertainty may have increased, but error in the simulated flow remains minimally impacted. For these reasons MPCA has indicated that a 10% MOS should provide an accurate protection. EPA agrees with this MOS due to MPCAs explanation above.

Total P

A 10% explicit margin of safety was established for the NRW E. coli TMDLs. MPCA states that while the HSPF model may have error in the 50% low flows and 10% high flows there is good accountability for total flow. MPCA further explains that while the simulated flows are only fair, this likely reflects

[15] Protocol for Developing Pathogen TMDLs EPA 841-R-00-002 – https://nepis.epa.gov/Exe/ZyPDF.cgi/20004QSZ.PDF?Dockey=20004QSZ.PDF

uncertainty introduced when estimations were made during ice jam conditions. MPCA also clarifies that where flow was determined by area-weighting modeled segments, the added uncertainty may have increased, but error in the simulated flow remains minimally impacted. This HSPF model is the used to load the BATHUB model to determine the TMDL allocations. MPCA, therefore applied a similar 10% MOS as it should provide accurate protection. EPA agrees with this MOS due to MPCAs explanation above.

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

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variations (CWA §303(d)(l)(C), 40 C.F.R. §130.7(c)(l)).

Comment:

Seasonal variation is accounted for in each of the TMDLs by virtue of the datasets and modeling approaches capturing a wide range of conditions within a season, and across multiple years. In addition, MPCA has also developed their WQS to reflect the periods of concern associated with the designated uses addressed in this TMDL. Furthermore, the lake models specifically target the summer months, which are both the most biologically active, and when human contact is at its peak.

E. coli

Bacterial loads vary by season, typically reaching higher numbers in the dry summer months when low flows and bacterial growth rates contribute to their abundance, and reaching relatively lower values in colder months when bacterial growth rates attenuate and loading events, driven by stormwater runoff events aren't as frequent. Bacterial WQS need to be met between April 1st to October 31st, regardless of the flow condition. The *E. coli* TMDLs use the LDC methodology. The development of the LDCs utilized simulated flow data which were validated and calibrated with local flow gage data. Modeled flow (HSPF) measurements represented a variety of flow conditions from the recreation season. LDCs developed from these modeled flow conditions represented a range of flow conditions within the NRW and thereby accounted for seasonal variability over the recreation season.

TSS

The TSS WQS applies from April to September which is also the time period when high concentrations of sediment are expected in the surface waters of the NRW, although there are differences from reach-to-reach. Sediment loading to surface waters in the NRW varies depending on surface water flow, land cover, and climate/season. Typically, in the NRW, sediment transport is attributed to wet weather events. TSS loading comes from overland flow, channel and stream bank erosion, as well as bluff erosion. Spring is typically associated with large flows from snowmelt, the summer is associated with the growing season as well as periodic storm events and receding streamflow's, and the fall brings increasing precipitation and rapidly changing agricultural landscapes. The TSS TMDLs use the LDC methodology. The development of the LDCs utilized simulated flow data which were validated and calibrated with local flow gage data. Modeled flow (HSPF) measurements represented a variety of flow conditions from the recreation season. LDCs developed from these modeled flow conditions represented a range of flow conditions within the NRW and thereby accounted for seasonal variability over the recreation season.

Total P

Phosphorus levels in NRW lake TMDLs vary over the growing season (June 1st to September 30th). The water quality targets were designed to meet the eutrophication WQS during the period of the year where the frequency and severity of algal growth is the greatest.

The Minnesota eutrophication standards state that total phosphorus WQS are defined as the mean concentration of phosphorus values measured during the growing season. In the NRW phosphorus TMDL efforts, the LA and WLA estimates were calculated from modeling efforts (BATHTUB and HSPF), which incorporated mean growing season total phosphorus values. Nutrient loading capacities were set in the TMDL development process to meet the WQS during the most critical period. The mid-late summer time period is typically when eutrophication standards are exceeded and water quality within the NRW is deficient. By calibrating the modeling efforts to protect these waterbodies during the worst water quality conditions of the year, it is assumed that the loading capacities established by the TMDLs will be protective of water quality during the remainder of the calendar year (October through May).

