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

FEB 2 0 2020

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 completed its review of the final Total Maximum Daily Loads (TMDL) for segments within the Minnesota River-Mankato watershed (MRMW), including supporting documentation. The MRMW encompasses parts of Blue Earth, Brown, Cottonwood, Le Sueur, Nicollet, Redwood, Renville and Sibley counties in southwestern Minnesota. The MRMW TMDLs address impaired aquatic recreation due to excessive nutrients and bacteria, impaired aquatic life use due to excessive sediment and impaired drinking water resources due to excessive nitrate.

The MRMW 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 thirty-four bacteria TMDLs, eight phosphorus TMDLs, six sediment TMDLs and three nitrate TMDLs. EPA describes Minnesota's compliance with the statutory and regulatory requirements in the enclosed decision document.

EPA acknowledges 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. David Pfeifer, Chief of the Watersheds and Wetlands Branch, at 312-353-9024.

Sincerely,

Thomas R. Short, Jr.
Acting Director, Water Division

wq-iw7-53g

TMDL: Minnesota River-Mankato Watershed bacteria, nutrient, sediment and nitrate TMDLs in portions of Blue Earth, Brown, Cottonwood, Le Sueur, Nicollet, Redwood, Renville and Sibley counties in southern Minnesota
Date: February 20, 2020

DECISION DOCUMENT
FOR THE MINNESOTA RIVER-MANKATO WATERSHED TMDLS, IN PORTIONS OF BLUE EARTH, BROWN, COTTONWOOD, LE SUEUR, NICOLLET, REDWOOD, RENVILLE AND SIBLEY COUNTIES IN SOUTHERN, MINNESOTA

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

1. Identification of Water body, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the water body as it appears on the State's/Tribe's 303(d) list. The water body 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 water body 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 water body. 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 water body is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;

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

Comment:

Location Description/Spatial Extent:

The Minnesota River-Mankato Watershed (MRMW) in southwestern Minnesota contains numerous tributaries to the Minnesota River and drains approximately 1,347 square miles (862,080 acres). The Minnesota River starts near the Minnesota-South Dakota border and flows generally in a southeastern direction for 335 miles before joining the Mississippi River near St. Paul, Minnesota. The contributing areas addressed by MRMW Total Maximum Daily Loads (TMDLs) occupy portions of eight counties including, Blue Earth, Brown, Cottonwood, Le Sueur, Nicollet, Redwood, Renville and Sibley.

The MRMW TMDLs address thirty-four (34) segments impaired due to excessive bacteria, eight (8) impaired lakes due to excessive nutrients, six (6) impaired segments due to excessive sediment inputs and 3 impaired segments due to excessive nitrates (Table 1 of this Decision Document).

Table 1: Minnesota River- Mankato watershed impaired waters addressed by this TMDL

Water body name	Assessment Unit ID	Affected Use	Pollutant or stressor	TMDL
Crow Creek	07020007-569	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Birch Coulee Creek	07020007-587	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Purgatory Creek	07020007-645	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Wabasha Creek	07020007-527	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Three-Mile Creek	07020007-704	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Unnamed Creek	07020007-644	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Fort Ridgley Creek	07020007-689	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Spring Creek (Judicial Ditch 29)	07020007-622	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Spring Creek	07020007-573	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
County Ditch 13	07020007-712	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
County Ditch 10 (John's Creek)	07020007-571	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Little Rock Creek (Judicial Ditch 31)	07020007-687	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Eight-Mile Creek	07020007-684	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Huelskamp Creek	07020007-641	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Fritsche Creek (County Ditch 77)	07020007-709	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Heyman's Creek	07020007-640	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Altermatts Creek	07020007-518	Limited Resource Value	Bacteria (*E. coli*)	*E. coli* TMDL
Little Cottonwood River	07020007-676	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Little Cottonwood River	07020007-677	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Morgan Creek	07020007-691	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Swan Lake Creek (Nicollet Creek)	07020007-683	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL

County Ditch 56 (Lake Crystal Inlet)	07020007-557	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Minneopa Creek	07020007-534	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Unnamed Creek	07020007-604	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Unnamed Creek	07020007-603	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Unnamed Creek	07020007-602	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Unnamed Creek	07020007-600	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Unnamed Ditch	07020007-598	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
County Ditch 46A	07020007-679	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Seven-Mile Creek	07020007-703	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Unnamed Creek (Seven-Mile Creek Tributary)	07020007-637	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Seven-Mile Creek	07020007-562	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Shanaska Creek	07020007-693	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Rogers Creek (County Ditch 78)	07020007-613	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
			TOTAL bacteria TMDLs	**34**
Mills Lake	07-0097-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient TMDL
Loon Lake	07-0096-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient TMDL
Wita Lake	07-0077-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient TMDL
Duck Lake	07-0053-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient TMDL
George Lake	07-0047-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient TMDL
Washington Lake	40-0117-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient TMDL
Henry Lake	40-0104-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient TMDL
Scotch Lake	40-0109-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Nutrient TMDL
			TOTAL nutrient TMDLs	**8**
Little Cottonwood River	07020007-676	Aquatic Life	Sediment/TSS	TSS TMDL
Little Cottonwood River	07020007-677	Aquatic Life	Sediment/TSS	TSS TMDL
Minneopa Creek	07020007-534	Aquatic Life	Sediment/TSS	TSS TMDL
County Ditch 46A	07020007-679	Aquatic Life	Sediment/TSS	TSS TMDL
Seven-Mile Creek	07020007-703	Aquatic Life	Sediment/TSS	TSS TMDL
Seven-Mile Creek	07020007-562	Aquatic Life	Sediment/TSS	TSS TMDL
			TOTAL TSS TMDLs	**6**
County Ditch 10 (John's Creek)	07020007-571	Drinking Water	nitrate	nitrate TMDL
Unnamed Creek	07020007-577	Drinking Water	nitrate	nitrate TMDL
Seven Mile Creek	07020007-562	Drinking Water	nitrate	nitrate TMDL
			TOTAL nitrate TMDLs	**3**

The Minnesota River Watershed includes tribal lands for one federally recognized tribe, the Lower Sioux Indian Community. MPCA explained that the Lower Sioux Indian Community has tribal lands adjacent to the Minnesota River main stem segment (07020007-720) but that there are no tribal lands which contribute to impaired segments of the MRMW TMDLs (p. 3 of the final TMDL document).

Therefore, the MRMW TMDLs do not allocate any loading to tribal lands of the Lower Sioux Indian Community.

Land Use:
Land use in the MRMW is mostly agricultural land with a mix of urban land, forested land, wetlands and open water (see Table 7 and Figure 5 of the final TMDL document). MPCA estimated that combined agricultural lands (i.e., land used for corn and soybean crop growth, other crops and grassland/pasture lands) account for approximately 78% of land use throughout the MRMW. Open water (approx. 11.7%), urban land use (approx. 7.2%), wetland (approx. 6.0%) and forested land use (approx. 4.0) account for the remainder of land use in the MRMW.

Problem Identification:
Bacteria TMDLs: Bacteria impaired segments identified in Table 1 of this Decision Document were included on the final 2018 Minnesota 303(d) list due to excessive bacteria. Water quality monitoring within the MRMW indicated that these segments were not attaining their designated aquatic recreation uses due to exceedances of the bacteria criteria. Excessive bacteria can negatively impact recreational uses (e.g., swimming, wading, boating, fishing etc.) and public health. At elevated levels, bacteria may cause illness within humans who have contact with or ingest bacteria laden water. Recreation-based contact can lead to ear, nose, and throat infections, and stomach illness.

Phosphorus TMDLs: Lakes identified in Table 1 of this Decision Document were included on the final 2018 Minnesota 303(d) list due to excessive nutrients (phosphorus). Total phosphorus (TP), chlorophyll-*a* (chl-*a*) and Secchi depth (SD) measurements in the MRMW indicated that these waters were not attaining their designated aquatic recreation uses due to exceedances of nutrient criteria. Water quality monitoring was completed throughout the MRMW and that data formed the foundation for TP TMDL modeling efforts.

While TP is an essential nutrient for aquatic life, elevated concentrations of TP can lead to nuisance algal blooms that negatively impact aquatic life and recreation (e.g., swimming, boating, fishing, etc.). Algal decomposition depletes dissolved oxygen levels within the water column. The decreases in dissolved oxygen can stress benthic macroinvertebrates and fish. Depletion of oxygen in the water column can also lead to conditions where phosphorus is released from bottom sediments (i.e., internal loading). Also, excess algae can shade the water column which limits the distribution of aquatic vegetation. Aquatic vegetation stabilizes bottom sediments, and also is an important habitat for macroinvertebrates and fish.

Sediment (Total Suspended Solids) TMDLs: Sediment impaired segments identified in Table 1 of this Decision Document were included on the final 2018 Minnesota 303(d) list due to excessive sediment within the water column. Water quality monitoring within the MRMW indicated that these segments were not attaining their designated aquatic life uses due to high turbidity measurements and the negative impact of those conditions on aquatic life (i.e., fish and macroinvertebrate communities).

Total suspended solids (TSS) is a measurement of the sediment and organic material that inhibits natural light from penetrating the surface water column. Excessive sediment and organic material within the water column can negatively impact fish and macroinvertebrates within the ecosystem. Excess sediment and organic material may create turbid conditions within the water column and may increase the costs of treating surface waters used for drinking water or other industrial purposes (e.g., food processing).

Excessive amounts of fine sediment in stream environments can degrade aquatic communities. Sediment can reduce spawning and rearing areas for certain fish species. Excess suspended sediment can clog the gills of fish, stress certain sensitive species by abrading their tissue, and thus reduce fish health. When in suspension, sediment can limit visibility and light penetration which may impair foraging and predation activities by certain species.

Excessive fine sediment also may degrade aquatic habitats, alter natural flow conditions in stream environments and add organic materials to the water column. The potential addition of fine organic materials may lead to nuisance algal blooms which can negatively impact aquatic life and recreation (e.g., swimming, boating, fishing, etc.). Algal decomposition depletes oxygen levels which stresses benthic macroinvertebrates and fish. Excess algae can shade the water column and limit the distribution of aquatic vegetation. Established aquatic vegetation stabilizes bottom sediments and provides important habitat areas for healthy macroinvertebrates and fish communities.

Degradations in aquatic habitats or water quality (e.g., low dissolved oxygen) can negatively impact aquatic life use. Increased turbidity, brought on by elevated levels of nutrients within the water column, can reduce dissolved oxygen in the water column, and cause large shifts in dissolved oxygen and pH throughout the day. Shifting chemical conditions within the water column may stress aquatic biota (i.e., fish and macroinvertebrate species). In some instances, degradations in aquatic habitats or water quality have reduced fish populations or altered fish communities from those communities supporting sport fish species to communities which support more tolerant rough fish species.

Excess siltation and flow alteration in streams can negatively impact aquatic life by altering habitats. Excess sediment can fill pools, embed substrates, and reduce connectivity between different stream habitats. The result is a decline in habitat types that, in healthy streams, support diverse macroinvertebrate communities. Excess sediment can reduce spawning and rearing habitats for certain fish species. Flow alterations in the MRMW have resulted from drainage improvements on or near agricultural lands. Specifically, tile drains and land smoothing have increased surface and subsurface flow to streams. This results in higher peak flows during storm events and flashier flows which carry sediment loads to streams and erode streambanks.

Nitrate TMDLs: Nitrate impaired segments identified in Table 1 of this Decision Document were included on the final 2018 Minnesota 303(d) list. Water quality monitoring within the MRMW indicated that these segments were not attaining their drinking water designated use due to elevated nitrate measurements. Agricultural areas in southern Minnesota use nitrogen based fertilizers which allow bacteria present in the soil to convert fertilizer based nitrogen species to the nitrate (NO_3) species of nitrogen. MPCA explained that the nitrate species of nitrogen is easily dissolvable and very mobile when mixed into surface and groundwater.

Nitrate and nitrite (NO_2) are two of the forms of nitrogen which can be harmful to humans. Nitrite is toxic to humans while nitrate, if ingested, can transform to nitrite. Nitrite has been linked to methemoglobinemia (i.e., blue baby syndrome) in infants. Areas of southern Minnesota are particularly susceptible to nitrogen impacting drinking water resources due to the area's karst geology and use of nitrogen based fertilizers in agricultural areas.

Priority Ranking:
MPCA's schedule for TMDL completions, as indicated on the 303(d) impaired waters list, reflects Minnesota's priority ranking of this TMDL. MPCA has aligned TMDL priorities with the watershed approach and Watershed Restoration and Protection Strategy (WRAPS) cycle. The schedule for TMDL completion corresponds to the WRAPS report completion on the 10-year cycle. Mainstem river TMDLs, which are not contained in major watersheds and thus not addressed in WRAPS, must also be completed. The MPCA developed a state plan, Minnesota's TMDL Priority Framework Report, to meet the needs of EPA's national measure (WQ-27) under EPA's Long-Term Vision for Assessment, Restoration and Protection under the CWA section 303(d) program. As part of these efforts, the MPCA identified water quality-impaired segments that will be addressed by TMDLs by 2022. The waters of the MRMW addressed by this TMDL are part of the MPCA prioritization plan to meet EPA's national measure.

Pollutants of Concern:
The pollutants of concern are bacteria, TP (nutrients), TSS (sediment) and nitrate.

Source Identification (point and nonpoint sources):

Point Source Identification: The potential point sources to the MRMW are:

MRMW bacteria TMDLs:
National Pollutant Discharge Elimination Systems (NPDES) permitted facilities: NPDES permitted facilities may contribute bacteria loads to surface waters through discharges of treated wastewater. Permitted facilities must discharge wastewater according to their NPDES permit. MPCA determined that there are several wastewater treatment facilities/plants (WWTFs/WWTPs) in the MRMW which contribute bacteria from treated wastewater releases (Table 2 of this Decision Document). MPCA assigned each of these facilities a portion of the bacteria wasteload allocation (WLA).

