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

April 1, 2021

REPLY TO THE ATTENTION OF:
W-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 Des Moines River Basin Watershed (DMRBW), including supporting documentation. The DMRBW encompasses parts of Cottonwood, Jackson, Lyon, Martin, Murray, Nobles and Pipestone counties in southwestern Minnesota. The DMRBW TMDLs address impaired aquatic recreation due to excessive nutrients and bacteria and impaired aquatic life use due to excessive sediment and chloride.

The DMRBW 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 ten bacteria TMDLs, twenty-three phosphorus TMDLs, two sediment TMDLs and one chloride TMDL. 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. Paul Proto, at 312-353-8657 or proto.pau@epa.gov.

Sincerely,

Digitally signed by TERA FONG
Date: 2021.04.01 16:34:33 -05'00'

Tera L. Fong
Division Director, Water Division

wq-iw7-54g

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

REPLY TO THE ATTENTION OF:
W-16J

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

Dear Mr. Skuta:

The U.S. Environmental Protection Agency has reviewed the approval (dated April 1, 2021) of the final Total Maximum Daily Loads (TMDL) for segments within the Des Moines River Basins Watershed (DMRBW) and has determined that there were errors made in the Decision Document, specifically in certain values reported in Table 6 (Attachment #1 to the Decision Document), Table 7 (Attachment #2 to the Decision Document) and Table 8 (Attachment #3 to the Decision Document). EPA has corrected these values in a revised DMRBW TMDL Decision Document.

I am enclosing a copy of the revised Decision Document for your records. If you have any questions, please contact Mr. David Werbach, TMDL Coordinator, at 312-886-4242.

Sincerely,

DAVID PFEIFER
Digitally signed by DAVID PFEIFER
Date: 2021.06.10 16:29:23 -05'00'

David Pfeifer
Chief, Watersheds and Wetlands Branch

TMDL: Des Moines River Basin bacteria, nutrient, sediment and chloride TMDLs in portions of Cottonwood, Jackson, Lyon, Martin, Murray, Nobles and Pipestone counties in southwestern, Minnesota
Date: June 10, 2021 (revised)

DECISION DOCUMENT FOR THE DES MOINES RIVER BASIN TMDLS, IN PORTIONS OF 7 COUNTIES IN SOUTHWESTERN, 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 Des Moines River Basin (DMRB) in southwestern Minnesota covers an area of approximately 1,537 square miles (983,000 acres) across portions of seven counties, Cottonwood, Jackson, Lyon, Martin, Murray, Nobles and Pipestone. The DMRB encompasses parts of the Western Corn Belt Plains (WCBP) and Northern Glaciated Plains (NGP) ecoregions. Water in the DMRB generally flows in a southeasterly direction into Iowa (See Figures 1-3 of the final TMDL document). In the northwestern portion of the DMRB, the headwaters of the Des Moines River are fed by Lake Shetek. The Des Moines River flows southeasterly through southern Minnesota into Iowa and eventually joins the Mississippi River in Keokuk, Iowa.

The streams and lakes addressed by the DMRB TMDLs are within three hydrologic unit code (HUC) eight (HUC-8) sized watersheds. Those HUC-8s include, the Des Moines River Headwaters HUC-8 (07100001), the Lower Des Moines River HUC-8 (07100002) and the East Fork Des Moines River HUC-8 (07100003). Certain steam and lake segments of the DMRB TMDLs extend across the border into Iowa (e.g., Okamapeedan Lake (46-0051-00), Figure 7 of the final TMDL document), the TMDLs of this report only address the portions of those streams and lakes within the boundaries of Minnesota.

The Minnesota Pollution Control Agency (MPCA) developed Total Maximum Daily Load (TMDLs) for thirty-six impaired stream segments in the DMRB. These TMDLs address ten (10) impaired stream segments due to excessive bacteria, twenty-three (23) impaired lakes due to excessive nutrient inputs, two (2) stream segments impaired due to excessive sediment (total suspended sediment (TSS)) and one (1) stream segment impaired due to excessive chloride (Table 1 of this Decision Document).

Table 1: Des Moines River Basin impaired waters addressed by this TMDL

Water body name	Assessment Unit ID	Affected Use	Pollutant or stressor	TMDL
Okabena Creek	07100001-512	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Des Moines River	07100001-524	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Heron Lake Outlet	07100001-527	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Unnamed Ditch	07100001-564	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Jack Creek (North Branch)	07100001-652	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
County Ditch 11	07100003-503	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Fourmile Creek	07100003-510	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
County Ditch 1/Judicial Ditch 50	07100003-515	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Des Moines River (East Branch)	07100003-525	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
Des Moines River (East Branch)	07100003-527	Aquatic Recreation	Bacteria (*E. coli*)	*E. coli* TMDL
			TOTAL bacteria TMDLs	**10**
North Oaks Lake	17-0044-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Talcot Lake	17-0060-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL

Boot Lake	32-0015-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Flahtery Lake	32-0045-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Teal Lake	32-0053-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Heron (Duck) Lake	32-0057-02	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Heron (North) Lake	32-0057-05	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Heron (South) Lake	32-0057-07	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Timber Lake	32-0058-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Yankton Lake	42-0047-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Okamapeedan Lake*	46-0051-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Bright Lake	46-0052-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Pierce Lake	46-0076-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Temperance Lake	46-0103-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Lime Lake	51-0024-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Bloody Lake	51-0040-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Fox Lake	51-0043-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Lake Shetek	51-0046-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Corabelle Lake	51-0054-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Sarah Lake	51-0063-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
Currant Lake	51-0082-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
East Graham Lake	53-0020-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
West Graham Lake	53-0021-00	Aquatic Recreation	Excess Nutrients (total phosphorus)	Phosphorus TMDL
			TOTAL nutrient TMDLs	**23**
Unnamed Creek	07100001-551	Aquatic Life	Excess Sediment (total suspended solids)	TSS TMDL
Judicial Ditch 56*	07100002-505	Aquatic Life	Excess Sediment (total suspended solids)	TSS TMDL
			TOTAL TSS TMDLs	**2**
Okabena Creek*	07100001-602	Aquatic Life	chloride	chloride TMDL
			TOTAL chloride TMDLs	**1**

* = Okamapeedan Lake lies on the Minnesota/Iowa border, Iowa refers to this lake as Tuttle Lake. Judicial Ditch 56 (07100002-505) has upstream contributions from Iowa subwatershed areas.

Land Use:
Land use in the DMRB is predominantly agricultural land (i.e., cultivated crop lands) with a mix of developed land, rangeland, wetlands, open water and forested lands (Table 2 of this Decision Document and Table 8 of the final TMDL document).

Table 2: Land use in the Three HUC-8 watersheds in the Des Moines River Basin (based on Multi-Resolution Land Characteristics (MLRC) data from 2011)

Land Use	Cropland	Rangeland	Developed	Wetland	Open Water	Forest/Shrub	Barren/Mining	Total
	(percent of HUC-8)							
Des Moines River Headwaters (07100001)	81.1	5.9	6.0	3.1	2.9	1.1	0.03	**100**
Lower Des Moines River (07100002)	84.3	5.2	6.0	2.2	1.1	0.7	0.1	**100**
East Fork Des Moines River (07100003)	87.2	3.3	6.3	1.9	0.8	0.5	0.03	**100**

Problem Identification:
DMRB 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 DMRB 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.

DMRB Phosphorus TMDLs: Lakes segments identified in Table 1 of this Decision Document were included on the final 2018 Minnesota 303(d) list due to excessive nutrients (phosphorus). For the lake segments, total phosphorus (TP), chlorophyll-*a* (chl-*a*) and Secchi depth (SD) measurements in the DMRB indicated that these waters were not attaining their designated aquatic recreation uses due to exceedances of nutrient criteria (Table 5 of this Decision Document). Water quality monitoring was completed throughout the DMRB 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 can deplete dissolved oxygen levels within the water column and 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.

DMRB Total Suspended Solids (TSS) (Sediment) TMDLs: Sediment (turbidity) 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 DMRB indicated that these segments were not attaining their designated aquatic life uses due to excessive turbidity or TSS measurements and the negative impact of those conditions on fish and macroinvertebrate communities.

TSS is a measurement of the sediment and organic material that inhibits natural light from penetrating the surface water column. When in suspension, sediment can limit visibility and light penetration which may impair foraging and predation activities by certain species. 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 sediment and organic material within the water column can negatively impact fish and macroinvertebrates within the ecosystem via reducing spawning and rearing areas for certain fish species, clogging gills and abrading fish tissue and subjecting sensitive species to unnecessary stress. Excessive amounts of fine sediment in stream environments can degrade aquatic communities.

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 (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 DMRB 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.

DMRB Chloride TMDL: The chloride impaired segment identified in Table 1 of this Decision Document was included on the final 2018 Minnesota 303(d) list due to excessive chloride. Water quality monitoring within the DMRB indicated that this segment was not attaining its designated aquatic life uses due to high chloride measurements and the negative impact of those conditions on aquatic life (i.e., fish and macroinvertebrate communities).

Low levels of chloride can be found naturally in the DMRB lakes and streams. Chloride is essential for aquatic life to carry out a range of biological functions. However, high concentrations of chloride in the surrounding water can harm cellular osmotic processes in aquatic life. Excessive dissolved chlorides in water may stress aquatic species and prohibit the transport of needed molecules into the cell. If elevated concentrations of chloride persist in the water, aquatic life such as fish, invertebrates and even some plant species may become stressed and/or die.

Excessive dissolved chloride can also alter the density of water in lake environments. Density changes can impact seasonal mixing patterns of lake waters, especially in deeper lakes. Seasonal mixing in lake environments distributes oxygen and nutrients throughout the water column and is necessary for healthy aquatic communities. Disruptions to lake mixing processes can also impact nutrient cycling, phytoplankton and zooplankton community composition and productivity and fish and macroinvertebrate health.

High levels of salt can also negatively affect infrastructure, vehicles, plants, soils, pets, wildlife and groundwater and drinking water supplies.

