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

MAY 0 8 2019

REPLY TO THE ATTENTION OF

WW-16J

RECEIVED
MAY 1 3 2019
BY:

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

Dear Mr. Skuta:

The U.S. Environmental Protection Agency has conducted a complete review of thirty final Total Maximum Daily Loads (TMDLs) for the South Fork Crow River Watershed, located in central Minnesota. The TMDLs are calculated for Total Suspended Solids, *E. Coli*, Dissolved Oxygen, and Total Phosphorus and address impairments to Aquatic Life, Limited Resource Value and Aquatic Recreation designated uses.

EPA has determined that these TMDLs meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, EPA hereby approves Minnesota's Thirty TMDLs for the South Fork Crow River Watershed. The statutory and regulatory requirements, and EPA's review of Minnesota's compliance with each requirement, are described in the enclosed decision document.

We wish to acknowledge Minnesota's effort in submitting these TMDLs addressing aquatic life and recreational uses, and look forward to future submissions by the State of Minnesota. If you have any questions, please contact Mr. David Pfeifer, Acting Chief of the Watersheds and Wetlands Branch, at 312-353-9024.

Sincerely,

Joan M. Tanaka

Joan M. Tanaka
Acting Director, Water Division

Enclosure

cc: Celine Lyman, MPCA
Scott Lucas, MPCA

wq-iw8-52g

South Fork Crow River Watershed

Total Maximum Daily Load Report

EPA Review and Decision

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.

This is a final decision on EPAs review and approval of the TMDL Document titled:

> South Fork Crow River Watershed Total Maximum Daily Load Report
> October 2018

Each section begins with an introductory summary of what is expected in the TMDL based on EPA guidance, followed by a comments section that documents information in support of EPA's approval decision.

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

The TMDL submittal should identify the waterbody as it appears on the State's/Tribe's 303(d) list. The waterbody should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the waterbody and specify the link between the pollutant of concern and the water quality standard (see Section 2 below). The TMDL submittal should include an identification of the point and nonpoint sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the NPDES permits within the waterbody. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of the natural background. This information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation.

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

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

Section 1 Review Comments:

The waterbodies are identified as they appear on the 303(d) list.

A comparison of Tables 1-1 and 1-2 of the TMDL document to the information found in the 2018 Minnesota (MN) 303(d) list and summarized in Review Tables 1 and 2 of this decision document show that the waterbodies subject to approval in this document are currently listed on the MN 2018 303(d) list. However, in reviewing Table 1-1 it should be noted that the waterbodies appear as they did on the MN 303(d) list at the time TMDL development was initiated, prior to the 2016 303(d) list. The following changes occurred in the listing subsequent to the 2014 303(d) listing and impact EPA's approval in the following way.

Reach assessment unit ID 07010205-501 was changed to ID 07010205-638 on the 2016 MN 303(d) list.

EPA confirmed with the State the boundaries of the new assessment unit 07010205-638 are the same as the old assessment unit ID 07010205-501.[1] The dissolved oxygen TMDL approval for the old assessment unit 501 will apply to the new assessment unit 638.

Reach assessment unit ID 07010205-540 was split and renumbered to ID 07010205-658 and 07010205-659 on the 2016 MN 303(d) list.

EPA confirmed with the State that the boundaries of the new assessment unit IDs 07010205-658 and 659 are within the boundaries of the old assessment unit ID 07010205-540.[1] The TMDL approval for the old assessment unit 540 will apply to the new assessment units 658 and 659.

[1] Email communication between Jim Ruppel of EPA Region 5 and Scott Lucas of the Minnesota Pollution Control Agency, May 10th, 2019.

Reach assessment units ID 07010205-501(now 638) and ID 07010205-510 are no longer listed as impaired for Turbidity on the 2016 MN 303(d) list.

While the development of TMDLs for these reaches will provide useful information to the State for water quality management purposes, federal statutes only require EPA review and approval of TMDLs for waterbody pollutant combinations that address impairments on the current 303(d) list. EPA's review and approval does not apply to the TSS/Turbidity waterbody pollutant combination for reach assessment unit ID 07010205-501(now 638), or to the TSS/Turbidity waterbody pollutant combination for reach assessment unit ID 07010205-510. EPA is taking no action (neither approval nor disapproval) on these waterbody pollutant combinations.

Table 1-1. Stream impairments addressed in this TMDL, presented upstream to downstream.

Reach Name	AUID#	Impairment	Class	Beneficial Use[1]	Year Listed	Target Start / Completion
Judicial Ditch 15	07010205-513	*E. coli*	7	LRV	2010	2012/2018
Buffalo Creek	07010205-501*	DO	2B	AQL	2010	2012/2018
Buffalo Creek	07010205-501*	TSS/Turbidity	2B	AQL	2006	2006/2012
South Fork Crow River	07010205-540**	TSS/Turbidity	2B	AQL	2006	2012/2018
South Fork Crow River	07010205-510***	TSS/Turbidity	2B	AQL	2006	2012/2018
South Fork Crow River	07010205-511	TSS/Turbidity	2B	AQL	2006	2012/2018
South Fork Crow River	07010205-508	Fecal coliform	2B	AQR	2006	2012/2018
South Fork Crow River	07010205-508	TSS/Turbidity	2B	AQL	2004	2012/2018

[1]Beneficial use abbreviations: AQL = aquatic life; AQR = aquatic recreation; LRV = limited resource value

*Note: Reach ID number recently changed from 501 to 638 in the 2016 303(d) list and it is delisted for turbidity on the 2016 303(d) list.

**Note: Reach was split in two and the ID number changed from 540 to 658 and 659 on the 2016 303(d) list.

***Note: Reach ID number 510 is no longer listed for turbidity on the 2016 303(d) list due to new assessment method.

Excerpted from the TMDL document.

Review Table 1 Summary of Stream Impairments Addressed.

Reach Name	AUID[6] 07010205-	2018 303d Match	Impairment	Pollutant of Concern	WQ Target
Judicial Ditch 15	513	Y	*E. coli*	*E. coli*	126 cfu /100 ml
Buffalo Creek	638(3)	Y	DO	O_2 demand(1)	5 mg/l
Buffalo Creek	638(2)	N	TSS/Turbidity	TSS	65 mg/l
South Fork Crow River	658(4)	Y	TSS/Turbidity	TSS	65 mg/l
South Fork Crow River	659(4)	Y	TSS/Turbidity	TSS	65 mg/l
South Fork Crow River	510(2)	N	TSS/Turbidity	TSS	65 mg/l
South Fork Crow River	511	Y	TSS/Turbidity	TSS	65 mg/l
South Fork Crow River	508	Y	Fecal coliform	*E. coli*	126 cfu /100 ml
South Fork Crow River	508	Y	TSS/Turbidity	TSS	65 mg/l

1) Oxygen demand accounts for the combination of SOD, NOD, and BOD as discussed in Section 3.6.2. and reflected in the TMDL document in Table 4-10. Buffalo Creek Dissolved Oxygen Total Maximum Daily Load.
2) TMDL approval decisions in this document do not apply to these waterbody pollutant combinations as they are not currently listed as impaired on a EPA approved 303(d) list.
3) Previously listed as segment 501 prior to 2016 303(d) list.
4) Previously listed as segment 540 prior to 2016 303(d) list.

Table 1-2. Lake impairments addressed in this TMDL study.

Lake Name	Lake ID	Impairment	Year Listed	Target Start / Completion
Bear	43-0076-00	Nutrients	2016	2012/2017
Belle	47-0049-01	Nutrients	2016	2012/2017
Big Kandiyohi	34-0086--00	Nutrients	2008	2013/2018
Boon	65-0013-00	Nutrients	2016	2012/2017
Cedar	43-0115-00	Nutrients	2010	2013/2018
Goose	47-0127-00	Nutrients	2016	2012/2017
Green Leaf	47-0062-00	Nutrients	2010	2013/2018
Hoff	47-0106-00	Nutrients	2016	2012/2017
Johnson	34-0012-00	Nutrients	2016	2012/2017
Kasota	34-0105-00	Nutrients	2010	2013/2018
Lillian	34-0072-00	Nutrients	2016	2012/2017
Little Kandiyohi	34-0096-00	Nutrients	2010	2013/2018
Marion	43-0084-00	Nutrients	2010	2013/2018
Minnetaga	34-0076-00	Nutrients	2016	2012/2017
Mud	10-0094-00	Nutrients	2016	2012/2017
Preston	65-0002-00	Nutrients	2016	2012/2017
Rice	86-0032-00	Nutrients	2016	2012/2017
Silver	43-0034-00	Nutrients	2016	2012/2017
Star	47-0129-00	Nutrients	--	--
Thompson	47-0159-00	Nutrients	2016	2012/2017
Wakanda	34-0169-03	Nutrients	2008	2013/2018
Willie	47-0061-00	Nutrients	2016	2012/2017
Winsted	43-0012-00	Nutrients	2016	2012/2017

Excerpted from the TMDL document

Review Table 2, Lake impairments, POC, and WQ Targets.								
Lake Name	**Lake ID**	**Impairment**	**Matches 2018 303d list**	**Pollutant of Concern**	**Depth[1]**	**Ecoregion[1]**	**TP Target[1] µg/l**	**TMDL[2] (Tables in Appendix A)**
Bear	43-0076	Nutrients	Y	P	Shallow	NCHF	60	4-34
Belle	47-0049	Nutrients	Y	P	Deep	NCHF	40	4-32
Big Kandiyohi	34-0086	Nutrients	Y	P	Shallow	WCBP	90	4-19
Boon	65-0013	Nutrients	Y	P	Shallow	WCBP	90	4-35
Cedar	43-0115	Nutrients	Y	P	Shallow	NCHF	60	4-27
Goose	47-0127	Nutrients	Y	P	Shallow	WCBP	90	4-29
Green Leaf	47-0062	Nutrients	Y	P	Shallow	NCHF	60	4-28
Hoff	47-0106	Nutrients	Y	P	Shallow	WCBP	90	4-30
Johnson	34-0012	Nutrients	Y	P	Shallow	WCBP	90	4-20
Kasota	34-0105	Nutrients	Y	P	Shallow	WCBP	90	4-21
Lillian	34-0072	Nutrients	Y	P	Shallow	WCBP	90	4-22
Little Kandiyohi	34-0096	Nutrients	Y	P	Shallow	WCBP	90	4-23
Marion	43-0084	Nutrients	Y	P	Shallow	WCBP	90	4-18
Minnetaga	34-0076	Nutrients	Y	P	Shallow	WCBP	60	4-24
Mud	10-0094	Nutrients	Y	P	Shallow	NCHF	60	4-38
Preston	65-0002	Nutrients	Y	P	Shallow	WCBP	90	4-17
Rice	86-0032	Nutrients	Y	P	Shallow	NCHF	60	4-39
Silver	43-0034	Nutrients	Y	P	Shallow	WCBP	90	4-36
Star	47-0129	Nutrients	Y	P	Shallow	NCHF	60	4-31
Thompson	47-0159	Nutrients	Y	P	Shallow	WCBP	90	4-25
Wakanda	34-0169	Nutrients	Y	P	Shallow	WCBP	90	4-26
Willie	47-0061	Nutrients	Y	P	Shallow	NCHF	60	4-33
Winsted	43-0012	Nutrients	Y	P	Shallow	NCHF	60	4-37

1) Under Minn. R. 7050.0150 and 7050.0222, subp. 4, the lakes addressed in this study are shallow and deep lakes located within the North Central Hardwood Forest (NCHF) and the Western Cornbelt Plain (WCBP) Ecoregions with numeric targets listed in Table 2-1 of the TMDL document, excerpted below.

2) TMDL loading capacities, LAs, WLAs, and MOS are presented in the TMDL document for each of the lakes in the table.

The TMDL clearly identifies the pollutant(s) for which the TMDL is being established.

Turbidity/Total Suspended Solids

Section 2.1 of the TMDL document identifies Total Suspended Solids (TSS) as the pollutant of concern for the assessment units impaired by TSS/Turbidity.

Dissolved Oxygen / Organic Matter / Biological Oxygen Demand

Sections 2.2 and 3.6.2 discuss biochemical oxygen demand as the pollutant of concern for the segment of Buffalo Creek listed as impaired for low dissolved oxygen.

Bacteria/Fecal Coliform/E.coli

Section 2.3 of the TMDL document identifies *E. coli* as the pollutant of concern for the waterbodies listed as impaired for bacteria.

Total Phosphorus

Section 2.4 of the TMDL document identifies total phosphorus (P) as the primary pollutant of concern for all of the lakes listed as impaired for nutrients. Chlorophyll-a and Secchi Disk Transparency are identified as secondary response variables that are expected to meet water quality standards once Total Phosphorus water quality standards are achieved.

The TMDL identifies the priority ranking of the waterbody

Table 1-1 and 1-2 of the TMDL document provide the Target Start and Completion date for each of the waterbody pollutant combinations.

The link between the pollutant of concern (POC) and the water quality standard is specified.

TSS/Turbidity

TSS is identified as the pollutant of concern for the 4 river segments, and the MN state water quality standard of 65 mg/l is specified as the target. Section 2.1 of the TMDL document provides additional detail regarding water quality standards applicable to total suspended solids.

> *The results of the TSS criteria development were published by the MPCA in 2011, and proposed a 65 mg/L TSS standard for Class 2B waters in the Southern River Nutrient Region that may not be exceeded more than 10% of the time over a multi-year data window (MPCA 2011). The assessment season is identified as April through September. [Excerpted from the TMDL document]*

Organic Matter, Biochemical Oxygen Demand and Dissolved Oxygen Levels

Section 3.6.2 of the TMDL document provides a discussion of the link between the decomposition of organic matter, the resulting biochemical oxygen demand, and dissolved oxygen levels.

> *The water quality target for Buffalo Creek is the DO criteria. The pollutants of concern are constituents that reduce or lead to the reduction of DO in the listed reach. The decomposition of organic matter such as proteins, human and animal waste, and dead plant matter, and the oxidation of inorganic ammonia, consume oxygen. Phosphorus, and, in some cases, nitrogen, can be a limiting nutrient to the production of algae and aquatic macrophytes, which die, decompose, and use oxygen in the water. One of the required elements of a TMDL is the identification of the pollutants of concern. The pollutant of concern for this TMDL is organic matter, which is measured as biochemical oxygen demand (BOD). While nutrients such as phosphorus and nitrogen may contribute to the growth of organic matter within the reach (i.e., algae) and inputs from the*

watershed (i.e., ammonia and organic-nitrogen), this TMDL is written for oxygen demanding substances. It is assumed that future TMDL efforts will establish appropriate phosphorus and/or nitrogen loading capacities for this reach to meet Minnesota's River Nutrient Eutrophication Criteria and State nitrogen standards when they are developed. [Excerpted from the TMDL document]

Bacteria / Fecal Coliform / *E. coli*

The MN WQS for *E. coli E. coli* of 126 colony forming units / 100 ml is identified and utilized for both the *E. coli* impaired segment (Judicial Ditch 15) and South Fork Crow River segment 508. The state noted that segment 508 was originally listed as impaired for fecal coliform, but the WQS was revised in 2008 to *E. coli*. The rationale for using *E. coli* as a substitute target for Fecal Coliform is provided in Section 2.3 of the TMDL document.

With the revisions of Minnesota's water quality rules in 2008, the state changed to an E. coli standard because it is a superior potential illness indicator and costs for lab analysis are less (MPCA 2007). The revised standards now state: "E. coli concentrations are not to exceed 126 colony forming units per 100 milliliters (cfu/100 ml) as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than 10% of all samples taken during any calendar month individually exceed 1,260 cfu/100 ml. The standard applies only between April 1 and October 31." The E. coli concentration standard of 126 cfu/100 ml was considered reasonably equivalent to the fecal coliform standard of 200 cfu/100 ml from a public health protection standpoint. The SONAR (Statement of Need and Reasonableness) section that supports this rationale uses a log plot that shows a good 18 relationship between these two parameters. The following regression equation was deemed reasonable to convert fecal coliform data to E. coli equivalents: E coli concentration (equivalents) = 1.80 x (Fecal Coliform Concentration)$^{0.81}$
[Excerpted from the TMDL document]

Nutrients / Total Phosphorus / Chlorophyll A / Secchi Disk

The POC for the lakes impaired by nutrients is identified as P. Section 2.4 of the TMDL document discusses the link between Total Phosphorus and the response variables of Chlorophyll A and Secchi depth.

In addition to meeting phosphorus limits, Chlorophyll-a (Chl-a) and Secchi depth standards must also be met for the resource to be considered "fully supporting" its designated use. In developing the nutrient standards for Minnesota lakes (Minn. R. ch. 7050), the MPCA evaluated data from a large cross-section of lakes within each of the state's ecoregions (MPCA 2005). Clear relationships were established between the causal factor TP and the response variables Chl-a and Secchi disk. Based on these relationships, it is expected that by meeting the phosphorus targets, the Chl-a and Secchi standards will likewise be met.
[Excerpted from the TMDL document]

The location and quantity of point and non-point sources are identified.

Section 3.6 of the TMDL document provides a summary of the sources of pollutants to the impaired waterbodies.