Table 2: NPDES facilities which contribute pollutant loading in the Minnesota River-Mankato Watershed

Facility Name	Permit #	Impaired Reach	WLA
Facilities assigned bacteria (*E. coli*) WLA (billions of bacteria/day)			
Morgan WWTP	MN0020443	07020007-527	11.03
Comfrey WWTP	MN0021687	07020007-518 , 07020007-676 & 07020007-677	0.36
Hanska WWTP	MN0052663	07020007-691	3.57
Lake Crystal WWTP	MN0055981	07020007-534	2.81
Nicollet WWTP	MNG580037	07020007-683	12.20
Fairfax WWTP	MNG580060	07020007-689	20.13
Searles WWTP	MNG580080	07020007-677	1.84
Jeffers WWTP	MNG580111	07020007-676 & 07020007-677	1.63
Evan WWTP	MNG580202	07020007-622 & 07020007-573	0.69
Facilities assigned Total Suspended Solids (TSS) WLA (lbs/day)			
Comfrey WWTP	MN0021687	07020007-518 , 07020007-676 & 07020007-677	19
Lake Crystal WWTP	MN0055981	07020007-534	148

POET Biorefining - Lake Crystal LLC	MN0067172	07020007-534	33
OMG Midwest Inc./Southern MN Construction Co. Inc.	MNG490131	07020007-676 & 07020007-677	905
Searles WWTP	MNG580080	07020007-677	144
Jeffers WWTP	MNG580111	07020007-676 & 07020007-677	128

Municipal Separate Storm Sewer System (MS4) communities: Stormwater from MS4s can transport bacteria to surface water bodies during or shortly after storm events. MPCA identified several MS4 permittees which were assigned a portion of the WLA for the bacteria TMDLs (Table 3 of this Decision Document).

Table 3: MS4 communities which contribute pollutant loading in the Minnesota River-Mankato Watershed

MS4 Permittee	Permit #
Blue Earth County MS4	MS400276
Mankato City MS4	MS400226
Mankato Township MS4	MS400297
Minnesota State University - Mankato MS4	MS400279
Redwood Falls City MS4	MS400236
Skyline City MS4	MS400292
South Bend Township MS4	MS400299
St. Peter City MS4	MS400245

Concentrated Animal Feedlot Operations (CAFOs): MPCA recognized the presence of CAFOs in the MRMW (Appendix D of the final TMDL document). CAFO facilities must be designed to contain all surface water runoff (i.e., have zero discharge from their facilities) and have a current manure management plan. MPCA explained that these facilities do not discharge effluent and therefore were not assigned a portion of the WLA (WLA = 0).

Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs): MPCA determined that the MRMW does not have CSOs nor SSOs which contribute bacteria to waters of the MRMW.

MRMW phosphorus TMDLs:

Stormwater runoff from permitted construction and industrial areas: Construction and industrial sites may contribute phosphorus via sediment runoff during stormwater events. These areas within the MRMW must comply with the requirements of the MPCA's NPDES Stormwater Program and create a Stormwater Pollution Prevention Plan (SWPPP) that summarizes how stormwater will be minimized from the site.

MRMW sediment (TSS) TMDLs:

NPDES permitted facilities: NPDES permitted facilities may contribute sediment loads to surface waters through discharges of wastewater. Permitted facilities must discharge wastewater according to their NPDES permit. MPCA determined that there are several facilities which contribute sediment from treated wastewater releases (Table 2 of this Decision Document). MPCA assigned each of these facilities a portion of the sediment WLA.

MS4 communities: Stormwater from MS4s can transport sediment to surface water bodies during or shortly after storm events. MPCA identified several MS4 permittees which were assigned a portion of the WLA for the TSS TMDLs (Table 3 of this Decision Document).

Stormwater runoff from permitted construction and industrial areas: Construction and industrial sites may contribute sediment via stormwater runoff during precipitation events. These areas within the MRMW must comply with the requirements of the MPCA's NPDES Stormwater Program and create a SWPPP that summarizes how stormwater will be minimized from the site.

MRMW nitrate TMDLs:
Stormwater runoff from permitted construction and industrial areas: Construction and industrial sites may contribute nitrate via stormwater runoff during precipitation events. These areas within the MRMW must comply with the requirements of the MPCA's NPDES Stormwater Program and create a SWPPP that summarizes how stormwater will be minimized from the site.

Nonpoint Source Identification: The potential nonpoint sources to the MRMW are:

MRMW bacteria TMDLs:
Non-regulated urban runoff: Runoff from urban areas (i.e., urban, residential, commercial or industrial land uses) can contribute bacteria to local water bodies. Stormwater from urban areas, which drain impervious surfaces, may introduce bacteria (e.g., derived from wildlife or pet droppings) to surface waters.

Stormwater from agricultural land use practices and feedlots near surface waters: Animal Feeding Operations (AFOs) in close proximity to surface waters can be a source of bacteria to water bodies in the MRMW. These areas may contribute bacteria via the mobilization and transportation of pollutant laden waters from feeding, holding and manure storage sites. Runoff from agricultural lands may contain significant amounts of bacteria which may lead to impairments in the MRMW. Feedlots generate manure which may be spread onto fields. Runoff from fields with spread manure can be exacerbated by tile drainage lines, which channelize the stormwater flows and reduce the time available for bacteria to die-off.

Unrestricted livestock access to streams: Livestock with access to stream environments may add bacteria directly to the surfaces waters or resuspend particles 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.

Discharges from Subsurface Sewage Treatment Systems (SSTS) or unsewered communities: Failing septic systems are a potential source of bacteria within the MRMW. Septic systems generally do not discharge directly into a water body, 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.

Failing SSTS are specifically defined as systems that are failing to protect groundwater from contamination, while those 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: Wildlife is a known source of bacteria in water bodies as many animals spend time in or around water bodies. Deer, geese, ducks, raccoons, and other animals all create potential sources of bacteria via contaminated runoff from animal habitats, such as urban park areas, forest, and rural areas.

MRMW phosphorus TMDLs:

Internal loading: The release of phosphorus from lake sediments, the release of phosphorus from lake sediments via physical disturbance from benthic fish (i.e., rough fish (e.g., carp)), the release of phosphorus from wind mixing the water column, and the release of phosphorus from decaying curly-leaf pondweed, may all contribute internal phosphorus loading to the lakes of the MRMW. 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.

Urban/residential sources: Nutrients, organic material and organic-rich sediment may be added via runoff from urban/developed areas near the impaired lakes in the MRMW. Runoff from urban/developed areas can include phosphorus derived from fertilizers, leaf and grass litter, pet wastes, and other sources of anthropogenic derived nutrients.

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of nutrients, organic material and organic-rich sediment which may lead to impairments in the MRMW. 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. Phosphorus, organic material and organic-rich sediment may be added via surface runoff from upland areas which are being used for Conservation Reserve Program (CRP) lands, grasslands, and agricultural lands used for growing hay or other crops. Stormwater runoff may contribute nutrients and organic-rich sediment to surface waters from livestock manure, fertilizers, vegetation and erodible soils.

Unrestricted livestock access to streams: Livestock with access to stream environments may add nutrients directly to the surface waters or resuspend particles that had settled on the stream bottom. Direct deposition of animal wastes can result in very high localized nutrient concentrations and may contribute to downstream impairments. Smaller animal facilities may add nutrients to surface waters via wastewater from these facilities or stormwater runoff from near-stream pastures.

Stream channelization and stream erosion: 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 encourage down-cutting of the streambed and streambanks. Stream channelization efforts 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.

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 MRMW. Phosphorus can be bound to these particles which may add to the phosphorus inputs to surface water environments.

Discharges from SSTS or unsewered communities: Failing septic systems are a potential source of nutrients within the MRMW. Septic systems generally do not discharge directly into a water body, 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.

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 MRMW. Storm events may mobilize phosphorus through the transport of suspended solids and other organic debris.

Wildlife: Wildlife is a known source of nutrients in water bodies as many animals spend time in or around water bodies. Deer, geese, ducks, raccoons, and other animals all create potential sources of nutrients via contaminated runoff from animal habitats, such as urban park areas, forest, and rural areas.

MRMW sediment (TSS) TMDLs:

Stream channelization and streambank erosion: Eroding streambanks and channelization efforts may add sediment to local surface waters. 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 encourage down-cutting of the streambed and streambanks. Stream channelization efforts 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. Unrestricted livestock access to streams and streambank areas may lead to streambank degradation and sediment additions to stream environments.

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of sediment which may lead to impairments in the MRMW. 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.

Wetland and Forest Sources: Sediment may be added to surface waters by stormwater flows through wetland or forested areas in the MRMW. Storm events may mobilize decomposing vegetation, 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 MRMW.

MRMW nitrate TMDLs:

Leaching loss from manure and nitrogen based fertilizer application in agricultural areas: MPCA identified nitrogen based fertilizer and manure usage in agricultural areas as nonpoint sources of nitrogen leaching into shallow groundwater and surface waters of the MRMW. Nitrate and nitrite can easily mix into groundwater and move through the subsurface soils via interflow and karst pathways which are a part of the geology in southern Minnesota.

Stormwater from agricultural land use practices and feedlots near surface waters: AFOs in close proximity to surface waters can be a source of nitrate to water bodies in the MRMW. These areas may contribute nitrate via the mobilization and transportation of pollutant laden waters from feeding, holding and manure storage sites. Runoff from agricultural lands may contain significant amounts of nitrate which may lead to impairments in the MRMW. Feedlots generate manure which may be spread onto fields. Runoff from fields with spread manure can be exacerbated by tile drainage lines, which channelize the stormwater flows and reduce the time available for bacteria to die-off.

Unrestricted livestock access to streams: Livestock with access to stream environments may add nitrate directly to the surfaces waters or resuspend particles that had settled on the stream bottom. Direct deposition of animal wastes can result in very high localized nitrate counts and may contribute to downstream impairments.

Discharges from SSTS or unsewered communities: Failing septic systems are a potential source of nitrate within the MRMW. Septic systems generally do not discharge directly into a water body, 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 nitrate contribution from these systems.

Failing SSTS are specifically defined as systems that are failing to protect groundwater from contamination, while those systems which discharge partially treated sewage to the ground surface, road ditches, tile lines, and directly into streams, rivers and lakes are considered an ITPHS. ITPHS systems also include illicit discharges from unsewered communities.

Atmospheric deposition: Nitrogen may be added via particulate deposition. Particles from the atmosphere may fall onto surface waters within the MRMW.

Future Growth:
MPCA does not anticipate there to be imminent growth in the MRMW. During discussions with the MPCA project manager during the development of the MRMW TMDLs MPCA shared that most of the agricultural areas in the MRMW are unlikely to be changing in the near future. The exception being agricultural areas near larger towns and cities which may be annexing surrounding agricultural areas as their population grows over time. The WLA and load allocations (LA) for the MRMW TMDLs were calculated for all current and future sources. Any expansion of point or nonpoint sources will need to comply with the respective WLA and LA values calculated in the MRMW TMDLs.

The 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 water body, the applicable numeric or narrative water quality criterion, and the antidegradation policy (40 C.F.R. §130.7(c)(1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether or not the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

Comment:

Designated Uses:

Water quality standards (WQS) are the fundamental benchmarks by which the quality of surface waters are 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.

Minnesota Rule Chapter 7050 designates uses for waters of the state. The segments addressed by the MRMW TMDLs are designated as Class 1 waters (1B and 1C) for drinking water use (nitrates) and Class 2 waters for aquatic recreation use (fishing, swimming, boating, etc.) and aquatic life use (phosphorus and TSS). The Class 2 designated use is described in Minnesota Rule 7050.0140 (3):

> *"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."*

Water use classifications for individual water bodies are provided in Minnesota Rules 7050.0470, 7050.0425, and 7050.0430. This TMDL report addresses the water bodies that do not meet the standards for Class 1, 2, and 7 waters. The impaired streams in this report are classified as class 1B, 2Ag, 2Bg, 2Bm, and/or 7 waters (Table 2 of the final TMDL document). MPCA explained that the three streams with nitrate impairments are designated coldwater streams, which are also protected as a source of drinking water (Minnesota Rule 7050.0222, subp. 2).

Class 1B waters are protected for domestic consumption (requires moderate treatment). Class 2Ag waters are protected for aquatic life and recreation—general cold-water habitat (lakes and streams). Class 2B waters are protected for aquatic life and recreation, and the streams in this project fall into two categories—Class 2Bg, which are general warm water habitat and Class 2Bm, which are modified warm water habitat. Class 7 waters are limited resource value waters and are protected for aesthetic qualities, secondary body contact use, and groundwater for use as a potable water supply. The lakes addressed in this report are classified as class 2B waters, which are protected for aquatic life and recreation.

Standards:

<u>Narrative Criteria:</u>

Minnesota Rule 7050.0221 (Subp. 3 and 4) set forth the following narrative criteria for Class 1B and 1C waters of the State:

> *"Class 1B waters - The quality of Class 1B waters of the state shall be such that with approved disinfection, such as simple chlorination or its equivalent, the treated water will meet both the primary (maximum contaminant levels) and secondary drinking water standards issued by the United States Environmental Protection Agency as referenced in subpart 1. The Environmental Protection Agency drinking water standards are adopted and incorporated by reference, except as noted in subpart 1.*
>
> *These standards will ordinarily be restricted to surface and underground waters with a moderately high degree of natural protection and apply to these waters in the untreated state.*
>
> *Class 1C waters - The quality of Class 1C waters of the state shall be such that with treatment consisting of coagulation, sedimentation, filtration, storage, and chlorination, or other equivalent treatment processes, the treated water will meet both the primary (maximum contaminant levels) and secondary drinking water standards issued by the United States Environmental Protection Agency as referenced in subpart 1. The Environmental Protection Agency drinking water standards are adopted and incorporated by reference, except as noted in subpart 1.*
>
> *These standards will ordinarily be restricted to surface waters, and groundwaters in aquifers not considered to afford adequate protection against contamination from surface or other sources of pollution. Such aquifers normally would include fractured and channeled limestone, unprotected impervious hard rock where water is obtained from mechanical fractures or joints with surface connections, and coarse gravels subjected to surface water infiltration. These standards shall also apply to these waters in the untreated state."*

Minnesota Rule 7050.0150 (3) set forth narrative criteria for Class 2 waters of the State:

> *"For all Class 2 waters, the aquatic habitat, which includes the waters of the state and stream bed, shall not be degraded in any material manner, there shall be no material increase in undesirable slime growths or aquatic plants, including algae, nor shall there be any significant increase in harmful pesticide or other residues in the waters, sediments, and aquatic flora and fauna; the normal fishery and lower aquatic biota upon which it is dependent and the use thereof shall not be seriously impaired or endangered, the species composition shall not be altered materially, and the propagation or migration of the fish and other biota normally present shall not be prevented or hindered by the discharge of any sewage, industrial waste, or other wastes to the waters."*

Numeric criteria:

Bacteria TMDLs: The bacteria water quality standards which apply to MRMW TMDLs are:

Table 4: Bacteria Water Quality Standards Applicable to the MRMW TMDLs

Parameter	Units	Water Quality Standard
E. coli [1]	# of organisms / 100 mL	The geometric mean of a minimum of 5 samples taken within any calendar month may not exceed 126 organisms
		No more than 10% of all samples collected during any calendar month may individually exceed 1,260 organisms

[1] = Standards apply only between April 1 and October 31

Bacteria TMDL Targets: The bacteria TMDL targets employed for the MRMW bacteria TMDLs are the *E. coli* standards as stated in Table 4 of this Decision Document. The focus of this TMDL is on the 126 organisms (orgs) per 100 mL (126 orgs/100 mL) 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 MRMW 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 parts of the water quality standard is required.