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 DMRB 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 chloride.

Source Identification (point and nonpoint sources):

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

<u>DMRB bacteria TMDLs:</u>
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 wastewater treatment facilities/plants (WWTFs/WWTPs) in the DMRB which contribute bacteria from treated wastewater releases. MPCA assigned each of these facilities a portion of the bacteria wasteload allocation (WLA). For details of regarding WLAs assigned to individual facilities, see Tables 3 and 6 of this Decision Document.

Table 3: NPDES facilities and MS4 communities which contribute pollutant loading in the Des Moines River Basin TMDLs

MS4/Facility Name	Permit #	Impaired Reach	WLA
Facilities assigned bacteria (*E. coli*) WLA (billions of bacteria/day)			
Avoca & Iona WWTP	MNG580165	07100001-524	3.84
Brewster WWTP	MN0021750	07100001-524 & 07100001-527	9.53
Currie WWTP	MNG580221	07100001-524	4.42
Dundee WWTP	MN0070271	07100001-524	0.58
Fulda WWTP	MNG580188	07100001-524	4.20
Heron Lake WWTP	MNG580189	07100001-524 & 07100001-527	3.65
Lake Wilson WWTP	MGG580061	07100001-524	2.44
Lakefield WWTP	MN0020427	07100001-524 & 07100001-527	2.78
Okabena WWTP	MN0050288	07100001-524 & 07100001-527	1.17
Shetek Area Water & Sewer District WWTP	MN0070947	07100001-524	17.25
Slayton WWTP	MNG580191	07100001-524	9.67
Worthington Industrial WWTP	MN0031178	07100001-512, 07100001-524 & 07100001-527	10.301
Worthington WWTP	MN0031186	07100001-512, 07100001-524 & 07100001-527	19.076
Sherburn WWTP	MN0024872	07100003-503 & 07100003-527	1.583
Worthington MS4	MS400257	07100001-512, 07100001-524 & 07100001-527	Variable
Facilities assigned Total Phosphorus (TP) WLA (lbs/day)			
Alpha WTP	MNG640102	Okamanpeedan Lake	See Tables 7 & 8 of the Decision Document
Avoca & Iona WWTP	MNG580165	Talcot Lake	
Brewster WWTP	MN0021750	North Heron Lake	
Ceylon WWTP	MNG580006	Okamanpeedan Lake	
Currie WWTP	MNG580221	Talcot Lake	
Dundee WWTP	MN0070271	Talcot Lake	
Fulda WWTP	MNG580188	Talcot Lake	
Hubbard Feeds Inc.-Worthington	MN0033375	North Heron Lake	
Lake Wilson WWTP	MGG580061	Talcot Lake	
Lakefield WWTP	MN0020427	South Heron Lake	
Okabena WWTP	MN0050288	North Heron Lake	
Sherburn WWTP	MN0024872	Okamanpeedan Lake	
Shetek Area Water & Sewer District WWTP	MN0070947	Talcot Lake	
Slayton WWTP	MNG580191	Talcot Lake	
Worthington Industrial WWTP	MN0031178	North Heron Lake	
Worthington WWTP	MN0031186	North Heron Lake	
Worthington MS4	MS400257	North Heron Lake	
Facilities assigned Chloride WLA (lbs/day)			
Brewster WWTP	MN0021750	07100001-602	3,831
Hubbard Feeds Inc.-Worthington	MN0033375		17
Okabena WWTP	MN0050288		468
Worthington Industrial WWTP	MN0031178		4,143
Worthington WWTP	MN0031186		7,673
Worthington MS4	MS400257		16,728

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 one MS4 permittee, the City of Worthington (MS400257) which was assigned a portion of the WLA for the bacteria TMDLs. For details of regarding WLAs assigned to individual MS4 communities, see Tables 3 and 6 of this Decision Document.

Concentrated Animal Feedlot Operations (CAFOs): MPCA acknowledged the presence of CAFOs in the DMRB (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). CAFOs are generally defined as having over 1000 animal units confined for more than 45 days in a year. Under MPCA NPDES permit requirements, discharges of pollutants from CAFOs are not allowed except under extreme circumstances (24-hour storm duration exceeding the 25-year recurrence interval), and therefore no allocations were developed for the manure-handling facilities. Runoff from the spreading of manure in agronomic rates is not regulated as a point source discharge and is therefore considered in the non-point source load discussed below.

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

DMRB phosphorus TMDLs:

NPDES permitted facilities: NPDES permitted facilities may contribute nutrient loads to surface waters through discharges of wastewater. Permitted facilities must discharge treated wastewater according to their NPDES permit. MPCA determined that there are several WWTFs/WWTPs in the DMRB which contribute nutrients (TP) from treated wastewater releases. MPCA assigned each of these facilities a portion of the TP WLA. For details of regarding WLAs assigned to individual facilities, see Tables 3, 7 and 8 of this Decision Document.

MS4 communities: Stormwater from MS4s can transport nutrients to surface water bodies during or shortly after storm events. MPCA identified one MS4 permittee, the City of Worthington (MS400257) which was assigned a portion of the WLA for the phosphorus TMDLs. For details of regarding WLAs assigned to individual MS4 communities, see Tables 3 and 7 of this Decision Document.

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 DMRB 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.

DMRB TSS (sediment) TMDLs:

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 DMRB 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.

DMRB chloride TMDL:

NPDES permitted facilities: NPDES permitted facilities may contribute chloride loads to surface waters through discharges of wastewater. Permitted facilities must discharge treated wastewater according to their NPDES permit. MPCA determined that there are several WWTFs/WWTPs in the DMRB which contribute chloride from treated wastewater releases. MPCA assigned each of these facilities a portion of the chloride WLA. For details of regarding WLAs assigned to individual facilities, see Tables 3 and 10 of this Decision Document.

MS4 communities: Stormwater from MS4s can transport chloride to surface water bodies during or shortly after storm events. MPCA identified one MS4 permittee, the City of Worthington (MS400257) which was assigned a portion of the WLA for the chloride TMDL. For details of regarding WLAs assigned to individual MS4 communities, see Tables 3 and 10 of this Decision Document.

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

DMRB bacteria TMDLs:

Non-regulated urban runoff: Runoff from urban areas (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 (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 DMRB. 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 DMRB. 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 DMRB. 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.

DMRB phosphorus TMDLs:

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

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 DMRB. 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 DMRB. 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.

DMRB TSS (sediment) 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 DMRB. 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 DMRB. 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 DMRB.

DMRB chloride TMDL:
Natural background chloride load: Chloride is present in soils and minerals and is added to groundwater due to natural weathering processes of minerals and rock.

Snow/ice removal: Chloride may be added to waters of the DMRB via the application of deicing compounds from state, county and local entities. Deicing compounds may be mobilized and transported to surface waters during stormwater runoff events (e.g., winter rain events, spring melt, etc.).

Stormwater from areas not covered under a MS4 NPDES permit: Stormwater runoff from areas outside the boundaries of MS4 areas, such as non-permitted urban, residential, commercial or industrial areas, can contribute chloride to surface waters of the DMRB. Non-regulated stormwater may drain impervious surfaces and add any residual chlorides from those surfaces to surface waters.

Discharges from SSTS or unsewered communities: Septic systems are a potential source of chloride within the DMRB. 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 chloride contribution from these systems. Water softening systems which are in areas not connected to municipal sewer lines likely discharge to septic fields and chloride contributions from those septic systems may ultimately mix with groundwater or surface water near the septic field.

Chloride contributions from agricultural lands: Chloride may be added via use of fertilizers containing chloride anions (e.g., potassium chloride (KCl)) and biosolids which are spread onto agricultural areas. Chloride may be liberated from farm fields within stormwater runoff which can be exacerbated by tile drainage lines, which channelize the stormwater flows.

Other nonpoint sources: MPCA cited chloride as a component of dust suppressants on gravel roads and parking areas, as a portion of landfill leachate and as a chemical byproduct of alum chloride treatments for lake sediments or ferric chloride treatments for stormwater.

Future Growth:
MPCA does not anticipate there to be imminent growth in the DMRB. MPCA anticipates that most of the agricultural areas in the DMRB are unlikely to be changing in the near future. The WLA and load allocations (LA) for the DMRB 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 DMRB TMDLs.

MPCA did calculate a reserve capacity for three lakes in the DMRB. TP TMDLs for Talcot Lake (17-0060-00), Heron (North) Lake (32-0057-05) and Okamanpeedan Lake (46-0051-00) included a reserve capacity calculation (Section 4.6.5 of the final TMDL document). MPCA explained that the reserve capacity is set aside for current unsewered communities which, at some point in the future, may be connected into the sewer lines for the existing WWTPs. The reserve capacity calculation was based on assumed TP loads (0.8 kg/capita/year) and a reduction efficiency of the WWTP (Table 42 of the final TMDL document).

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 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 DMRB TMDLs are designated as Class 2 waters for aquatic recreation use (fishing, swimming, boating, etc.) and aquatic life use (*E. coli*, phosphorus, TSS and chloride). 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."*

Standards:

Narrative Criteria:

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:

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

Table 4: Bacteria Water Quality Standards Applicable in the Des Moines River Basin TMDLs

Parameter	Units	Water Quality Standard
E. coli [1] (Class 2B designated waters)	# / 100 mL	1,260 in < 10% of samples [2]
		Geometric Mean < 126 [3]
E. coli [4] (Class 7 designated waters)	# / 100 mL	1,260 in < 10% of samples [2]
		Geometric Mean < 630 [3]

[1] = *E. coli* standards apply only between April 1 and October 31
[2] = Standard shall not be exceeded by more than 10% of the samples taken within any calendar month
[3] = Geometric mean based on minimum of 5 samples taken within any calendar month
4 = *E. coli* standards apply only between May 1 and October 31

Bacteria TMDL Targets: The bacteria TMDL targets employed for the DMRB bacteria TMDLs are the *E. coli* standards as stated in Table 4 of this Decision Document. The DMRB bacteria TMDLs use the **126 organisms (orgs) per 100 mL** (126 orgs/100 mL) portion of the standard for all bacteria TMDLs except for the bacteria TMDLs for Okabena Creek (07100001-512) and County Ditch 11 (07100003-503). These two segments are designated as Class 7 waters and use the Class 7 bacteria **630 orgs per 100 mL** standard. MPCA believes that using the 126 orgs/100 mL and/or 630 orgs/100 mL portions of the Class 2B and Class 7 bacteria water quality standards for TMDL calculations will result in the greatest bacteria reductions within the DMRB 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.