TSS Sources

TSS sources are discussed in Section 3.6.1 of the TMDL document:

> *The HSPF model was used to determine the contribution of TSS from identified sources in the South Fork Crow River Watershed. Source assessment modeling results were summarized using the following categories: bed/bank, cropland, pasture/rangeland, urban, and other. The "other" category includes point sources, feedlots, forest, septic, and wetland; it makes up less than 2% of overall sources for all impaired reaches. Pie charts, shown in Figure 3-9, were produced at each of the five TMDL endpoints to show the relative contribution of each source.*
> *[Excerpted from the TMDL document]*

Figure 3-9. TSS source assessment modeling results within the South Fork Crow River Watershed impaired reaches.

Excerpted from the TMDL document

NPDES permitted wastewater treatment plants (WWTPs) are identified, including permit numbers in Table 4-1 of the document and municipal separate storm sewer systems (MS4) permitted facilities are identified in Table 4-2. Wasteload allocations for individual permit holders are provided in Table 4-1.

Table 4-1. Permitted TSS allocations for point sources in the South Fork Crow River Watershed.

Impaired Reach AUID	Facility	Permit	Facility Type	Effluent Design Flow (mgd)	Permitted Concentration (mg/L)	Permitted Load (tons/day)	Impaired Reach Point Source WLA
07010205-501	Brownton WWTP	MN0022951	Continuous	0.196	30	0.025	1.9
	Buffalo Lake Advanced Biofuels LLC	MN0063151	Continuous	0.04	30	0.005	
	Buffalo Lake WWTP	MN0050211	Controlled	1.74	45	0.327	
	Gascoyne Materials Handling & Recycling LLC	MN0069612	Periodic/ Seasonal	0.30	30	0.038	
	Glencoe WWTP	MN0022233	Continuous	2.60	30	0.325	
	Hector WWTP	MN0025445	Continuous	0.66	30	0.083	
	Seneca Foods Corp – Glencoe	MN0001236	Continuous	0.45	15	0.028	
	Seneca Foods Corp – Glencoe	MN0001236	Controlled	5.00	45	0.939	
	Stewart WWTP	MNG580077	Controlled	0.841	45	0.158	
07010205-508	Delano WWTP	MN0051250	Continuous	2.20	30	0.275	0.81
	Loretto WWTP	MN0023990	Controlled	0.80	45	0.150	
	Mayer WWTP	MN0021202	Continuous	0.44	30	0.054	
	New Germany WWTP	MN0024295	Controlled	0.38	45	0.071	
	Watertown WWTP	MN0020940	Continuous	1.26	30	0.158	
	Winsted WWTP	MN0021571	Continuous	0.82	30	0.103	
07010205-510	AB Mauri Food Inc.	MNG250099	Continuous	3.00	30	0.376	1.1
	Hutchinson WWTP	MN0055832	Continuous	5.43	30	0.680	
07010205-512	Silver Lake WWTP	MNG580164	Controlled	1.32	45	0.248	0.25
07010205-540	Cedar Mills WWTP	MN0066605	Controlled	0.20	45	0.037	1.5
	Cosmos WWTP	MNG580056	Controlled	0.45	45	0.084	
	Duininck Bros Inc - Aggregate	MNG490046	Periodic/Seasonal	2.60	30	0.325	
	Lake Lillian WWTP	MNG580225	Controlled	0.39	45	0.073	
	Lester Prairie WWTP	MN0023957	Continuous	0.36	30	0.046	

Excerpted and recombined from the TMDL document

Table 4-2. Wasteload allocations for all MS4 communities that contribute directly to impaired reaches.

Reach	MS4	Permit #	Area (acres)	TSS Standard (mg/L)	Individual TSS MS4 Allocation (Percent of Allowable Load)
Buffalo Creek (07010205-501)	Glencoe City MS4	MS400252	1,967	65	2.1%
South Fork Crow River (07010205-540)	Willmar City MS4	MS400272	2,693	65	2.4%
	Hutchinson City MS4	MS400248	2,319		
South Fork Crow River (07010205-510)	Hutchinson City MS4	MS400248	3,346	65	7.3%
South Fork Crow River (07010205-508)	Corcoran City MS4	MS400081	164	65	22.8%
	Independence City MS4	MS400095	17,981		
	Loretto City MS4	MS400030	68		
	Maple Plain City MS4	MS400103	485		
	Medina City MS4	MS400105	4,397		
	Minnetrista City MS4	MS400106	7,093		

Excerpted from the TMDL document

Construction and industrial stormwater sources are discussed in Section 4.7.3.3 of the TMDL document. General permit numbers are included.

State's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001).... Industrial Stormwater Multi-Sector General Permit (MNR050000).... Sand and Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities (MNG490000).
[Excerpted from the TMDL document]

Dissolved Oxygen Demand Sources:

A discussion of contributing sources of pollutants and the factors that influence the rate at which they generate demand for dissolved oxygen is provided in Section 3.6.2 of the TMDL document. The pollutants that generate the biochemical oxygen demand for the segment of Buffalo Creek impaired by low oxygen levels are further categorized as;

CBOD - carbonaceous biological oxygen demand,
SOD – Sediment Oxygen Demand from decomposing organic matter, &
NBOD – the oxidation of inorganic ammonia.

For the South Branch Crow River Low DO TMDL, it has been determined that SOD, CBOD, and NBOD are the significant sources contributing to the low DO impairment.
[Excerpted from the TMDL document]

The current oxygen demands (SOD, BOD, and NOD) were calculated within the HSPF model.
[Excerpted from the TMDL document]

Source assessment modeling results were summarized using the following categories: cropland, point sources, urban, pasture/rangeland, septic, and other. The "other" category includes feedlot, forest, groundwater, and wetland. The "other" category makes up less than 1% of overall sources of TKN and BOD for all impaired reaches. Pie charts, shown in Figure 3-17, were produced at the Buffalo Creek TMDL endpoint for each source. Cropland was the dominant source of both TKN and BOD, as it contributed to approximately 93% of the load of each. All other sources accounted for less than 3% of the total load individually. It is important to note that because much of the feedlot manure is spread on local cropland, feedlot loads in the HSPF model application source pie-charts are accounted for in the cropland category as opposed to the feedlot category. The HSPF model was used to determine the contribution of oxygen demanding substances from identified sources in the South Fork Crow River Watershed.
[Excerpted from the TMDL document]

In addition to oxygen demanding substances, sources of low oxygen content (anoxic) water, such as groundwater and water draining from wetlands, can also reduce the DO concentration of a stream reach. This source could be classified as background.
[Excerpted from the TMDL document]

Additional discussion relating oxygen demand to land use is summarized in Figure 3-17 of the TMDL document.

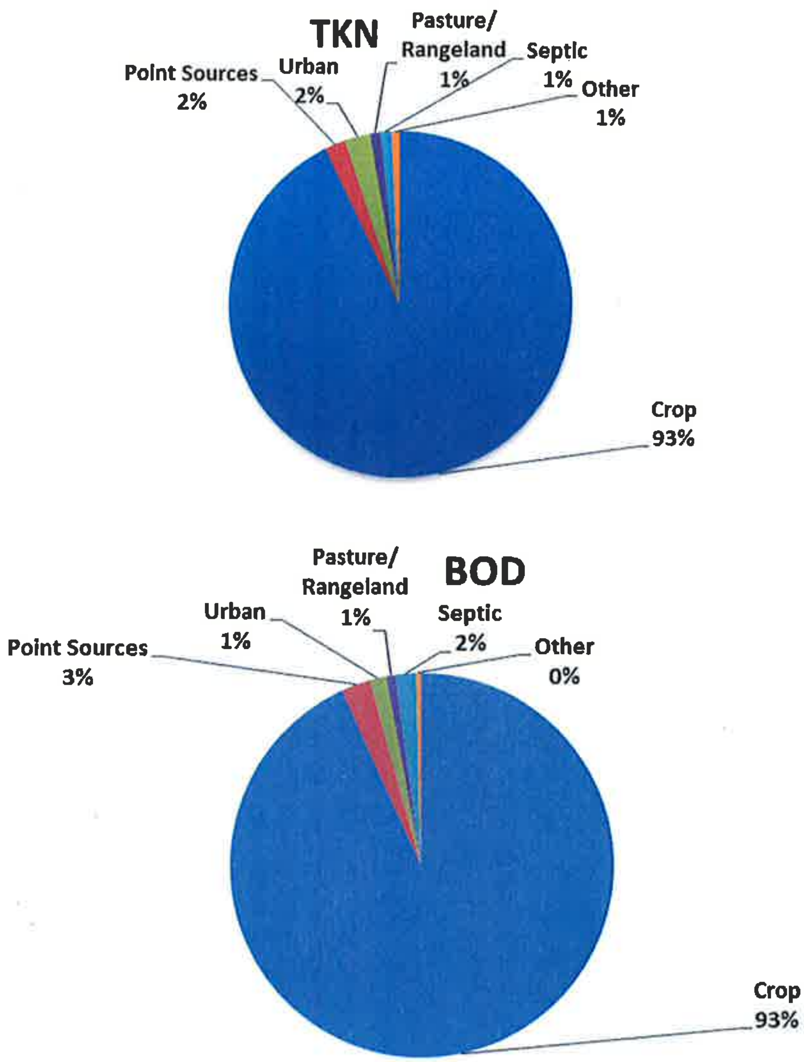

Figure 3-17. Oxygen Demand Source Assessment Modeling Results Within the South Fork Crow River Watershed.

Excerpted from the TMDL document 1

<u>NPDES WWTP Sources of DO Demand</u>

NPDES WWTP sources of DO demand are discussed in Section 4.8 of the TMDL document. Nine NPDES wastewater sources are identified, in Tables 4-8 and 4-9 of the TMDL document, including their permit numbers. The combined converted CBODu and Ammonia NOD load assumptions are later assigned as waste load allocations in Table 4-10.

There are nine NPDES wastewater dischargers throughout the Buffalo Creek DO impaired reach, five of which are WWTPs and four of which are more industrial in nature. The WWTPs have permitted CBOD5 effluent limits, which were used for the CBOD5 concentration assumptions.
[Excerpted from the TMDL document]

The CBOD5 and ammonia load assumptions were calculated as the product of the facility design flows or maximum permitted flow rates, the effluent concentration assumptions in Tables 4-8 for CBOD5 and 4-9 for ammonia, and a unit conversion factor.
[Excerpted from the TMDL document]

Table 4-8. CBOD concentration and loading assumptions for point sources in the Buffalo Creek Watershed.

Facility	Permit	Facility Type	Effluent Design Flow (MGD)	CBOD5 Concentration Assumption (mg/L)	Converted CBODu Concentration Assumption (mg/L)	CBOD5 Load Assumption (lb/day)	Converted CBODu Load Assumption (lb/day)
Brownton WWTP	MN0022951	Continuous	0.196	10	25	16.4	41.6
Buffalo Lake Advanced Biofuels LLC	MN0063151	Continuous	0.040	15	38	5.0	12.7
Buffalo Lake WWTP	MN0050211	Controlled	1.743	25	64	363.7	924.4
Gascoyne Materials Handling & Recycling LLC	MN0069612		0.300	20	51	50.1	127.3
Glencoe WWTP	MN0022233	Continuous	2.600	25	64	542.5	1,378.6
Hector WWTP	MN0025445	Continuous	0.660	15	38	82.6	210.0
Seneca Foods Corp – Glencoe	MN0001236	Continuous	0.450	10	25	37.6	95.4
Seneca Foods Corp – Glencoe	MN0001236	Controlled	5.000	25	64	1,043.2	2,651.2
Stewart WWTP	MNG580077	Controlled	0.841	25	64	175.5	445.9
					Total Loads	2,316.6	5,887.1

Excerpted from the TMDL document

Table 4-9. Ammonia concentration and loading assumptions for point sources in the Buffalo Creek Watershed.

Facility	Permit	Facility Type	Effluent Design Flow (MGD)	Ammonia Concentration Assumption (mg/L)	Converted Ammonia NOD Concentration Assumption (mg/L)	Ammonia Load Assumption (lb/day)	Converted Ammonia NOD Load Assumption (lb/day)
Brownton WWTP	MN0022951	Continuous	0.196	6	26.0	9.8	42.4
Buffalo Lake Advanced Biofuels LLC	MN0063151	Continuous	0.040	6	26.0	2.0	8.7
Buffalo Lake WWTP	MN0050211	Controlled	1.743	6	26.0	87.3	378.0
Gascoyne Materials Handling & Recycling LLC	MN0069612		0.300	6	26.0	15.0	65.0
Glencoe WWTP	MN0022233	Continuous	2.600	6	26.0	130.2	563.8
Hector WWTP	MN0025445	Continuous	0.660	6	26.0	33.0	142.9
Seneca Foods Corp – Glencoe	MN0001236	Continuous	0.450	6	26.0	22.5	97.4
Seneca Foods Corp – Glencoe	MN0001236	Controlled	5.000	6	26.0	250.4	1084.2
Stewart WWTP	MNG580077	Controlled	0.841	6	26.0	42.1	182.3
					Total Loads	592.3	2,564.7

Excerpted from the TMDL document

BOD consists of carbonaceous (CBODu) and nitrogenous (NOD) components. The permitted CBODu load assumptions from Table 4-8, the ammonia load assumptions from Table 4-9, and the design flows were input into the HSPF model as constant loads in place of their observed data.
[Excerpted from the TMDL document]

NPDES MS4s Sources of DO Demand

The Glencoe City MS4 (MS400252) is identified as the only MS4 in the Buffalo Creek watershed. A discussion of the contribution of oxygen demanding pollutants is provided is Section 4.8.2.2 of the TMDL document.

There is only one MS4, Glencoe City MS4 (MS400252), with a municipal boundary located above the Buffalo Creek outlet. The percent flow volume that the Glencoe City MS4 was contributing above the endpoint of the reach was calculated to be 2.1% using HSPF. The percent flow volume contributing was then multiplied by the loading capacity after the MOS and NPDES portion of the WLAs were subtracted.
[Excerpted from the TMDL document]

Construction and Industrial Stormwater Sources of DO Demand

Construction and industrial stormwater sources are discussed in *Section 4.8.2.3* of the TMDL document. General permit numbers are included.

State's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001).... Industrial Stormwater Multi-Sector General Permit (MNR050000).... Sand and Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities (MNG490000).
[Excerpted from the TMDL document]

Bacteria Sources:

A general discussion of potential sources of bacteria are identified in Section 3.6.3 of the TMDL document. The potential sources identified include industrial waste water, municipal wastewater, municipal stormwater runoff, permitted feedlots, runoff from homes and pastures, pet waste, and failing septic systems.

Watershed Sources of Bacteria

Potential watershed sources identified include 15 NPDES permitted concentrated animal feeding operations (CAFOs), non-NPDES registered feedlot operations, pet waste, livestock pastures, and failing septic systems or subsurface sewage treatment systems (SSTS). Tables 3-9 and 3-10 of the TMDL document presents the results of a bacteria accounting exercise for watershed sources.

A bacteria accounting exercise was performed to estimate the total amount of bacteria produced within the direct drainage area of each impaired reach. The accounting *exercise uses available livestock, geographic information systems (GIS), human and pet populations, wildlife population, septic data and literature rates from various studies/sources to estimate bacteria production in each watershed. The purpose of this exercise was to compare the number of bacteria generated by each source to aid in focusing implementation activities. A similar inventory was conducted as part of the Buffalo Creek Bacteria TMDL (Wenck Associates 2013) and therefore the inventory for reach 508 does not include this portion of the watershed. The source inventory for reach 508 also does not include the Headwaters, Hutchinson, and Lester Prairie South Fork Crow River Major subwatersheds since there are currently no bacteria impairments in these subwatersheds. Tables 3-9 and 3-10 below provide a general source assessment summary for each reach based on the watershed bacteria accounting exercise. [Excerpted from the TMDL document]*

Table 3-9. Bacteria production in the JD15 bacteria impaired reach (513) watershed.

Major Category	Source	Animal Units or Individuals in Subwatershed	Bacteria Organisms Produced Per Unit Per Day [Billions of Org.] (8)	Total Bacteria Produced Per Month [Billions of Org.]	Total Bacteria Produced Per Month by Major Category [Billions of Org.]	Percent by Category
Livestock (1)	Horses (Animal Units)	17	58	29,700	12,182,300	99.0%
	Cattle (Animal Units)	1,584	74	4,476,800		
	Chicken/Turkeys (Animal Units)	1,176	21	723,200		
	Swine	7,087	33	6,952,600		
Wildlife	Deer (3)	597	0.5	9,000	12,800	0.1%
	Waterfowl (4)	995	0.4	11,900		
Human	Failing Septic Systems (5)	133	2	7,980	8,160	<0.1%
	WWTP effluent (6)	3	2	180		
Domestic Animals (2)	Improperly Managed Pet Waste (7)	758	4	102,300	102,300	0.8%

(1) Livestock animal units estimated based on MPCA registered feedlot database
(2) Calculated based on # of households in watershed multiplied by 0.58 dogs/ household and 0.73 cates/household according to the Southeast Minnesota Regional TMDL (MPCA, 2012)
(3) Assumes average deer density of 6 deer/mi2 (DNR Willmar Office, personal communication)
(4) Estimated from the DNR and U.S. Fish & Wildlife Service 2011 Waterfowl Breeding Population Survey (Minnesota DNR, 2011)
(5) Based on county SSTS inventory failure rates (MPCA, 2013) and rural population estimates
(6) Based on WWTP effluent data from facility discharge monitoring reports (DMRs)
(7) Estimated that 35% of the bacteria produced per month attributed to pet waste is improperly managed and available for runoff (CWP, 1999)
(8) Derived from literature rates in Metcalf and Eddy (1991), Horsley and Witten (1996), Alderisio and De Luca (1999), ASAE Standards (1998) and the Southeast Minnesota Regional TMDL (MPCA, 2012). Values have been reported to two significant digits.