Phosphorus TMDLs: Numeric criteria for TP, chlorophyll-*a*, and Secchi Disk depth are set forth in Minnesota Rules 7050.0222. These three parameters form the MPCA eutrophication standard that must be achieved to attain the aquatic recreation designated use. The numeric eutrophication standards which are applicable to the MRMW lake TMDLs are found in Table 5 of this Decision Document.

Table 5: Minnesota Eutrophication Standards for Deep and Shallow lakes within the North Central Hardwood Forest (NCHF) and Western Cornbelt Plan (WCBP) ecoregions

Parameter	Total Phosphorus (µg/L)	Chlorophyll-a (µg/L)	Secchi Depth (m)
NCHF Eutrophication Standard (shallow lakes)[1]	TP < 60	chl-a < 20	SD > 1.0
NCHF Eutrophication Standard (lakes and reservoirs)	TP < 40	chl-a < 14	SD > 1.4
WCBP Eutrophication Standard (shallow lakes)[1]	TP < 90	chl-a < 30	SD > 0.7
WCBP Eutrophication Standard (lakes and reservoirs)	TP < 65	chl-a < 20	SD > 0.9

[1] = Shallow lakes are defined as lakes with a maximum depth less than 15-feet, or with more than 80% of the lake area shallow enough to support emergent and submerged rooted aquatic plants (littoral zone).

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, TP, and the response variables, chl-*a* and SD depth. MPCA anticipates that by meeting the TP concentrations of NCHF and WCBP WQS the response variables chl-*a* and SD will be attained and the lakes of the MRMW TMDL 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 enduring minimal nuisance algal blooms and exhibiting desirable water clarity.

Nutrient TMDL Targets: MPCA selected TP targets of 40 µg/L, 60 µg/L, 65 µg/L and 90 µg/L (for WCBP shallow lakes) for lakes identified in Table 1 of this Decision Document. MPCA selected TP as the appropriate target parameter to address eutrophication problems because of the interrelationships between TP and chl-*a*, and TP and SD depth. Algal abundance is measured by chl-*a*, which is a pigment found in algal cells. As more phosphorus becomes available, algae growth can increase. Increased algae in the water column will decrease water clarity that is measured by SD depth. EPA finds the nutrient targets employed for the MRMW TP TMDLs to be reasonable.

Sediment (TSS) TMDLs: In January 2015, EPA approved MPCA's regionally-based TSS criteria for rivers and streams. The TSS criteria replaced Minnesota's statewide turbidity criterion (measured in Nephelometric Turbidity Units (NTU)). The TSS criteria provide water clarity targets for measuring suspended particles in rivers and streams.

Sediment (TSS) TMDL Targets: MPCA employed the regional TSS criterion for the South River Nutrient Region (SRNR), **65 mg/L**, for the MRMW TMDLs.

Nitrate TMDLs: Nitrate impaired waters in the MRMW are designated as drinking water sources (Class 1B waters) and thus the Minnesota nitrate drinking water quality standard of 10 mg/L was applied to these segments.

Nitrate TMDL Targets: MPCA employed the nitrate drinking water quality standard of 10 mg/L as a target for these waters.

The EPA finds that the TMDL document submitted by 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 water body for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

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

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

TMDLs must take into account *critical conditions* for steam flow, loading, and water quality parameters as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1)). TMDLs should define applicable *critical conditions* and describe their approach to estimating both point and nonpoint source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

Comment:

MRMW bacteria TMDLs: MPCA used the geometric mean (**126 orgs/100 mL**) of the *E. coli* water quality standard to calculate loading capacity values for the bacteria TMDLs. 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 Water Quality Standards for Coastal and Great Lakes Recreation Waters Final Rule"* (69 FR 67218-67243, November 16, 2004) on page 67224, "…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." MPCA stated that the bacteria TMDLs will focus on the geometric mean portion of the water quality standard (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.

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" (40 CFR §130.2). To establish the loading capacities for the MRMW bacteria TMDLs, MPCA used Minnesota's WQS for *E. coli* (126 orgs/100 mL). A loading capacity is, "the greatest amount of loading that a water can receive without violating water quality standards." (40 CFR §130.2). 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 water body. If all sources meet the WQS at discharge, then the water body should meet the WQS and the designated use.

Separate flow duration curves (FDCs) were created for the each of the bacteria TMDLs in the MRMW. The MRMW FDCs were developed using flow data from stream gaging data collected by MPCA and Minnesota Department of Natural Resources (MDNR). Stream data used in TMDL development efforts was also generated from Hydrologic Simulation Program-Fortran (HSPF) modeling efforts. MPCA focused on daily modeled flows from approximately January 1, 1995 to December 31, 2012 for the HSPF modeled subwatershed and on flow data January 1, 1986 to December 31, 2015 for MPCA/MDNR stream gage data (Table 8 of the final TMDL document). HSPF hydrologic models were developed to simulate flow characteristics within the MRMW and flow data focused on dates within the recreation season (April 1 to October 31). Daily stream flows were necessary to implement the load duration curve approach.

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.[1,2] The output of the HSPF process is a model of multiple hydrologic response units (HRUs), or subwatersheds of the overall MRMW. The flow from these HRUs were calibrated to different gage sites with up to seventeen years of data (1995 through 2012).

FDCs graphs have flow duration interval (percentage of time flow exceeded) on the X-axis and discharge (flow per unit time) on the Y-axis. The FDC were transformed into LDC by multiplying individual flow values by the WQS (126 orgs/100 mL) and then multiplying that value by a conversion factor. The resulting points are plotted onto a load duration curve graph. LDC graphs, for the MRMW bacteria TMDLs, have flow duration interval (percentage of time flow exceeded) on the X-axis and *E. coli* loads (number of bacteria per unit time) on the Y-axis. The MRMW LDC used *E. coli* measurements in billions of bacteria per day. The curved line on a LDC graph represents the TMDL of the respective flow conditions observed at that location.

Water quality monitoring was completed in the MRMW and measured *E. coli* 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 and then by a conversion factor which allows the individual samples to be plotted on the same figure as the LDCs (e.g., Figure A-1 of Appendix A of the final TMDL document). Individual LDCs are found in Appendix A of the final TMDL document.

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 which plot above the LDC represent violations of the WQS and the allowable load under those flow conditions at those locations. The difference between individual sampling loads plotting above the LDC and the LDC, measured at the same flow, is the amount of reduction necessary to meet WQS.

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.

Implementing the results shown by the LDC requires watershed managers to understand the sources contributing to the water quality impairment and which Best Management Practices (BMPs) may be the most effective for reducing bacteria loads based on flow magnitudes. Different sources will contribute bacteria loads under varying flow conditions. For example, if exceedances are significant during high flow events this would suggest storm events are the cause and implementation efforts can target BMPs

[1] HSPF User's Manual - https://water.usgs.gov/software/HSPF/code/doc/hspfhelp.zip
[2] EPA TMDL Models Webpage - https://www.epa.gov/exposure-assessment-models/tmdl-models-and-tools

that will reduce stormwater runoff and consequently bacteria loading into surface waters. This allows for a more efficient implementation effort.

Bacteria TMDLs for the MRMW were calculated and those results are found in Table 6 of this Decision Document. The load allocations were calculated after the determination of the WLA, and the Margin of Safety (MOS) (10% of the loading capacity). Load allocations (e.g., stormwater runoff from agricultural land use practices and feedlots, SSTS, wildlife inputs etc.) were not split among individual nonpoint contributors. Instead, load allocations were combined together into a categorical LA ('Watershed Load') to cover all nonpoint source contributions.

Table 6 of this Decision Document reports 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 collected bacteria monitoring data and allows for the estimation of load reductions necessary for attainment of the bacteria water quality standard. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for the segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. Table 6 of this Decision Document identifies the loading capacity for the water body at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved for this TMDL.

Table 6: Bacteria (*E. coli*) TMDLs for the Minnesota River-Mankato Watershed are located at the end of this Decision Document

MPCA explained that estimated current conditions and segment reduction calculations are included within the MRMW's Watershed Restoration and Protection Strategies (WRAPS) document. Tables within the MRMW WRAPS document (Section 3 of the WRAPS document) outline broad goals for bacteria reductions in the MRMW which are aimed at ultimately attaining the TMDL goals outlined in Table 6 of this Decision Document.

EPA concurs with the data analysis and LDC approach utilized by MPCA in its calculation of loading capacities, wasteload allocations, load allocations and the margin of safety for the MRMW bacteria TMDLs. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[3]

MRMW phosphorus TMDLs: MPCA used the U.S. Army Corps of Engineers (USACE) BATHTUB model to calculate the loading capacities for the MRMW TP TMDLs. The BATHTUB model was utilized to link observed phosphorus water quality conditions and estimated phosphorus loads to in-lake water quality estimates. MPCA has previously employed BATHTUB successfully in many lake studies in Minnesota. BATHTUB is a steady-state annual or seasonal model that predicts a lake's growing season (June 1 to September 30) average surface water quality. BATHTUB utilizes annual or seasonal time-scales which are appropriate because watershed TP loads are normally impacted by seasonal conditions.

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[3] U.S. Environmental Protection Agency. August 2007. *An Approach for Using Load Duration Curves in the Development of TMDLs*. Office of Water. EPA-841-B-07-006. Washington, D.C.

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 TP model that accounts for water and TP inputs from tributaries, direct watershed runoff, the atmosphere, and sources internal to the lake, and outputs through the lake outlet, water loss via evaporation, and TP sedimentation and retention in the lake sediments. BATHTUB provides flexibility to tailor model inputs to specific lake morphometry, watershed characteristics and watershed inputs. The BATHTUB model also allows MPCA to assess different impacts of changes in nutrient loading. BATHTUB allows the user the choice of several different mass-balance TP models for estimating loading capacity.

The loading capacity of the lake was determined through the use of BATHTUB and the Canfield-Bachmann subroutine and then allocated to the WLA, LA, and MOS. To simulate the load reductions needed to achieve the WQS, a series of model simulations were performed. Each simulation reduced the total amount of TP entering each of the water bodies during the growing season (or summer season, June 1 through September 30) and computed the anticipated water quality response within the lake. The goal of the modeling simulations was to identify the loading capacity appropriate (i.e., the maximum allowable load to the system, while allowing it to meet WQS) from June 1 to September 30. The modeling simulations focused on reducing the TP to the system.

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 water bodies can receive over an annual period and still meet the shallow and general lake nutrient WQS (Table 5 of this Decision Document). Loading capacities on the annual scale (pounds per year (lbs/year)) were calculated to meet the WQS during the growing season (June 1 through September 30). The time period of June to September was chosen by MPCA as the growing season because it corresponds to the eutrophication criteria, contains the months that the general public typically uses lakes in the MRMW for aquatic recreation, and is the time of the year when water quality is likely to be impaired by excessive nutrient loading. Loading capacities were divided by 365 to calculate the daily loading capacities.

Loading capacities were determined using Canfield-Bachmann equations from BATHTUB. The model equations were originally developed from data taken from over 704 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, each time reducing current loads to the lake until the model result shows that in-lake total phosphorus would meet the applicable water quality standards.

MPCA subdivided the loading capacity among the WLA, LA, and MOS components of the TMDL (Table 7 of this Decision Document). These calculations were based on the critical condition, the summer growing season, which is typically when the water quality in each lake is typically degraded and phosphorus loading inputs are the greatest. TMDL allocations assigned during the summer growing season will protect the MRMW lakes during the worst water quality conditions of the year. MPCA assumed that the loading capacities established by the TMDL will be protective of water quality during the remainder of the calendar year (October through May).

Table 7: Total phosphorus TMDLs for the Minnesota River-Mankato Watershed are located at the end of this Decision Document

Table 7 of this Decision Document communicate MPCA's estimates of the reductions required for the lakes of the MRMW to meet their water quality targets. These loading reductions (i.e., the percentage column) were estimated from existing and TMDL load calculations. MPCA expects that these reductions will result in the attainment of the water quality targets and the lake water quality will return to a level where the designated uses are no longer considered impaired.

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 MRMW TP TMDLs. Additionally, EPA concurs with the loading capacities calculated by the MPCA in these TP TMDLs. EPA finds MPCA's approach for calculating the loading capacity to be reasonable and consistent with EPA guidance.

MRMW sediment (TSS) TMDLs: MPCA developed LDCs to calculate sediment TMDLs for the six sediment impaired segments of the MRMW. The same LDC development strategies were employed for the sediment and bacteria TMDLs (e.g., the incorporation of HSPF model simulated flows to develop FDCs, water quality monitoring information collected within the MRMW informing the LDC, etc.). The FDC were transformed into LDC by multiplying individual flow values by the TSS target (65 mg/L) and then multiplying that value by a conversion factor.

Sediment (TSS) TMDLs were calculated (Table 8 of this Decision Document). The load allocation was calculated after the determination of the WLA, and the MOS. Load allocations (e.g., stormwater runoff from agricultural land use practices) was not split among individual nonpoint contributors. Instead, load allocations were combined together into one value to cover all nonpoint source contributions. Table 8 of this Decision Document reports five points (i.e., 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 collected sediment monitoring data and allows for the estimation of load reductions necessary for attainment of the TSS water quality standard. Using this method, daily loads were developed based upon the flow in the water body. 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. Table 8 of this Decision Document identifies the loading capacity for each segment at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved for this TMDL.

Table 8: Total Suspended Solids (TSS) TMDLs for the Minnesota River-Mankato Watershed are located at the end of this Decision Document

MPCA explained that estimated current conditions and segment reduction calculations are included within the MRMW's WRAPS document. Tables within the MRMW WRAPS document (Section 3 of the WRAPS document) outline broad goals for sediment (TSS) reductions in the MRMW which are aimed at ultimately attaining the TMDL reduction goals outlined in Table 8 of this Decision Document.

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 sediment (TSS) TMDLs. Additionally, EPA concurs with the loading capacities calculated by the MPCA in the sediment (TSS) TMDLs. EPA finds

MPCA's approach for calculating the loading capacity for the sediment (TSS) TMDLs to be reasonable and consistent with EPA guidance.

MRMW nitrate TMDLs: MPCA developed LDCs to calculate nitrate TMDLs for the three nitrate impaired segments of the MRMW. The same LDC development strategies were employed for the nitrate TMDLs as they were for the sediment and bacteria TMDLs (e.g., the incorporation of HSPF model simulated flows to develop FDCs, water quality monitoring information collected within the MRMW informing the LDC, etc.). The FDC were transformed into LDC by multiplying individual flow values by the nitrate target of 10 mg/L and then multiplying that value by a conversion factor.