DMRB Phosphorus TMDLs (lakes impaired due to excessive nutrients): Numeric criteria for TP, chl-*a* and SD 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 DMRB lake TMDLs are found in Table 5 of this Decision Document.

Table 5: Minnesota Eutrophication Standards for Shallow lakes within the Northern Glacial Plain (NGP) and the Western Corn Belt Plan (WCBP) ecoregions applicable in the Des Moines River Basin TMDLs

Parameter	NGP Eutrophication Standard (shallow lakes)[1, 2]	WCBP Eutrophication Standard (shallow lakes)[1,3]
Total Phosphorus (µg/L)	TP < 40	TP < 90
Chlorophyll-a (µg/L)	chl-a < 14	chl-a < 30
Secchi Depth (m)	SD > 1.4	SD > 0.7

[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).
[2] = The Northern Glacial Plan ecoregion eutrophication standards apply to Yankton Lake (42-0047-00), Sarah Lake (51-0063-00) and Currant Lake (51-0082-00)
[3] = The Western Corn Belt Plan ecoregion eutrophication standards apply to all lakes in Table 1, ***except*** Yankton Lake (42-0047-00), Sarah Lake (51-0063-00) and Currant Lake (51-0082-00)

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 NGP and WCBP WQS the response variables chl-*a* and SD will be attained and the lakes of the DMRB 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.

Phosphorus TMDL Targets (lakes impaired due to excessive nutrients): MPCA selected TP targets of **40 µg/L** and **90 µg/L** 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 DMRB TP TMDLs to be reasonable.

DMRB TSS (Sediment) TMDLs: On January 23, 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.

TSS (Sediment) TMDL Targets: MPCA employed the **65 mg/L TSS** target applicable to Class 2B (coldwater or warmwater streams) of the Southern River Nutrient Region (SRNR) to streams in the DMRB.

DMRB Chloride TMDL: The chronic standard for chloride to protect for Class 2B uses is 230 mg/L. The chronic standard is defined in Minn. R. 7050.0218, subp. 3.l., as '*the highest water concentration of a toxicant to which organisms can be exposed indefinitely without causing chronic toxicity*.'

The 230 mg/L value is based on a 4-day exposure of aquatic organisms to chloride. The maximum (acute) standard to protect for 2B uses is 860 mg/L. The maximum standard is defined in Minn. R. 7050.0218, subp. 3.T., as '*the highest concentration of a toxicant in water to which organisms can be exposed for a brief time with zero to slight mortality*.' The 860 mg/L value is based on a 24-hour exposure of aquatic organisms to chloride. These criteria are adopted from the EPA's recommended water quality criteria for chloride. EPA agrees it is reasonable for MPCA to believe that by meeting its chronic chloride water quality standard (230 mg/L) the acute chloride water quality standard (860 mg/L) will also be attained.

Chloride TMDL Target: The chloride TMDL target for the DMRB TMDL is the chronic standard of **230 mg/L**.

Given the location of the DMRB in the southwestern portion of Minnesota, MPCA considered water quality standards and TMDL targets from Iowa during its development of DMRB TMDLs. MPCA reviewed waters which traverse state boundaries (i.e., Lake Okamapeedan (46-0051-00)) and waters such as Judicial Ditch 56 (07100002-505) which have upstream areas in Iowa which contribute loading to impaired segments on the Minnesota side of the Minnesota/Iowa border. MPCA explained that its TMDL process calculates TMDL endpoints, based on Minnesota WQS, at the most downstream endpoint of the impaired reach or for those waters which span state boundaries (e.g., waters originating in Minnesota which flow into Iowa) at the state border. MPCA communicated that Minnesota WQS are to be achieved at the state border and that waters originating within its boundaries will not cause or contribute to impairments downstream. EPA believes that MPCA's consideration of Iowa water quality standards was reasonable.

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:
DMRB bacteria TMDLs: MPCA used the geometric mean (**126 orgs/100 mL or 630 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 or 630 orgs/100 mL) and that it expects that by attaining the 126 orgs/100 mL portion and/or 630 orgs/100 mL 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 DMRB bacteria TMDLs, MPCA used Minnesota's WQS for *E. coli* (126 orgs/100 mL or 630 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 DMRB. There is one USGS station with continuous daily flow data in 07100001-501 and MPCA employed simulated daily flows from Hydrologic Simulation Program-Fortran (HSPF) modeling efforts. MPCA focused on daily modeled flows from 2005-2014 during the recreation season (April 1 to October 31). For DMRB subwatersheds without measured stream flow data, MPCA employed HSPF hydrologic models to estimate daily flow characteristics. Measured or simulated daily stream flows were used to develop load duration curves (LDC) and calculate TMDLs.

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 or 630 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 DMRB 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 DMRB 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 DMRB 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 24 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 that will reduce stormwater runoff and consequently bacteria loading into surface waters. This allows for a more efficient implementation effort.

Bacteria TMDLs for the DMRB 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 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 Des Moines River Basin

Table 6 of this Decision Document communicates MPCA's estimates of reductions required for streams impaired due to excessive bacteria. Attaining these reduction percentage estimates under the flow conditions which the reductions are prescribed to will allow the impaired segment 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 stream segment's water quality will return to a level where the designated uses are no longer considered impaired.

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 DMRB bacteria TMDLs. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[1]

DMRB phosphorus TMDLs: MPCA used the U.S. Army Corps of Engineers (USACE) BATHTUB model to calculate loading capacities for the DMRB lake TP TMDLs (Table 1 of this Decision Document). 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.

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.

MPCA used the Crystal Ball spreadsheet model to calculate the loading capacities for each of the nutrient impaired lakes in Table 1 of this Decision Document. Crystal Ball employs a Monte Carlo approach, resulting in stochastic simulations. The Monte Carlo approach allowed selected modeling inputs to vary, based upon known or assumed statistical distributions, and result in distributions of in-lake eutrophication conditions based on the distributions of the input parameters. The stochastic modeling approach reflects the variability in model parameters inherent in natural systems (e.g., climate) and allows for a more realistic prediction of long-term water quality condition. The lake models were used to estimate the TP load reductions necessary to meet current water quality lake eutrophication standards in each lake.

The loading capacity of the lake was determined through the use these stochastic model simulations and then allocated to the WLA, LA, and MOS. 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.

[1] 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.

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 DMRB 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.

Additionally, for Talcot Lake (17-0060-00), Bright Lake (46-0052-00) and Okamanpeedan Lake (46-0051-00) loading capacities were calculated to meet WQS on the seasonal scale (lbs/122 days) because of the relatively short residence time (Table 8 of this Decision Document). MPCA examined residence time estimates to determine which lakes should employ annual versus seasonal calculations (Section 4.6.7 of the final TMDL document). Loading capacities for these three lakes were divided by 122 to calculate the daily loading capacities.

MPCA subdivided the loading capacity among the WLA, LA, and MOS (variable) components of the TMDL (Tables 7 and 8 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 DMRB 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 (TP) Lake TMDLs for the Des Moines River Basin daily loads/annual time scale

Table 8: Total Phosphorus (TP) Lake TMDLs for the Des Moines River Basin daily loads/seasonal time scale

Tables 7 and 8 of this Decision Document communicate MPCA's estimates of the reductions required for the lakes of the DMRB TMDL 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.

DMRB TSS (sediment) TMDLs: MPCA developed LDCs to calculate sediment TMDLs for the impaired segments in Table 1 of this Decision Document. The LDC development strategies employed for the bacteria TMDLs were also used to develop sediment TMDLs (e.g., the incorporation of HSPF model simulated flows to develop FDCs, water quality monitoring information collected within the DMRB informing the LDC, etc.). The FDC were transformed into LDC by multiplying individual flow values by the TSS target of 65 mg/L and then multiplying that value by a conversion factor.

TSS were calculated (Table 9 of this Decision Document). The load allocation was calculated after the determination of the WLA, and the MOS (10%). 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 9 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 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 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: TSS TMDLs for the Des Moines River Basin

Allocation	**Source**	**Very High**	**High**	**Mid-range**	**Low**	**Very Low**
		0-10%	**10-40%**	**40-60%**	**60-90%**	**90-100%**
		Sediment (tons/day)				
TMDL for Unnamed Creek (07100001-551)						
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.0050	0.0020	0.0008	0.0003	0.0001
	WLA Totals	0.0050	0.0020	0.0008	0.0003	0.0001
Load Allocation	**Load Allocation**	4.70	1.60	0.70	0.27	0.12
Margin Of Safety (10%)		0.52	0.18	0.08	0.03	0.01
	Loading Capacity (TMDL)	**5.23**	**1.78**	**0.78**	**0.30**	**0.13**
Estimated Load Reduction (%)		**34%**				
TMDL for Judicial Ditch 56 (07100002-505)						
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.0020	0.0006	0.0002	0.0001	0.00004
	WLA Totals	0.0020	0.0006	0.0002	0.0001	0.00004
Load Allocation	**Load Allocation**	1.50	0.51	0.20	0.09	0.04
Margin Of Safety (10%)		0.20	0.06	0.02	0.01	0.004
	Loading Capacity (TMDL)	**1.70**	**0.57**	**0.22**	**0.10**	**0.04**
Estimated Load Reduction (%)		**46%**				

MPCA estimated load reductions needed for the Unnamed Creek (07100001-551) and Judicial Ditch 56 (07100002-505) segments to attain 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 that 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 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.