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

8. Reasonable Assurances

When a TMDL is developed for waters impaired by point sources only, the issuance of a NPDES permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL.

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

EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations.

Comment:

The Clean Water Legacy Act (CWLA) is a statute passed in Minnesota in 2006 for the purposes of protecting, restoring, and preserving Minnesota water. The CWLA provides the process to be used in Minnesota to develop TMDL implementation plans, which detail the restoration activities needed to achieve the allocations in the TMDL. The TMDL implementation plans are required by the State to obtain funding from the Clean Water Fund (CWF). The Act discusses how MPCA and the involved public agencies and private entities will coordinate efforts regarding land use, land management, water management, etc. Cooperation is also expected between agencies and other entities regarding planning efforts, authorities, and responsibilities. This would also 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 (BWSR) administers the CWF and has developed a detailed grants policy explaining what is required to be eligible to receive CWF money[16].

The CWLA also provides details on public and stakeholder participation, and how the funding will be used. In part to attain these goals, the CWLA requires MPCA to develop WRAPS. MPCA views the WRAPS document as a starting point for which MPCA and local partners can develop tools that will help local governments, land owners, and special interest groups determine (1) the best strategies for making improvements and protecting resources that are already in good condition, and (2) focus those strategies in the best places to do work. The WRAPS are required to contain such elements as the identification of impaired waters, watershed modeling outputs, point and nonpoint sources, load reductions, etc.[17, 18] The WRAPS also contain a preliminary implementation table of strategies to achieve loading reductions for both point and nonpoint sources.[19] These tables contain more than needed actions including: a timeline for achieving water quality reductions; reductions needed from both point and nonpoint sources; the governmental units responsible; and interim milestones for achieving the actions. All of the required components can be found in MPCA's WRAPS guidance.[20] The NR WRAPS was approved by MPCA on June 14, 2017.

EPA agrees that the detail provided in the WRAPS document is a sound starting point for providing a focused, comprehensive implementation plan on the watershed scale providing reasonable assurance that load reductions will be achieved. Subsequent work will be done in watershed by BWSR under the leadership of Carlton County Soil and Water Conservation District (SWCD) to further refine implementation at local level via the development of a NR One Watershed, One Plan (1W1P).[21] This plan is expected to be developed within the next 10 years. Projects to achieve the outlined reductions plans will be funded through various programs including: Clean Water Fund projects; Clean Water Act Section 319 grants; NRCS programs (EQUIP, etc.); Great Lakes Restoration Initiative grants; and local government cost-share and loan programs.

For the reasons above EPA determines that MPCA has provided reasonable assurance that actions identified in the implementation section of the TMDL (i.e., Sections 6 and 8 of the TMDL document), will be applied to attain the loading capacities and allocations calculated for the impaired reaches within the NRW. EPA anticipates that the recommendations made by MPCA will be successful at improving water quality if the appropriate local groups work to implement these recommendations. Those mitigation suggestions, which fall outside of regulatory authority, will require commitment from state agencies and local stakeholders to carry out the suggested actions. To address the lack of regulatory authority MPCA developed the above mentioned WRAPS to better identify nonregulated sources and community specific

[16] Minnesota Clean Water Fund – http://www.bwsr.state.mn.us/cleanwaterfund/index.html
[17] Chapter 114D.26; CWLA – https://www.revisor.leg.state.mn.us/statutes/?id=114D&view=chapter#stat.114D.26
[18] Clean Water Fund RFP – http://www.bwsr.state.mn.us/cleanwaterfund/index.html
[19] Chapter 114D.26, Subd. 1(8); CWLA – https://www.revisor.leg.state.mn.us/statutes/?id=114D&view=chapter#stat.114D.26
[20] WRAPS Template – https://www.pca.state.mn.us/water/tmdl-policy-and-guidance
[21] BWSR One Watershed, One Plan - http://bwsr.state.mn.us/planning/1W1P/index.html

BMPs to reduce pollutant loading. The sections below outline the reasonable assurance by pollutant sources.