Nitrate TMDLs were calculated (Table 9 of this Decision Document) and load allocations for each impaired segment were calculated after the determination of the WLA, and the MOS. Similar to the bacteria TMDLs, load allocations were not split into individual nonpoint contributors, but combined together into one value to cover all nonpoint source contributions. Table 9 of this Decision Document reports five points (i.e., 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 collected nitrate monitoring data and allows for the estimation of load reductions necessary for attainment of the nitrate target. Using this method, daily loads were developed based upon the flow in the water body. 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. Table 9 of this Decision Document identifies the loading capacity for each segment at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved for this TMDL.

Table 9: Nitrate TMDLs for the Minnesota River-Mankato Watershed are located at the end of this Decision Document

MPCA explained that estimated current conditions and segment reduction calculations are included within the MRMW's WRAPS document. Tables within the MRMW WRAPS document (Section 3 of the WRAPS document) outline the necessary practices and goals for nitrate reductions in the MRMW which are aimed at ultimately attaining the TMDL reduction goals outlined in Table 9 of this Decision Document.

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 nitrate TMDLs. Additionally, EPA concurs with the loading capacities calculated by the MPCA in the nitrate TMDLs. EPA finds MPCA's approach for calculating the loading capacity for the nitrate TMDLs to be reasonable and consistent with EPA guidance.

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

4. Load Allocations (LA)

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 MRMW TMDLs can be attributed to different nonpoint sources.

MPCA explained that the allocations for several segments are calculated as formulas rather than loads. In these segments, point source flow discharges theoretically exceed the actual instream flow. For the lowest flow regime, the WLA and LA estimates were set based on the formula of
Allocation = (flow contribution from a given source) * water quality standard/target (e.g., for sediment TMDLs, 65 mg/L).

MRMW bacteria TMDLs: The calculated LA values for the bacteria TMDLs are applicable across all flow conditions in the MRMW (Table 6 of this Decision Document). MPCA identified several nonpoint sources which contribute bacteria loads to the surface waters of the MRMW, including; non-regulated urban stormwater runoff, stormwater from agricultural and feedlot areas, failing septic systems, wildlife (e.g., deer, geese, ducks, raccoons, turkeys and other animals) and bacteria contributions from upstream subwatersheds. MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations but aggregated the nonpoint sources into one 'watershed load' LA calculation (Table 6 of this Decision Document).

MRMW phosphorus TMDLs: MPCA identified several nonpoint sources which contribute nutrient loading to the lakes of the MRMW (Table 7 of this Decision Document). These nonpoint sources included: watershed contributions from each lake's direct watershed, watershed contributions from upstream watersheds, internal loading and atmospheric deposition. MPCA did not calculate individual load allocation values for each of these potential nonpoint source considerations. Instead MPCA combined the LA sources into one 'watershed load' LA calculation (Table 7 of this Decision Document).

MRMW sediment (TSS) TMDLs: The calculated LA values for the sediment (TSS) TMDLs are applicable across all flow conditions. MPCA identified several nonpoint sources which contribute sediment loads to the surface waters in the MRMW (Table 8 of this Decision Document). Load allocations were recognized as originating from many diverse nonpoint sources including; stormwater contributions from agricultural lands, stream channelization and streambank erosion, wetland and forest sources, and atmospheric deposition. MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations but aggregated the nonpoint sources into one 'watershed load' LA calculation (Table 8 of this Decision Document).

MRMW nitrate TMDLs: The calculated LA values for the nitrate TMDLs are applicable across all flow conditions. MPCA identified several nonpoint sources which contribute nitrate loads to the surface waters in the MRMW (Table 9 of this Decision Document). Load allocations were recognized as originating from; nonpoint source leaching loss, runoff from agricultural land use practices, nitrate contributions from upstream watersheds, and atmospheric deposition. MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations but aggregated the nonpoint sources into one ‘watershed load’ LA calculation (Table 9 of this Decision Document).

EPA finds MPCA’s approach for calculating the LA for bacteria, phosphorus, TSS and nitrate to be reasonable.

The 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:
MRMW bacteria TMDLs: MPCA identified NPDES permitted facilities within the MRMW and assigned those facilities a portion of the WLA (Table 6 of this Decision Document). The WLAs for each of these individual facilities were calculated based on the facility’s average wet weather design flow and the *E. coli* WQS (126 orgs /100 mL). MPCA explained that the WLA for each individual WWTP was calculated based on the *E. coli* WQS but WWTF permits are regulated for the fecal coliform WQS (200 orgs /100 mL) and that if a facility is meeting its fecal coliform limits, which are set in the facility’s discharge permit, MPCA assumes the facility is also meeting the calculated *E. coli* WLA from the MRMW TMDLs. The WLA was therefore calculated using the assumption that the *E. coli* standard of 126 orgs/100 mL provides equivalent protection from illness due to primary contact recreation as the fecal coliform WQS of 200 orgs/100 mL.

MS4 allocations were calculated for the MRMW bacteria based on whether the MS4 was a city, township, a nontraditional MS4 (e.g., Minnesota State University-Mankato) or a county based MS4 (e.g., Blue Earth County MS4).

- **City, township, and nontraditional MS4s:** WLA were approximated by estimating developed land areas (i.e., open space, low intensity, medium intensity, and high intensity land cover classes of the 2011 National Land Cover database) divided by the total jurisdictional area.
- **County MS4s:** WLA were based on estimated road coverage within the county boundaries based on the U.S. Census Bureau 2010 urban area mapping layer. The regulated roads and rights-of-way were approximated by the county road lengths (county and county state aid highways in the Minnesota Department of Transportation's [MnDOT's] STREETS_LOAD shapefile1) in the 2010 urban area multiplied by an average right-of-way width of 90 feet on either side of the centerline.

The estimated regulated area of each permitted MS4 within an impaired watershed was divided by the total area of the watershed to represent the percent coverage of each permitted MS4 within the impaired watershed. The WLAs for permitted MS4s were calculated as the percent coverage of each permitted MS4 multiplied by the loading capacity minus the MOS minus wastewater WLAs.

MPCA acknowledged the presence of CAFOs in the MRMW in Section 3.6.2 of the final TMDL document. CAFOs and other feedlots are generally not allowed to discharge to waters of the State (Minnesota Rule 7020.2003). CAFOs were assigned a WLA of zero (WLA = 0) by MPCA for the MRMW bacteria TMDLs.

EPA finds the MPCA's approach for calculating the WLAs for the MRMW bacteria TMDLs to be reasonable and consistent with EPA guidance.

MRMW phosphorus TMDLs: MPCA identified construction and industrial stormwater contributions as necessitating a WLA (Table 7 of this Decision Document). This WLA was represented as a categorical WLA for construction stormwater and industrial stormwater. The categorical WLA was calculated based on the average annual percent area of each county that is regulated through the construction stormwater permit (provided in the Minnesota Stormwater Manual [Minnesota Stormwater Manual contributors 2018]) which was further area-weighted based on the contributing subwatershed for each impaired segment. The construction stormwater WLA was calculated as the percent area multiplied by the loading capacity less the MOS and wastewater WLAs. MPCA explained that it assumed that loads from permitted construction stormwater sites that operate in compliance with their permits are meeting the WLA.

MPCA explained (Section 4.5 of the final TMDL document) that permitted industrial activities make up a small portion of the watershed areas, and the industrial stormwater WLA for each impaired water body was set equal to the construction stormwater WLA. It is assumed that loads from permitted industrial stormwater sites that operate in compliance with the permit are meeting the WLA. In the allocation tables presented in Appendix A, these two categorical WLAs are combined into one line item and referred to as the WLA for "Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)".

Attaining the construction stormwater and industrial stormwater loads described in the MRMW TP TMDLs is the responsibility of construction and industrial site managers. For example, for the Mills Lake (07-0097-00) TP TMDL, local MS4 permittees (e.g., cities) are responsible for overseeing that construction stormwater loads which impact water quality in Mills Lake do not exceed the WLA assigned to those areas. Local MS4 permittees are required to have a construction stormwater ordinance at least as stringent as the State's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001). In the final TMDL document MPCA explained that if a construction site owner/operator obtains coverage under the NPDES/SDS General Stormwater Permit (MNR100001) and properly selects, installs and maintains all BMPs required under MNR100001 and applicable local construction stormwater ordinances, including those related to impaired waters discharges and any applicable additional requirements found in Appendix A of the Construction General Permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL. BMPs and other stormwater control measures which act to limit the discharge of the pollutant of concern (phosphorus) are defined in MNR100001.

The MPCA is responsible for overseeing industrial stormwater loads which impact water quality to lakes in the MRMW. Industrial sites within lake subwatersheds are expected to comply with the requirements of the State's NPDES/SDS Industrial Stormwater Multi-Sector General Permit (MNR050000) or NPDES/SDS General Permit for Construction Sand & Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities (MNG490000). MPCA explained that if a facility owner/operator obtains coverage under the appropriate NPDES/SDS General Stormwater Permit and properly selects, installs and maintains all BMPs required under the permit, the stormwater discharges would be expected to be consistent with the WLA in this TMDL. BMPs and other stormwater control measures which act to limit the discharge of the pollutant of concern (phosphorus) are defined in MNR050000 and MNG490000.

The NPDES program requires construction and industrial sites to create SWPPPs which summarize how stormwater pollutant discharges will be minimized from construction and industrial sites. Under the MPCA's Stormwater General Permit (MNR100001) and applicable local construction stormwater ordinances, managers of sites under construction or industrial stormwater permits must review the adequacy of local SWPPPs to ensure that each plan complies with the applicable requirements in the State permits and local ordinances. As noted above, MPCA has explained that meeting the terms of the applicable permits will be consistent with the WLAs set in the MRMW TP TMDLs. In the event that the SWPPP does not meet the WLA, the SWPPP will need to be modified within 18-months of the approval of the TMDL by the U.S. EPA. This applies to sites under permits for MNR100001, MNR050000 and MNG490000.

EPA finds the MPCA's approach for calculating the WLA for the MRMW TP TMDLs to be reasonable and consistent with EPA guidance.

MRMW sediment (TSS) TMDLs: MPCA identified six NPDES permitted facilities within the MRMW and assigned those facilities a portion of the WLA (Table 8 of this Decision Document). Individual WLAs were calculated for each of these individual facilities were calculated based on the information in the facilities NPDES permit:

- **Load Limit:** When a permit defined a calendar monthly average TSS load limit, that limit was used as the WLA.

- **Design flow and concentration limits:** When a permit did not define a TSS load limit but did define one or more design flows and TSS concentration limits, the WLA was calculated using a design flow and a concentration limit. If an average wet weather design flow was defined, it was used to calculate the WLA; if the average wet weather design flow was not defined, then the maximum design flow was used to calculate the WLA. If a monthly average TSS concentration limit was defined, then that limit was used to calculate the WLA; if only a daily maximum concentration limit was defined, then that limit was used to calculate the WLA.
- **No design flow and concentration limits:** If a permit did not define a design flow, the WLA was calculated using an estimated design flow and the TSS concentration limit. The design flow was estimated as the average reported flows for similar sites in the vicinity of the project area.

All the WLAs were based on TSS concentration limits less than or equal to the TSS standard of 65 mg/L. Therefore, facilities that discharge consistent with their WLAs are not a cause for in-stream exceedances of the TSS standard within their receiving water bodies.

In some instances, the loading capacity in the low flow zone for some reaches is less than the permitted wastewater treatment facility design flows. This is an artifact of using design flows for allocation setting and results in these point sources appearing to use all (or more than) the available loading capacity. To account for these unique situations, the WLAs and LAs in these flow zones where needed are expressed as an equation rather than an absolute number:

Allocation = flow contribution from a given source x 65 mg/L (or NPDES permit concentration)

This amounts to assigning a concentration-based limit to these sources for the lower flow zones. By definition rainfall and thus runoff is very limited if not absent during low flow. Thus, runoff sources would need little-to-no allocation for these flow zones.

MS4 allocations for the MRMW TSS TMDLs were calculated in the same manner as the MS4 allocations for the MRMW bacteria TMDLs (i.e., see calculative method in ***Section 5 - MRMW bacteria TMDLs***, within this Decision Document). There is one permitted MS4 community, the South Bend Township (MS400299) which received a TSS WLA for the Minneopa Creek (07020007-534) TSS TMDL.

Similar to the TP TMDLs, MPCA calculated a portion of the WLA for construction and industrial stormwater for the sediment (TSS) TMDLs. This WLA was represented as a categorical WLA for construction and industrial stormwater. The construction and industrial stormwater allocations for the MRMW sediment (TSS) TMDLs were calculated in the same manner as the construction and industrial stormwater allocations for the MRMW TP TMDLs (i.e., see calculative method in ***Section 5 – MRMW TP TMDLs***, within this decision document).

MPCA's expectations and responsibilities for overseeing construction and industrial stormwater loads for the TP TMDLs are the same for the sediment TMDLs. Construction and industrial sites are expected to create SWPPPs which summarize how stormwater pollutant discharges will be minimized from construction and industrial sites. Under the MPCA's Stormwater General Permit (MNR100001) and applicable local construction stormwater ordinances, managers of sites under construction or industrial stormwater permits must review the adequacy of local SWPPPs to ensure that each plan complies with the applicable requirements in the State permits and local ordinances. As noted above, MPCA has explained that meeting the terms of the applicable permits will be consistent with the WLAs set in the sediment (TSS) TMDLs for MRMW. In the event that the SWPPP does not meet the WLA, the SWPPP will need to be modified within 18-months of the approval of the TMDL by the U.S. EPA. This applies to sites under permits for MNR100001, MNR050000 and MNG490000.

EPA finds the MPCA's approach for calculating the WLA for the MRMW sediment (TSS) TMDLs to be reasonable and consistent with EPA guidance.

MRMW nitrate TMDLs: Similar to the TP and TSS TMDLs, MPCA calculated a portion of the WLA for construction and industrial stormwater for the nitrate TMDLs. This WLA was represented as a categorical WLA for construction and industrial stormwater. The construction and industrial stormwater allocations for the MRMW nitrate TMDLs were calculated in the same manner as the construction and industrial stormwater allocations for the MRMW TP TMDLs (i.e., see calculative method in ***Section 5 – MRMW TP TMDLs***, within this decision document).

MPCA's expectations and responsibilities for overseeing construction and industrial stormwater loads for the nitrate TMDLs are the same for the TP and TSS TMDLs. Construction and industrial sites are expected to create SWPPPs which summarize how stormwater pollutant discharges will be minimized from construction and industrial sites. Under the MPCA's Stormwater General Permit (MNR100001) and applicable local construction stormwater ordinances, managers of sites under construction or industrial stormwater permits must review the adequacy of local SWPPPs to ensure that each plan complies with the applicable requirements in the State permits and local ordinances. As noted above, MPCA has explained that meeting the terms of the applicable permits will be consistent with the WLAs set in the nitrate TMDLs for MRMW. In the event that the SWPPP does not meet the WLA, the SWPPP will need to be modified within 18-months of the approval of the TMDL by the U.S. EPA. This applies to sites under permits for MNR100001, MNR050000 and MNG490000.