DMRB chloride TMDLs: MPCA calculated a chloride TMDL for the Okabena Creek (07100001-602) segment. This chloride TMDL was calculated to meet the chloride water quality target of 230 mg/L (i.e., the chronic water quality criterion). The LDC development strategies employed for the bacteria and sediment TMDLs were also used to develop the chloride sediment TMDL (e.g., the incorporation of HSPF model simulated flows to develop FDCs, water quality monitoring information collected within the DMRB informing the LDC, etc.). The FDC were transformed into LDC by multiplying individual flow values by the chloride target of 230 mg/L and then multiplying that value by a conversion factor.

A chloride TMDL for Okabena Creek was calculated (Table 10 of this Decision Document). The load allocation was calculated after the determination of the WLA, and the MOS (10%). Load allocations was not split among individual nonpoint contributors. Instead, load allocations were combined together into one value to cover all nonpoint source contributions. MPCA also calculated a load allocation contribution attributed to natural background (Section 4.3.2 of the final TMDL document). Table 10 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 chloride monitoring data and allows for the estimation of load reductions necessary for attainment of the chloride water quality standard. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for the Okabena Creek segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. Table 10 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 10: Chloride TMDL for the Des Moines River Basin

Allocation	Source	Very High	High	Mid-range	Low	Very Low
		0-10%	**10-40%**	**40-60%**	**60-90%**	**90-100%**
		Chloride Load (lbs/day)				
TMDL for Okabena Creek (07100001-602)						
Wasteload Allocation	WLA - Brewster WWTP (MN0021750)	3,831	3,831	3,831	a[1]	a[1]
	WLA - Hubbard Feeds Inc.-Worthington (MN0033375)	17	17	17	a[1]	a[1]
	WLA - Okabena WWTP (MN0050288)	468	468	468	a[1]	a[1]
	WLA - Worthington Industrial WWTP (MN0031178)	4,143	4,143	4,143	a[1]	a[1]
	WLA - Worthington WWTP (MN0031186)	7,673	7,673	7,673	a[1]	a[1]
	WLA - Worthington MS4 (MS400257)	16,728	16,728	16,728	--	--
	WLA Totals	32,860	32,860	32,860	a[1]	a[1]
Load Allocation	Nonpoint Source Contributions	420,629	81,824	3,487	b[1]	b[1]
	Natural Background	45,036	11,389	3,610	1202	625
	LA Totals	465,665	93,213	7,097	b[1]	b[1]
Margin Of Safety (10%)		55,392	14,008	4,440	1,478	769
Loading Capacity (TMDL)		**553,917**	**140,081**	**44,397**	**14,780**	**7,691**

Estimated Load Reduction (%)	4.6%

a[1] = MPCA explained that permitted wastewater design flows exceed the stream flow in the low flow zone, therefore, the allocations are expressed as an equation (point source discharge * water quality standard (230 mg/L))

b[1] = MPCA explained that the Load Allocation was determined by an equation (flow from a given source * water quality standard (230 mg/L))

MPCA estimated load reductions needed for the Okabena Creek (-602) segment to attain 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 that 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 chloride TMDL. Additionally, EPA concurs with the loading capacities calculated by the MPCA in the chloride TMDL. EPA finds MPCA's approach for calculating the loading capacity for the chloride TMDL 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 DMRB TMDLs can be attributed to different nonpoint sources.

DMRB bacteria TMDLs: The calculated LA values for the bacteria TMDLs are applicable across all flow conditions in the DMRB (Table 6 of this Decision Document). MPCA identified several nonpoint sources which contribute bacteria loads to the surface waters of the DMRB, including; non-regulated urban (i.e., non-MS4) stormwater runoff, stormwater from agricultural and feedlot areas, failing septic systems, wildlife (e.g., deer, geese, ducks, raccoons, turkeys and other animals). MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations but aggregated the nonpoint sources into a categorical LA value.

DMRB phosphorus TMDLs: MPCA identified several nonpoint sources which contribute nutrient loading to the lakes of the DMRB (Tables 7 and 8 of this Decision Document). These nonpoint sources included: watershed contributions from each lake's direct watershed, watershed contributions from upstream watersheds, non-regulated urban (i.e., non-MS4) stormwater runoff, internal loading and atmospheric deposition. For the lake nutrient TMDLs, MPCA calculated individual load allocation values for atmospheric deposition and combined the rest of the LA contributions into one 'watershed load' line item of the TMDL calculation (Tables 7 and 8 of this Decision Document).

DMRB TSS (sediment) TMDLs: The calculated LA values for the TSS TMDLs are applicable across all flow conditions. MPCA identified several nonpoint sources which contribute sediment loads to the surface waters in the DMRB (Table 9 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 LA value ('watershed load').

DMRB chloride TMDLs: The calculated LA values for the chloride TMDL are applicable across all flow conditions. MPCA identified several nonpoint sources which contribute chloride nonpoint source loads to the surface waters in the DMRB (Table 10 of this Decision Document). Load allocations were recognized as originating from many diverse nonpoint sources including; stormwater contributions from agricultural lands, discharges from SSTS, and stormwater runoff liberating salt from roads, parking lots, commercial/industrial areas and or sidewalks. MPCA did not determine individual load allocation values for each of these potential nonpoint source considerations but aggregated the nonpoint sources into one LA value ('nonpoint source contributions'). MPCA calculated LA for natural background and gave this estimate its own line item within the chloride TMDL (Table 10 of this Decision Document).

EPA finds MPCA's approach for calculating the LA 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:

DMRB bacteria TMDLs: MPCA identified NPDES permitted facilities within the DMRB and assigned those facilities a portion of the WLA (Table 6 of this Decision Document). The WLAs for these individual facilities were calculated based on the facility's maximum allowable discharge (Table 21 of the final TMDL document), the *E. coli* WQS (126 orgs /100 mL or 630 orgs/100 mL) and a conversion factor. MPCA explained that the WLA for each individual WWTP was calculated based on the *E. coli* WQS but WWTP 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 DMRB 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.

MPCA explained that loading capacity values in the low or very low flow regimes for certain segments were less than permitted WWTP's maximum allowable discharge flows. To account for these circumstances, WLAs and LAs in these low flow regimes were expressed as an equation rather than a number. The equation was,

Allocation = flow contribution from a given source * 126 orgs/100 mL
(or 630 orgs/100 mL for Class 7 waters)

MS4 allocation for the City of Worthington (MS400257) was calculated based on the percentage of the drainage area for the impaired reach which is covered by the City of Worthington's MS4 area. Table 22 of the final TMDL document includes the equations used to calculate the percent drainage areas for the 07100001-512, 07100001-524 and 07100001-527 subwatersheds. The percentage value was then multiplied by the loading capacity for that impaired segment to calculate the WLA attributed to the City of Worthington.

MPCA acknowledged the presence of CAFOs in the DMRB. 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) for the DMRB bacteria TMDLs. CAFOs in Minnesota are regulated under either a general permit or an individual CAFO permit. CAFO facilities must comply with all authorized discharge and overflow requirements described in the Minnesota general CAFO permit or individual CAFO permits. In accordance with the CAFO General Permit and individual permits, overflow events from CAFOs are allowable due to precipitation related overflows from CAFO storage structures which are properly designed, constructed, operated and maintained in accordance with CAFO permits. Discharges from such overflows are allowable only if they do not cause or contribute to a violation of water quality standards. MPCA determined a WLA = 0 for CAFOs in the basin. Manure spreading from CAFOs at agronomic rates are considered a non-point source of phosphorus and are included in the non-point source loads in the TMDL calculations.

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

__DMRB lake phosphorus TMDLs:__ MPCA identified NPDES permitted facilities within the lakes addressed in the DMRB TMDL and assigned those facilities a portion of the WLA (Tables 7 and 8 of this Decision Document). The WLAs for each of these individual facilities were calculated based on the described approaches in Section 4.6.3 of the DMRB final TMDL document. WLAs for WWTPs were based on the permittee's maximum daily flow (industrial permittees) or average wet weather design flow (municipal permittees) multiplied by a phosphorus concentration (Tables 38 and 40 of the final TMDL document).

MPCA noted that the WLAs for Heron (North) Lake (32-0057-05) and Heron (South) Lake (32-0057-07) TP TMDLs in the Des Moines River Basin TMDLs (2021) replace WLAs developed in an earlier West Fork Des Moines River Watershed TMDL for excess nutrients for North and South Heron Lakes (2008) (Section 4.6.3 of the final TMDL document).

MS4 allocations for the DMRB phosphorus TMDLs were calculated in the same manner as the MS4 allocations for the DMRB bacteria (i.e., see calculative method in ***Section 5 - DMRB bacteria TMDLs***, within this Decision Document). MPCA calculated a MS4 WLA for the City of Worthington (MS400257) for the Heron (North) Lake (32-0057-05) TP TMDL.

MPCA also calculated a portion of the WLA and assigned it to both construction stormwater and industrial stormwater. Overall, the construction and industrial stormwater WLA make up a very small portion of the overall loading capacity but MPCA wanted to recognize their contributions. Both of these WLAs were represented as a categorical WLA and WLAs were not subdivided out into individual WLAs. The industrial stormwater WLA was set equal to the construction stormwater WLA.

Attaining the construction stormwater and industrial stormwater loads described in the DMRB TP TMDLs is the responsibility of construction and industrial site managers. For example, for the Heron (North) Lake (32-0057-05) TP TMDL, the City of Worthington's MS4 (MS400257) program is responsible for overseeing construction stormwater loads from the City of Worthington's MS4 jurisdictional area which impact water quality in Heron (North) Lake. The City of Worthington is 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 DMRB. Industrial sites within these 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 DMRB 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 EPA. This applies to sites under permits for MNR100001, MNR050000 and MNG490000.