Excerpted from the TMDL document

Table 3-10. Bacteria production in the South Fork Crow River Subwatershed that drains directly to reach 508.

Major Category	Source	Animal Units or Individuals in Subwatershed	Bacteria Organisms Produced Per Unit Per Day [Billions of Org.] (8)	Total Bacteria Produced Per Month [Billions of Org.]	Total Bacteria Produced Per Month by Major Category [Billions of Org.]	Percent by Category
Livestock (1)	Horses (Animal Units)	715	58	1,248,400	28,243,300	93.5%
	Cattle (Animal Units)	11,979	74	25,472,300		
	Chicken/Turkeys (Animal Units)	4	21	2,500		
	Swine	1,550	33	1,520,100		
Wildlife	Deer (3)	1,048	0.5	15,700	36,700	0.1%
	Waterfowl (4)	1,746	0.4	21,000		
Human	Failing Septic Systems (5)	375	2	22,500	22,860	<0.1%
	WWTP effluent (6)	6	2	360		
Domestic Animals (2)	Improperly Managed Pet Waste (7)	14,060	4	1,898,000	1,898,000	6.3%

(1) Livestock animal units estimated based on MPCA registered feedlot database
(2) Calculated based on # of households in watershed multiplied by 0.58 dogs/ household and 0.73 cates/household according to the Southeast Minnesota Regional TMDL (MPCA 2012)
(3) Assumes average deer density of 6 deer/mi2 (DNR Willmar Office, personal communication)
(4) Estimated from the DNR and U.S. Fish & Wildlife Service 2011 Waterfowl Breeding Population Survey (Minnesota DNR 2011)
(5) Based on county SSTS inventory failure rates (MPCA 2013) and rural population estimates
(6) Based on WWTP effluent data from facility discharge monitoring reports (DMRs)
(7) Estimated that 35% of the bacteria produced per month attributed to pet waste is improperly managed and available for runoff (CWP 1999)
(8) Derived from literature rates in Metcalf and Eddy (1991), Horsley and Witten (1996), Alderisio and De Luca (1999), ASAE Standards (1998) and the Southeast Minnesota Regional TMDL (MPCA 2012). Values have been reported to two significant digits.

Excerpted from the TMDL document

WWTP Sources

NPDES permitted WWTP are identified in Table 4-12 of the TMDL document

There are 13 active permitted NPDES surface wastewater dischargers in the impaired reach watersheds that will require E. coli *allocations (Table 4-12, Figure 1-1)*

Table 4-12. NPDES permitted wastewater dischargers in the bacteria impaired reach watersheds.

Impaired Reach	Facility Name	NPDES ID#	Major Subwatershed	Facility Type	Effluent Design Flow (MGD)	Allocated Load (billions organisms/ day)
513	Buffalo Lake WWTP	MN0050211	Judicial Ditch 15	Controlled	1.74	8.31
513	Hector WWTP	MN0025445	Hector WWTP	Continuous	0.66	3.15
					Reach 513 Total	**11.46**
508	Delano WWTP	MN0051250	SFC River	Continuous	2.20	10.49
508	Mayer WWTP	MN0021202	SFC River	Continuous	0.44	2.07
508	New Germany WWTP	MN0024295	SFC River	Controlled	0.38	1.81
508	Watertown WWTP	MN0020940	SFC River	Continuous	1.26	6.02
508	Cedar Mills WWTP	MN0066605	Hutchinson - SFC	Controlled	0.20	0.93
508	Cosmos WWTP	MNG580056	Hutchinson - SFC	Controlled	0.45	2.14
508	Hutchinson WWTP	MN0055832	Lester Prairie - SFC	Continuous	5.43	25.90
508	Lake Lillian WWTP	MNG580225	Headwaters - SFC	Controlled	0.39	1.87
508	Lester Prairie WWTP	MN0023957	Lester Prairie - SFC	Continuous	0.36	1.74
508	Silver Lake WWTP	MNG580164	Lester Prairie - SFC	Controlled	1.32	6.29
508	Winsted WWTP	MN0021571	Lester Prairie - SFC	Continuous	0.82	3.91
					Reach 508 Total	**63.17**

Excerpted from the TMDL document

<u>MS4 Sources</u>

Table 4-13 of the TMDL document provides a listing of the MS4s present in reach 508 of the South Fork Crow River Watershed, including permit numbers. No MS4s are identified as contributing bacteria loads to the Judicial Ditch 15 stream segment.

There are eight MS4s that are completely within or have a portion of their municipal boundary in the impaired reach watersheds (Table 4-13; Figure 1-1) and are therefore assigned WLAs.
[Excerpted from the TMDL document]

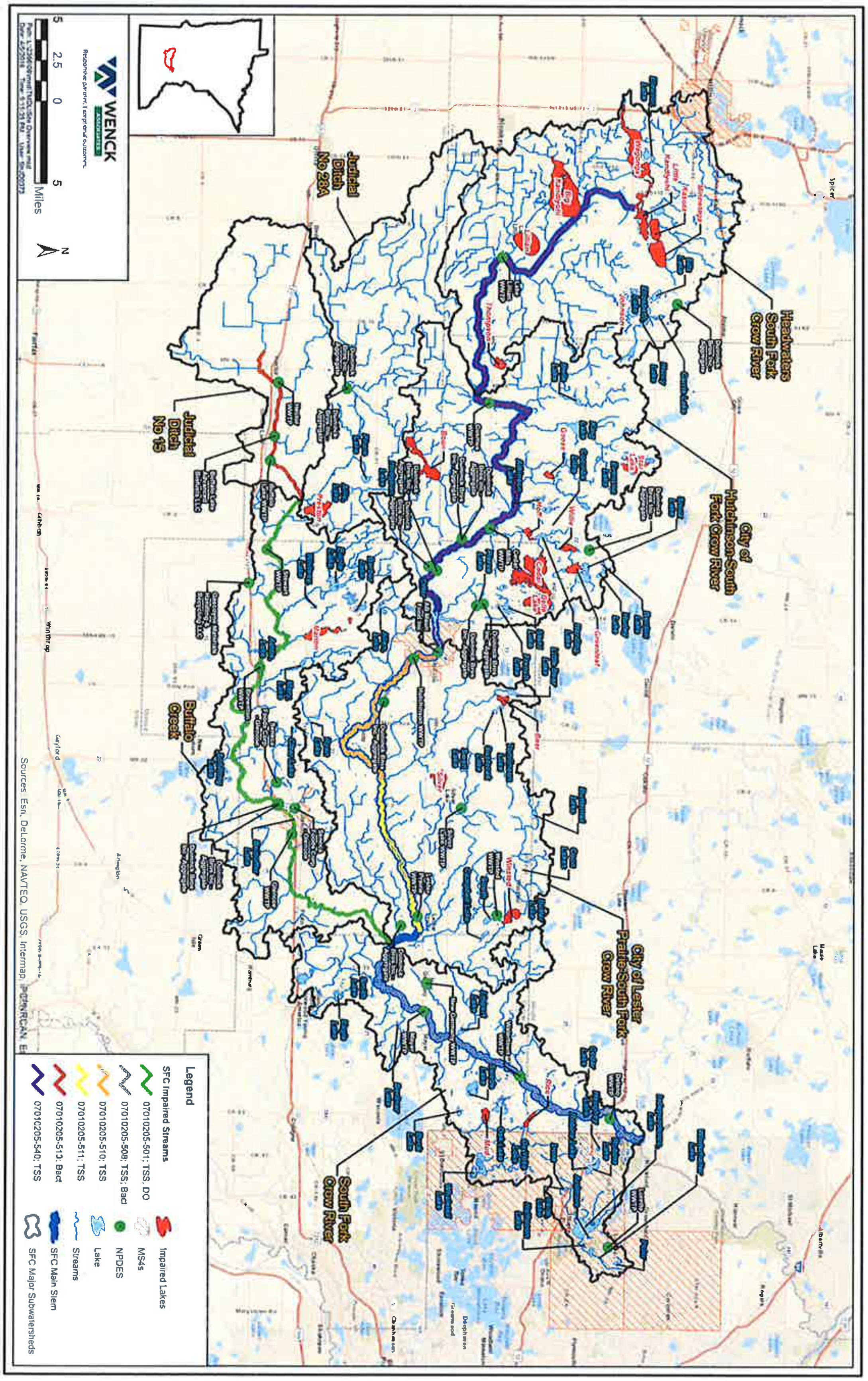

Figure 1-1. South Fork Crow River Watershed impairments addressed in this TMDL study.

Table 4-13. Summary of permitted MS4s in the bacteria impaired reach watersheds.

TMDL Reach	MS4	Permit #	Area within watershed (acres)	Percent of Watershed
508	Corcoran City MS4	MS400081	164	0.03%
508	Hutchinson City MS4	MS400248	5,665	1.01%
508	Independence City MS4	MS400095	17,981	3.21%
508	Loretto City MS4	MS400030	68	0.01%
508	Maple Plain City MS4	MS400103	485	0.09%
508	Medina City MS4	MS400105	4,397	0.79%
508	Minnetrista City MS4	MS400106	7,093	1.27%
508	Willmar City MS4	MS400272	2,693	0.48%

Excerpted from the TMDL document

Construction and Industrial Stormwater Sources of Bacteria

Construction and industrial stormwater are not identified as sources of bacteria.

Phosphorus Sources

Section 3.6.4 of the TMDL document discusses potential sources of P to the impaired lakes. Additional details of how sources were quantified are provided in Section 4.6 of the TMDL document. NPDES permitted potential sources of P are discussed in Section 4.10 of the TMDL document and shown in Table 3-11.

WWTP

No NPDES permitted municipal or industrial waste water dischargers are identified as contributing P to the impaired lakes.

There is currently no permitted wastewater dischargers located in the impaired lake watersheds.
[Excerpted from the TMDL document]

MS4s

There are four MS4s that are completely within or have a portion of their municipal boundary in at least one of the impaired lake watersheds (Table 4-16).
[Excerpted from the TMDL document]

Table 4-16. Summary of permitted MS4s in the impaired lake watersheds.

Lake	MS4	Permit #	Area within watershed (acres)*	Percent of Watershed*
Mud	Minnetrista City	MS400106	783	16%
Rice	Minnetrista City	MS400106	3,975	25%
	Maple Plain City	MS400103	485	3%
	Independence City	MS400095	8,282	53%
Wakanda	Willmar City	MS400272	9533	41%

*Does not include upstream lake boundary condition MS4 area

Excerpted from the TMDL document

Construction and Industrial Stormwater

Construction and Industrial stormwater are identified as potential sources of P in Table 3-11 of the TMDL document.

Table 3-11. Potential permitted sources of phosphorus.

Permitted Source	Source Description	Phosphorus Loading Potential
Phase II Municipal Stormwater NPDES/SDS General Permit	Municipal Separate Storm Sewer Systems (MS4s)	Potential for runoff to transport sediment, grass clippings, leaves, and other phosphorus-containing materials to surface water through a regulated MS4 conveyance system.
Construction Stormwater NPDES/SDS General Permit	Permits for any construction activities disturbing: 1) One acre or more of soil, 2) Less than one acre of soil if that activity is part of a "larger common plan of development or sale" that is greater than one acre or 3) Less than one acre of soil, but the MPCA determines that the activity poses a risk to water resources.	The EPA estimates a soil loss of 20 to 150 tons per acre per year from stormwater runoff at construction sites. Such sites vary in the number of acres they disturb.
Multi-sector Industrial Stormwater NPDES/SDS General Permit	Applies to facilities with Standard Industrial Classification Codes in ten categories of industrial activity with significant materials and activities exposed to stormwater.	Significant materials include any material handled, used, processed, or generated that when exposed to stormwater may leak, leach, or decompose and be carried offsite.

Watershed Sources of P

Table 3-12 of the TMDL document describes phosphorus sources that are not regulated by the NPDES program. Table 3-12 of the TMDL document provides a categorization and identification of the primary and secondary sources of P to each of the impaired lakes.

Phosphorus loading from a lake's watershed can come from a variety of sources such as fertilizer, manure, and the decay of organic matter. Wind and water action erode the soil, detaching particles and conveying them in stormwater runoff to nearby waterbodies where the phosphorus that comes with the soil becomes available for algal growth (Table 3-11). Organic material such as leaves and grass clippings can leach dissolved phosphorus into standing water and runoff or be conveyed directly to waterbodies where biological action breaks down the organic matter and releases phosphorus.... [Excerpted from the TMDL document]

Internal loading of P from bottom sediments.

For many lakes, especially shallow lakes, internal sources can be a significant portion of the TP load. Under anoxic conditions at the lake bottom, weak iron-phosphorus adsorption bonds on sediment particles break, releasing phosphorus into the water column in a form highly available for algal uptake. In many lakes, high internal loading rates are the result of a large pool of phosphorus in the sediment that has accumulated

over several decades of watershed loading to the lake.
[Excerpted from the TMDL document]

Table 3-12. Potential non-permitted sources of phosphorus.

Non-Permitted Source	Source Description
Atmospheric Phosphorus Loading	Precipitation and dryfall (dust particles suspended by winds and later deposited).
Watershed Phosphorus Export	Variety in land use (see Table 3-3) creating both rural and urban stormwater runoff that does not pass through a regulated MS4 conveyance system.
Internal Phosphorus Release	Release from lake bottom sediments during periods of low dissolved oxygen; release from aquatic vegetation during senescence and breakdown.
Failing SSTS	SSTS failures on lakeshore homes can contribute to lake nutrient impairments.

Excerpted from the TMDL document

<u>Nonconforming Subsurface Sanitary Treatment Systems (SSTS)</u>

Section 4.10.1.2 of the TMDL document describes how the HSPF model was utilized to estimate the phosphorus loadings from failing septic systems.

Failing or nonconforming SSTSs can be an important source of phosphorus to surface waters. Currently, knowledge of the exact number and status of SSTSs in the South Fork Crow River Watershed is unclear. The MPCA's 10-year Plan to upgrade and maintain Minnesota's On-Site Treatment Systems (MPCA 2013) includes some information regarding the performance of SSTSs in the South Fork Crow River Watershed. To address failing SSTSs and phosphorus loading to impaired lakes, HSPF modeled phosphorus loading from SSTS was used in the BATHTUB lake response models.
[Excerpted from the TMDL document]

<u>Loadings from Upstream Lakes</u>

Section 4.10.1.3 of the TMDL document discusses loadings from upstream lakes.

...lake outflow loads from the upstream lakes were routed directly into the downstream lake and were estimated using flow results from the HSPF model, and monitored lake water quality data.
[Excerpted from the TMDL document]

<u>Atmospheric Deposition</u>

Section 4.10.1.4 of the TMDL document discusses P loads from atmospheric deposition.

Atmospheric inputs of phosphorus from wet and dry deposition were estimated using published rates based on annual precipitation (Barr Engineering 2004).
[Excerpted from the TMDL document]

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

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

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. (40 C.F.R. §130.7(c)(1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.
The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether or not the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

Section 2 Review Comments:

Applicable WQS are identified, described, and a numerical water quality target is included.

TSS:
Section 2.1 discusses the WQS applicable to the 4 TSS impaired reaches of the South Fork Crow River.

... a committee of MPCA staff across several divisions met for over a year to develop TSS criteria to replace the current turbidity standards. These TSS criteria are regional in scope and based on a combination of both biotic sensitivity to TSS concentrations and reference streams/least impacted streams as data allow. The results of the TSS criteria development were published by the MPCA in 2011, and proposed a 65 mg/L TSS standard for Class 2B waters in the Southern River Nutrient Region that may not be exceeded more than 10% of the time over a multi-year data window (MPCA 2011). The assessment season is identified as April through September.
[Excerpted from the TMDL document]

Dissolved Oxygen TMDLs:
Section 2.2 of the TMDL document discusses the WQS applicable to the reach of Buffalo Creek impaired for low dissolved oxygen.

Minnesota's standard for DO in Class 2B waters is a daily minimum of 5.0 mg/L, as set forth in Minn. R. 7050.0222 (4). This DO standard requires compliance with the standard 50% of the days at *which the flow of the receiving water is equal to the 7-day, 10 year low-flow condition ($7Q_{10}$). [Excerpted from the TMDL document]*

Bacteria TMDLs:

Section 2.3 of the TMDL document discusses the WQS applicable to the two stream reaches impaired by bacteria.

E. coli concentrations are not to exceed 126 colony forming units per 100 milliliters (cfu/100 ml) as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than 10% of all samples taken during any calendar month individually exceed 1,260 cfu/100 ml. The standard applies only between April 1 and October 31.
[Excerpted from the TMDL document]

Phosphorus TMDLs:

Section 2.4 of the TMDL document discusses the water quality standards applicable to the lakes impaired by nutrients. Table 2-1 provides numeric water quality criteria for Total Phosphorus as well as for the response variables Chlorophyll-a, and Secchi Disk Transparency.