EPA finds the MPCA's approach for calculating the WLA for the MRMW nitrate TMDLs to be reasonable and consistent with EPA guidance.

The 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)(1)(C), 40 C.F.R. §130.7(c)(1)). EPA's 1991 TMDL Guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

Comment:
The final TMDL submittal outlines the determination of the Margin of Safety for the bacteria, nutrient, sediment (TSS) and nitrate TMDLs. All five parameters employed an explicit MOS set at 10% of the loading capacity.

MRMW bacteria, phosphorus, sediment (TSS) and nitrate TMDLs: The MRMW TMDLs incorporated a 10% explicit MOS applied to the total loading capacity calculation for each flow regime of the LDC. Ten percent of the total loading capacity was reserved for MOS with the remaining load allocated to point and nonpoint sources (Tables 6, 7, 8 and 9 of this Decision Document). MPCA explained that the explicit MOS was set at 10% due to the following factors discovered during TMDL development for these pollutants:

- Environmental variability in pollutant loading;
- Variability in water quality data (i.e., collected water quality monitoring data, field sampling error, etc.);
- Calibration and validation processes of LDC modeling efforts, uncertainty in modeling outputs, and conservative assumptions made during the modeling efforts;
- Conservative assumptions made during the modeling efforts; and
- MPCA's confidence in the BATHTUB model's performance during the development of TP TMDLs.

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 makes quantifying stormwater bacteria loads particularly difficult. The MOS for the MRMW bacteria TMDLs also incorporated certain conservative assumptions in the calculation of the TMDLs. No rate of decay, or die-off rate of pathogen species, was 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* (EPA 841-R-00-002), 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 condition/circumstances of the water, and therefore 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. Thus, 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.

The EPA finds that the TMDL document submitted by MPCA contains an appropriate MOS satisfying the requirements of the sixth criterion.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variations. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)).

Comment:

MRMW bacteria TMDLs: 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 development of the LDCs utilized simulated flow data which were validated and calibrated with local flow gage data. Modeled flow 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 MRMW and thereby accounted for seasonal variability over the recreation season.

Critical conditions for *E. coli* loading occur in the dry summer months. This is typically when stream flows are lowest, and bacterial growth rates can be high. By meeting the water quality targets during the summer months, it can reasonably be assumed that the loading capacity values will be protective of water quality during the remainder of the calendar year (November through March).

MRMW phosphorus TMDLs: Seasonal variation was considered for the MRMW TP TMDLs as described in Section 4.3 of the final TMDL document. The nutrient targets employed in the MRMW TP TMDLs were based on the average nutrient values collected during the growing season (June 1 to September 30). The water quality targets were designed to meet the NCHF and WCBP 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 MRMW nutrient TMDL efforts, the LA and WLA estimates were calculated from modeling efforts which incorporated mean growing season total phosphorus values. Nutrient loading capacities were set in the TMDL development process to meet the WQS during the most critical period. The mid-late summer time period is typically when eutrophication standards are exceeded and water quality within the MRMW is deficient. By calibrating the modeling efforts to protect these water bodies 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).

MRMW sediment (TSS) TMDLs: 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 MRMW (Section 4.3 of the final TMDL document). Sediment loading in the MRMW varies depending on surface water flow, land cover and climate/season. 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 streamflows, and the fall brings increasing precipitation and rapidly changing agricultural landscapes. In all seasons sediment inputs to surface waters typically occur primarily through wet weather events. Critical conditions that impact the response of MRMW water bodies to sediment inputs may typically occur during periods of low flow. During low flow periods, sediment can accumulate within the impacted water bodies, there is less assimilative capacity within the water body, and generally sediment is not transported through the water body at the same rate it is under normal flow conditions.

Critical conditions that impact loading, or the rate that sediment is delivered to the water body, were identified as those periods where large precipitation events coincide with periods of minimal vegetative cover on fields. Large precipitation events and minimally covered land surfaces can lead to large runoff volumes, especially to those areas which drain agricultural fields. The conditions generally occur in the spring and early summer seasons.

MRMW nitrate TMDLs: Critical conditions which may impact nitrate's introduction to surface water are likely very similar to sediment in that these conditions are influences by precipitation events. Nitrate and manure fertilizer application to agricultural areas in the MRMW can introduce nitrate concentrations to local surface waters during precipitation events. Critical conditions that impact loading, or the rate that nitrate is delivered to the water body, were identified as those periods where large precipitation events coincide with periods of minimal vegetative cover on fields. Large precipitation events and minimally covered land surfaces can lead to large runoff volumes, especially to those areas which drain agricultural fields. The conditions generally occur in the spring and early summer seasons.

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

8. Reasonable Assurance

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

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

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

Comment:

The MRMW bacteria, nutrient, sediment (TSS) and nitrate TMDLs provide reasonable assurance that actions identified in the implementation section of the final TMDL (i.e., Sections 7 and 9 of the final

TMDL document), will be applied to attain the loading capacities and allocations calculated for the impaired reaches within the MRMW. 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.

MPCA has identified several local partners which have expressed interest in working to improve water quality within the MRMW. Implementation practices will be implemented over the next several years. It is anticipated that staff from Soil and Water Conservation District (SWCDs) (e.g., the Redwood County SWCD) staff, local Minnesota Board of Soil and Water Resources (BWSR) offices, and other local watershed groups, will work together to reduce pollutant inputs to the MRMW. MPCA has authored a Minnesota River-Mankato WRAPS document (January 2020) which provides information on the development of scientifically-supported restoration and protection strategies for implementation planning and action. MPCA sees 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.

EPA understands that there are several existing TMDLs in the Minnesota River Watershed and other TMDL projects which are in final stages of development by MPCA, e.g., the Lower Minnesota River TMDL and the Watonwan River TMDL (https://www.pca.state.mn.us/water/total-maximum-daily-load-tmdl-projects). The existing TMDLs have been approved for several years, and implementation activities are underway. MPCA also noted that several TMDLs addressing bacteria and nutrients in the Minnesota River Basin will also reduce sediment loads, as many sources of bacteria and nutrients are linked with sediment, such as row-crop runoff.

There are various localized water plans (e.g., Middle Minnesota River Watershed Lakes WRAPS Strategy, Middle Minnesota River Watershed Nicollet County WRAPS Strategy, etc., pp. 76-78 of the MRMW WRAPS document) which exist in the MRMW. These plans have been authored over the past few years and are specifically focused on county level water challenges (e.g., reducing priority pollutants (bacteria and nutrients), septic system improvements, working with local agricultural partners on feedlot maintenance, erosion and runoff minimization, etc.). These WRAPS documents are grounded on hydrologic management practices, environmental protection efforts and efficient management practices. These water plans demonstrate that at the county level there is great interest in improving water quality and restoring impaired water bodies as well as protecting waters which are threatened with potential further degradation. Between the county level water plans and planning efforts of local county SWCDs, EPA acknowledges that there is significant local interest in preserving and restoring water quality in the MRMW.

Continued water quality monitoring within the basin is supported by MPCA. Additional water quality monitoring results could provide insight into the success or failure of BMP systems designed to reduce bacteria, nutrient, sediment and nitrate loading into the surface waters of the watershed. Local watershed managers would 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.

The MPCA regulates the collection, transportation, storage, processing and disposal of animal manure and other livestock operation wastes at State registered animal feeding operation (AFO) facilities. The MPCA Feedlot Program implements rules governing these activities and provides assistance to counties and the livestock industry. The feedlot rules apply to most aspects of livestock waste management including the location, design, construction, operation and management of feedlots and manure handling facilities.

Reasonable assurance that the WLA set forth 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's stormwater program and the NPDES permit program are the implementing programs for ensuring WLA are consistent with the TMDL. The NPDES program requires construction and industrial sites to create SWPPPs which summarize how stormwater will be minimized from construction and industrial sites. Under the MPCA's Stormwater General Permit, managers of sites under construction or industrial stormwater permits must review the adequacy of local SWPPPs to ensure that each plan meets WLA set in the MRMW TMDLs. In the event that the SWPPP does not meet the WLA, the SWPPP will need to be modified. This applies to sites under the MPCA's General Stormwater Permit for Construction Activity (MNR100001) and its NPDES/SDS Industrial Stormwater Multi-Sector General Permit (MNR050000) or NPDES/SDS General Permit for Construction Sand & Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities (MNG490000).

MPCA is responsible for applying federal and state regulations to protect and enhance water quality within the TMDL study area. MPCA oversees all regulated MS4 entities (e.g., Mankato City) in stormwater management accounting activities. MS4 permits require permittees to implement BMPs to reduce pollutants in stormwater runoff to the Maximum Extent Practicable (MEP).

All regulated MS4 communities are required to satisfy the requirements of the MS4 general permit which requires the permittee to develop a SWPPP which addresses all permit requirements, including the following six minimum control measures:

- Public education and outreach;
- Public participation;
- Illicit Discharge Detection and Elimination (IDDE) Program;
- Construction-site runoff controls;
- Post-construction runoff controls; and
- Pollution prevention and municipal good housekeeping measures.

The MS4 General Permit requires permittees to develop compliance schedules for any TMDL that received U.S. EPA-approval prior to the effective date of the General Permit. This schedule must identify BMPs that will be implemented over the five-year permit term, timelines for their implementation, an assessment of progress, and a long term strategy for continued progress toward ultimately achieving those WLAs.

MPCA requires MS4 applicants to submit their application materials and SWPPP documentation to MPCA for review. Prior to extension of coverage under the general permit, all application materials are placed on 30-day public notice by the MPCA, to ensure adequate opportunity for the public to comment on each permittee's stormwater management program. Upon extension of coverage by the MPCA, the permittees are to implement the activities described within their SWPPP and submit annual reports to MPCA by June 30 of each year. These reports document the implementation activities which have been completed within the previous year, analyze implementation activities already undertaken, and outline any changes within the SWPPP from the previous year.

Various funding mechanisms will be utilized to execute the recommendations made in the implementation section of this TMDL. The Clean Water Legacy Act (CWLA) was passed in Minnesota in 2006 for the purposes of protecting, restoring, and preserving Minnesota water. The CWLA provides the protocols and practices to be followed in order to protect, enhance, and restore water quality in Minnesota. The CWLA outlines how MPCA, public agencies and private entities should coordinate in their efforts toward improving land use management practices and water management. The CWLA anticipates that all agencies (i.e., MPCA, public agencies, local authorities and private entities, etc.) will cooperate regarding planning and restoration efforts. Cooperative efforts would likely include informal and formal agreements to jointly use technical, educational, and financial resources.

The CWLA also provides details on public and stakeholder participation, and how the funding will be used. In part to attain these goals, the CWLA requires MPCA to develop WRAPS. The WRAPS are required to contain such elements as the identification of impaired waters, watershed modeling outputs, point and nonpoint sources, load reductions, etc. (*Chapter 114D.26*; CWLA). The WRAPS also contain an implementation table of strategies and actions that are capable of achieving the needed load reductions, for both point and nonpoint sources (*Chapter 114D.26*, Subd. 1(8); CWLA). Implementation plans developed for the TMDLs are included in the table, and are considered "priority areas" under the WRAPS process (*Watershed Restoration and Protection Strategy Report Template*, MPCA). This table includes not only needed actions but a timeline for achieving water quality targets, the reductions needed from both point and nonpoint sources, the governmental units responsible, and interim milestones for achieving the actions. MPCA has developed guidance on what is required in the WRAPS (*Watershed Restoration and Protection Strategy Report Template*, MPCA).

The Minnesota Board of Soil and Water Resources administers the Clean Water Fund as well, and has developed a detailed grants policy explaining what is required to be eligible to receive Clean Water Fund money (FY 2014 Clean Water Fund Competitive Grants Request for Proposal (*RFP*); *Minnesota Board of Soil and Water Resources*, 2014).

The EPA finds that this criterion has been adequately addressed.

9. Monitoring Plan to Track TMDL Effectiveness

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

Comment:
The final TMDL document outlines the water monitoring efforts in the MRMW (Section 8 of the final TMDL document). Progress of TMDL implementation will be measured through regular monitoring efforts of water quality and total BMPs completed. MPCA anticipates that monitoring will be completed by local groups (e.g., the Blue Earth County SWCD, Le Sueur County SWCD and Redwood County SWCD) and volunteers, as long as there is sufficient funding to support the efforts of these local entities. At a minimum, the MRMW will be monitored once every 10 years as part of the MPCA's Intensive Watershed Monitoring cycle.

MPCA explained that one local group, the Discovery Farms Minnesota group, is a famer-led initiative which collects farm and field scale water quality data. This program is coordinated via the Minnesota Agricultural Water Resource Center in partnership with the Minnesota Department of Agriculture and the University of Minnesota Extension. There is one farm in Renville County and one farm in Redwood County which participate in this Discovery Farms program.

Water quality monitoring is a critical component of the adaptive management strategy employed as part of the implementation efforts utilized in the MRMW. Water quality information will aid watershed managers in understanding how BMP pollutant removal efforts are impacting water quality. Water quality monitoring combined with an annual review of BMP efficiency will provide information on the success or failure of BMP systems designed to reduce pollutant loading into water bodies of the MRMW. Watershed managers will have the opportunity to reflect on the progress or lack of progress, and will have the opportunity to change course if progress is unsatisfactory. Review of BMP efficiency is expected to be completed by the local and county partners.

Stream Monitoring:
River and stream monitoring in the MRMW, has been completed by a variety of organizations (i.e., SWCDs) and funded by Clean Water Partnership Grants, and other available local funds. MPCA anticipates that stream monitoring in the MRMW should continue in order to build on the current water quality dataset and track changes based on implementation progress. Continuing to monitor water quality and biota scores in the listed segments will determine whether or not stream habitat restoration measures are required to bring the watershed into attainment with water quality standards. At a minimum, fish and macroinvertebrate sampling should be conducted by the MPCA, Minnesota Department of Natural Resources (MDNR), or other agencies every five to ten years during the summer season.

Lake Monitoring:
The lakes in the MRMW have all been periodically monitored by volunteers and staff over the years. Monitoring for some of these locations is planned for the future in order to keep a record of the changing water quality as funding allows. Lakes are generally monitored for TP, chl-*a*, and Secchi disk transparency. MPCA expects that in-lake monitoring will continue as implementation activities are installed across the watersheds. These monitoring activities should continue until water quality goals are met. Some tributary monitoring has been completed on the inlets to the lakes and may be important to continue as implementation activities take place throughout the subwatersheds.

The EPA finds that this criterion has been adequately addressed.