DMRB TSS (sediment) TMDLs: Similar to the DMRB lake phosphorus TMDLs, MPCA calculated a portion of the WLA and assigned it to both construction stormwater and industrial stormwater. Overall, the construction and industrial stormwater WLA make up a very small portion of the overall loading capacity but MPCA wanted to recognize their contributions. Both of these WLAs were represented as a categorical WLA and WLAs were not subdivided out into individual WLAs. The construction and industrial stormwater allocations for the DMRB TSS TMDLs were calculated in the same manner as the construction and industrial stormwater allocations for the DMRB lake phosphorus TMDLs (i.e., see calculative method in ***Section 5 – DMRB lake phosphorus TMDLs***, within this decision document).

MPCA's expectations and responsibilities for overseeing construction and industrial stormwater loads for the DMRB lake phosphorus TMDLs are the same for the DMRB 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 TSS TMDLs for DMRB. 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 EPA. This applies to sites under permits for MNR100001, MNR050000 and MNG490000.

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

DMRB chloride TMDLs: Similar to the bacteria WLA calculations, chloride WLAs were calculated based on the facility's maximum allowable discharge (Table 16 of the final TMDL document), the chloride WQS (230 mg/L) and a conversion factor.

MPCA explained that loading capacity values in the low or very low flow regimes for segment 07100001-602 were less than permitted WWTP's maximum allowable discharge flows. To account for these circumstances, WLAs and LAs in these low flow regimes were expressed as an equation rather than a number. The equation was,

Allocation = flow contribution from a given source * 230 mg/L

MS4 allocation for the City of Worthington (MS400257) was calculated based on the percentage of the drainage area for the impaired reach which is covered by the City of Worthington's MS4 area. Section 4.3.3 of the final TMDL document includes the estimate for MS4 coverage area (3.02% of the loading capacity) in the subwatershed for segment 07100001-602. The percentage value (3.02%) was then multiplied by the loading capacity for that impaired segment to calculate the WLA attributed to the City of Worthington.

EPA finds the MPCA's approach for calculating the WLA for the DMRB chloride TMDL 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 DMRB TMDLs all had slight deviations in the Margin of Safety employed for the bacteria, nutrient, TSS and chloride TMDLs. For the bacteria, TSS and chloride TMDLs, MPCA used a MOS of 10% of the loading capacity. For the nutrient TMDLs, MPCA employed a sliding scale MOS which was dependent on the simulated load reductions at the 50^{th} percentile and the 90^{th} percentile (See Table 41 of the final TMDL document).

DMRB bacteria, TSS (sediment) and chloride TMDLs: The bacteria, TSS and chloride TMDLs incorporated an explicit MOS of 10% which was applied to the loading capacity. Ten percent of the total loading capacity was reserved for MOS with the remaining load allocated to point and nonpoint sources (Tables 6, 9 and 10 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;
- Uncertainty in the observed daily flow record, the simulated flow and concentration data from the HSPF model;

- Calibration and validation processes of LDC modeling efforts, uncertainty in modeling outputs; and
- Variability in water quality data (i.e., collected water quality monitoring data, field sampling error, etc.).

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 DMRB 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 or 630 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 or 630 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.

DMRB phosphorus TMDLs: MPCA explained that for the lake nutrient TMDLs it used a sliding scale MOS which was dependent on the simulated load reductions at the 50th percentile and the 90th percentile (See Table 41 of the final TMDL document). The range of MOS for the nutrient TMDLs was from 6% to 15% (Tables 7 and 8 of this Decision Document) and was attributed to assumptions made during the BATHTUB TMDL development process. The conservative assumptions were pursued to account for an inherently imperfect understanding of the lakes' systems, and to ensure that the nutrient reductions called for in the TMDL calculations will be protective of the nutrient WQS. Conservative modeling assumptions included;

- Using the summer average (June through September) of in-lake samples to account for the highest algal growth potential of the lake. During this time period, average air temperatures and water temperatures are in the optimal range for high productivity of the lake.
- Environmental variability in pollutant loading; and
- MPCA's confidence in the BATHTUB model's performance during the development of TP TMDLs.

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:

DMRB 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 DMRB 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).

DMRB phosphorus TMDLs: Seasonal variation was considered for the DMRB TP TMDLs via the nutrient targets which 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 NGP 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 DMRB 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 to late summer time period is typically when eutrophication standards are exceeded and water quality within the DMRB 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).

DMRB TSS (sediment) 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 DMRB (Section 4.5.5 of the final TMDL document). Sediment loading in the DMRB 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 season's sediment inputs to surface waters typically occur primarily through wet weather events. Critical conditions that impact the response of DMRB 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.

DMRB chloride TMDL: MPCA explained that the DMRB chloride TMDL considered chloride sources across all seasons since chloride is added to the system on a seasonal basis as well as an annual basis. Spring snowmelt and subsequent runoff contribute chloride to local waterbodies during the spring time period, summer storms may contribute chlorides via stormwater runoff and continuous year-round sources of chloride are present in the DMRB due to contributions from WWTPs and water softening systems in areas which are not tied into municipal sanitary sewer systems. Chloride loadings to streams vary seasonally. Stream water quality responds to loadings on a seasonal basis and the highest chloride concentrations tend to occur during the spring snowmelt.

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 DMRB bacteria, nutrient, TSS and chloride TMDLs provide reasonable assurance that actions identified in the implementation section of the final TMDL (i.e., Sections 6 and 8 of the final TMDL

document), will be applied to attain the loading capacities and allocations calculated for the impaired reaches within the DMRB. 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 DMRBW. 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 Cottonwood County SWCD) staff, local Minnesota Board of Soil and Water Resources (BWSR) offices, and other local watershed groups (i.e., the Heron Lake Watershed District), will work together to reduce pollutant inputs to the DMRBW. MPCA has authored a Des Moines River Basin WRAPS document (February 25, 2021) 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.

Different organizations have been active in the DMRBW at implementing various programs to improve overall water quality in the watershed. The Heron Lake Watershed District (https://hlwdonline.org/php/) is one such organization whose goals are to protect and improve water resources in the Des Moines River Watershed by supporting watershed residents through the use of education and financial programming. The Heron Lake Watershed District has provided incentives for landowners to install practices such as filter strips, field windbreaks, critical area plantings, terrace systems, conservation tillage/residue coverage, grass buffers, streambank stabilization, new septic system installation, feedlot planning and inventories, and other flood storage project work. The Heron Lake Watershed District intends to facilitate local collaboration that encourages, educates, and demonstrates how to improve flood control, riparian stabilization, area soil health and water quality while improving productivity, profitability and sustainability of natural resources.

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 chloride 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 DMRB 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., the City of Worthington) 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, was reissued November 16, 2020 and requires permittees to develop compliance schedules for any TMDL that received 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. Because this TMDL will be approved after the effective date of the General Permit, MS4s will not be required to report on WLAs contained in this TMDL until the effective date of the next General Permit.

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*, Sub d. 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 Des Moines River WRAPS report was approved by MPCA on February 25, 2021.

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 DMRB (Section 7 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 Heron Lake Watershed District) and volunteers, as long as there is sufficient funding to support the efforts of these local entities. At a minimum, the DMRB will be monitored once every 10 years as part of the MPCA's Intensive Watershed Monitoring cycle.

Water quality monitoring is a critical component of the adaptive management strategy employed as part of the implementation efforts utilized in the DMRB. 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 DMRB. 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 DMRB, 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 DMRB should continue in order to build on the current water quality dataset and track changes based on implementation progress. Continuing to monitor water quality in the listed segments will determine whether or not stream restoration measures are required to bring the watershed into attainment with water quality standards.

Lake Monitoring:
The lakes in the DMRB 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 DMRB TMDLs will be used to inform the selection of implementation activities as part of the Des Moines River Basin 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.

MPCA outlined the importance of prioritizing areas within the DMRB, education and outreach efforts with local partners, and partnering with local stakeholders to improve water quality within the watershed. The Des Moines River Basin WRAPS document includes additional detail regarding specific recommendations from MPCA to aid in the reduction of bacteria, nutrients, sediment and chloride to surface waters of the DMRB.

DMRB 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 DMRB.

Stormwater wetland treatment systems: Constructed wetlands with the purpose of treating wastewater or stormwater inputs could be explored in selected areas of the DMRB. 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 DMRB.

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.

Education and Outreach Efforts: Increased education and outreach efforts to the general public bring greater awareness to the issues surrounding bacteria contamination and strategies to reducing loading and transport of bacteria. Education efforts targeted to the general public are commonly used to provide information on the status of impacted waterways as well as to address pet waste and wildlife issues. Education efforts may emphasize aspects such as cleaning up pet waste or managing the landscape to discourage nuisance congregations of wildlife and waterfowl. Education can also be targeted to municipalities, wastewater system operators, land managers and other groups who play a key role in the management of bacteria sources.

DMRB phosphorus TMDLs:

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

Manure management (feedlot and manure stockpile runoff controls): Manure has been identified as a potential source of nutrients in the DMRB. 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 DMRB. 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 DMRB. 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 DMRB 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 DMRB 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.

Public Education Efforts: Public programs will be developed to provide guidance to the general public on nutrient reduction efforts and their impact on water quality. These educational efforts could also be used to inform the general public on what they can do to protect the overall health of lakes in the DMRB.

DMRB TSS (sediment) 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 DMRB. 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 DMRB. 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 DMRB and minimize or eliminate degradation of habitat.

DMRB chloride TMDLs:
The potential BMPs which, if installed and maintained, would likely result in decreases in chloride to surface waters of the DMRB involve more efficient uses of salt resources. Improving winter maintenance practices (i.e., reducing the amount of salt used) of municipal and private applicators for smarter and more efficient use of salt resources. The key challenge in reducing salt usage is balancing the need for public safety with the growing expectation for clear, dry roads, parking lots, and sidewalks throughout the mix, severity, and duration of winter conditions in the DMRB.

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 9 of the final TMDL document. Throughout the development of the DMRB 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 (e.g., from Cottonwood County), members of the Heron Lake Watershed District, citizens and other state agency staff to promote water quality, to gain input from landowners via surveys and interviews and to better understand the social dynamics of stakeholders in the DMRBW. 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 Des Moines River Basin WRAPS report (February 25, 2021).

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 December 7, 2020 and ended on January 6, 2021.