Under Minn. R. 7050.0150 and 7050.0222, subp. 4, the lakes addressed in this study are shallow and deep lakes located within the North Central Hardwood Forest (NCHF) and the Western Cornbelt Plain (WCBP) Ecoregions with numeric targets listed in Table 2-1.
[Excerpted from the TMDL document]

Table 2-1. Numeric standards for lakes in the NCHF and WCBP Ecoregions.

Parameter	NCHF Ecoregion Standards (shallow lakes[1])	NCHF Ecoregion Standards (deep lakes)	WCBP Ecoregion Standards (shallow lakes[1])	WCBP Ecoregion Standards (deep lakes)
Total Phosphorus [µg/L]	60	40	90	65
Chlorophyll-a [µg/L]	20	14	30	22
Secchi Disk Transparency [meters]	1.0	1.4	0.7	0.9

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

<u>The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. If the target is not pollutant of concern, the linkage between the surrogate and POC is described.</u>

TSS / Turbidity TMDLs:

The numeric water quality target is expressed directly as a concentration of the pollutant of concern (TSS). The HSPF model is used to both estimate the contributions of existing sources (Section 3.6.1) and determine the loading reductions needed to attain the numeric water quality concentration (Section 4.7).

Dissolved Oxygen TMDLs:

The linkage between the pollutants of concern, biochemical oxygen demand, and the numeric water quality target of dissolved oxygen concentrations are discussed in Section 3.6.2 and Section 4.8 of the TMDL document. Section 3.6.2.2. addresses the issue of oxygen demand and how it is linked to the pollutants of concern. The HSPF model is utilized to assess the main drivers of oxygen demand and resulting dissolved oxygen levels. Reaeration, phytoplankton and benthic algae contribute dissolved oxygen to the water column while oxygen demanding chemicals consume dissolved oxygen. The results are presented in the TMDL document as Figure 3-16.

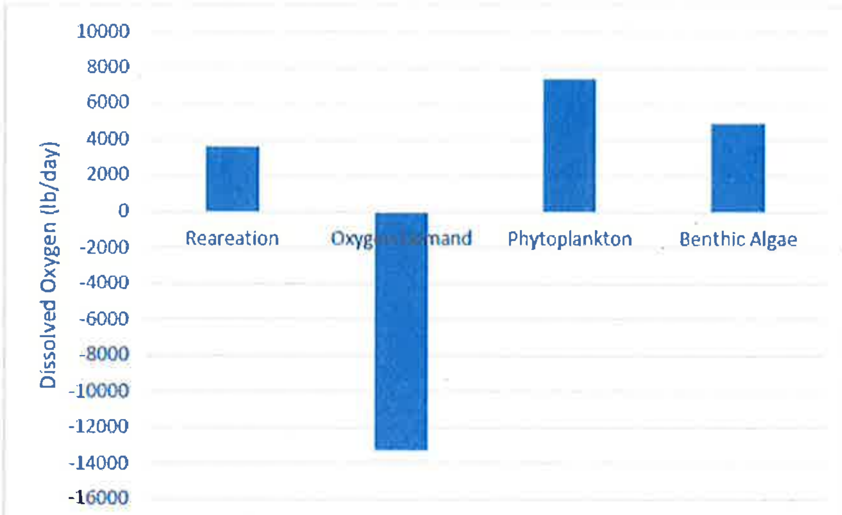

Figure 3-16. HSPF modeled drivers of dissolved oxygen in Buffalo Creek (AUID 07010205-501).

Excerpted from the TMDL document

Bacteria TMDLs:

The numeric water quality target is expressed directly as a concentration of *E. coli* . *E. coli* is the commonly used indicator organism and the water quality standard is set based on *E. coli* concentrations. Section 3.6.3 of the TMDL document discusses the relationship between the sources of bacteria to the respective watersheds and the concentration of *E. coli* in the impaired waters.

Phosphorus TMDLs:

The numeric water quality target is expressed directly as a concentration of the pollutant of concern (P), and additionally as the related water quality standards of chlorophyll-a concentration and secchi disk depth. Under MN water quality standards, achievement of the total P water quality criterion is assumed to achieve the response variable criteria chlorophyll-a and secchi disk depth. A discussion of the significant sources of P and their potential contributions is presented in Section 3.4.6 of the TMDL document.

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

Section3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a waterbody for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).
The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is additionally 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.

Section 3 Review Comments:

The Method to establish cause and effect relationship between the POC and the numerical target is documented, and the loading capacity is presented for the POC (including daily loads).

An HSPF model was developed and used to develop TMDLs for all four pollutants of concern.

> *To determine the loading capacity, oxygen demand rates were adjusted in the HSPF model until model-predicted minimum daily DO in the impaired reach was below the 5.0 mg/L standard less than 5% of the open water months (April through November) during the modeled years (2003 through 2013).*
> *[Excerpted from the TMDL document]*

> *An HSPF basin runoff model was developed in 2011/2012 and updated in 2015 for the Crow River Watershed, including South Fork Crow River. The model application*

predicts the range of flows that have historically occurred in the modeled area, the load contributions from a variety of point and nonpoint sources in a watershed, and the source contributions when paired flow and concentration data are limited. [Excerpted from the TMDL document]

Pollutant loading capacity for the impaired stream reaches were developed using duration curves. The LDCs incorporate flow and water quality across stream flow regimes and provide loading capacities and a means of estimating load reductions necessary to meet water quality standards. To develop the LDCs, HSPF simulated average daily flow values for each reach from 2000 through 2013 were multiplied by the appropriate water quality standard and converted to daily loads to create "continuous" LDCs. For the purposes of this TMDL, the baseline year for implementation will be 2007, which represents the mid range year of the HSPF flow record used to construct the LDCs (See section 8.2). The LDCs presented throughout this report were divided into flow zones including very high (0% to 10%), high (10% to 40%), mid (40% to 60%), low (60% to 90%), and very low (90% to 100%) flow conditions. For simplicity, only the median (or midpoint) load of each flow zone is used to show the TMDL equation components in the TMDL tables. However, it should be understood that the entire curve represents the TMDL and is what is ultimately approved by the EPA.
[Excerpted from the TMDL document]

TSS TMDLs Loading Capacity

The TMDL target was established directly in terms meeting numerical water quality criteria for TSS. Load duration curves were developed to represent the loading capacity of the impaired reaches which vary based on flow. Historical flows were used to establish the underlying flow duration curve. A complete documentation of the methodology used is presented in Section 4 of the TMDL document.

The loading capacities for the four TSS impaired segments are presented as load duration curves in Figures 4-1 through 4-5 of the TMDL document. Tables 4-3 through 4-7 present numerical values representative of the TSS daily loading capacities (TDLC) for the 5 divisions of the flow duration curve broken down by flow zones, (Very High, High, Mid, Low, Very Low).

Note that reaches 501 and 510 are no longer listed as impaired for turbidity and therefore the TMDLs presented here are for informational purposes only and are not subject to EPA review and approval.

The TDLC can also be compared to current conditions by plotting individual load measurements (green squares in LDCs) for each water quality sampling event. Each value that is above the TDLC lines (blue line) represents an exceedance of the standards while those below the lines are below the water quality standards. The

difference between the blue line and the green squares provides a general percent reduction in TSS that will be needed to remove each reach from the impaired waters list. Simulated loads are also shown on the LDCs as light grey dots, as these were used to determine exceedances. A simulated load for every day from 2003 through 2013 is shown on the plot. The curves are divided into flow zones including very high (0% to 10%), high (10% to 40%), mid (40% to 60%), low (60% to 90%), and very low (90% to 100%) [EPA 2007]. The TSS LDCs and TMDL Tables by reach are shown for Buffalo Creek, and then from upstream to downstream along the South Fork Crow River in Figures 4-1 through 4-5 and Tables 4-3 through 4-7. Current loads calculated using the 90th percentile of the HSPF simulated TSS loads were used, with loading capacities calculated using median flows in each flow zone to determine required reductions.
[Excerpted from the TMDL document]

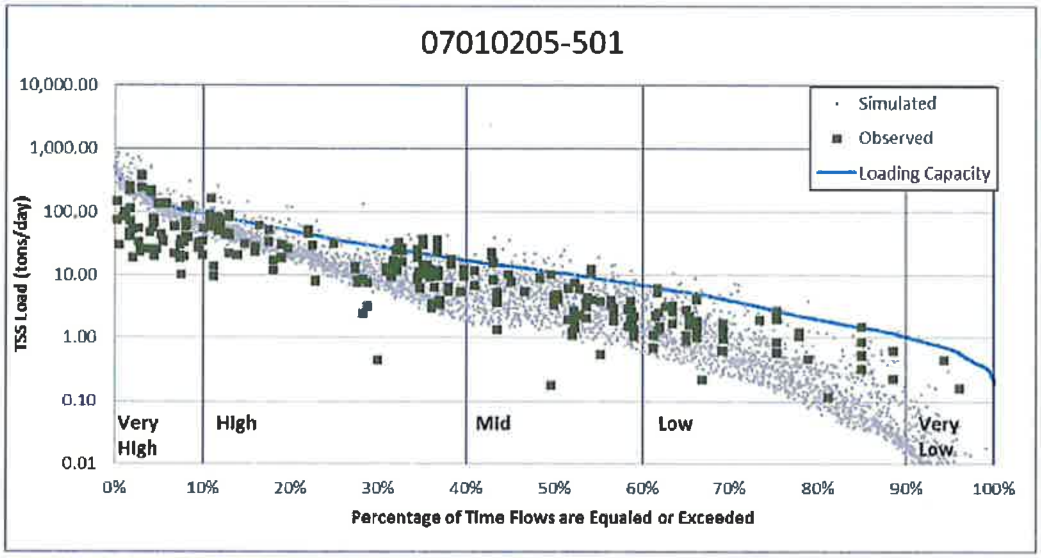

Figure 4-1. Buffalo Creek (07010205-501) TSS load duration curve.

Table 4-3. Buffalo Creek (07010205-501) TMDL allocations.

		Flow Zone*				
		Very High	High	Mid	Low	Very Low
		TSS Load (tons/day)				
Wasteload	Total WLA	4.9	2.7	2.1	1.9	*
	Permitted Wastewater Dischargers	1.9	1.9	1.9	1.9	*
	MS4 Communities (City of Glencoe)	2.7	0.7	0.2	<0.1	*
	Industrial & Construction Stormwater	0.3	0.1	<0.1	<0.1	*
Load	Total LA	126.0	30.3	7.8	0.6	*
	Reach 501 Watershed Nonpoint Source	126.0	30.3	7.8	0.6	*
MOS		14.6	3.7	1.1	0.3	0.1
TOTAL LOAD (TMDL)		145.5	36.7	11.0	2.8	0.7
Existing Load (90th percentile of observed data)		324.0	52.1	9.1	1.8	<0.1
Estimated Reduction (%)		55%	30%	0%	0%	0%

* The WLA for the permitted wastewater dischargers are based on facility design flow. The WLA exceeded the low flow regimes total daily loading capacity and is denoted in the table by a "*". For this flow regime, the WLA and non-point source load allocation is determined by the following formula:
Allocation = (flow contribution from a given source) X (TSS concentration limit or standard)

Excerpted from the TMDL document

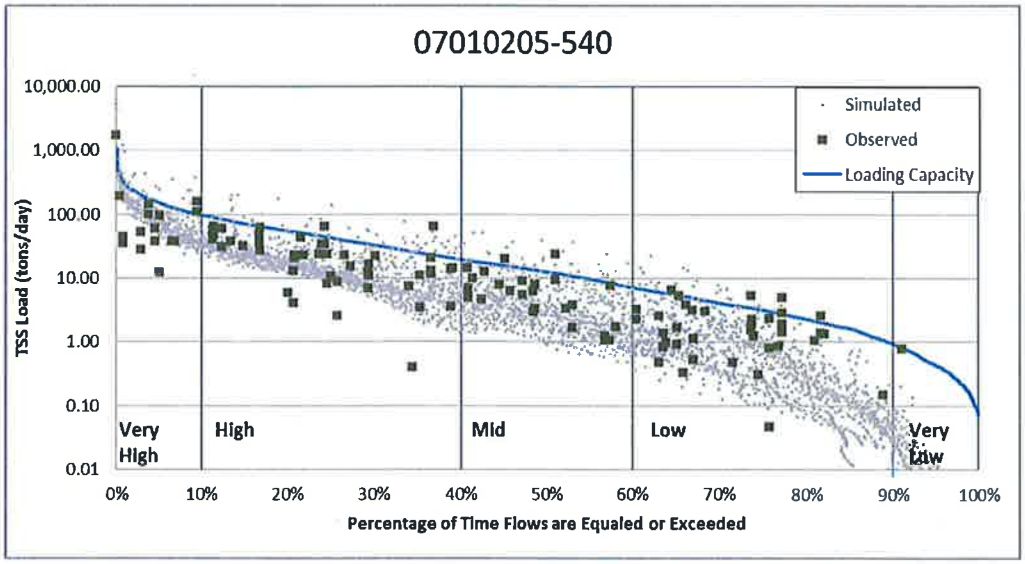

Figure 4-2. South Fork Crow (07010205-540) TSS load duration curve.

Table 4-4. South Fork Crow (07010205-540) TMDL allocations.

		Flow Zone*				
		Very High	High	Mid	Low	Very Low
		TSS Load (tons/day)				
Wasteload	Total WLA	5.1	2.5	1.7	1.5	*
	Permitted Wastewater Dischargers	1.5	1.5	1.5	1.5	*
	MS4 Communities (Cities of Wilmar and Hutchinson)	3.3	0.9	0.2	<0.1	*
	Industrial & Construction Stormwater	0.3	0.1	<0.1	<0.1	*
Load	Total LA	131.3	36.2	9.6	1.4	*
	Reach 540 Watershed Nonpoint Source	131.3	36.2	9.6	1.4	*
MOS		15.2	4.3	1.3	0.3	<0.1
TOTAL LOAD (TMDL)		151.6	43.0	12.6	3.2	0.4
Existing Load		240.1	35.0	9.2	2.2	<0.1
Estimated Reduction (%)		37%	0%	0%	0%	0%

* The WLA for the permitted wastewater dischargers are based on facility design flow. The WLA exceeded the low flow regimes total daily loading capacity and is denoted in the table by a "*". For this flow regime, the WLA and non-point source load allocation is determined by the following formula:
Allocation = (flow contribution from a given source) X (TSS concentration limit or standard)

Excerpted from the TMDL document

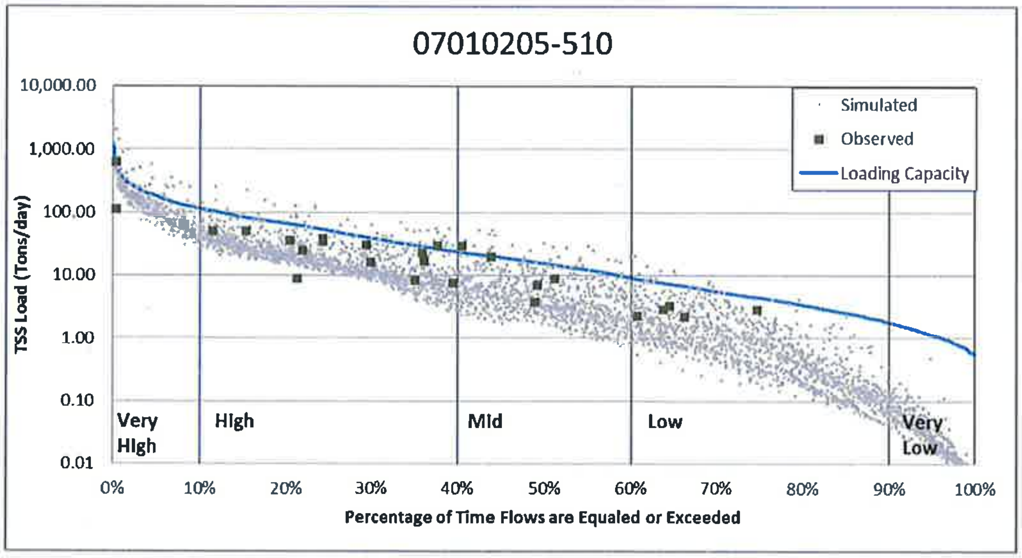

Figure 4-3. South Fork Crow (07010205-510) TSS load duration curve.

Table 4-5. South Fork Crow (07010205-510) TMDL allocations.