Point Source

Reasonable assurance that WLAs will be implemented is provided by regulatory actions. According to 40 CFR 122.44(d)(1)(vii)(B), NPDES permit effluent limits must be consistent with assumptions and requirements of all WLAs in an approved TMDL. MPCA implements its storm water and NPDES permit programs, and is responsible for making the effluent limits consistent with the WLAs in this TMDL. TSS and Total P WLAs were assigned in this TMDL for general construction and industrial stormwater sources (MNR100001). The NPDES program requires construction and industrial sites to create a Stormwater Pollution Prevention Plan (SWPPP) that summarizes how stormwater will be minimized from the site. As a part of this SWPPP, the general permit for construction requires that BMPs are properly selected, installed, and maintained.

Nonpoint Sources

MPCA has identified several local partners which have expressed interest in working to reduce nonpoint source pollution within the NRW. The following groups are expected to work closely with one another to ensure that pollutant reduction efforts via BMPs are being implemented within the NRW: local municipal governments; private land owners; local conservation groups; state government; federal government; other nongovernmental organizations (NGOs); all under the guidance of the Carlton County SWCD[22]. The Carlton County SWCD has been working in the NRW for over 30 years. They have lead efforts to reduce loading including: installing runoff retention dams; enhancing riparian including on private lands; and engaging local residents. Part of these efforts include the implementation of the Nemadji River Basin Plan.[23] MPCA has also indicated that a technical workgroup will be established, led by Carlton County SWCD, whose first task will be to inventory past implementation activities. This baseline assessment will support future site selection and project design, raising the chances of success for future implementation activities. Furthermore, Carlton Count SWCD will be responsible for coordinating the efforts outlined in the NR WRAPS report.

EPA finds that the eighth criterion has been adequately addressed.

9. Monitoring Plan to Track TMDL Effectiveness

EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur. Such a TMDL should provide assurances that nonpoint source controls will achieve expected load reductions and, such TMDL should include a monitoring plan that assess if load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

<u>Comment:</u>

MPCA has a comprehensive water quality monitoring program, Minnesota's Water Quality Monitoring Strategy[24]. This program is comprised of three monitoring programs: Intensive Watershed

[22] Carlton County SWCD – http://carltonswcd.org/
[23] Nemadji River Basin Project Overview - http://carltonswcd.org/watersheds/nemadji-river-watershed-guide/watershed-projects/nemadji-river-basin-project/
[24] Minnesota's Water Quality Monitoring Strategy – https://www.pca.state.mn.us/sites/default/files/p-gen1-10.pdf

Monitoring[25], Watershed Pollutant Load Monitoring Network[26], Citizen Stream and Lake Monitoring Program[27]. MPCA's statewide monitoring program assesses the states waters on a ten-year rotating timeframe. This past monitoring created a robust dataset that was used for the model development of the NRW TMDL, and will be used as a baseline to evaluate overall improvements in the watershed. Furthermore, continued water quality monitoring within the basin will provide insight into the success or failure of BMP systems designed to reduce *E. coli*, nutrient and TSS loading into the surface waters of the watershed. Local watershed managers will be able to reflect on the progress of the various pollutant removal strategies and would have the opportunity to change course if observed progress is unsatisfactory.

EPA finds that the ninth criterion has been adequately addressed.

10. Implementation

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

Comment:

As was stated in the Reasonable Assurance section of this Decision Document, the Carlton County SWCD has been working in the NRW for over 30 years and will be heading up restoration implementation efforts. Some of these restoration plans are already underway such as the Nemadji River Basin Plan. The Nemadji River Basin Plan's goal is to achieve all beneficial uses by 2025. Specific practices in this plan include: wildlife management; bank protection/stabilization; habitat improvement; livestock management; and riparian zone management. Water quality monitoring, wetland restoration, and riparian tree planting have already been enacted as part of this plan to name a few practices.[28]

In addition to the Carlton Count SWCD, the Carlton County Land Offices has developed a county management plan. The plan outlines specific activities to manage sensitive areas. Additionally, the plan sets out specific prohibitions and outlines goals for the counties "experimental forest". One of the specific suggestions is to prohibit active forest management on clay slopes and river bottoms of the NRW.[29]