MPCA received two public comments on the Des Moines River Headwaters Watershed River Eutrophication TMDL and the Des Moines River Basin Watersheds TMDL which were developed concurrently by MPCA. The first commenter requested clarification on WLA assigned to the Worthington WWTP. MPCA addressed the comment and adjusted its discussion of WLA within the final TMDL document. The second commenter expressed concern regarding cattle access to streams in the Des Moines River watershed. MPCA forwarded the comment onto its feedlot enforcement staff who provided a response and referenced relevant sections of the WRAPs document. EPA agrees that MPCA adequately addressed the comments received during the public notice period. All public comments and MPCA responses to publicly submitted comments were shared with EPA on March 1, 2021.

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

12. Submittal Letter

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

Comment:
The EPA received the final Des Moines River Basin TMDLs, the submittal letter and accompanying documentation from MPCA on March 1, 2021. 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 Des Moines River Basin TMDLs by MPCA satisfies the requirements of this twelfth element.

13. Conclusion

After a full and complete review, the EPA finds that the 10 bacteria TMDLs, the 23 TP TMDLs, the 2 sediment (TSS) TMDLs and the 1 chloride TMDL satisfy all elements for approvable TMDLs. This

TMDL approval is for **thirty-six TMDLs**, addressing segments for aquatic recreational, aquatic life 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 from the Des Moines River Basin**

Attachment #2: **Table 7: Total Phosphorus (TP) TMDLs for the Des Moines River Basin daily loads/annual time scale**

Attachment #3: **Table 8: Total Phosphorus (TP) Lake TMDLs for the Des Moines River Basin daily loads/seasonal time scale**

++

Attachment #1

Table 6: Bacteria (*E. coli*) TMDLs for the Des Moines River Basin

Allocation	Source	Very High	High	Mid-range	Low	Very Low
		0-10%	**10-40%**	**40-60%**	**60-90%**	**90-100%**
		E. coli (billions of bacteria/day)				
TMDL for Okabena Creek (07100001-512)						
Wasteload Allocation	WLA - Worthington Industrial WWTP (MN0031178)	10	10	10	10	10
	WLA - Worthington WWTP (MN0031186)	19	19	19	19	19
	WLA - Worthington MS4 (MS400257)	265	96	45	22	15
	WLA Totals	294	125	74	51	44
Load Allocation	***LA Totals***	936	320	136	51	25
Margin Of Safety (10%)		137	50	23	11	7.7
Loading Capacity (TMDL)		**1367**	**495**	**233**	**113**	**77**
Estimated Load Reduction (%)		**84%**				
TMDL for Des Moines River (07100001-524)						
Wasteload Allocation	WLA - Avoca & Iona WWTP (MNG580165)	3.8	3.8	3.8	3.8	a[1]
	WLA - Brewster WWTP (MN0021750)	9.5	9.5	9.5	9.5	a[1]
	WLA -Currie WWTP (MNG580221)	4.4	4.4	4.4	4.4	a[1]
	WLA - Dundee WWTP (MN0070271)	0.58	0.58	0.58	0.58	a[1]
	WLA - Fulda WWTP (MNG580188)	4.2	4.2	4.2	4.2	a[1]
	WLA - Heron Lake WWTP (MNG580189)	3.7	3.7	3.7	3.7	a[1]
	WLA - Lake Wilson WWTP (MGG580061)	2.4	2.4	2.4	2.4	a[1]
	WLA - Lakefield WWTP (MN0020427)	2.8	2.8	2.8	2.8	a[1]
	WLA - Okabena WWTP (MN0050288)	1.2	1.2	1.2	1.2	a[1]
	WLA - Shetek Area Water & Sewer District WWTP (MN0070947)	17.0	17.0	17.0	17.0	a[1]
	WLA - Slayton WWTP (MNG580191)	9.7	9.7	9.7	9.7	a[1]
	WLA - Worthington Industrial WWTP (MN0031178)	10.0	10.0	10.0	10.0	a[1]
	WLA - Worthington WWTP (MN0031186)	19.0	19.0	19.0	19.0	a[1]

	WLA - Worthington MS4 (MS400257)	32.0	12.0	5.1	1.3	a[1]
	WLA Totals	120.3	100.3	93.4	89.6	a[1]
Load Allocation	***LA Totals***	7726.0	2883.0	1171.0	225.0	b[1]
Margin Of Safety (10%)		872.0	332.0	141.0	35.0	9.9
Loading Capacity (TMDL)		**8718.3**	**3315.3**	**1405.4**	**349.6**	**99.0**
Estimated Load Reduction (%)		**47%**				
TMDL for Heron Lake Outlet (07100001-527)						
Wasteload Allocation	WLA - Brewster WWTP (MN0021750)	9.5	9.5	9.5	9.5	9.5
	WLA - Heron Lake WWTP (MNG580189)	3.7	3.7	3.7	3.7	3.7
	WLA - Lakefield WWTP (MN0020427)	2.8	2.8	2.8	2.8	2.8
	WLA - Okabena WWTP (MN0050288)	1.2	1.2	1.2	1.2	1.2
	WLA - Worthington Industrial WWTP (MN0031178)	10.0	10.0	10.0	10.0	10.0
	WLA - Worthington WWTP (MN0031186)	19.0	19.0	19.0	19.0	19.0
	WLA - Worthington MS4 (MS400257)	33.0	14.0	6.4	1.6	0.6
	WLA Totals	79.2	60.2	52.6	47.8	46.8
Load Allocation	***LA Totals***	3307.0	1341.0	593.0	118.0	9.3
Margin Of Safety (10%)		376.0	156.0	72.0	18.0	6.3
Loading Capacity (TMDL)		**3762.2**	**1557.2**	**717.6**	**183.8**	**62.4**
Estimated Load Reduction (%)		**18%**				
TMDL for Unnamed Ditch (07100001-564)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	0.00
Load Allocation	***LA Totals***	314.00	109.00	40.00	3.30	1.10
Margin Of Safety (10%)		35.00	12.00	4.40	0.37	0.12
Loading Capacity (TMDL)		**349.00**	**121.00**	**44.40**	**3.67**	**1.22**
Estimated Load Reduction (%)		**38%**				
TMDL for Jack Creek (North Branch) (07100001-652)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	0.00
Load Allocation	***LA Totals***	459.00	164.00	71.00	23.10	8.40
Margin Of Safety (10%)		51.00	18.00	7.90	2.60	0.93
Loading Capacity (TMDL)		**510.00**	**182.00**	**78.90**	**25.70**	**9.33**
Estimated Load Reduction (%)		**80%**				
TMDL for County Ditch 11 (07100003-503)						
Wasteload Allocation	WLA- Sherburn WWTP (MN0024872)	1.60	1.60	1.60	1.60	1.60
	WLA Totals	1.60	1.60	1.60	1.60	1.60
Load Allocation	***LA Totals***	2166.00	512.00	148.00	38.00	7.30
Margin Of Safety (10%)		241.00	57.00	17.00	4.40	0.99
Loading Capacity (TMDL)		**2408.60**	**570.60**	**166.60**	**44.00**	**9.89**

Estimated Load Reduction (%)		**55%**				
TMDL for Fourmile Creek (07100003-510)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	0.00
Load Allocation	***LA Totals***	172.00	40.00	11.00	2.40	0.27
Margin Of Safety (10%)		19.00	4.40	1.20	0.27	0.03
Loading Capacity (TMDL)		**191.00**	**44.40**	**12.20**	**2.67**	**0.30**
Estimated Load Reduction (%)		**88%**				
TMDL for County Ditch 1/Judicial Ditch 50 (07100003-515)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	0.00
Load Allocation	***LA Totals***	265.00	61.00	17.00	3.80	0.45
Margin Of Safety (10%)		30.00	6.80	1.90	0.42	0.05
Loading Capacity (TMDL)		**295.00**	**67.80**	**18.90**	**4.22**	**0.50**
Estimated Load Reduction (%)		**82%**				
TMDL for Des Moines River (07100003-525)						
Wasteload Allocation	***WLA Totals***	0.00	0.00	0.00	0.00	0.00
Load Allocation	***LA Totals***	862.00	199.00	54.00	13.00	1.70
Margin Of Safety (10%)		96.00	22.00	6.00	1.40	0.19
Loading Capacity (TMDL)		**958.00**	**221.00**	**60.00**	**14.40**	**1.89**
Estimated Load Reduction (%)		**73%**				
TMDL for Des Moines River (East Branch) (07100003-527)						
Wasteload Allocation	WLA- Sherburn WWTP (MN0024872)	1.60	1.60	1.60	1.60	1.60
	WLA Totals	1.60	1.60	1.60	1.60	1.60
Load Allocation	***LA Totals***	1483.00	348.00	97.00	24.00	3.40
Margin Of Safety (10%)		165.00	38.80	11.00	2.80	0.50
Loading Capacity (TMDL)		**1649.60**	**388.40**	**109.60**	**28.40**	**5.50**
Estimated Load Reduction (%)		**56%**				

a[1] = MPCA explained that permitted wastewater design flows exceed the stream flow in the low flow zone, therefore, the allocations are expressed as an equation (point source discharge * water quality standard (126 orgs/100 mL))
b[1] = MPCA explained that the Load Allocation was determined by an equation (flow from a given source * water quality standard (126 orgs/100 mL))

<u>**Attachment #2**</u>

Table 7: Total Phosphorus (TP) Lake TMDLs for the Des Moines River Basin - Annual time scale