		Flow Zone*				
		Very High	High	Mid	Low	Very Low
		TSS Load (tons/day)				
Wasteload	Total WLA	2.9	1.6	1.2	1.1	*
	Permitted Wastewater Dischargers	1.1	1.1	1.1	1.1	*
	MS4 Communities (City of Hutchinson)	1.8	0.5	0.1	<0.1	*
	Industrial & Construction Stormwater	<0.1	<0.1	<0.1	<0.1	*
Load	Total LA	174.2	49.1	14.0	3.3	*
	Upstream Boundary Condition (Reach 540)	151.6	43.0	12.6	3.2	0.4
	Reach 510 Watershed Nonpoint Source	22.6	6.1	1.4	0.1	*
MOS		2.8	0.8	0.3	0.1	0.1
TOTAL LOAD (TMDL)		179.9	51.5	15.5	4.5	*
Existing Load		310.9	42.9	11.8	2.7	0.1
Estimated Reduction (%)		42%	0%	0%	0%	0%

Reach 510

**The WLA for the permitted wastewater dischargers are based on facility design flow. The WLA exceeded the low flow regimes total daily loading capacity (less the MOS) and is denoted in the table by a "*". For this flow regime, the WLA and non-point source load allocation is determined by the following formula:
Allocation = (flow contribution from a given source) X (TSS concentration limit or standard)

Excerpted from the TMDL document

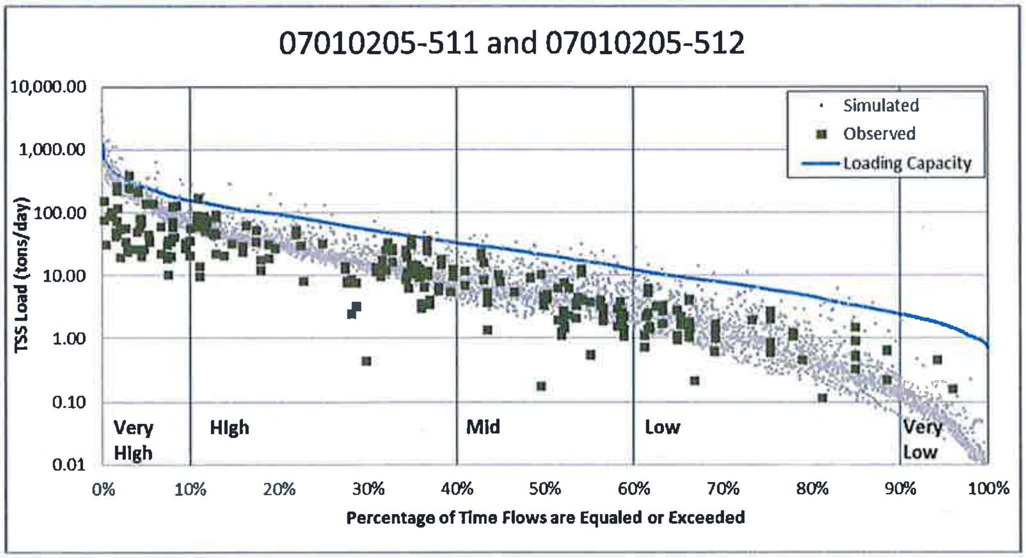

Figure 4-4. South Fork Crow (07010205-511 and 07010205-512) TSS load duration curve.

Table 4-6. South Fork Crow (07010205-511 and 07010205-512) TMDL allocations.

		Flow Zone*				
		Very High	High	Mid	Low	Very Low
		TSS Load (tons/day)				
Wasteload	Total WLA	0.3	0.2	0.2	0.2	0.2
	Permitted Wastewater Dischargers	0.2	0.2	0.2	0.2	0.2
	Industrial & Construction Stormwater	0.1	<0.1	<0.1	<0.1	<0.1
Load	Total LA	241.3	68.7	20.2	5.6	1.4
	Upstream Boundary Condition (Reach 510)	179.9	51.5	15.5	4.5	1.1
	Reach 510 Watershed Nonpoint Source	61.4	17.2	4.7	1.1	0.3
MOS		6.9	1.9	0.5	0.2	<0.1
TOTAL LOAD (TMDL)		248.5	70.8	20.9	6.0	1.6
Existing Load		433.9	57.5	12.7	3.3	0.1
Estimated Reduction (%)		43%	0%	0%	0%	0%

***The WLA for the permitted wastewater dischargers are based on facility design flow. The WLA exceeded the low flow regimes total daily loading capacity (less the MOS) and is denoted in the table by a "*". For this flow regime, the WLA and non-point source load allocation is determined by the following formula:**
Allocation = (flow contribution from a given source) X (TSS concentration limit or standard)

Excerpted from the TMDL document

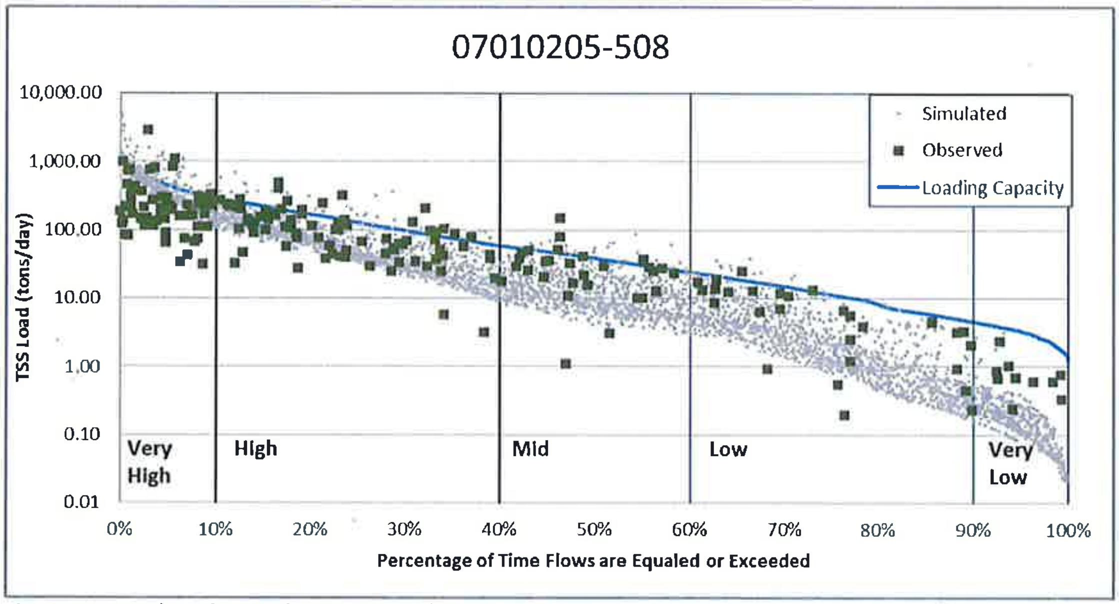

Figure 4-5. South Fork Crow (07010205-508) TSS load duration curve.

Table 4-7. South Fork Crow (07010205-508) TMDL allocations.

		Flow Zone*				
		Very High	High	Mid	Low	Very Low
		TSS Load (tons/day)				
Wasteload	**Total WLA**	**11.1**	**4.8**	**2.0**	**1.1**	**0.8**
	Permitted Wastewater Dischargers	0.8	0.8	0.8	0.8	0.8
	MS4 Communities	10.2	4.0	1.2	0.3	<0.1
	Industrial & Construction Stormwater	0.1	<0.1	<0.1	<0.1	<0.1
Load	**Total LA**	**428.3**	**121.2**	**36.0**	**10.0**	**2.4**
	Upstream Boundary Condition (Reaches 501 & 502)	394.0	107.6	31.9	8.8	2.3
	Reach 508 Watershed Nonpoint Source	34.3	13.6	4.1	1.2	0.1
MOS		**5.1**	**2.1**	**0.7**	**0.3**	**0.1**
TOTAL LOAD (TMDL)		**444.5**	**128.1**	**38.7**	**11.4**	**3.3**
Existing Load (90th percentile of observed data)		869.8	140.1	26.6	8.0	0.3
Estimated Reduction (%)		49%	9%	0%	0%	0%

Excerpted from the TMDL document

In the TMDL tables of this report, only five points on the loading capacity curve are depicted (one for each flow zone). However, it should be understood that the entire curve represents the TMDL. The TMDL is the loading capacity of a reach and is the sum of the LA, the WLA, and a margin of safety (MOS), shown in Equation 1.

TMDL = LA + WLA + MOS (Equation 1)

The LDCs were used to represent the loading capacity. The flow component of the loading capacity curve is based on the HSPF simulated daily average flows (2003 through 2013), and the concentration component is the TSS concentration criteria of 65 mg/L. The loading capacities presented in the TMDL tables are the products of the median simulated flow in each flow zone, the TSS concentration criterion, and a unit conversion factor.
[Excerpted from the TMDL document]

Bacteria TMDLs Loading Capacity

The TMDL target was established directly in terms meeting numerical water quality criteria for *E. coli*. Load duration curves were developed to represent the loading capacity of the impaired reaches which vary based on flow. Historical flows were used to establish the underlying flow duration curves. A complete documentation of the methodology used is presented in Section 4.9 of the TMDL document.

The loading capacity for each reach is presented as load duration curves in units of billions of *E. coli* colony forming units per day in Figure 4-6 for JD15, and Figure 4-7 for South Fork Crow River reach 508 of the TMDL document.

Tables 4-14. and 4-15 provide summaries of the TMDL values for the midpoints of the 5 flow regimes in terms of billions of *E. coli* organisms per day.

The loading capacity for each bacteria impaired reach was developed using LDCs. To develop each E. coli LDC, HSPF daily flow values for each reach were multiplied by the 126 cfu/100 mL standard and converted to a daily load to create a "continuous" LDC. E. coli LDCs for each impaired reach are shown in Figures 4-6 and 4-7.
[Excerpted from the TMDL document]

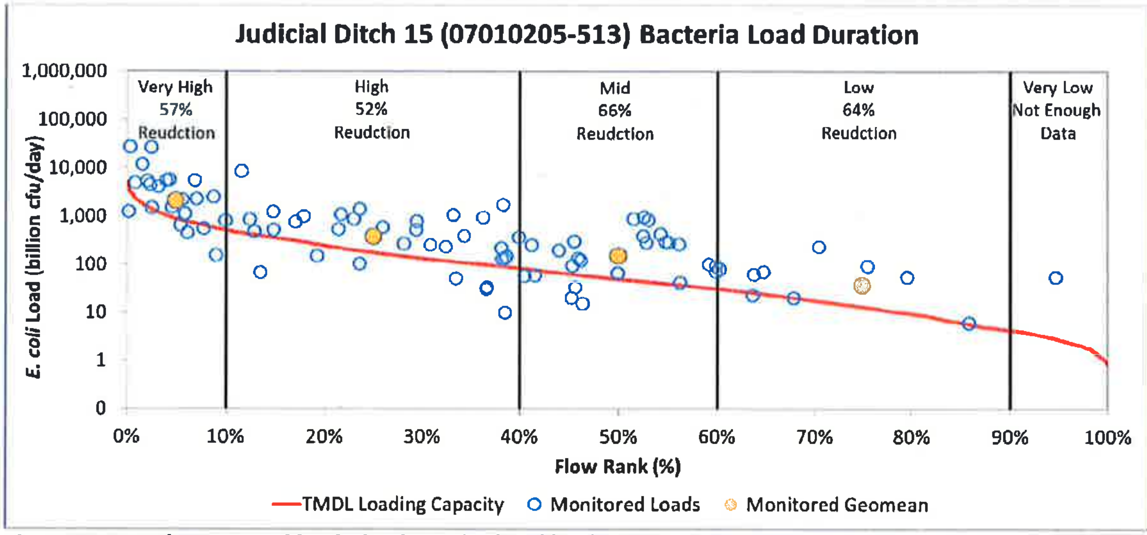

Figure 4-6. ***E. coli*** **monitored loads, load standard and load reductions for JD15 reach 513.**

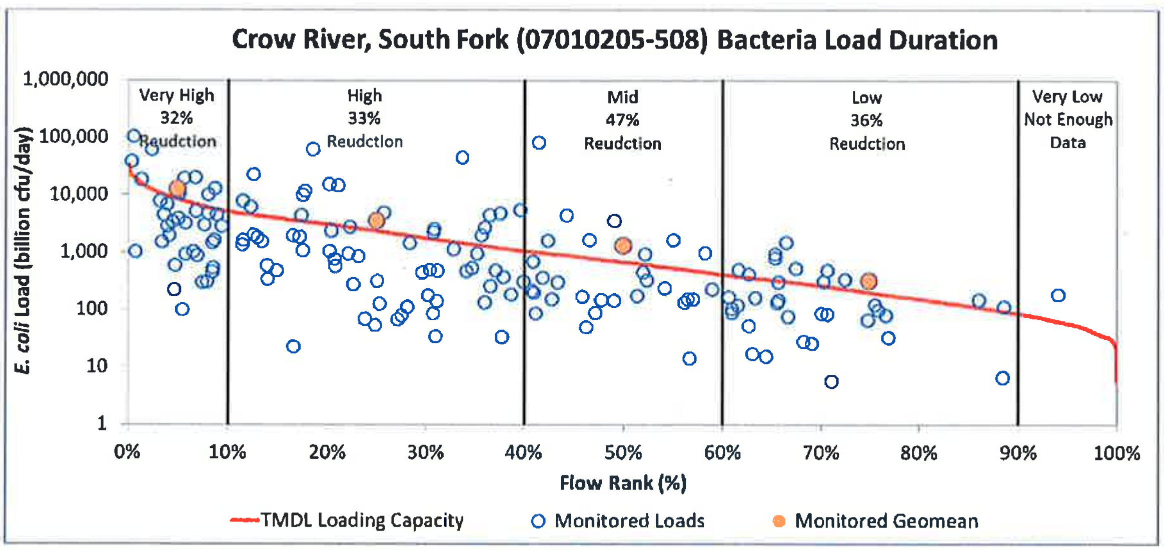

Figure 4-7. ***E. coli*** **monitored loads, load standard and load reductions for South Fork Crow River reach 508.**

Excerpted from the TMDL document

Table 4-14. South Fork Crow River reach 508 *E. coli* TMDL.

		Flow Regime*				
		Very High	High	Mid	Low	Very Low
		E. coli in billions of cfu/day				
Wasteload	**Total WLA**	**613.29**	**213.82**	**106.77**	**76.06**	**
	Corcoran City MS4	*2.34*	*0.64*	*0.19*	*0.05*	**
	Hutchinson City MS4	*80.85*	*22.14*	*6.41*	*1.90*	**
	Independence City MS4	*256.61*	*70.27*	*20.33*	*6.02*	**
	Loretto City MS4	*0.98*	*0.27*	*0.08*	*0.02*	**
	Maple Plain City MS4	*6.92*	*1.90*	*0.55*	*0.16*	**
	Medina City MS4	*62.75*	*17.18*	*4.97*	*1.47*	**
	Minnetrista City MS4	*101.23*	*27.72*	*8.02*	*2.37*	**
	Willmar City MS4	*38.44*	*10.53*	*3.05*	*0.90*	**
	NPDES Wastewater Dischargers (individual allocations summarized in Table 4-1)	*63.17*	*63.17*	*63.17*	*63.17*	**
Load	**Total LA**	**7,373.91**	**1,973.30**	**526.05**	**111.24**	**
	Buffalo Creek Boundary Condition (Reach 501)	*3,909.08*	*965.92*	*275.03*	*70.19*	**
	Watershed LA	*3,464.83*	*1,007,38*	*251.02*	*41.05*	**
MOS		**420.38**	**115.11**	**33.31**	**9.86**	**2.84**
TOTAL LOAD (TMDL)		**8,407.58**	**2,302.23**	**666.13**	**197.16**	**56.89**
Existing Load (geomean of observed data)		12,409.11	3,417.86	1,260.48	306.29	***
Estimated Reduction (%)		32%	33%	47%	36%	***

* HSPF simulated flow was used to develop the flow regimes and loading capacities for this reach
** The WLA for the permitted wastewater dischargers (Table 4-1) are based on facility design flow. The WLA exceeded the dry flow regimes total daily loading capacity and is denoted in the table by "**". For this flow regime, the WLA and LAs are determined by the following formula:
Allocation = (flow contribution from a given source) X (*E. coli* concentration limit or standard)
*** Not enough data at this time to estimate a reduction

Excerpted from the TMDL document

Table 4-15. JD15 reach 513 *E. coli* TMDL summary.

		Flow Regime*				
		Very High	High	Mid	Low	Very Low
		E. coli in billions of cfu/day				
Wasteload	**Total WLA**	**11.46**	**11.46**	**11.46**	**11.46**	**
	NPDES Wastewater Dischargers (individual allocations summarized in Table 4-1)	*11.46*	*11.46*	*11.46*	*11.46*	**
Load	**Total LA**	**827.23**	**157.19**	**36.69**	**1.19**	**
	Watershed LA	*827.23*	*157.19*	*36.69*	*1.19*	**
MOS		**44.14**	**8.88**	**2.53**	**0.67**	**0.14**
TOTAL LOAD (TMDL)		**882.83**	**177.53**	**50.68**	**13.32**	**2.73**
Existing Load (geomean of observed data)		2,061.27	371.27	148.91	37.16	***
Estimated Reduction (%)		57%	52%	66%	64%	***

* HSPF simulated flow was used to develop the flow regimes and loading capacities for this reach
** The WLA for the permitted wastewater dischargers (Table 4-1) are based on facility design flow. The WLA exceeded the dry flow regimes total daily loading capacity and is denoted in the table by "**". For this flow regime, the WLA and LAs are determined by the following formula:
Allocation = (flow contribution from a given source) X (*E. coli* concentration limit or standard)
*** Not enough data at this time to estimate a reduction

Excerpted from the TMDL document

Dissolved Oxygen TMDLs Loading Capacity

The TMDL target to meet dissolved oxygen water quality standards is established in terms of the load of oxygen demanding pollutants and represented as lbs of oxygen demand. The cause and effect relationship between the sources of oxygen demanding pollutants, oxygen demand, and resulting concentrations of D.O. in Buffalo Creek reach 501 is discussed starting in Section 3.6.2 of the TMDL document and continued in Section 4 of the TMDL document. The HSPF model was utilized to estimate the loading capacity of oxygen demanding pollutants that can be tolerated while meeting the WQS for dissolved oxygen. Oxygen demand is used as a general term to encompass a number of pollutants of concern that consume dissolved oxygen. These pollutants and their contributions to overall oxygen demand are discussed in Section 4.8 of the TMDL document. The overall oxygen demand load needed to meet the DO WQS was determined using the HSPF model. The total daily load of oxygen demanding pollutants for Buffalo Creek is presented with units of lbs./day in the TMDL document in Table 4-11 of the TMDL document.