As for the NR WRAPS (Section 3.7 Restoration and Protection Strategies), MPCA outlines a profusion of BMPs to be implemented at HUC-10 subwatershed providing a roadmap towards achieving WQS. A description of these practices can be found in Table 15 of the NR WRAPS document. Furthermore, MPCA indicates that there will be annual watershed newsletters and outreach events to inform watershed

[25] Intensive Watershed Monitoring – https://www.pca.state.mn.us/water/watershed-sampling-design-intensive-watershed-monitoring
[26] Watershed Pollutant Load Monitoring Network – https://www.pca.state.mn.us/water/watershed-pollutant-load-monitoring-network
[27] Citizen Stream and Lake Monitoring Program – https://www.pca.state.mn.us/water/citizen-water-monitoring
[28] Nemadji River Basin Project Overview - http://carltonswcd.org/watersheds/nemadji-river-watershed-guide/watershed-projects/nemadji-river-basin-project/
[29] Carlton County Land Management Plan – http://www.co.carlton.mn.us/vertical/Sites/%7B315ADE76-21A3-4241-B977-F94AEE8A7F04%7D/uploads/Land_Management_Plan.pdf

residents of various pollution sources and BMPs to address these issues. Moreover, as a means of increased accountability, MPCA identifies various government entities in the WRAPS that will be responsible for achieving these goals.[30]

The findings from the NRW TMDLs, the NR WRAPS, and other existing plans will be used to support local working groups and jointly develop scientifically-supported restoration and protection strategies. Some of this work will culminate in the development of the 1W1P mentioned in the Reasonable Assurance section of this Decision Document. These goals will be accomplished through education and outreach, local ordinances, and BMPs. Various locally specific BMPs and restorations strategies outlined in the existing plans and in Section 8 of the NR TMDL can be found in the subsections below broken down by pollutant.

E. coli

MPCA's main approach to address bacteria contamination is to increase understanding of the main sources and provide that knowledge to the residents of the watershed. Increased education and outreach to the general public bring greater awareness to the issues surrounding bacteria contamination and strategies to reduce loading and transport of bacteria. Education efforts targeted to the general public are commonly used to provide information on the status of impacted waterways as well as to address pet waste and wildlife issues. Education efforts may emphasize aspects such as cleaning up pet waste or managing the landscape to discourage nuisance congregations of wildlife and waterfowl. Education can also be targeted to municipalities, land managers and other groups who play a key role in the management of bacteria sources.

Pasture Management/Livestock Exclusion Plans – Reducing livestock access to stream environments will lower the opportunity for direct transport of bacteria to surface waters. The installation of exclusion fencing near stream and river environments to prevent direct access for livestock, installing alternative water supplies, and installing stream crossings between pastures, would work to reduce the influxes of bacteria and improve water quality within the watershed. Additionally, introducing rotational grazing to increase grass coverage in pastures, and maintaining appropriate numbers of livestock per acre for grazing, can also aid in the reduction of bacteria inputs.

Manure Collection and Storage Practices – Manure has been identified as a source of bacteria. Bacteria can be transported to surface waterbodies via stormwater runoff. Bacteria laden water can also leach into groundwater resources. Improved strategies for the collection, storage and management of manure can minimize impacts of bacteria entering the surface and groundwater system. Repairing manure storage facilities or building roofs over manure storage areas may decrease the amount of bacteria in stormwater runoff.

Manure Management Plans – Developing manure management plans can ensure that the storage and application rates of manure are appropriate for land conditions. Determining application rates that take into account the crop to be grown on that particular field and soil type will ensure that the correct amount of manure is spread on a field given the conditions. Spreading the correct amount of manure will reduce the availability of bacteria to migrate to surface waters.

Feedlot Runoff Controls – Treatment of feedlot runoff via diversion structures, holding/storage areas, and stream buffering areas can all reduce the transmission of bacteria to surface water environments.

[30] NR WRAPS – https://www.pca.state.mn.us/sites/default/files/wq-ws4-30a.pdf

Additionally, cleaner stormwater runoff can be diverted away from feedlots so as to not liberate bacteria. While Pine and Carlton Counties have not been delegated authority to administer MN feedlot rules they can provide education and outreach materials to residents.