Allocation	Source	Existing TP Load		TMDL TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr	%
TP TMDL for North Oaks (17-0044-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	1.20	0.003	1.20	0.003	0.00	0%
	WLA Totals	**1.20**	**0.003**	**1.20**	**0.003**	**0.00**	**0%**
Load Allocation	Watershed Load	4695.00	12.863	1006.00	2.800	3689.00	79%
	Atmospheric Deposition	134.00	0.367	134.00	0.370	0.00	0%
	LA Totals	**4829.00**	**13.230**	**1140.00**	**3.100**	**3689.00**	**76%**
Margin Of Safety (6%)		--	--	73.00	0.200	--	--
Loading Capacity (TMDL)		**4830.20**	**13.233**	**1214.20**	**3.300**	**3616.00**	**75%**
TP TMDL for Boot Lake (32-0015-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.13	0.0004	0.13	0.0004	0.00	0%
	WLA Totals	**0.13**	**0.000**	**0.13**	**0.0004**	**0.00**	**0%**
Load Allocation	Watershed Load	240.00	0.658	54.00	0.150	186.00	78%
	Atmospheric Deposition	61.00	0.167	61.00	0.170	0.00	0%
	LA Totals	**301.00**	**0.825**	**115.00**	**0.310**	**186.00**	**62%**
Margin Of Safety (10%)		--	--	13.00	0.035	--	--
Loading Capacity (TMDL)		**301.13**	**0.825**	**128.13**	**0.35**	**173.00**	**57%**
TP TMDL for Flahtery Lake (32-0045-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	1.10	0.003	1.10	0.003	0.00	0%
	WLA Totals	**1.10**	**0.003**	**1.10**	**0.003**	**0.00**	**0%**
Load Allocation	Watershed Load	2849.00	7.805	798.00	2.200	2051.00	72%
	Atmospheric Deposition	167.00	0.458	167.00	0.460	0.00	0%
	LA Totals	**3016.00**	**8.263**	**965.00**	**2.6**	**2051.00**	**68%**
Margin Of Safety (8%)		--	--	84.00	0.230	--	--
Loading Capacity (TMDL)		**3017.10**	**8.266**	**1050.10**	**2.900**	**1967.00**	**65%**
TP TMDL for Teal Lake (32-0053-00)							

Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.26	0.0007	0.26	0.0007	0.00	0%
	WLA Totals	**0.26**	**0.001**	**0.26**	**0.001**	**0.00**	**0%**
Load Allocation	Watershed Load	613.00	1.679	203.00	0.560	410.00	67%
	Atmospheric Deposition	36.00	0.099	36.00	0.100	0.00	0%
	LA Totals	**649.00**	**1.778**	**239.00**	**0.650**	**410.00**	**63%**
Margin Of Safety (9%)		--	--	24.00	0.065	--	--
Loading Capacity (TMDL)		**649.26**	**1.779**	**263.26**	**0.720**	**386.00**	**59%**
TP TMDL for Heron (Duck) Lake (32-0057-02)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	1.20	0.003	1.20	0.003	0.00	0%
	WLA Totals	**1.20**	**0.003**	**1.20**	**0.003**	**0.00**	**0%**
Load Allocation	Watershed Load	3657.00	10.019	999.00	2.700	2658.00	73%
	Atmospheric Deposition	123.00	0.337	123.00	0.340	0.00	0%
	LA Totals	**3780.00**	**10.356**	**1122.00**	**3.040**	**2658.00**	**70%**
Margin Of Safety (8%)		--	--	98.00	0.270	--	--
Loading Capacity (TMDL)		**3781.20**	**10.359**	**1221.20**	**3.300**	**2560.00**	**68%**
TP TMDL for Heron (North) Lake (32-0057-05)							
Wasteload Allocation	WLA - Brewster WWTP (MN0021750)	311.00	0.852	582.00	1.595	0.00	0%
	WLA - Hubbard Feeds Inc.-Worthington (MN0033375)	0.40	0.001	26.00	0.071	0.00	0%
	WLA - Okabena WWTP (MN0050288)	57.00	0.156	95.00	0.260	0.00	0%
	WLA - Worthington Industrial WWTP (MN0031178)	3488.00	9.556	6579.00	18.025	0.00	0%
	WLA - Worthington WWTP (MN0031186)	4759.00	13.038	12183.00	33.378	0.00	0%
	WLA - Worthington MS4 (MS400257)	--	--	441.00	1.208	0.00	0%
	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	46.00	0.126	46.00	0.126	0.00	0%
	WLA Totals	**8661.40**	**23.730**	**19952.00**	**55.000**	**0.00**	**0%**
Load Allocation	Atmospheric Deposition	1281.00	3.510	1281.00	3.510	0.00	0%
	Watershed Load	188705.00	517.000	13037.00	36.000	175669.00	93%

	South Heron Lake nonpoint contribution	24904.00	68.230	5874.00	16.000	19030.00	76%
	East Heron Lake nonpoint contribution	4425.00	12.123	2133.00	5.800	2292.00	52%
	Corabelle Lake nonpoint contribution	158.00	0.433	56.00	0.150	102.00	65%
	LA Totals	**219,473**	**601.296**	**22381.00**	**61.000**	**197093.00**	**90%**
Margin Of Safety (7%)		--	--	3187.00	8.700	--	--
Reserve Capacity				6.30	0.020		
Loading Capacity (TMDL)		**228,134**	**625.026**	**45526.30**	**125.00**	**182608.10**	**80%**
TP TMDL for Heron (South) Lake (32-0057-07)							
Wasteload Allocation	WLA - Lakefield WWTP (MN0020427)	838.00	2.296	1772.00	4.900	0.00	0%
	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	8.90	0.024	8.90	0.024	0.00	0%
	WLA Totals	**846.90**	**2.320**	**1780.90**	**4.924**	**0.00**	**0%**
Load Allocation	Atmospheric Deposition	1067.00	2.923	1067.00	2.800	0.00	0%
	Okabena Creek Overflow nonpoint contribution	7292.00	19.978	1386.00	3.800	5906.00	81%
	Watershed Load	29863.00	81.816	3793.00	10.400	26070.00	87%
	Flahtery Lake nonpoint contribution	2481.00	6.797	347.00	1.000	2134.00	86%
	LA Totals	**40703.00**	**111.515**	**6593.00**	**18.000**	**34110.00**	**84%**
Margin Of Safety (6%)		--	--	535.00	1.500	--	--
Loading Capacity (TMDL)		**41549.90**	**113.835**	**8908.90**	**24.000**	**32641.00**	**79%**
TP TMDL for Timber Lake (32-0058-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.26	0.0007	0.26	0.0007	0.00	0%
	WLA Totals	**0.26**	**0.001**	**0.26**	**0.0007**	**0.00**	**0%**
Load Allocation	Watershed Load	501.00	1.373	149.00	0.410	352.00	70%
	Atmospheric Deposition	77.00	0.211	77.00	0.210	0.00	0%
	LA Totals	**578.00**	**1.584**	**226.00**	**0.620**	**352.00**	**61%**
Margin Of Safety (12%)		--	--	31.00	0.085	--	--
Loading Capacity (TMDL)		**578.26**	**1.584**	**257.26**	**0.710**	**321.00**	**56%**
TP TMDL for Yankton Lake (42-0047-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.52	0.001	0.52	0.001	0.00	0%

	WLA Totals	**0.52**	**0.001**	**0.52**	**0.001**	**0.00**	**0%**
Load Allocation	Watershed Load	791.00	2.167	311.00	0.850	480.00	61%
	Atmospheric Deposition	159.00	0.436	159.00	0.440	0.00	0%
	LA Totals	**950.00**	**2.603**	**470.00**	**1.300**	**480.00**	**51%**
Margin Of Safety (10%)		--	--	52.00	0.140	--	--
Loading Capacity (TMDL)		**950.52**	**2.604**	**522.52**	**1.400**	**428.00**	**45%**
TP TMDL for Lime Lake (51-0024-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	3.90	0.011	3.90	0.032	0.00	0%
	WLA Totals	**3.90**	**0.011**	**3.90**	**0.032**	**0.00**	**0%**
Load Allocation	Watershed Load	8773.00	24.036	3269.00	27.000	5504.00	63%
	Atmospheric Deposition	62.00	0.170	62.00	0.510	0.00	0%
	LA Totals	**8835.00**	**24.205**	**3331.00**	**27.000**	**5504.00**	**62%**
Margin Of Safety (15%)		--	--	589.00	4.800	--	--
Loading Capacity (TMDL)		**8838.90**	**24.216**	**3923.90**	**32.000**	**4915.00**	**56%**
TP TMDL for Bloody Lake (51-0040-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.78	0.002	0.78	0.002	0.00	0%
	WLA Totals	**0.78**	**0.002**	**0.78**	**0.002**	**0.00**	**0%**
Load Allocation	Watershed Load	553.00	1.515	481.00	1.300	72.00	13%
	Fox Lake nonpoint contribution	250.00	0.685	99.00	0.270	151.00	60%
	Atmospheric Deposition	101.00	0.277	101.00	0.280	0.00	0%
	LA Totals	**904.00**	**2.477**	**681.00**	**1.900**	**223.00**	**25%**
Margin Of Safety (13%)		--	--	102.00	0.280	--	--
Loading Capacity (TMDL)		**904.78**	**2.479**	**783.78**	**2.100**	**121.00**	**13%**
TP TMDL for Fox Lake (51-0043-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.29	0.001	0.29	0.0008	0.00	0%
	WLA Totals	**0.29**	**0.001**	**0.29**	**0.0008**	**0.00**	**0%**
Load Allocation	Watershed Load	247.00	0.677	176.00	0.500	71.00	29%
	Atmospheric Deposition	72.00	0.197	72.00	0.200	0.00	0%
	LA Totals	**319.00**	**0.874**	**248.00**	**0.680**	**71.00**	**22%**
Margin Of Safety (15%)		--	--	44.00	0.121	--	--
Loading Capacity (TMDL)		**319.29**	**0.875**	**292.29**	**0.80**	**27.00**	**8%**