> *The loading capacity in a DO TMDL is the maximum allowable oxygen demand the stream can withstand and still meet water quality standards. To determine the loading capacity, oxygen demand rates were adjusted in the HSPF model until model-predicted minimum daily DO in the impaired reach was below the 5.0 mg/L*

standard less than 5% of the open water months (April through November) during the modeled years (2003 through 2013). The oxygen demand calculated using the TMDL scenario was 5,784 lb/day (a reduction of 57% from the current load of 13,312 lb/day).
[Excerpted from the TMDL document]

Table 4-11. Buffalo Creek Dissolved Oxygen Total Maximum Daily Load.

TMDL Component		HSPF Oxygen Demand* (lbs.'/day)
Total Daily Loading Capacity		5,784
Margin of Safety (MOS)		578
Wasteload Allocations	Permitted Wastewater Dischargers	765
	Glencoe City MS4	95
	Construction and Industrial Stormwater	9
Load Allocation		4,337
Current Load		13,312
Required Reduction		57%

*Oxygen demand accounts for the combination of SOD, NOD, and BOD as discussed in Section 3.6.2.
Excerpted from the TMDL document

Phosphorus TMDLs Loading Capacity

The TMDL target was established directly in terms meeting numerical water quality criteria for Total Phosphorus. The Canfield-Bachman lake response model was utilized to evaluate the impact of phosphorus loading to each lake, including the effects of upstream loads and internal loads from sediment. A detailed discussion of the methodology used is presented in Section 4.10.1 of the TMDL document. Tables 4-17 through 4-39 in Appendix A of the TMDL document present the total daily loading capacity for the impaired lakes in the South Fork Crow River Watershed in units of lbs./day.

Critical Conditions are described and accounted for.

TSS TMDLs

Section 4.7.6 of the TMDL document addresses how critical conditions are accounted for in the TMDLs developed to address TSS impairment. TSS critical conditions are accounted for by the use of a load duration curve which takes into account flow conditions that directly influence water column concentrations of TSS.

Both seasonal variation and critical conditions are accounted for in this TMDL through the application of LDCs. LDCs evaluate water quality conditions across all

flow regimes including high flow runoff conditions where sediment transport tends to be greatest. Seasonality is accounted for by addressing all flow conditions in a given reach.
[Excerpted from the TMDL document]

Dissolved Oxygen TMDLs

Section 4.8.5 of the TMDL document addresses how critical conditions are accounted for in the TMDLs developed to address low dissolved oxygen. Critical conditions for dissolved oxygen are addressed by targeting the TMDL to achieve DO values during the summer months when dissolved oxygen is typically at its lowest concentrations.

Figure 3-7 in Section 3.5.2 shows that the DO exceedances did not occur during the winter where data were available. Therefore, the critical period for DO was determined to be the open water months, and the TMDL was written for the months of April through November.
[Excerpted from the TMDL document]

Bacteria TMDLs

Section 4.9.5 of the TMDL document addresses how critical conditions are accounted for in the TMDLs developed to address bacteria impairment. Critical conditions for *E. coli* production are accounted for by the use of a load duration curve which take into account all flow conditions that directly influence water column concentrations of bacteria.

Critical conditions and seasonal and annual variations are accounted for in these TMDLs by setting the TMDL across the entire observed flow record using the load duration method.
[Excerpted from the TMDL document]

Phosphorus TMDLs

Section 4.10.5 of the TMDL document addresses how critical conditions are accounted for in the TMDLs developed to address phosphorus impairment in the lakes. Lakes respond to phosphorus loads over longer periods of time following an annual cycle in which the summer months see the greatest response to P loading. Loads set to achieve the water quality criteria of the response variables chlorophyll-a and secchi depth during the summer months are assumed to be protective during the other times of the year. Water quality targets in this TMDL are set to be protective of lakes during the summer months, thereby accounting for both seasonal and critical conditions.

Seasonal variation is accounted for through the use of annual loads and developing targets for the summer period, where the frequency and severity of nuisance algal growth will be the greatest. Although the critical period is the summer, lakes are not sensitive to short term changes in water quality, rather lakes respond to long-term changes such as changes in the annual load. Therefore, seasonal variation is

> *accounted for in the annual loads. By setting the TMDL to meet targets established for the most critical period (summer), the TMDL will inherently be protective of water quality during the other seasons.*
> *[Excerpted from the TMDL document]*

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

Section 4. Load Allocations (LAs)

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

Section 4 Review Comments

The load allocations for existing (and future if applicable) nonpoint sources are accounted for.

TSS TMDLs

Section 4.7.4 of the TMDL document addresses the development of load allocations for the stream reaches impaired by suspended sediment.

> *Once WLAs (regulated point sources, construction and industrial stormwater) and MOS were determined for each reach and flow regime, the remaining loading capacity was considered the LA. The LA includes nonpoint pollution sources that are not subject to NPDES permit requirements such as natural background, wind-blown materials, and soil erosion from stream channel and upland areas. The LA also includes runoff from agricultural lands and non-NPDES stormwater runoff.*_
> *[Excerpted from the TMDL document]*

TMDL Summary Tables 4-3 through 4-7 provide numerical values for the TSS load allocations in tons/day for each of the 5 flow regimes included in the load duration curves.

Dissolved Oxygen TMDLs

Section 4.8.3 addresses the development of the load allocation for the stream segment impaired by low dissolved oxygen.

The LA is oxygen demand from non-point sources such as headwater, tributary and groundwater sources and from the sediments. The LA represents the load allowed from nonpoint sources such as direct runoff-related sources as well as organic material and sediment that have settled into the bed and bank and exert oxygen demand. The LA was calculated as the loading capacity minus the MOS and the WLA. [Excerpted from the TMDL document]

Table 4-11. of the TMDL includes a numerical value in lbs/day of oxygen demand.

Bacteria TMDLs

Section 4.9.3 of the TMDL document discusses development of the load allocation for the stream reaches impaired by bacteria.

"The LA, also referred to as the watershed LA, is the remaining load after the MOS and WLAs are subtracted from the total load capacity of each flow zone. The watershed LA includes all non-permitted sources such as outflow from lakes and wetlands in the watershed and runoff from agricultural land, forested land, and non-regulated MS4 residential areas. For this TMDL, the watershed LAs are primarily comprised of agricultural land outside the MS4 boundaries."
[Excerpted from the TMDL document]

Tables 4-14 and 4-15 of the TMDL document provide numerical load allocations in units of billions of organisms per day for the 5 flow regimes utilized in the respective load duration curves.

Phosphorus TMDLs

Section 4.10.1 of the TMDL document addresses the development of the load allocation for lakes impaired by nutrients.

The South Fork Crow River HSPF model was used to estimate phosphorus loading from the watershed and failing SSTSs for each impaired lake. Annual flow and phosphorus output from the HSPF models were incorporated into a spreadsheet version of the Canfield-Bachman lake equation.
[Excerpted from the TMDL document]

Tables 4-17 through 4-39 (pages 83-94 of the TMDL document) present the load allocations for the impaired lakes in the South Fork Crow River Watershed in units of lbs/yr. as well as in lbs/day.

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

Section 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.

Section 5 Review Comments

WLAs are properly assigned

TSS TMDL WLAs

The WLAs were divided into five primary categories including NPDES permitted wastewater dischargers, industrial dischargers, MS4 stormwater, and NPDES-permitted construction and industrial stormwater.
[Excerpted from the TMDL document]

NPDES Permitted municipal and industrial wastewater sources:

Section 4.7.3 of the TMDL document addresses the WLA of TSS for the steam reaches impaired by excess suspended sediment.

Facility maximum daily effluent TSS loads were established and provided by the MPCA and are a function of the facility design flows and permitted TSS *concentration limits (Table 4-1). The WLA was calculated as the product of the TSS effluent limit and permitted facility design flow and a unit conversion factor. [Excerpted from the TMDL document]*

Table 4-1 of the TMDL document provides detailed information on municipal and industrial point sources broken down by impaired reach. TMDL summary Tables 4-3 through 4-7 of the TMDL document provide numerical WLA for the two impaired reaches in units of tons/day for each of the five flow regimes identified in the load duration curves.

MS4 Permitted Sources:

The waste load allocation methodology for MS4 permitted sources is discussed in Section 4.7.3.2 of the TMDL document.

Multiple regulated MS4s have portions of their municipal boundaries within the South Fork Crow River Watershed (Table 4-2). The percent flow volume that all MS4s were contributing above the endpoint of each reach was calculated using HSPF. It was assumed that the MS4 areas draining to an upstream reach addressed with a TSS TMDL were in compliance with their respective TMDL, and therefore upstream MS4 loads were not reallocated for downstream TSS TMDLs. The percent flow volume contributing, which was derived from the HSPF model application, was then multiplied by the loading capacity in each flow zone after the MOS and NPDES portion of the WLAs were subtracted.
[Excerpted from the TMDL document]

Table 4-2 of the TMDL document identifies the MS4 communities subject to WLA and provides the corresponding permit numbers. WLA for each of the MS4 communities are grouped by watershed and provided in the corresponding TMDL summary Tables 4-3 through 4-7.

Construction and Industrial Stormwater Sources:

Section 4.7.3.3 of the TMDL document addresses WLA for construction and industrial site storm water runoff

A categorical WLA was assigned to all construction activity in the watershed. The average annual acres under construction in each applicable county were available from 2009 through 2015 from the MPCA Construction Stormwater Permit data. The percent of each county in the South Fork Crow Watershed was multiplied by the average annual construction acres for that county to determine the acres under construction in the South Fork Crow River Watershed. Finally, percent of area under construction was determined by dividing total construction acres over total watershed acres. This percentage was multiplied by the portion of the TMDL LA associated with

direct drainage to determine the construction stormwater WLA. Average annual construction acres from 2009 through 2015 were determined to occur on 0.06% of the watershed. This was rounded up to 0.1% to represent the construction stormwater WLA to account for future growth.
[Excerpted from the TMDL document]

Industrial stormwater is regulated by NPDES permits if the industrial activity has the potential for significant materials and activities to be exposed to stormwater discharges. The number of acres regulated under 2015 industrial permits was available from MPCA Industrial Stormwater Permit data. The percent of each county in the South Fork Crow Watershed was multiplied by 2015 industrial permitted acres for that county to determine the acres under industrial permits in the South Fork Crow River Watershed. Finally, percent of area with industrial uses was determined by dividing total industrial acres over total watershed acres. Industrial permits in 2015 were determined to occur on 0.06% of the watershed. This was rounded up to 0.1% to represent the industrial stormwater WLA to account for future growth.
[Excerpted from the TMDL document]

General permit numbers for both categories of stormwater are included in the TMDL document text.

The BMPs and other stormwater control measures that should be implemented at construction sites are defined in the State's NPDES/State Disposal System (SDS) General Stormwater Permit for Construction Activity (MNR100001).
[Excerpted from the TMDL document]

The BMPs and other stormwater control measures that should be implemented at the industrial sites are defined in the State's NPDES/SDS Industrial Stormwater Multi-Sector General Permit (MNR050000) or facility specific Individual Wastewater Permit or NPDES/SDS General Permit for Construction Sand and Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities (MNG490000).
[Excerpted from the TMDL document]

TMDL summary Tables 4-3 through 4-7 each include a combined construction and industrial stormwater WLA for each of the impaired segments.

Dissolved Oxygen TMDL WLAs

Section 4.8.2 of the TMDL document discusses the methodology for assigning WLA for dissolved oxygen. The WLAs are divided into three categories: NPDES point source dischargers, permitted MS4s, and construction and industrial stormwater. Table 4-11 of the TMDL document provides WLA for all three sources in terms of lbs. of oxygen demand per day (the combination of SOD, NOD, and BOD).

NPDES Permitted Sources:

The methodology for assigning waste load allocations to NPDES permitted point sources of dissolved oxygen is discussed in Section 4.8.2.1 of the TMDL document. Table 4-10 of the TMDL document provides individual WLAs for each of the NPDES permitted point sources of O2 demand

BOD consists of carbonaceous (CBODu) and nitrogenous (NOD) components. The permitted CBODu load assumptions from Table 4-8, the ammonia load assumptions from Table 4-9, and the design flows were input into the HSPF model as constant loads in place of their observed data. The modeled difference in oxygen demand occurring from this run, and a run with no point sources, was set as the WLA and represents the actual oxygen demand that the permitted wastewater dischargers exert on the TMDL stream segment. The loading assumptions in Tables 4-8 and 4-9 are not comparable to the oxygen demand WLA from wastewater dischargers because the loading assumptions represent the total potential oxygen demand, which is counteracted in-stream by reaeration and other oxygen supplying processes that are simulated in the model application. The "end of pipe" Oxygen Demand wastewater treatment facility WLAs, calculated as the sum of CBODu and NOD loading model inputs are shown in Table 4-10.]
[Excerpted from the TMDL document]

Table 4-10. Oxygen demand WLAs for individual permitted wastewater dischargers.

Facility	Permit	Facility Type	Effluent Design Flow (MGD)	Converted CBODu Load Assumption (lbs/day)	Converted Ammonia NOD Load Assumption (lbs/day)	Oxygen Demand WLA (lbs/day)
Brownton WWTP	MN0022951	Continuous	0.196	41.6	42.4	84.0
Buffalo Lake Advanced Biofuels LLC	MN0063151	Continuous	0.040	12.7	8.7	21.4
Buffalo Lake WWTP	MN0050211	Controlled	1.743	924.4	378.0	1,302.4
Gascoyne Materials Handling & Recycling LLC	MN0069612		0.300	127.3	65.0	192.3
Glencoe WWTP	MN0022233	Continuous	2.600	1,378.6	563.8	1,942.4
Hector WWTP	MN0025445	Continuous	0.660	210.0	142.9	352.9
Seneca Foods Corp – Glencoe	MN0001236	Continuous	0.450	95.4	97.4	192.8
Seneca Foods Corp – Glencoe	MN0001236	Controlled	5.000	2,651.2	1,084.2	3,735.4
Stewart WWTP	MNG580077	Controlled	0.841	445.9	182.3	628.2
			Total Loads	5,887.1	2,564.7	8,451.8

Excerpted from the TMDL document

MS4 Permitted Sources:

Section 4.8.2.2 discusses calculation of the WLA for the Glencoe City MS4 (MS400252). Table 4-10 of the TMDL document. Buffalo Creek Dissolved Oxygen Total Maximum Daily Load includes a WLA for the Glencoe City MS4 in units of lbs of oxygen demand per day.

There is only one MS4, Glencoe City MS4 (MS400252), with a municipal boundary located above the Buffalo Creek outlet. The percent flow volume that the Glencoe City MS4 was contributing above the endpoint of the reach was calculated to be 2.1% using HSPF. The percent flow volume contributing was then multiplied by the loading capacity after the MOS and NPDES portion of the WLAs were subtracted. [Excerpted from the TMDL document]

Construction and Industrial Stormwater Sources:

Section 4.8.2.3 of the TMDL document discusses the calculation of a WLA for both construction and industrial stormwater sources based on the percentage of land in the basin historically under construction at a given time, and the area being used for industrial purposes and subject to industrial stormwater permits. MN General Permit numbers are included:

- Construction Activity (MNR100001),
- Industrial Stormwater Multi-Sector General Permit (MNR050000),
- and Industrial Stormwater Multi-Sector General Permit (MNR050000)

A categorical WLA was assigned to all construction activity in the watershed. The average annual acres under construction in each applicable county were available from 2009 through 2015 from MPCA Construction Stormwater Permit data. The percent of each county in the South Fork Crow Watershed was multiplied by the average annual construction acres for that county to determine the acres under construction in the South Fork Crow River Watershed. Finally, percent of area under construction was determined by dividing total construction acres over total watershed acres. This percentage was multiplied by the portion of the TMDL LA associated with direct drainage to determine the construction stormwater WLA. Average annual construction acres from 2009 through 2015 were determined to occur on 0.06% of the watershed. This was rounded up to 0.1% to represent the construction stormwater WLA to account for future growth. [Excerpted from the TMDL document]

The number of acres regulated under 2015 industrial permits was available from MPCA Industrial Stormwater Permit data. The percent of each county in the South Fork Crow Watershed was multiplied by 2015 industrial permitted acres for that county to determine the acres under industrial permits in the South Fork Crow River Watershed. Finally, percent of area under construction was determined by dividing total industrial acres over total watershed acres. Industrial permits in 2015 were determined to occur on 0.06% of the watershed. This was rounded up to 0.1% to represent the industrial stormwater WLA to account for future growth. [Excerpted from the TMDL document]

Table 4-11 of the TMDL document includes a combined WLA for construction and industrial stormwater sources.