10. Implementation

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

Comment:
The findings from the MRMW TMDLs will be used to inform the selection of implementation activities as part of the Minnesota River-Mankato Watershed WRAPS process. The purpose of the WRAPS report is to support local working groups and jointly develop scientifically-supported restoration and protection strategies to be used for subsequent implementation planning.

The TMDL outlined some implementation strategies in Section 9 of the final TMDL document. MPCA outlined the importance of prioritizing areas within the MRMW, education and outreach efforts with local partners, and partnering with local stakeholders to improve water quality within the watershed. The MRMW WRAPS document (January 2020) includes additional detail regarding specific recommendations from MPCA to aid in the reduction of bacteria, nutrients, sediment (TSS) and nitrate to surface waters of the MRMW. Additionally, MPCA referenced the Statewide Nutrient Reduction Strategy (https://www.pca.state.mn.us/water/nutrient-reduction-strategy) for focused implementation efforts targeting phosphorus and nitrate nonpoint sources in MRMW. The reduction goals for the bacteria, nutrient, sediment (TSS) and nitrate TMDLs may be met via components of the following strategies:

MRMW bacteria TMDLs:
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 water bodies 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. Additionally, cleaner stormwater runoff can be diverted away from feedlots so as to not liberate bacteria.

Subsurface septic treatment systems: 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 MRMW.

Stormwater wetland treatment systems: Constructed wetlands with the purpose of treating wastewater or stormwater inputs could be explored in selected areas of the MRMW. Constructed wetland systems may be vegetated, open water, or a combination of vegetated and open water. MPCA explained that recent studies have found that the more effective constructed wetland designs employ large treatment volumes in proportion to the contributing drainage area, have open water areas between vegetated areas, have long flow paths and a resulting longer detention time, and are designed to allow few overflow events.

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 MRMW.

Bioinfiltration of stormwater: Biofiltration practices rely on the transport of stormwater and watershed runoff through a medium such as sand, compost or soil. This process allows the medium to filter out sediment and therefore sediment-associated bacteria. Biofiltration/bioretention systems, are vegetated and are expected to be most effective when sized to limit overflows and designed to provide the longest flow path from inlet to outlet.

MRMW phosphorus TMDLs:

Septic Field Maintenance: Septic systems are believed to be a source of nutrients to waters in the MRMW. 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 water body. 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 MRMW.

Manure management (feedlot and manure stockpile runoff controls): Manure has been identified as a potential source of nutrients in the MRMW. Nutrients derived from manure can be transported to surface water bodies 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.

Urban/Residential Nutrient Reduction Strategies: These strategies involve reducing stormwater runoff from lakeshore homes and other residences within the MRMW. These practices would include; rain gardens, lawn fertilizer reduction, lake shore buffer strips, vegetation management and replacement of failing septic systems. Water quality educational programs could also be utilized to inform the general public on nutrient reduction efforts and their impact on water quality.

Municipal activities: Municipal programs, such as street sweeping, can also aid in the reduction of nutrients to surface water bodies within the MRMW. Municipal partners can team with local watershed groups or water district partners to assess how best to utilize their monetary resources for installing new stormwater BMPs (e.g., vegetated swales) or retro-fitting existing stormwater BMPs.

Internal Loading Reduction Strategies: Internal nutrient loads may be addressed to meet the TMDL allocations outlined in the MRMW TP TMDLs. MPCA recommends that before any strategy is put into action, an intensive technical review, to evaluate the costs and feasibility of internal load reduction options be completed. Several options should be considered to manage internal load inputs to each of the water bodies addressed in this TMDL.

- *Management of fish populations:* Monitor and manage fish populations to maintain healthy game fish populations and reduce rough fish (i.e. carp, bullheads, fathead minnows) populations.
- *Vegetation management:* Improved management of in-lake vegetation in order to limit phosphorus loading and to increase water clarity. Controlling the vitality of curly-leaf pondweeds via chemical treatments (herbicide applications) will reduce one of the significant sources of internal loading, the senescence of curly-leaf plants in the summer months.
- *Chemical treatment:* The addition of chemical reactants (e.g., aluminum sulfate) to lakes of the MRMW in order for those reactants to permanently bind phosphorus into the lake bottom sediments. This effort could decrease phosphorus releases from sediment into the lake water column during anoxic conditions.

MRMW sediment (TSS) TMDLs:

Improved Agricultural Drainage Practices: A review of local agricultural drainage networks should be completed to examine how improving drainage ditches and drainage channels could be reorganized to reduce the influx of sediment to the surface waters in the MRMW. The reorganization of the drainage network could include the installation of drainage ditches or sediment traps to encourage particle settling during high flow events. Additionally, cover cropping and residue management is recommended to reduce erosion and thus siltation and runoff into streams.

Reducing Livestock Access to Stream Environments: 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.

Identification of Stream, River, and Lakeshore Erosional Areas: An assessment of stream channel, river channel, and lakeshore erosional areas should be completed to evaluate areas where erosion control strategies could be implemented in the MRMW. Implementation actions (e.g., planting deep-rooted vegetation near water bodies to stabilize streambanks) could be prioritized to target areas which are actively eroding. This strategy could prevent additional sediment inputs into surface waters of the MRMW and minimize or eliminate degradation of habitat.

MRMW nitrate TMDLs:
Septic Field Maintenance: Septic systems are believed to be a source of nitrate to waters in the MRMW. 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 water body. 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 nitrates inputs into the MRMW.

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

Pasture management and agricultural reduction strategies: These strategies involve reducing nitrate 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 nitrate management planning.

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

11. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. The TMDL regulations require that each State/Tribe must subject calculations to establish TMDLs to public review consistent with its own continuing planning process

(40 C.F.R. §130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's/Tribe's public participation process, including a summary of significant comments and the State's/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. §130.7(d)(2)).

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

Comment:

The public participation section of the TMDL submittal is found in Section 10 of the final TMDL document. Throughout the development of the MRMW TMDLs the public was given various opportunities to participate. As part of the strategy to communicate the goals of the TMDL project and to engage with members of the public, MPCA worked with county and SWCD staff from the eight counties in the MRMW to promote water quality, to gain input from landowners via surveys and interviews and to better understand the social dynamics of stakeholders in the MRMW. MPCA's goal was to create civic engagement and discussion which would enhance the content of the TMDL and WRAPS documents. A full description of civic engagement activities associated with the TMDL process is available within in the MRMW WRAPS report (January 2020).

MPCA posted the draft TMDL online at (http://www.pca.state.mn.us/water/tmdl) for a public comment period. The public comment period was started on July 22, 2019 and ended on September 20, 2019. MPCA received sixteen (16) public comments during the public comment period. Comments were submitted by landowners and special interest groups regarding the TMDL document and the WRAPS document. A summary of some of the main topics expressed in the public comments and MPCA's responses to those topics is expressed below.

Commenters provided feedback to MPCA on specific language used in the TMDL and the WRAPS document and requested clarification on language and supporting arguments expressed in these documents. MPCA reviewed the highlighted language from the various commenters and revised the TMDL and WRAPS documents where appropriate. An example of this was one commenter highlighted certain local programming which they felt had been overlooked by the MPCA. In response, the MPCA agreed with the commenter and added information to its reasonable assurance and implementation discussions of the TMDL document.

In those instances where MPCA needed to provide further clarification regarding certain statements or arguments made in the TMDL or WRAPS document, it did so within its response to the individual commenter. In some cases, MPCA requested additional discussion(s) with the commenter to further communication and potentially improve partnering opportunities during future implementation activities in the MRMW.

Some commenters disagreed with MPCA that agricultural drain tiles are a significant source of flow and associated sediment into water bodies in the MRMW. They explained that groundwater seepage and freeze-thaw cycles are leading to destabilized bluffs and gullies, causing them to fail and slump into the Minnesota River and its tributaries, rather than increased streamflow from agricultural tiles causing increased undercutting of streambanks and bluffs. MPCA explained that the causes of sediment loading in the MRMW vary in type and amount across the watershed. In some locations, bluff erosion is a significant source, while in others, there is clear evidence that agricultural tiles are contributing to increased in-stream flows and related streambank erosion. MPCA agreed that detailed analyses (such as in the WRAPS and other implementation plans) are needed to determine the specific causes and locations of sediment loading, and that a suite of BMPs are best suited to reducing the loads. The State welcomed further study of sediment sources in the TMDL watershed to better understand sources and impacts.

Commenters voiced concern regarding the recommendation to reduce high flows in the various water bodies of the MRMW. MPCA noted that precipitation and related runoff levels have increased in the Minnesota River watershed, since the mid-20th century. Some commenters requested that MPCA focus on additional stormwater controls (e.g., ponds, detention structures and constructed/restored wetland areas) to increase water storage in the MRMW and reduce stormwater inputs to local steam and river environments. MPCA explained that the strategies discussed in the TMDL and WRAPS documents are focused on slowing down and holding the release of stormwater to streams, ditches and lakes. MPCA affirmed its interest in BMPs which retain water on the land surface and minimize storm event driven flows to local surface waters.

Comments were also raised regarding the prioritization of CWLA funding. Several commenters requested that MPCA allocate a greater percentage of CWLA funds toward implementation and decrease the current amount of funding allocated to watershed monitoring and assessment efforts. MPCA explained since the inception of the CWLA fund in July of 2009, approximately 81% of CWLA funds had been spent on implementation. MPCA also added that it has been exploring ways to reduce the costs of TMDL and WRAPS development to free up additional funding for implementation efforts.

EPA believes that MPCA adequately addressed the comments received during the public notice period and where necessary updated the final TMDL and WRAPS documents in response to those comments. All public comments and MPCA responses to publicly submitted comments were shared with EPA.

The Minnesota River-Mankato Watershed includes Lower Sioux Indian Community tribal lands in upstream areas of the watershed (Section 1.2 of the final TMDL document). EPA invited representatives of the Lower Sioux Indian Community to consult with EPA regarding EPA's review and decision on the MRMW TMDLs.[4] Representatives from the Lower Sioux Indian Community did not respond to EPA's invitation to consult on EPA's review and decision of the MRMW TMDLs. EPA understood this as the Lower Sioux Indian Community deferring on EPA's invitation to consult. Therefore, EPA closed out the tribal consultation invitation via a follow-up letter to the President of the Lower Sioux Indian Community.[5]

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

[4] EPA Letter from Thomas R. Short Jr., Acting Director Water Division, Region 5, U.S. EPA to Robert Larsen, President of the Lower Sioux Indian Community, *Invitation for Consultation on EPA's Final Review for the Minnesota River-Mankato Watershed Total Maximum Daily Load Study*, January 30, 2020.
[5] EPA Letter from Thomas R. Short Jr., Acting Director Water Division, Region 5, U.S. EPA to Robert Larsen, President of the Lower Sioux Indian Community, *Closeout of EPA's consultation invitation and final review of the Minnesota River-Mankato Watershed Total Maximum Daily Load Study*, February 20, 2020.

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 water body, and the pollutant(s) of concern.

Comment:

The EPA received the final Minnesota River-Mankato watershed TMDL document, submittal letter and accompanying documentation from MPCA on January 28, 2020. The transmittal letter explicitly stated that the final TMDLs referenced in Table 1 of this Decision Document were being submitted to EPA pursuant to Section 303(d) of the Clean Water Act for EPA review and approval.

The letter clearly stated that this was a final TMDL submittal under Section 303(d) of CWA. The letter also contained the name of the watershed as it appears on Minnesota's 303(d) list, and the causes/pollutants of concern. This TMDL was submitted per the requirements under Section 303(d) of the Clean Water Act and 40 CFR 130.

The EPA finds that the TMDL transmittal letter submitted for the Minnesota River-Mankato River watershed TMDLs by MPCA satisfies the requirements of this twelfth element.

13. Conclusion

After a full and complete review, the EPA finds that the 34 bacteria TMDLs, the 8 TP TMDLs, the 6 sediment (TSS) TMDLs, the 3 nitrate TMDLs satisfy all elements for approvable TMDLs. This TMDL approval is for **fifty-one TMDLs**, addressing segments for aquatic recreational, aquatic life and drinking water use impairments (Table 1 of this Decision Document).

The EPA's approval of these TMDLs extends to the water bodies which are identified above with the exception of any portions of the water bodies that are within Indian Country, as defined in 18 U.S.C. Section 1151. The EPA is taking no action to approve or disapprove TMDLs for those waters at this time. The EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.

ATTACHMENTS

Attachment #1: **Table 6: Bacteria (*E. coli*) TMDLs for the Minnesota River-Mankato Watershed**

Attachment #2: **Table 7: Total Phosphorus TMDLs for the Minnesota River-Mankato Watershed**

Attachment #3: **Table 8: Total Suspended Solid (TSS) TMDLs for the Minnesota River-Mankato Watershed**

Attachment #4: **Table 9: Nitrate TMDLs for the Minnesota River-Mankato Watershed**

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Table 6: Bacteria (*E. coli*) TMDLs for the Minnesota River-Mankato Watershed

Allocation	Source	Very High	High	Mid	Low	Very Low
		E. coli (billions of bacteria/day)				
TMDL for Crow Creek (07020007-569)						
Wasteload Allocation	Redwood Falls City MS4 (MS400236)	6.60	1.60	0.49	0.10	--[a]
	WLA Totals	6.60	1.60	0.49	0.10	--[a]
Load Allocation	Watershed Load	150.00	35.00	11.00	2.30	--[a]
	LA Totals	150.00	35.00	11.00	2.30	--[a]
Margin Of Safety (10%)		18.00	4.10	1.30	0.27	--[a]
	Loading Capacity (TMDL)	**174.60**	**40.70**	**12.79**	**2.67**	--[a]
Estimated Load Reduction (%)		**91%**				
TMDL for Birch Coulee Creek (07020007-587)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	0.00
Load Allocation	Watershed Load	247.00	83.00	36.00	18.00	8.30
	LA Totals	247.00	83.00	36.00	18.00	8.30
Margin Of Safety (10%)		28.00	9.20	4.00	2.00	0.92
	Loading Capacity (TMDL)	**275.00**	**92.20**	**40.00**	**20.00**	**9.22**
Estimated Load Reduction (%)		**66%**				
TMDL for Purgatory Creek (07020007-645)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	170.00	32.00	5.50	0.39	--[a]
	LA Totals	170.00	32.00	5.50	0.39	--[a]
Margin Of Safety (10%)		19.00	3.50	0.61	0.043	--[a]
	Loading Capacity (TMDL)	**189.00**	**35.50**	**6.11**	**0.43**	--[a]
Estimated Load Reduction (%)		**87%**				
TMDL for Wabasha Creek (07020007-527)						
Wasteload Allocation	Morgan WWTP (MN0020443)	11.03	11.03	11.03	--[b]	--[a]
	WLA Totals	11.03	11.03	11.03	--[b]	--[a]