SSTS – Improvements to septic management programs and educational opportunities can reduce the occurrence of septic pollution. Educating the public on proper septic maintenance, finding and eliminating illicit discharges and repairing failing systems could lessen the impacts of septic derived bacteria inputs into the NRW.

Riparian Area Management Practices – Protection of streambanks within the watershed through planting of vegetated/buffer areas with grasses, legumes, shrubs or trees will mitigate bacteria inputs into surface waters. These areas will filter stormwater runoff before the runoff enters the main stem or tributaries of the NRW.

TSS

Sediment is primarily a problem from near channel source. MPCA plans to focus their restoration work in these areas. This work will include educating the local population and businesses about the major sources of sediment in the NRW. Specific educational components include encouraging compliance with MN Forest Resources Council Forest Management Guidelines, and targeted lessons to near shore property owners of BMPs that can improve water quality.

Reducing Livestock Access to Streams – Livestock managers should be encouraged to implement measures to protect riparian areas. Managers should install exclusion fencing near stream environments to prevent direct access to these areas by livestock. Additionally, installing alternative watering locations and stream crossings between pastures may aid in reducing sediments to surface waters.

Construction of Controlled Stream Crossings and Forest Road/Trail Management – Fencing, installing permanent crossing structures, and exclusion from at risk areas can mitigate sediment contributions to the NRW. An important part of this work is maintaining and enhancing fish passages. Additionally, regularly managing the trials and crossings can prevent tail collapse events, or more severely mass wasting from trail use, reducing major sediment input episodes.

Streambank/stream channel stabilization and log jam removal – Failing streambanks lead to mass wasting events, which are typically the single most dramatic contributor to degraded habitat. Additionally, an unstable stream banks is often a steady source of sediment to the waterbody. Minnesota Department of Natural Resources (MDRN) in cohort with Carlton County and Carlton County SWCD will mitigate this issue by regrading streambanks, hard armoring at risk areas with rip-rap, and seeding barren streambanks. Decreasing channel incision by regrading the stream and streambanks will greatly reduce sediment inputs. Furthermore, removing instream log jams can prevent both channel incision and undercutting of streambanks. Carlton County is tasked with inventorying these jams with assistance of MDNR.

Clay Dam Removal/Replacement – Clay dams can provide a way to capture sediment prior to entering the stream. When these dams are failing they become a major source of sediment. By restoring or removing the dam and all of its trapped sediment loads in the NRW can be greatly decreased.

Riparian Area Management Practices – Protection of stream areas within the watershed through planting of vegetated/buffer areas with grasses, legumes, shrubs or trees will mitigate sediment inputs into surface waters. These areas will filter stormwater runoff before the runoff enters the main stem or tributaries of the NRW.

Sediment Volcano Mitigation – The NRW contains multiple so called sediment volcanoes. They are caused by artesian springs that contain high levels of sediment or are occurring under deep layers of deposited sediment. To mitigate these a source of sediment MPCA has proposed installed wells above their occurrences to relive the hydraulic pressure. Additionally, MPCA has indicated that a historic study of sediment levels should be conducted in the NRW to determine if these are naturally occurring.

Total P

As with TSS and *E. coli* a major component of addressing the phosphorus loading is to educate the watershed inhabitants. For the NRW phosphorus is a problem associated with watershed loading solely with internal loading not considered an issue. For these reasons the practices in this section are about preventing phosphorus from reaching the impaired lakes.

Septic Field Maintenance – Septic systems are believed to be a source of nutrients to waters in the NRW. Failing systems are expected to be identified and addressed via upgrades to those SSTS not meeting septic ordinances. MPCA explained that SSTS improvement priority should be given to those failing SSTS on lakeshore properties or those SSTS adjacent to streams within the direct watersheds for each waterbody. MPCA aims to greatly reduce the number of failing SSTS in the future via local septic management programs and educational opportunities. Educating the public on proper septic maintenance, finding and eliminating illicit discharges, and repairing failing systems could lessen the impacts of septic derived nutrients inputs into the NRW.