Bacteria TMDLs WLAs

Section 4.9.2 of the TMDL document discusses the development of bacterial WLAs for NPDES permitted point sources. The WLAs are divided into two categories, permitted wastewater dischargers, and permitted MS4s.

<u>NPDES Permitted Sources:</u>

Waste Load Allocations for NPDES permitted sources are calculated based on existing discharge permits and facility design flows.

> *There are 13 active permitted NPDES surface wastewater dischargers in the impaired reach watersheds that will require* E. coli *allocations (Table 4-12, Figure 1-1). There are eight additional dischargers in the reach 508 watershed not listed in Table 4-11 that are located in the Buffalo Creek Watershed. These facilities were addressed and allocated as part of the Buffalo Creek Bacteria TMDL (Wenck Associates 2013). The LAs for the six facilities were calculated by multiplying the facility's wet weather design flow by the* E. coli *standard (126 cfu/100 mL). Discharge monitoring reports (DMRs) were downloaded to assess the typical monthly discharge values and bacteria concentrations at which each facility discharges. It should be noted that NPDES wastewater permit limits for bacteria are currently expressed in fecal coliform concentrations, not* E. coli. *However, the fecal coliform permit limit for each WWTF (200 organisms/100 mL) is believed to be equivalent to this TMDLs 126 organism/100 mL* E. coli *criterion. The fecal coliform-*E. coli *relationship is documented extensively in the SONAR for the 2007- 2008 revisions of Minn. R. ch. 7050. Results of DMRs are presented in Appendix A. The WLA for permitted wastewater dischargers is based on facility design flow. For both reaches, however, the WLA exceeds the dry flow regimes daily loading capacity because the facilities in these reaches typically discharge less than their design flows. To account for this, the WLA and nonpoint source LA for this flow regime is determined by the following formula:*
>
> *Allocation = (flow contribution from a given source) X (*E. coli *concentration limit or standard)*

Table 4-12 provides a listing of the waste load allocated to each of the NPDES permitted waste water dischargers to the two reaches impaired by *E.coli* in units of billions of organisms per day.

Tables 4-14 and 4-15. of the TMDL document include total WLA in units of billions of *E. coli* organisms per day.

Table 4-12. NPDES permitted wastewater dischargers in the bacteria impaired reach watersheds.

Impaired Reach	Facility Name	NPDES ID#	Major Subwatershed	Facility Type	Effluent Design Flow (MGD)	Allocated Load (billions organisms/ day)
513	Buffalo Lake WWTP	MN0050211	Judicial Ditch 15	Controlled	1.74	8.31
513	Hector WWTP	MN0025445	Hector WWTP	Continuous	0.66	3.15
					Reach 513 Total	11.46
508	Delano WWTP	MN0051250	SFC River	Continuous	2.20	10.49
508	Mayer WWTP	MN0021202	SFC River	Continuous	0.44	2.07
508	New Germany WWTP	MN0024295	SFC River	Controlled	0.38	1.81
508	Watertown WWTP	MN0020940	SFC River	Continuous	1.26	6.02
508	Cedar Mills WWTP	MN0066605	Hutchinson - SFC	Controlled	0.20	0.93
508	Cosmos WWTP	MNG580056	Hutchinson - SFC	Controlled	0.45	2.14
508	Hutchinson WWTP	MN0055832	Lester Prairie - SFC	Continuous	5.43	25.90
508	Lake Lillian WWTP	MNG580225	Headwaters - SFC	Controlled	0.39	1.87
508	Lester Prairie WWTP	MN0023957	Lester Prairie - SFC	Continuous	0.36	1.74
508	Silver Lake WWTP	MNG580164	Lester Prairie - SFC	Controlled	1.32	6.29
508	Winsted WWTP	MN0021571	Lester Prairie - SFC	Continuous	0.82	3.91
					Reach 508 Total	63.17

MS4 Permitted Sources:

Section 4.9.2.2 of the TMDL document discusses the area weighted methodology utilized for setting WLA for MS4s in the watershed draining to reach 508 (South Fork Crow). There are no MS4s listed as contributing to JD15 (impaired reach 513).

> *Individual MS4 allocations were calculated by multiplying each MS4's percent watershed coverage (determined in GIS) by the total watershed loading capacity (determined by LDCs) after the MOS and NPDES point source dischargers were subtracted.*
> *[Excerpted from the TMDL document]*

Table 4-13. provides a summary of the MS4s, their permit numbers, and their relative contributions to the overall MS4 WLA.

Table 4-13. Summary of permitted MS4s in the bacteria impaired reach watersheds.

TMDL Reach	MS4	Permit #	Area within watershed (acres)	Percent of Watershed
508	Corcoran City MS4	MS400081	164	0.03%
508	Hutchinson City MS4	MS400248	5,665	1.01%
508	Independence City MS4	MS400095	17,981	3.21%
508	Loretto City MS4	MS400030	68	0.01%
508	Maple Plain City MS4	MS400103	485	0.09%
508	Medina City MS4	MS400105	4,397	0.79%
508	Minnetrista City MS4	MS400106	7,093	1.27%
508	Willmar City MS4	MS400272	2,693	0.48%

Excerpted from the TMDL document

A summary of the factors used to compute the WLAs for all MS4s in reach 508 is included in Table 4-13 of the TMDL document. Individual WLAs in terms of billions of cfu/day is provided in Table 4-14 of the TMDL document which is also included in Section 3 of this review document.

Construction and Industrial Stormwater Sources:

WLAs for construction and industrial stormwater sources were not developed since *E. coli* is not a typical pollutant from these sources.

> *WLAs for regulated construction stormwater (Permit #MNR100001) were not developed, since* E. coli *is not a typical pollutant from construction sites. The WLAs for regulated industrial stormwater were also not developed. Industrial stormwater must receive a WLA only if the pollutant is part of benchmark monitoring for an industrial site in the watershed of an impaired waterbody. There are no bacteria or* E. coli *benchmarks associated with any of the Industrial Stormwater Permits (Permit #MNR050000).*
> *[Excerpted from the TMDL document]*

Phosphorus TMDLs WLAs

> *The WLA were divided into four primary categories including NPDES permitted wastewater dischargers, MS4 permits, and NPDES-permitted construction and industrial stormwater.*
> *[Excerpted from the TMDL document]*

Tables 4-17 through 4-39 present the WLAs for the impaired lakes in the South Fork Crow River Watershed in units of lbs. of total phosphorus per day.

NPDES Permitted Sources:

Section 4.10.3.1 of the TMDL document states there are currently no NPDES permitted wastewater dischargers in the watersheds draining into the impaired lakes, and no WLA are provided for NPDES wastewater treatment facilities.

<u>MS4 Permitted Sources:</u>

There are four MS4s that discharge P to one or more of the impaired lake watersheds.

> *These MS4 communities were assigned WLAs by multiplying the percent area of each MS4 by the total annual watershed phosphorus load to each lake.*
> *[Excerpted from the TMDL document]*

Table 4-16 of the TMDL document shows the 4 MS4s located in the watersheds draining to the impaired lakes including the lake they drain into, and their respective MS4 permit number. Figure 1-1 shows general boundaries of the MS4s in the South Fork Crow River Watershed.

Table 4-16. Summary of permitted MS4s in the impaired lake watersheds.

Lake	MS4	Permit #	Area within watershed (acres)*	Percent of Watershed*
Mud	Minnetrista City	MS400106	783	16%
Rice	Minnetrista City	MS400106	3,975	25%
	Maple Plain City	MS400103	485	3%
	Independence City	MS400095	8,282	53%
Wakanda	Willmar City	MS400272	9533	41%

*Does not include upstream lake boundary condition MS4 area

Excerpted from the TMDL document

<u>Construction and Industrial Stormwater Sources:</u>

Section 4.10.3.3 of the TMDL document discusses the allocation of waste load to construction and industrial stormwater sources.

> *Construction and industrial stormwater WLAs were established based on estimated percentage of land in the watershed that is currently under construction or permitted for industrial use. ... To account for future growth (reserve capacity), allocations in the TMDL were rounded up to 0.1% of the total watershed load for construction stormwater, and 0.1% for industrial stormwater.*
> *[Excerpted from the TMDL document]*

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

Section 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.

Section 6 Review Comments:

A margin of safety is provided and justified. If an implicit MOS is used, conservative assumptions are identified, and their relative impacts discussed.

The quality of the data set used for development and calibration of the HSPF model is discussed in several places throughout the TMDL document to support the selection of the margins of safety.

Data requirements for developing and calibrating an HSPF model application are both spatially and temporally extensive. The model evaluation period was from 2000 through 2013. Time-series data used in developing the model application included meteorological, atmospheric deposition, and point-source data. Precipitation, potential evapotranspiration, air temperature, wind speed, solar radiation, dewpoint temperature, and cloud cover data are used in HSPF to simulate hydrology (including snow processes).
[Excerpted from the TMDL document]

Stream discharge sites with time-series monitoring data were used for calibration and validation. Data from all but the first year of the simulation period were used to calibrate the model. The model simulated the conditions in 1999 (one year prior to the model period) to allow it to adjust to existing conditions. The 13-year simulation period covered a range of dry years (2000, 2003, 2006, and 2008) and wet years (2002, 2005, and 2010).
[Excerpted from the TMDL document]

The 13-year simulation period covered a range of dry years (2000, 2003, 2006, and 2008) and wet years (2002, 2005, and 2010). This range improved the model calibration and validation and provided an application that can simulate hydrology *and water quality during a broad range of recently observed climatic conditions. [Excerpted from the TMDL document]*

TSS TMDLs MOS

Section 4.7.5 discusses the rationale for the MOS for the TSS TMDLs. An explicit 10% MOS is used.

For TSS TMDLs in the South Fork Crow River Watershed, an explicit MOS was calculated as 10% of the loading capacity. Ten percent was considered an appropriate MOS since the LDC approach minimizes a great deal of uncertainty associated with the development of TMDLs because the calculation of the loading capacity is the product of monitored flow and the TSS target concentration. Most of the uncertainty with this calculation is therefore associated with the flows in the impaired reach that were calculated based on monitored flows at S003-326, which is a well-established continuous flow monitoring station with a long flow record. [Excerpted from the TMDL document]

Dissolved Oxygen TMDLs MOS

Section 4.8.4 discusses the rationale for the MOS for the DO TMDLs. Both an explicit MOS of 10% and implicit MOS were utilized to account for uncertainties, including uncertainties in modeling predictions

An explicit 10% MOS was included in TMDLs to provide a reasonable cushion against uncertainties. Oxygen demand for this TMDL was not measured directly as it was calculated using model predicted rates and variables. Thus, a 10% MOS accounts for the uncertainty in model predicted loads and the uncertainty in how the stream may respond to changes in oxygen demand loading. It is also important to note that the TMDL was set to predict the stream meeting the DO standard 95% of the time whereas the standard only requires meeting the DO standard 50% of the time below the 7Q10. Consequently, the current modeling also provides an implicit MOS.
[Excerpted from the TMDL document]

Bacteria TMDLs MOS

Section 4.9.4 of the TMDL document discusses the MOS for Bacterial TMDLs. A 5% explicit margin of safety was deemed adequate due to the use of load duration curves and the quality of the monitoring data used to calibrate the HSPF model.

An explicit MOS equal to 5% of the total load was applied whereby 5% of the loading capacity for each flow regime was subtracted before allocations were made among the waste load and watershed load. Five percent was considered an appropriate MOS since the LDC approach minimizes a great deal of uncertainty associated with the development of TMDLs because the calculation of the loading capacity is the product

of monitored flow and the target E. coli concentration. Most of the uncertainty with this calculation is associated with the flows in each impaired reach, which were simulated using the HSPF model which was calibrated using well established, long term monitored flow data at several stations throughout the South Fork Crow River Watershed.
[Excerpted from the TMDL document]

Phosphorus TMDLs MOS

Section 4.10.4 discusses the selection of a 10% MOS for to account for potential errors in the development of Nutrient TMDLs

Ten percent of the load has been set aside to account for any uncertainty in the lake response models. The 10% MOS was considered reasonable for all of the modeled lakes due to uncertainties in the HSPF model and the quantity of watershed and in-lake monitoring data available. Watershed modeling results over a 10-year period (2004 to 2013) were used for the majority of the lake modeling. In-lake monitoring data collected during the same 10-year period was also available for the majority of the lakes.
[Excerpted from the TMDL document]

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

Section 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)).

Section 7 Review Comments:

Seasonal variation in loads and/or effects are described and accounted for.

TSS TMDLs Seasonal Variation

Section 4.7.6 of the TMDL document discusses how seasonal variation is accounted for through the application of LDCs.

Both seasonal variation and critical conditions are accounted for in this TMDL through the application of LDCs. LDCs evaluate water quality conditions across all flow regimes including high flow runoff conditions where sediment transport tends to

be greatest. Seasonality is accounted for by addressing all flow conditions in a given reach.
[Excerpted from the TMDL document]

Dissolved Oxygen TMDLs Seasonal Variation

Section 4.8.5 of the TMDL document discusses how dissolved oxygen levels are affected by temperature levels during different seasons of the year. Targeting the TMDL to protect during the warmers months is expected to ensure protection during the cooler seasons.

Figure 3-7 in Section 3.5.2 shows that the DO exceedances did not occur during the winter where data were available. Therefore, the critical period for DO was determined to be the open water months, and the TMDL was written for the months of April through November. It was determined that most exceedances occurring during May, June, and early July occurred in the high and very high flow zones and most exceedances occurring during late July, August, and September occurred in the mid, and low, and very low flow zones. For Buffalo Creek, because exceedances occur in all flow zones, as shown in Figure 3-10, it was determined that the critical condition is not flow-related.
[Excerpted from the TMDL document]

Bacteria TMDLs Seasonal Variation

Section 4.9.5 of the TMDL document discusses how bacteria populations are influenced by seasonal temperature differences, and how this seasonal variation is accounted for through the application of LDCs.

Thus, these organisms are expected to be at their highest concentrations during warmer summer months when stream flow is low and water temperatures are high. High E. coli concentrations in these reaches continue into the fall, which may be attributed to constant sources of E. coli (such as animal access to the stream) and less flow for dilution. However, this data may be skewed as more samples were collected in the summer months than in October. Critical conditions and seasonal and annual variations are accounted for in these TMDLs by setting the TMDL across the entire observed flow record using the load duration method.
[Excerpted from the TMDL document]

Phosphorus TMDLs Seasonal Variation

Section 4.10.5 discusses the impact of seasonal variation on the nutrient TMDLs.

Seasonal variation is accounted for through the use of annual loads and developing targets for the summer period, where the frequency and severity of nuisance algal growth will be the greatest. Although the critical period is the summer, lakes are not sensitive to short term changes in water quality, rather lakes respond to long-term changes such as changes in the annual load. Therefore, seasonal variation is

accounted for in the annual loads. By setting the TMDL to meet targets established for the most critical period (summer), the TMDL will inherently be protective of water quality during the other seasons.
[Excerpted from the TMDL document]

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

Section 8. Reasonable Assurances

When a TMDL is developed for waters impaired by point sources only, the issuance of a National Pollutant Discharge Elimination System (NPDES) permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL. When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.
EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations.

Section 8 Review Comments:

Reasonable assurance that NPS load reductions will occur is provided in the document (applicable for waterbodies with both PS and NPS load allocations).

Load reductions are feasible to achieve

The Crow River Organization of Water (CROW) is a watershed group dedicated to protection and restoration of the Crow River watershed. The CROW was formed in 1999 as a result of heightened interest in the Crow River. A Joint Powers Agreement was signed by all 10 of the counties with land in the Crow River Watersheds. The CROW Joint Powers Board is made up of one representative from each of the county boards who signed the agreement. The counties involved in the CROW Joint Powers Board include Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Renville, Sibley, Stearns and Wright. CROW has developed numerous projects over the years that reduce sediment and phosphorus loads to the Crow River (CROW Annual Report, 2018).

> *In the fall of 2011, the CROW and local partners began working with the MPCA's new WRAPS approach in the South Fork Crow River Watershed. See the WRAPS report developed concurrently with this TMDL report for more details. Specific practices that can be successfully implemented to address the loading reductions required for these TMDLs are identified in Sections 8.3.1-8.3.4 of this document. The organizations listed below have the technical expertise to identify and implement the correct BMPs for each parameter.*
> *[Excerpted from the TMDL document]*

Another example is the Buffalo Creek Watershed District. The District Overall Plan (2014-2023) discusses the various BMPs implemented in the Buffalo Creek watershed, along with the identification of priority areas for implementation efforts an additional monitoring. The plan also contains a list of completed projects and the funding used to implement them. https://www.bcwatershed.org/pdf/BCWD%20Overall%20Plan%202014-2023%20[with%20%20Appendix%20D%20Amendment%208-5-2015].pdf

Technical and Logistical Resources are available and adequate.