Load Allocation	Watershed Load	410.00	84.00	12.00	--[b]	--[a]
	LA Totals	410.00	84.00	12.00	0.00	--[a]
Margin Of Safety (10%)		47.00	11.00	2.60	0.60	--[a]
Loading Capacity (TMDL)		**468.03**	**106.03**	**25.63**	**6.00**	--[a]
Estimated Load Reduction (%)		**90%**				
TMDL for Three-Mile Creek (07020007-704)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	98.00	19.00	3.00	0.044	--[a]
	LA Totals	98.00	19.00	3.00	0.044	--[a]
Margin Of Safety (10%)		11.00	2.10	0.33	0.0049	--[a]
Loading Capacity (TMDL)		**109.00**	**21.10**	**3.33**	**0.049**	--[a]
Estimated Load Reduction (%)		**27%**				
TMDL for Unnamed Creek (07020007-644)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	166.00	31.00	5.10	0.30	--[a]
	LA Totals	166.00	31.00	5.10	0.30	--[a]
Margin Of Safety (10%)		18.00	3.40	0.57	0.033	--[a]
Loading Capacity (TMDL)		**184.00**	**34.40**	**5.67**	**0.33**	--[a]
Estimated Load Reduction (%)		**81%**				
TMDL for Fort Ridgley Creek (07020007-689)						
Wasteload Allocation	Fairfax WWTP (MNG580060)	20.13	20.13	20.13	--[b]	--[a]
	WLA Totals	20.13	20.13	20.13	--[b]	--[a]
Load Allocation	Watershed Load	503.00	93.00	5.20	--[b]	--[a]
	LA Totals	503.00	93.00	5.20	0.00	--[a]
Margin Of Safety (10%)		58.00	13.00	2.80	0.47	--[a]
Loading Capacity (TMDL)		**581.13**	**126.13**	**28.13**	**4.70**	--[a]
Estimated Load Reduction (%)		**47%**				
TMDL for Spring Creek-Judicial Ditch 29 (07020007-622)						
Wasteload Allocation	Evan WWTP (MNG580202)	0.69	0.69	0.69	0.69	--[a]
	WLA Totals	0.69	0.69	0.69	0.69	--[a]
Load Allocation	Watershed Load	177.00	45.00	11.00	1.70	--[a]
	LA Totals	177.00	45.00	11.00	1.70	--[a]
Margin Of Safety (10%)		20.00	5.10	1.30	0.27	--[a]
Loading Capacity (TMDL)		**197.69**	**50.79**	**12.99**	**2.66**	--[a]
Estimated Load Reduction (%)		**70%**				
TMDL for Spring Creek (07020007-573)						
Wasteload Allocation	Evan WWTP (MNG580202)	0.69	0.69	0.69	0.69	--[a]

	WLA Totals	0.69	0.69	0.69	0.69	--[a]
Load Allocation	Watershed Load	276.00	70.00	16.00	3.00	--[a]
	LA Totals	276.00	70.00	16.00	3.00	--[a]
Margin Of Safety (10%)		31.00	7.90	1.90	0.41	--[a]
Loading Capacity (TMDL)		**307.69**	**78.59**	**18.59**	**4.10**	--[a]
Estimated Load Reduction (%)		**81%**				
TMDL for County Ditch 13 (07020007-712)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	82.00	20.00	5.40	0.79	--[a]
	LA Totals	82.00	20.00	5.40	0.79	--[a]
Margin Of Safety (10%)		9.10	2.20	0.60	0.088	--[a]
Loading Capacity (TMDL)		**91.10**	**22.20**	**6.00**	**0.88**	--[a]
Estimated Load Reduction (%)		**83%**				
TMDL for County Ditch 10 (07020007-571)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	95.00	23.00	6.30	1.00	--[a]
	LA Totals	95.00	23.00	6.30	1.00	--[a]
Margin Of Safety (10%)		11.00	2.50	0.70	0.110	--[a]
Loading Capacity (TMDL)		**106.00**	**25.50**	**7.00**	**1.11**	--[a]
Estimated Load Reduction (%)		**90%**				
TMDL for Little Rock Creek (07020007-687)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	414.00	107.00	29.00	6.70	--[a]
	LA Totals	414.00	107.00	29.00	6.70	--[a]
Margin Of Safety (10%)		46.00	12.00	3.20	0.740	--[a]
Loading Capacity (TMDL)		**460.00**	**119.00**	**32.20**	**7.44**	--[a]
Estimated Load Reduction (%)		**79%**				
TMDL for Eight-Mile Creek (07020007-684)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	203.00	52.00	15.00	3.30	--[a]
	LA Totals	203.00	52.00	15.00	3.30	--[a]
Margin Of Safety (10%)		23.00	5.80	1.70	0.370	--[a]
Loading Capacity (TMDL)		**226.00**	**57.80**	**16.70**	**3.67**	--[a]
Estimated Load Reduction (%)		**78%**				
TMDL for Huelscamp Creek (07020007-641)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	73.00	18.00	5.70	1.20	--[a]

	LA Totals	73.00	18.00	5.70	1.20	--[a]
Margin Of Safety (10%)		8.10	2.00	0.63	0.130	--[a]
	Loading Capacity (TMDL)	**81.10**	**20.00**	**6.33**	**1.33**	--[a]
Estimated Load Reduction (%)		**69%**				
TMDL for Fritsche Creek (07020007-709)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	115.00	27.00	8.90	1.70	--[a]
	LA Totals	115.00	27.00	8.90	1.70	--[a]
Margin Of Safety (10%)		13.00	3.00	1.00	0.190	--[a]
	Loading Capacity (TMDL)	**128.00**	**30.00**	**9.90**	**1.89**	--[a]
Estimated Load Reduction (%)		**69%**				
TMDL for Heyman's Creek (07020007-640)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	107.00	24.00	8.00	1.40	--[a]
	LA Totals	107.00	24.00	8.00	1.40	--[a]
Margin Of Safety (10%)		12.00	2.70	0.89	0.160	--[a]
	Loading Capacity (TMDL)	**119.00**	**26.70**	**8.89**	**1.56**	--[a]
Estimated Load Reduction (%)		**76%**				
TMDL for Altermatt's Creek (07020007-518)						
Wasteload Allocation	Comfrey WWTP (MN0021687)	0.36	0.36	0.36	0.36	--[a]
	WLA Totals	0.36	0.36	0.36	0.36	--[a]
Load Allocation	Watershed Load	709.00	175.00	57.00	19.00	--[a]
	LA Totals	709.00	175.00	57.00	19.00	--[a]
Margin Of Safety (10%)		79.00	19.00	6.40	2.20	0.0049
	Loading Capacity (TMDL)	**788.36**	**194.36**	**63.76**	**21.56**	**0.049**
Estimated Load Reduction (%)		**12%**				
TMDL for Little Cottonwood River (07020007-676)						
Wasteload Allocation	Jeffers WWTP (MNG580111)	1.63	1.63	1.63	1.63	1.63
	Comfrey WWTP (MN0021687)	0.36	0.36	0.36	0.36	0.36
	WLA Totals	1.99	1.99	1.99	1.99	1.99
Load Allocation	Watershed Load	700.00	207.00	72.00	21.00	1.20
	LA Totals	700.00	207.00	72.00	21.00	1.20
Margin Of Safety (10%)		78.00	23.00	8.20	2.50	0.35
	Loading Capacity (TMDL)	**779.99**	**231.99**	**82.19**	**25.49**	**3.54**
Estimated Load Reduction (%)		**80%**				
TMDL for Little Cottonwood River (07020007-677)						
Wasteload Allocation	Searles WWTP (MNG580080)	1.84	1.84	1.84	1.84	1.84
	Jeffers WWTP (MNG580111)	1.63	1.63	1.63	1.63	1.63
	Comfrey WWTP (MN0021687)	0.36	0.36	0.36	0.36	0.36

	WLA Totals	3.83	3.83	3.83	3.83	3.83
Load Allocation	Watershed Load	836.00	246.00	84.00	23.00	0.02
	LA Totals	836.00	246.00	84.00	23.00	0.02
Margin Of Safety (10%)		93.00	28.00	9.80	3.00	0.42
Loading Capacity (TMDL)		**932.83**	**277.83**	**97.63**	**29.83**	**4.27**
Estimated Load Reduction (%)		**72%**				
TMDL for Morgan Creek (07020007-691)						
Wasteload Allocation	Hanska WWTP (MN0052663)	3.57	3.57	3.57	3.57	3.57
	WLA Totals	3.57	3.57	3.57	3.57	3.57
Load Allocation	Watershed Load	271.00	85.00	32.00	11.00	2.30
	LA Totals	271.00	85.00	32.00	11.00	2.30
Margin Of Safety (10%)		31.00	9.80	4.00	1.60	0.65
Loading Capacity (TMDL)		**305.57**	**98.37**	**39.57**	**16.17**	**6.52**
Estimated Load Reduction (%)		**66%**				
TMDL for Swan Lake Outlet (07020007-683)						
Wasteload Allocation	Nicollet WWTP (MNG580037)	12.20	12.20	12.20	--[b]	--[a]
	WLA Totals	12.20	12.20	12.20	--[b]	--[a]
Load Allocation	Watershed Load	169.00	46.00	4.20	--[b]	--[a]
	LA Totals	169.00	46.00	4.20	--[b]	--[a]
Margin Of Safety (10%)		20.00	6.40	1.80	0.56	0.21
Loading Capacity (TMDL)		**201.20**	**64.60**	**18.20**	**5.60**	**2.10**
Estimated Load Reduction (%)		**84%**				
TMDL for County Ditch 56 (07020007-557)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	0.00
Load Allocation	Watershed Load	89.00	25.00	9.00	3.70	0.90
	LA Totals	89.00	25.00	9.00	3.70	0.90
Margin Of Safety (10%)		10.00	2.80	1.00	0.410	0.10
Loading Capacity (TMDL)		**99.00**	**27.80**	**10.00**	**4.11**	**1.00**
Estimated Load Reduction (%)		**80%**				
TMDL for Minneopa Creek (07020007-534)						
Wasteload Allocation	South Bend Township MS4 (MS400299)	1.80	0.50	0.20	0.07	0.02
	Lake Crystal WWTP (MN0055981)	2.81	2.81	2.81	2.81	2.81
	WLA Totals	4.61	3.31	3.01	2.88	2.83
Load Allocation	Watershed Load	448.00	125.00	49.00	17.00	3.80
	LA Totals	448.00	125.00	49.00	17.00	3.80
Margin Of Safety (10%)		50.00	14.00	5.80	2.20	0.73
Loading Capacity (TMDL)		**502.61**	**142.31**	**57.81**	**22.08**	**7.36**
Estimated Load Reduction (%)		**87%**				
TMDL for Unnamed Creek (07020007-604)						

Wasteload Allocation	Blue Earth County MS4 (MS400276)	0.0797	0.0138	0.0041	0.0010	--[a]
	Mankato City MS4 (MS400226)	1.0163	0.1762	0.0522	0.0129	--[a]
	Mankato Township MS4 (MS400297)	0.4040	0.0700	0.0207	0.0051	--[a]
	WLA Totals	1.50	0.26	0.08	0.02	--[a]
Load Allocation	Watershed Load	5.80	1.00	0.29	0.07	--[a]
	LA Totals	5.80	1.00	0.29	0.07	--[a]
Margin Of Safety (10%)		0.81	0.14	0.04	0.01	--[a]
Loading Capacity (TMDL)		**8.11**	**1.40**	**0.41**	**0.10**	--[a]
Estimated Load Reduction (%)		**92%**				
TMDL for Unnamed Creek (07020007-603)						
Wasteload Allocation	Blue Earth County MS4 (MS400276)	0.1711	0.0308	0.0096	0.0031	--[a]
	Mankato City MS4 (MS400226)	1.0693	0.1925	0.0599	0.0192	--[a]
	Mankato Township MS4 (MS400297)	1.2019	0.2163	0.0673	0.0216	--[a]
	South Bend Township MS4 (MS400299)	0.0577	0.0104	0.0032	0.0010	--[a]
	WLA Totals	2.50	0.45	0.14	0.04	--[a]
Load Allocation	Watershed Load	10.00	1.80	0.56	0.18	--[a]
	LA Totals	10.00	1.80	0.56	0.18	--[a]
Margin Of Safety (10%)		1.40	0.25	0.08	0.03	--[a]
Loading Capacity (TMDL)		**13.90**	**2.50**	**0.78**	**0.25**	--[a]
Estimated Load Reduction (%)		**75%**				
TMDL for Unnamed Creek (07020007-602)						
Wasteload Allocation	Blue Earth County MS4 (MS400276)	0.0448	0.0072	0.0022	0.0003	--[a]
	Mankato City MS4 (MS400226)	0.0384	0.0062	0.0019	0.0003	--[a]
	Mankato Township MS4 (MS400297)	0.1057	0.0169	0.0052	0.0008	--[a]
	South Bend Township MS4 (MS400299)	0.3610	0.0575	0.0177	0.0026	--[a]
	WLA Totals	0.5499	0.0878	0.0270	0.0040	--[a]
Load Allocation	Watershed Load	2.40	0.39	0.12	0.02	--[a]
	LA Totals	2.40	0.39	0.12	0.02	--[a]
Margin Of Safety (10%)		0.33	0.05	0.02	0.00	--[a]
Loading Capacity (TMDL)		**3.28**	**0.53**	**0.16**	**0.02**	--[a]
Estimated Load Reduction (%)		**84%**				
TMDL for Unnamed Creek (07020007-600)						
Wasteload Allocation	Blue Earth County MS4 (MS400276)	0.3290	0.0640	0.0200	0.0050	--[a]