TP TMDL for Shetek Lake (51-0046-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	45.00	0.123	45.00	0.12	0.00	0%
	WLA Totals	**45.00**	**0.123**	**45.00**	**0.12**	**0.00**	**0%**
Load Allocation	Atmospheric Deposition	1362.00	3.732	1362.00	3.700	0.00	0%
	Watershed Load	61151.00	167.537	35684.00	98.000	25467.00	42%
	Bloody Lake nonpoint contribution	526.00	1.441	57.00	0.160	469.00	89%
	Currant Lake nonpoint contribution	467.00	1.279	71.00	0.190	396.00	85%
	Sarah Lake nonpoint contribution	3862.00	10.581	1175.00	3.200	2687.00	70%
	Yankton Lake nonpoint contribution	345.00	0.945	12.00	0.030	333.00	97%
	LA Totals	**67713.00**	**185.515**	**38361.00**	**105.000**	**29352.00**	**43%**
Margin Of Safety (15%)		--	--	6778.00	19.000	--	--
Loading Capacity (TMDL)		**67758.00**	**185.638**	**45184.00**	**124.000**	**22574.00**	**33%**
TP TMDL for Corabelle Lake (51-0054-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.17	0.000	0.17	0.0005	0.00	0%
	WLA Totals	**0.17**	**0.000**	**0.17**	**0.0005**	**0.00**	**0%**
Load Allocation	Watershed Load	221.00	0.605	107.00	0.290	114.00	52%
	Atmospheric Deposition	41.00	0.112	41.00	0.110	0.00	0%
	LA Totals	**262.00**	**0.718**	**148.00**	**0.410**	**114.00**	**44%**
Margin Of Safety (10%)		--	--	17.00	0.045	--	--
Loading Capacity (TMDL)		**262.17**	**0.718**	**165.17**	**0.450**	**97.00**	**37%**
TP TMDL for Sarah Lake (51-0063-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	7.30	0.020	7.30	0.020	0.00	0%
	WLA Totals	**7.30**	**0.020**	**7.30**	**0.020**	**0.00**	**0%**
Load Allocation	Watershed Load	12943.00	35.460	5978.00	16.000	6965.00	54%
	Atmospheric Deposition	456.00	1.249	456.00	1.200	0.00	0%
	LA Totals	**13399.00**	**36.710**	**6434.00**	**18.000**	**6965.00**	**52%**
Margin Of Safety (12%)		--	--	878.00	2.405	--	--
Loading Capacity (TMDL)		**13406.30**	**36.730**	**7319.30**	**20.000**	**6087.00**	**45%**

TP TMDL for Currant Lake (51-0082-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.76	0.002	0.76	0.002	0.00	0%
	WLA Totals	**0.76**	**0.002**	**0.76**	**0.002**	**0.00**	**0%**
Load Allocation	Watershed Load	1265.00	3.466	508.00	1.400	757.00	60%
	Atmospheric Deposition	153.00	0.419	153.00	0.430	0.00	0%
	LA Totals	**1418.00**	**3.885**	**661.00**	**1.800**	**757.00**	**53%**
Margin Of Safety (13%)		--	--	98.90	0.270	--	--
Loading Capacity (TMDL)		**1418.76**	**3.887**	**760.66**	**2.100**	**658.10**	**46%**
TP TMDL for East Graham Lake (53-0020-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	2.90	0.008	2.90	0.024	0.00	0%
	WLA Totals	**2.90**	**0.008**	**2.90**	**0.024**	**0.00**	**0%**
Load Allocation	Watershed Load	4969.00	13.614	1995.00	16.000	2974.00	60%
	West Graham Lake nonpoint contribution	539.00	1.477	407.00	3.300	132.00	24%
	Atmospheric Deposition	91.00	0.249	91.00	0.740	0.00	0%
	LA Totals	**5599.00**	**15.340**	**2493.00**	**20.000**	**3106.00**	**55%**
Margin Of Safety (14%)		--	--	406.00	3.300	--	--
Loading Capacity (TMDL)		**5601.90**	**15.348**	**2901.90**	**24.000**	**2700.00**	**48%**
TP TMDL for West Graham Lake (53-0021-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	3.20	0.009	3.20	0.009	0.00	0%
	WLA Totals	**3.20**	**0.009**	**3.20**	**0.009**	**0.00**	**0%**
Load Allocation	Watershed Load	6371.00	17.455	2641.00	7.200	3730.00	59%
	Atmospheric Deposition	139.00	0.381	139.00	0.380	0.00	0%
	LA Totals	**6510.00**	**17.836**	**2780.00**	**7.600**	**3730.00**	**57%**
Margin Of Safety (13%)		--	--	416.00	1.100	--	--
Loading Capacity (TMDL)		**6513.20**	**17.844**	**3199.20**	**8.800**	**3314.00**	**51%**
TP TMDL for Pierce Lake (46-0076-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.21	0.001	0.21	0.0006	0.00	0%
	WLA Totals	**0.21**	**0.001**	**0.21**	**0.0006**	**0.00**	**0%**

Load Allocation	Watershed Load	418.00	1.145	67.00	0.180	351.00	84%
	Atmospheric Deposition	115.00	0.315	115.00	0.320	0.00	0%
	LA Totals	**533.00**	**1.460**	**182.00**	**0.500**	**351.00**	**66%**
Margin Of Safety (12%)		--	--	25.00	0.068	--	--
Loading Capacity (TMDL)		**533.21**	**1.461**	**207.21**	**0.57**	**326.00**	**61%**
TP TMDL for Temperance Lake (46-0103-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	0.17	0.000	0.17	0.0005	0.00	0%
	WLA Totals	**0.17**	**0.000**	**0.17**	**0.0005**	**0.00**	**0%**
Load Allocation	Watershed Load	417.00	1.142	95.00	0.260	322.00	77%
	Atmospheric Deposition	61.00	0.167	61.00	0.170	0.00	0%
	LA Totals	**478.00**	**1.310**	**156.00**	**0.430**	**322.00**	**67%**
Margin Of Safety (10%)		--	--	17.00	0.048	--	--
Loading Capacity (TMDL)		**478.17**	**1.310**	**173.17**	**0.48**	**305.00**	**64%**

Table 8: Total Phosphorus (TP) Lake TMDLs for the Des Moines River Basin - Seasonal time scale

Allocation	Source	Existing TP Load		TMDL TP Load		Estimated Load Reduction	
		lbs/season	lbs/day	lbs/season	lbs/day	lbs/season	%
TP TMDL for Talcot Lake (17-0060-00)							
Wasteload Allocation	WLA - Avoca & Iona WWTP (MNG580165)	18.00	0.15	188.00	13.43	0.00	0%
	WLA -Currie WWTP (MNG580221)	25.00	0.20	108.00	7.7	0.00	0%
	WLA - Dundee WWTP (MN0070271)	--	--	14.00	1.0	--	--
	WLA - Fulda WWTP (MNG580188)	252.00	2.07	205.00	15	47.00	19%
	WLA - Lake Wilson WWTP (MGG580061)	119.00	0.98	119.00	8.5	0.00	0%
	WLA - Shetek Area Water & Sewer District WWTP (MN0070947)	--	--	422.00	30	--	--
	WLA - Slayton WWTP (MNG580191)	161.00	1.32	237.00	17	0.00	0%
	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	29.00	0.238	29.00	0.24	0.00	0%
	WLA Totals	**604.00**	**4.951**	**1322.00**	**92.9**	**47.00**	**8%**
Load Allocation	Atmospheric Deposition	168.00	1.377	168.00	1.400	0.00	0%
	Watershed Load	70498.00	577.852	18308.00	68.100	52190.00	74%
	Lime Lake	7013.00	57.484	1783.00	15.000	5230.00	75%
	North Oaks Lake	1909.00	15.648	280.00	2.300	1629.00	85%
	Shetek Lake	13497.00	110.631	3469.00	28.000	10028.00	74%
	LA Totals	**93085.00**	**762.992**	**24008.00**	**114.800**	**69077.00**	**74%**
Margin Of Safety (13%)		--	--	3791.00	31.000	--	--
Reserve Capacity				38.00	0.310		
Loading Capacity (TMDL)		**93689.00**	**767.943**	**29159.00**	**239**	**64530.00**	**69%**
TP TMDL for Bright Lake (46-0052-00)							
Wasteload Allocation	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	1.80	0.015	1.80	0.015	0.00	0%
	WLA Totals	**1.80**	**0.015**	**1.80**	**0.015**	**0.00**	**0%**
Load Allocation	Watershed Load	2819.00	23.107	1409.00	12.000	1410.00	50%
	Pierce Lake nonpoint contribution	293.00	2.402	72.00	0.590	221.00	75%
	Atmospheric Deposition	126.00	1.033	126.00	1.000	0.00	0%
	LA Totals	**3238.00**	**26.541**	**1607.00**	**13.000**	**1631.00**	**50%**
Margin Of Safety (11%)		--	--	199.00	1.600	--	--
Loading Capacity (TMDL)		**3239.80**	**26.556**	**1807.80**	**15.000**	**1432.00**	**44%**

TP TMDL for Okamanpeedan Lake (46-0051-00)							
Wasteload Allocation	WLA - Alpha WTP (MNG640102)	0.025	0.0002	0.68	0.057	--	--
	WLA - Ceylon WWTP (MNG580006)	2.80	0.0230	55.00	3.900	--	--
	WLA - Sherburn WWTP (MN0024872)	162.00	1.3279	338.00	2.800	--	--
	Construction Stormwater (MNR100001) & Industrial Stormwater (MNR050000)	14.00	0.1148	14.00	0.110	0.00	0%
	WLA Totals	**178.83**	**1.466**	**407.68**	**6.900**	**0.00**	**0%**
Load Allocation	Atmospheric Deposition	201.00	1.648	201.00	1.700	0.00	0%
	Watershed Load	27860.00	228.361	10873.00	86.000	16987.00	61%
	Bright Lake nonpoint contribution	2208.00	18.098	621.00	5.100	1587.00	72%
	Temperance Lake nonpoint contribution	190.00	1.557	84.00	0.690	106.00	56%
	LA Totals	**30459.00**	**249.664**	**11779.00**	**93.000**	**18680.00**	**61%**
Margin Of Safety (11%)		--	--	1517.00	12.000	--	--
Reserve Capacity				13.00	0.110		
Loading Capacity (TMDL)		**30637.83**	**251.130**	**13716.68**	**112.00**	**16921.15**	**55%**