Manure Management (feedlot and manure stockpile runoff controls) – Manure has been identified as a potential source of nutrients in the NRW. Nutrients derived from manure can be transported to surface waterbodies via stormwater runoff. Nutrient laden water can also leach into groundwater resources. Improved strategies in the collection, storage and management of manure can minimize impacts of nutrients entering the surface and groundwater system. Repairing manure storage facilities or building roofs over manure storage areas may decrease the amount of nutrients in stormwater runoff.

Pasture Management and Agricultural Reduction Strategies – These strategies involve reducing nutrient transport from fields and minimizing soil loss. Specific practices would include; erosion control through conservation tillage, reduction of winter spreading of fertilizers, elimination of fertilizer spreading near open inlets and sensitive areas, installation of stream and lake shore buffer strips, streambank stabilization practices (gully stabilization and installation of fencing near streams), and nutrient management planning.

EPA finds the tenth criterion has been adequately addressed. EPA reviews, but does not approve TMDL implementation plans.

11. Public Participation

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

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

Comment:
The TMDL was on public notice from February 13th, 2017 to March 15th, 2017. The public comment period was announced in an MPCA news release and published in the Minnesota State Register on February 13th, 2017. Electronic copies of the draft TMDL were published on the MPCA website along with a notification of the public comment period.

MPCA received six separate comments during the public notice period. One commenter asked MPCA to better define “delivery factor” and to clarify the differences between the factors for the various sources. MPCA added a definition of how they determined the “delivery factor” value.

One commenter suggested an updated dataset for land use and development, MPCA responded by stating they would retrieve that information and provide it to the implementing stakeholders.

Another commenter expressed concerns that the model does not take into consideration future loading due to climate change. MPCA responded by clarifying that the model can easily be modified to take into account increased flows from climate change scenarios. The same commenter also indicted that there needed to be a better understand of loading due to slumping. MPCA agreed to these comments and have been investigating this source and indicated they will continue their investigation. To support reasonable assurance MPCA incorporated the commenters suggestion on how to accelerate septic system inspections and enforcement of feedlot ordinances by passing on the suggestions to the stakeholder committee. The WRAPS document was also updated with notes on climate change and a feedlot ordinance review.

There were other minor comments on various sources of loading and BMPs. MPCA passed along one commenters suggestion about ATV use to the stakeholders responsible for BMP development in the Nemadji State Forest. MPCA responded to one commenters concerns about stream restoration indicating how it is designed to work with the natural system.

All comments were addressed in letters sent out on May 18th, 2017.

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

12. Submittal Letter

A submittal letter should be included with the TMDL submittal, and should specify whether the TMDL is being submitted for a *technical review* or *final review and approval.* Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final review and approval, should contain such identifying information as the name and location of the waterbody, and the pollutant(s) of concern.

Comment:
On June 20th, 2017, EPA received a submittal letter dated June 14th, 2017 signed by Glenn Skuta, MPCA Watershed Division Director, addressed to Christopher Korleski, EPA Region 5, Water Division

Director. The submittal letter identified the Nemadji River Watershed as the subject of the TMDL. The locations of the specific waterbodies were provided in the supporting documentation. The TMDL submittal letter states that the pollutants of concern are bacteria, turbidity, and nutrients. These concerns are addressed by the *E. coli*, TSS, and Total P TMDLs in this document. The letter explicitly states that the Nemadji River Watershed TMDL was submitted for final approval by EPA under Section 303(d) of the Clean Water Act.

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

13. Conclusion

After a full and complete review, the EPA finds that the TMDLs for Nemadji Medicine River Watershed for *E. coli*, TSS, Total P meet all of the required elements of an approvable TMDL. This TMDL approval is for **thirteen TMDL**: two (2) total phosphorus TMDLs; nine (9) TSS TMDLs; and two (2) *E.* coli TMDLs. These TMDLs address impairments for aquatic recreational and aquatic life use impairments as identified on Minnesota's 2010 303(d) list.

U.S. EPA's approval of the Nemadji 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.