	Mankato City MS4 (MS400226)	1.5470	0.3030	0.0930	0.0250	--[a]
	Mankato Township MS4 (MS400297)	1.2130	0.2380	0.0730	0.0200	--[a]
	Skyline City MS4 (MS400292)	0.6370	0.1250	0.0380	0.0100	--[a]
	South Bend Township MS4 (MS400299)	1.2740	0.2500	0.0760	0.0210	--[a]
	WLA Totals	5.00	0.98	0.30	0.08	--[a]
Load Allocation	Watershed Load	18.00	3.40	1.10	0.29	--[a]
	LA Totals	18.00	3.40	1.10	0.29	--[a]
Margin Of Safety (10%)		2.50	0.49	0.15	0.04	--[a]
Loading Capacity (TMDL)		**25.50**	**4.87**	**1.55**	**0.41**	--[a]
Estimated Load Reduction (%)		**88%**				
TMDL for Unnamed Ditch (07020007-598)						
Wasteload Allocation	Blue Earth County MS4 (MS400276)	0.8900	0.1800	0.0500	0.0100	--[a]
	Mankato City MS4 (MS400226)	5.5000	1.1000	0.3400	0.0800	--[a]
	Mankato Township MS4 (MS400297)	1.3900	0.2800	0.0900	0.0200	--[a]
	Minnesota State University-Mankato MS4 (MS400279)	1.9300	0.3900	0.1200	0.0300	--[a]
	Skyline City MS4 (MS400292)	0.2500	0.0500	0.0200	0.0038	--[a]
	South Bend Township MS4 (MS400299)	1.0500	0.2100	0.0600	0.0200	--[a]
	WLA Totals	11.01	2.21	0.68	0.16	--[a]
Load Allocation	Watershed Load	22.00	4.40	1.40	0.34	--[a]
	LA Totals	22.00	4.40	1.40	0.34	--[a]
Margin Of Safety (10%)		3.70	0.73	0.23	0.06	--[a]
Loading Capacity (TMDL)		**36.71**	**7.34**	**2.31**	**0.56**	--[a]
Estimated Load Reduction (%)		**95%**				
TMDL for County Ditch 46A (07020007-679)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	0.00
Load Allocation	Watershed Load	68.00	13.00	4.10	0.85	0.08
	LA Totals	68.00	13.00	4.10	0.85	0.08
Margin Of Safety (10%)		7.50	1.40	0.45	0.094	0.01
Loading Capacity (TMDL)		**75.50**	**14.40**	**4.55**	**0.94**	**0.09**
Estimated Load Reduction (%)		**85%**				
TMDL for Seven-Mile Creek (07020007-703)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	106.00	20.00	6.00	0.90	--[a]
	LA Totals	106.00	20.00	6.00	0.90	--[a]
Margin Of Safety (10%)		12.00	2.20	0.67	0.100	--[a]

	Loading Capacity (TMDL)	**118.00**	**22.20**	**6.67**	**1.00**	--[a]
Estimated Load Reduction (%)		**73%**				
TMDL for Unnamed Creek (07020007-637)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	11.00	2.50	0.66	0.04	--[a]
	LA Totals	11.00	2.50	0.66	0.04	--[a]
Margin Of Safety (10%)		1.20	0.28	0.07	0.005	--[a]
	Loading Capacity (TMDL)	**12.20**	**2.78**	**0.73**	**0.046**	--[a]
Estimated Load Reduction (%)		**88%**				
TMDL for Seven-Mile Creek (07020007-562)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	0.00
Load Allocation	Watershed Load	270.00	58.00	13.00	2.30	1.20
	LA Totals	270.00	58.00	13.00	2.30	1.20
Margin Of Safety (10%)		30.00	6.40	1.40	0.250	0.13
	Loading Capacity (TMDL)	**300.00**	**64.40**	**14.40**	**2.550**	**1.330**
Estimated Load Reduction (%)		**40%**				
TMDL for Shanaska Creek (07020007-693)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	--[a]
Load Allocation	Watershed Load	193.00	41.00	11.00	1.80	--[a]
	LA Totals	193.00	41.00	11.00	1.80	--[a]
Margin Of Safety (10%)		21.00	4.50	1.20	0.200	--[a]
	Loading Capacity (TMDL)	**214.00**	**45.50**	**12.20**	**2.000**	--[a]
Estimated Load Reduction (%)		**60%**				
TMDL for Rogers Creek (07020007-613)						
Wasteload Allocation	St. Peter City MS4 (MS400245)	0.1900	0.0330	0.0082	0.0010	--[a]
	WLA Totals	0.19	0.03	0.01	0.00	--[a]
Load Allocation	Watershed Load	154.00	26.00	6.60	0.83	--[a]
	LA Totals	154.00	26.00	6.60	0.83	--[a]
Margin Of Safety (10%)		17.00	2.90	0.73	0.09	--[a]
	Loading Capacity (TMDL)	**171.19**	**28.93**	**7.34**	**0.92**	--[a]
Estimated Load Reduction (%)		**71%**				

a = MPCA explained that HSPF simulated flow estimates under the very low flow regime were zero and likely an underestimate of actual flow conditions during the very low flow regime

b = The permitted wastewater design flow exceeds the estimated stream flow in this flow zone. The allocation for this facility is expressed as an equation, rather than an absolute number, allocation = (flow contribution from a given source) x (126 org per 100 mL) x conversion factors

Table 7: Total Phosphorus (TP) Lake TMDLs for the Minnesota River-Mankato Watershed

Allocation	Source	TMDL TP Load	
		lbs/yr	lbs/day
TP TMDL for Mills Lake (07-0097-00)			
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	0.62	0.0017
	WLA Totals	**0.62**	**0.0017**
Load Allocation	Watershed Load	438.00	1.2000
	LA Totals	**438.00**	**1.20**
Margin Of Safety (10%)		48.70	0.13
Loading Capacity (TMDL)		**487.32**	**1.34**
Estimated Load Reduction (%)		**74%**	
TP TMDL for Loon Lake (07-0096-00)			
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	2.70	0.0074
	WLA Totals	**2.70**	**0.01**
Load Allocation	Watershed Load	1898.00	5.2000
	LA Totals	**1898.00**	**5.20**
Margin Of Safety (10%)		211.00	0.58
Loading Capacity (TMDL)		**2111.70**	**5.79**
Estimated Load Reduction (%)		**56%**	
TP TMDL for Wita Lake (07-0077-00)			
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	0.52	0.0014
	WLA Totals	**0.52**	**0.0014**
Load Allocation	Watershed Load	381.80	1.0460
	LA Totals	**381.80**	**1.05**
Margin Of Safety (10%)		42.50	0.12
Loading Capacity (TMDL)		**424.82**	**1.16**
Estimated Load Reduction (%)		**75%**	
TP TMDL for Duck Lake (07-0053-00)			
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	0.42	0.0012
	WLA Totals	**0.42**	**0.00**
Load Allocation	Watershed Load	297.00	0.8137
	LA Totals	**297.00**	**0.81**
Margin Of Safety (10%)		33.00	0.09
Loading Capacity (TMDL)		**330.42**	**0.91**
Estimated Load Reduction (%)		**72%**	
TP TMDL for George Lake (07-0047-00)			
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	0.197	0.0005

	WLA Totals	**0.20**	**0.00**
Load Allocation	Watershed Load	138.00	0.3781
	LA Totals	**138.00**	**0.38**
Margin Of Safety (10%)		15.40	0.04
Loading Capacity (TMDL)		**153.60**	**0.42**
Estimated Load Reduction (%)		**69%**	
TP TMDL for Washington Lake (40-0117-00)			
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	2.38	0.0065
	WLA Totals	**2.38**	**0.01**
Load Allocation	Watershed Load	2530.00	6.9315
	LA Totals	**2530.00**	**6.93**
Margin Of Safety (10%)		281.00	0.77
Loading Capacity (TMDL)		**2813.38**	**7.71**
Estimated Load Reduction (%)		**60%**	
TP TMDL for Henry Lake (40-0104-00)			
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	0.36	0.0010
	WLA Totals	**0.36**	**0.00**
Load Allocation	Watershed Load	661.00	1.8110
	LA Totals	**661.00**	**1.81**
Margin Of Safety (10%)		73.50	0.20
Loading Capacity (TMDL)		**734.86**	**2.01**
Estimated Load Reduction (%)		**91%**	
TP TMDL for Scotch Lake (40-0109-00)			
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	1.07	0.0029
	WLA Totals	**1.07**	**0.00**
Load Allocation	Watershed Load	1977.00	5.4164
	LA Totals	**1977.00**	**5.42**
Margin Of Safety (10%)		220.00	0.60
Loading Capacity (TMDL)		**2198.07**	**6.02**
Estimated Load Reduction (%)		**82%**	

Table 8: TSS TMDLs for the Minnesota River-Mankato Watershed

Allocation	Source	Very High	High	Mid	Low	Very Low
		Sediment (lbs/day)				
TMDL for Little Cottonwood River (07020007-676)						
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	61.00	18.00	6.20	1.90	--[a]
	OMG Midwest Inc./Southern MN Construction Co. Inc. (MNG490131)	905.00	905.00	905.00	905.00	--[a]
	Jeffers WWTP (MNG580111)	128.00	128.00	128.00	128.00	--[a]
	Comfrey WWTP (MN0021687)	19.00	19.00	19.00	19.00	--[a]
	WLA Totals	1113.00	1070.00	1058.20	1053.90	--[a]
Load Allocation	Watershed Load	78726.00	22699.00	7288.00	1534.00	--[a]
	LA Totals	78726.00	22699.00	7288.00	1534.00	--[a]
Margin Of Safety (10%)		8871.00	2641.00	927.00	288.00	40.00
Loading Capacity (TMDL)		**88710.00**	**26410.00**	**9273.20**	**2875.90**	**395.00**
Estimated Load Reduction (%)		**58%**				
TMDL for Little Cottonwood River (07020007-677)						
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	70.00	20.00	6.50	1.40	--[a]
	Searles WWTP (MNG580080)	144.00	144.00	144.00	144.00	--[a]
	OMG Midwest Inc./Southern MN Construction Co. Inc. (MNG490131)	905.00	905.00	905.00	905.00	--[a]
	Jeffers WWTP (MNG580111)	128.00	128.00	128.00	128.00	--[a]
	Comfrey WWTP (MN0021687)	19.00	19.00	19.00	19.00	--[a]
	WLA Totals	1266.00	1216.00	1202.50	1197.40	--[a]
Load Allocation	Watershed Load	94232.00	27216.00	8781.00	1899.00	--[a]
	LA Totals	94232.00	27216.00	8781.00	1899.00	--[a]
Margin Of Safety (10%)		10611.00	3159.00	1109.00	344.00	47.00
Loading Capacity (TMDL)		**106109.00**	**31591.00**	**11092.50**	**3440.40**	**473.00**
Estimated Load Reduction (%)		**78%**				
TMDL for Minneopa Creek (07020007-534)						
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	34.00	10.00	3.80	1.40	0.38
	South Bend Township MS4 (MS400299)	210.00	57.00	23.00	8.30	2.20
	POET Biorefining - Lake Crystal LLC (MN0067172)	33.00	33.00	33.00	33.00	33.00
	Lake Crystal WWTP (MN0055981)	148.00	148.00	148.00	148.00	148.00
	WLA Totals	425.00	248.00	207.80	190.70	183.58
Load Allocation	Watershed Load	51018.00	14291.00	5710.00	2064.00	559.00
	LA Totals	51018.00	14291.00	5710.00	2064.00	559.00

Margin Of Safety (10%)		5716.00	1616.00	658.00	251.00	83.00
Loading Capacity (TMDL)		**57159.00**	**16155.00**	**6575.80**	**2505.70**	**825.58**
Estimated Load Reduction (%)		**35%**				
TMDL for County Ditch 46A (07020007-679)						
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	10.00	1.90	0.59	0.12	0.01
	WLA Totals	10.00	1.90	0.59	0.12	0.01
Load Allocation	Watershed Load	7644.00	1474.00	456.00	95.00	9.00
	LA Totals	7644.00	1474.00	456.00	95.00	9.00
Margin Of Safety (10%)		851.00	164.00	51.00	11.00	1.00
Loading Capacity (TMDL)		**8505.00**	**1639.90**	**507.59**	**106.12**	**10.01**
Estimated Load Reduction (%)		**--**				
TMDL for Seven-Mile Creek (07020007-703)						
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	16.00	2.90	0.89	0.14	--[a]
	WLA Totals	16.00	2.90	0.89	0.14	--[a]
Load Allocation	Watershed Load	12029.00	2207.00	684.00	105.00	--[a]
	LA Totals	12029.00	2207.00	684.00	105.00	--[a]
Margin Of Safety (10%)		1338.00	246.00	76.00	12.00	--[a]
Loading Capacity (TMDL)		**13383.00**	**2455.90**	**760.89**	**117.14**	--[a]
Estimated Load Reduction (%)		**--**				
TMDL for Seven-Mile Creek (07020007-562)						
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	6.10	1.30	0.28	0.05	0.03
	WLA Totals	6.10	1.30	0.28	0.05	0.03
Load Allocation	Watershed Load	4717.00	1003.00	214.00	40.00	21.00
	LA Totals	4717.00	1003.00	214.00	40.00	21.00
Margin Of Safety (10%)		525.00	112.00	24.00	4.40	2.30
Loading Capacity (TMDL)		**5248.10**	**1116.30**	**238.28**	**44.45**	**23.33**
Estimated Load Reduction (%)		**96%**				

a = MPCA explained that HSPF simulated flow estimates under the very low flow regime were zero and likely an underestimate of actual flow conditions during the very low flow regime

Table 9: Nitrate TMDLs for the Minnesota River-Mankato Watershed

Allocation	Source	Very High	High	Mid	Low	Very Low
		Inorganic N (nitrate and nitrite) Load (lbs/day)				
TMDL for John's Creek (07020007-571)						
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	0.90	0.22	0.06	0.01	--[a]
	WLA Totals	0.90	0.22	0.06	0.01	--[a]
Load Allocation	Watershed Load	1668.00	400.00	111.00	17.00	--[a]
	LA Totals	1668.00	400.00	111.00	17.00	--[a]
Margin Of Safety (10%)		185.00	45.00	12.00	1.90	--[a]
	Loading Capacity (TMDL)	**1853.90**	**445.22**	**123.06**	**18.91**	--[a]
Estimated Load Reduction (%)		**52%**				
TMDL for Unnamed Creek (07020007-577)						
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	0.92	0.26	0.10	0.04	0.02
	WLA Totals	0.92	0.26	0.10	0.04	0.02
Load Allocation	Watershed Load	648.00	180.00	67.00	28.00	11.00
	LA Totals	648.00	180.00	67.00	28.00	11.00
Margin Of Safety (10%)		72.00	20.00	7.50	3.10	1.20
	Loading Capacity (TMDL)	**720.92**	**200.26**	**74.60**	**31.14**	**12.22**
Estimated Load Reduction (%)		**57%**				
TMDL for Seven-Mile Creek (07020007-562)						
Wasteload Allocation	Construction Stormwater (MNR100001) and Industrial Stormwater (MNR050000)	6.10	1.30	0.28	0.051	0.027
	WLA Totals	6.10	1.30	0.28	0.05	0.03
Load Allocation	Watershed Load	4717.00	1003.00	214.00	40.00	21.00
	LA Totals	4717.00	1003.00	214.00	40.00	21.00
Margin Of Safety (10%)		525.00	112.00	24.00	4.40	2.30
	Loading Capacity (TMDL)	**5248.10**	**1116.30**	**238.28**	**44.45**	**23.33**
Estimated Load Reduction (%)		**75%**				

a = MPCA explained that HSPF simulated flow estimates under the very low flow regime were zero and likely an underestimate of actual flow conditions during the very low flow regime