Section 8.3 of the TMDL document discusses the strategy for the implementation of potential best management practices (BMPs) that can be used to achieve the necessary load reductions. Table 8-2 of the document lists potential BMPs that could be used to reduce TSS loads.

Table 8-2. Potential TSS reduction implementation strategies.

Potential BMP/Reduction Strategy
Streambank Stabilization/Buffer Enhancement – *Repair and stabilize degraded banks throughout the impaired reach. Establish vegetation (preferably native) to filter runoff from urban areas, cropland and pastures adjacent to the stream. All reaches should have at least 50 feet of buffer on both sides of the stream.*
Vegetative Practices – *Reduce sediment generation and transport through vegetative practices focusing on the establishment and protection of crop and non-crop vegetation to minimize sediment mobilization and transport. Recommended vegetative practices include grassed waterways and grass filter strips, alternative crop rotations, forest management, field windbreaks, rotational grazing, contour farming, strip cropping, cover crops, and others.*
Primary Tillage Practices – *Promote conservation tillage practices to reduce the generation and transport of soil from fields. Conservation tillage techniques emphasize the practice of leaving at least some vegetation cover or crop residue on fields as a means of reducing the exposure of the underlying soil to wind and water, which leads to erosion. If managed properly, conservation tillage can reduce soil erosion on active fields by up to two-thirds (Randall et. al. 2008).*
Urban BMPs – *promote urban BMPs such as infiltration, bioretention, increased street sweeping and others to reduce sediment runoff and transport.*
Education – *Provide educational and outreach opportunities about responsible tillage practice, vegetative management practices, and other BMPs to encourage good individual property management practices to reduce soil loss and upland erosion.*
Control Animal Access to the Stream – *Control and/or limit animal access to streambanks and areas near streams and rivers by installing fencing in pastures where access is unimpeded and installing buffer vegetation where existing fencing is directly adjacent to the stream bank.*

Section 8.3.2 of the TMDL document discusses the potential BMPs that can be employed to reduce the load of oxygen demand.

As the CROW coordinates with its stakeholders on the details of this TMDL, some of the following BMPs may be selected to reduce oxygen demand in order achieve the Buffalo Creek DO TMDL:

- *Targeted monitoring to further identify high loading areas and sources of low DO*
- *Channel morphology alteration*
- *Lake restorations*
- *Watershed nutrient reduction strategies*
- *Urban BMPs*

[Excerpted from the TMDL document]

Table 8-3 of the TMDL document provides a list of BMPs that could be used to achieve *E. coli* reductions.

Table 8-3. Potential *E. coli* reduction implementation strategies.

Potential BMP/Reduction Strategy
Streambank Stabilization/Buffer Enhancement – *Stabilize vegetation to filter runoff from pastures adjacent to the stream. Enhancements should include at least 50 feet of buffer on both sides of the stream.*
Education – *Provide educational and outreach opportunities about proper manure management, grazing management, proper pet waste disposal, and other topics to encourage good individual property management practices.*
Pasture Management –*create alternate livestock watering systems, rotational grazing, and vegetated buffer strips between grazing land and surface water bodies.*
Manure Management – *Reduction of winter spreading, eliminate spreading near open inlets, apply at agronomic rates, erosion control practices, and manure stockpile runoff controls.*
Septic System Inspection Program Review - *Although not always a significant source of bacteria, counties should continue to inspect and order upgrades of existing septic systems, prioritizing properties near the impaired reaches and its tributaries.*
Control Animal Access to the Stream – *Control and/or limit animal access to streambanks and areas near streams and rivers, by installing fencing in pastures where access is unimpeded and installing buffer vegetation where existing fencing is directly adjacent to the stream bank.*
Pet Waste Management – *Review local ordinances and associated enforcement and fines for residents who do not clean up pet waste. Increase enforcement and education about compliance with such an ordinance.*

Table 8-4 of the TMDL document lists the BMPs that could be employed to achieve the nutrient load reductions needed.

Table 8-4. Potential nutrient reduction strategies.

Reduction Target	Potential BMP/Reduction Strategy
Watershed Load	**Education Programs –** *Provide education and outreach on low-impact lawn care practices, proper yard waste removal, and other topics to increase awareness of sources of pollutants.*
	Shoreline Restoration – *Encourage property owners to restore their shoreline with native plants and install/enhance shoreline buffers.*
	Raingarden/Bio-filtration Basins – *Encourage the use of rain gardens and similar features as a means of increasing infiltration and evapotranspiration. Opportunities may range from a single property owner to parks and open spaces.*
	Stormwater Pond Retrofits/Installation - *As opportunities arise, retrofit stormwater treatment through a variety of BMPs. Pond expansion and pre-treatment of water before it reaches the ponds may be beneficial dependent on drainage area. Also, identify target areas for new stormwater pond installation.*
	Street Sweeping Program Review/Implementation *Identify target areas for increased frequency of street sweeping and consider upgrades to traditional street sweeping equipment.*
	Agricultural BMP Implementation – *Encourage property owners to implement agricultural BMPs for nutrient load reduction. The Agricultural BMP Handbook for Minnesota (MDA 2012) provides an inventory of agricultural BMPs that address water quality in Minnesota. Several examples include conservation cover, buffer strips, grade stabilization, controlled drainage, rotational grazing, and irrigation management, among many other practices.*
Internal Load	**Technical Review –** *Prior to internal load reduction strategy implementation, a technical review is recommended to evaluate the cost and feasibility of lake management techniques such as hypolimnetic withdrawal, alum treatment, and hypolimnetic aeration to manage internal nutrient sources.*
	In-lake chemical treatment – *If determined feasible based on technical review, chemically treat with alum or other means to remove phosphorus from the water column as well as bind it in sediments.*
	Hypolimnetic Withdrawal or Aeration – *If determined feasible based on technical review, pump nutrient-rich water from the hypolimnion to an external location for phosphorus treatment and discharge treated water back into the lake. Or as an alternate option, aerate the hypolimnetic waters to maintain oxic conditions (the anoxic condition of the hypolimnetic sediments is the contributor to the internal phosphorus load).*
	Aquatic Plant Surveys/Vegetation Management – *Conduct periodic aquatic plant surveys and prepare and implement vegetation management plans.*
	Rough Fish Surveys/Management – *Consider partnership with the DNR to monitor and manage the fish population. Evaluate options to reduce rough fish populations such as installation of fish barriers and carp removal to reduce rough fish access and migration.*

Excerpted from the TMDL document

Section 8.1 of the TMDL document discusses the framework of how BMP implementation will be conducted in the watershed and names the Crow River Organization of Water (CROW) as the group that will coordinate efforts in the basin.

The CROW and local water resource managers will coordinate on the selection,

prioritization, and incorporation of implementation actions into local water plans, based on strategies identified in this TMDL and the WRAPS report, and implementation of those plans. The MPCA will work with regulated entities on meeting permit requirements based on the TMDLs.
[Excerpted from the TMDL document]

Section 6 of the TMDL document discusses the Watershed Restoration and Protection Strategy (WRAPS) as the principal document that will outline the goals and actions needed to achieve the pollutant load reductions.

The goals outlined in this TMDL study are consistent with and inform objectives outlined in the local county water management plans. These plans have the objective of implementing strategies called for in WRAPS/TMDLs through targeted actions to bring impaired waters into compliance with appropriate water quality standards, and thereby establish the basis for removing those impaired waters from the 303(d) Impaired Waters List. These plans provide the watershed management framework for addressing water quality issues. In addition, the stakeholder processes associated with this TMDL effort, as well as the broader planning efforts mentioned previously, have generated commitment and support from the local government units (LGUs) affected by this TMDL, and will help ensure that this TMDL project is carried successfully through implementation.
[Excerpted from the TMDL document]

A discussion is also included on the role of the Crow River Organization of Waters in coordinating local efforts to restore and protect the watershed.

The effects of rapid urban growth, new and expanding wastewater facilities, and erosion from agricultural lands have been common concerns of many citizens, and local, state, and regional governments in Central Minnesota. As a result, many parties began meeting in 1998 to discuss management of the Crow River sub-basin consisting of the South Fork and North Fork Crow River Watersheds. The CROW was formed in 1999 as a result of heightened interest in the Crow River. A Joint Powers Agreement was signed by all 10 of the counties with land in the Crow River Watersheds. The CROW Joint Powers Board is made up of one representative from each of the county boards who signed the agreement. The counties involved in the CROW Joint Powers Board include Carver, Hennepin, Kandiyohi, McLeod, Meeker, Pope, Renville, Sibley, Stearns and Wright. The CROW currently focuses on identifying and promoting the following:

- *Protecting water quality and quantity*
- *Protecting and enhancing fish and wildlife habitat, and water recreation facilities Public education & awareness*
- *BMP implementation*

In the fall of 2011, the CROW and local partners began working with the MPCA's *new WRAPS approach in the South Fork Crow River Watershed. See the WRAPS report developed concurrently with this TMDL report for more details. [Excerpted from the TMDL document]*

Financial resources are identified, and a cost estimate is provided.

Section 8.5 of the TMDL document provides estimates for the cost of implementing the necessary load reductions

Nutrient load reduction costs

The cost to implement the necessary BMPs to achieve the load reductions of P called for by the BMP was estimated at $4.1 million dollars per basin per year based on the average cost to achieve P reductions in previous studies.

> *A detailed analysis of the cost to implement the nutrient TMDLs was not conducted. However, as a rough approximation one can use some general results from BMP cost studies across the U.S. for example, an EPA summary of several studies showed a median life cycle cost of approximately $2,200 per pound TP removed for watershed BMPs (Foraste et al. 2012). Another recent review (Macbeth et al. 2015) of lake restoration projects performed throughout the State of Minnesota suggests a median life cycle cost of approximately $500 per pound of TP removed for internal load BMPs such as aluminum sulfate. Multiplying these rates by the needed watershed (29,941 pounds per year) and internal (57,477 pounds per year), TP reductions needed for the 23 lake basins in this TMDL provides a total cost of approximately $4.1 million per basin per year. This cost estimate assumes a 20-year life cycle for watershed and internal load BMPs.*
> *[Excerpted from the TMDL document]*

TSS load reduction costs

Cost estimates for reducing TSS loads are projected at $149.6 million over 10 years based on experience reducing loads on other watersheds throughout the state.

> *Utilizing estimates developed by an interagency work group (BWSR, USDA, MPCA, Minnesota Association of SWCDs, Minnesota Association of Watershed Districts, NRCS) who assessed restoration costs for several TMDLs throughout the State, it was determined that implementing the South Fork Crow River TSS TMDLs will cost approximately $149.6 million over 10 years. This was based on total area of the watershed (1,279 square miles) multiplied by the cost estimate of $117,000 per square mile for a watershed based treatment approach.*
> *[Excerpted from the TMDL document]*

Bacteria reduction costs.

Bacteria load reductions costs are estimated at $52 million dollars based on the typical cost of bacteria control per animal unit, and an estimate of the cost to bring failing septic systems up to code.

> *The cost estimate for bacteria load reduction is based on unit costs for the two major sources of bacteria: livestock and failing SSTSs. The unit cost for bringing AUs under manure management plans and feedlot lot runoff controls is $350 per AU. This value is based on USDA EQIP payment history and includes buffers, livestock access control, manure management plans, waste storage structures, and clean water diversions. Repair or replacement of failing SSTSs was estimated at $7,500 per system. Multiplying those unit costs by an estimated 508 failing SSTSs and 138,768 AU in the South Fork Crow River bacteria impaired reach watersheds provides a total cost of approximately $52 million. The MPCA staff calculates that approximately 30% these AUs currently have controls or management plans in place, thus reducing this estimate by around a third. [Excerpted from the TMDL document]*

Oxygen demand reduction cost estimates.

The cost to reduce oxygen demanding pollutants are estimated to start at $1.5 million dollars.

> *Based on the estimates provided in the Buffalo Creek plan, the costs associated with meeting the goals described in the WRAPS would start at roughly 1.5 million dollars, although the WRAPS goals are estimated over 20 years whereas the Buffalo creek plan is projected through 2023, so actual costs are likely to be significantly more.*
> *[Excerpted from the TMDL document]*

Section 6 of the TMDL document discusses a variety of funding resources that can be utilized to implement the BMPs discussed above.

> *Various sources of technical assistance and funding will be used to execute measures detailed in the South Fork Crow River WRAPS. Funding resources include a mixture of state and federal programs, including (but not limited to) the following:*
>
> - *Federal Section 319 Grants for watershed improvements*
> - *Funds ear-marked to support TMDL implementation from the Clean Water, Land, and Legacy constitutional amendment, approved by the state's citizens in November 2008.*
> - *Watershed District cost-share funds*
> - *Local government funds*

- *SWCD cost-share funds*
- *NRCS cost-share funds*
- *Local Lake Association funds*

[Excerpted from the TMDL document]

Clean Water Legacy Act: The CWLA was passed in Minnesota in 2006 for the purposes of protecting, restoring, and preserving Minnesota water. The CWLA provides the protocols and practices to be followed in order to 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 Watershed Restoration and Protection Strategies (WRAPS). The WRAPS are required to contain such elements as the identification of impaired waters, watershed modeling outputs, point and nonpoint sources, load reductions, etc. (Chapter 114D.26; CWLA). The WRAPS also contain an implementation table of strategies and actions that are capable of achieving the needed load reductions, for both point and nonpoint sources (Chapter 114D.26, Subd. 1(8); CWLA). Implementation plans developed for the TMDLs are included in the table, and are considered "priority areas" under the WRAPS process (Watershed Restoration and Protection Strategy Report Template, MPCA). This table includes not only needed actions but a timeline for achieving water quality targets, the reductions needed from both point and nonpoint sources, the governmental units responsible, and interim milestones for achieving the actions. MPCA has developed guidance on what is required in the WRAPS (Watershed Restoration and Protection Strategy Report Template, MPCA).

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

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

Section 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.

Section 9 Review Comments

Section 7 of the TMDL document identifies two types of monitoring to be conducted to ensure the effectiveness of the TMDL. The first type is monitoring conducted to ensure the actions needed to reduce the pollutant loads are being taken (i.e. implementation is moving forward). The second type is to monitor the actual chemical and physical aspects of the waterbodies to ensure that the load reduction implementation actions being taken are leading the reduction of pollutants of concern called for by the TMDL, and that the physical characteristics of the waterbody are responding to those reductions in accordance with the assumptions and predictions made when developing the TMDL. A commitment to adaptively managing the process of TMDL implementation in response to results of both of these types of monitoring is essential to ensuring that resources dedicated to achieving WQS are being utilized in the most efficient manner possible. A commitment to monitoring the affected resources by the Crow River Organization of Water on a ten year cycle is mentioned in the text.

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

Section 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.

Section 10 Review Comments

Section 8 of the TMDL document discusses potential measures, including a variety of BMPs, that may be utilized to achieve the pollutant load reductions needed to meet the pollutant waste load and NPS load allocations specified in the TMDL. Implementation of load reductions associated with MS4s, construction and industrial stormwater, and NPDES permitted wastewater facilities, will be implemented through their respective state permitting programs. Section 8.3 of the document provides a discussion of strategies for addressing load reductions for non-point sources of pollutants not subject to NPDES permitting requirements. These strategies were discussed and cited in greater detail in Section 8 of this decision document.

The EPA finds that the TMDL document submitted by the MPCA satisfies the requirements of the tenth criterion. The EPA reviews but does not approve implementation plans.

Section 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.

Section 11 Review Comments

TMDL development provided for adequate public participation.

The TMDL development process provided numerous opportunities for the public to participate including numerous public meetings and a formal notice in the state register that the state was soliciting public comments on the final draft of the TMDL document.

The public participation process is described.

A thorough description of the public participation process is included in Section 9 of the final TMDL document.

A stakeholder participation process was undertaken for this TMDL to obtain input from, review results with, and take comments from the public and interested and affected agencies regarding the development of and conclusions of the TMDL. The CROW board and Local Partner Technical Team convened multiple times to discuss and review TMDL results. The Technical Team consists of the CROW and stakeholders from local county government departments, SWCDs, cities, state and regional agencies, consultants, and others. Monthly CROW board meetings allowed for the general public and staff from *various agencies to be advised on the progress and results of the TMDL study. [Excerpted from the TMDL document]*

The stakeholder process involved meetings and other communications as tabulated below.

Date(s)	Description
12/19/2012	Consulting firm proposals and work plans for the South Fork Crow TMDL were reviewed and discussed at the Buffalo Creek Watershed District's Board meeting
11/30/2013 12/10/2014	Public and stakeholder meeting to kickoff TMDLs and provide background
12/15/2015	Meeting with MS4s and waste water treatment plant operators to discuss wasteload allocations
9/13/2016	Local Partner Technical Team meeting to discuss TMDL and WRAPS
1/31/2017	Public meeting to discuss final TMDL and WRAPS results
10/22/2014	Public open house to discuss Lake Wakanda Implementation Project and issues associated with the TMDLs for the South Fork Crow headwaters
1/27/2015 2/17/2015 6/9/2015	Workgroup, County Board, and public hearing meetings to review public comments and discuss Lake Wakanda restoration strategies
2/2/2012 4/5/2012 9/6/2012 11/8/2012 12/6/2012 2/6/2013 11/6/2013 11/5/2014 2/4/2015 4/14/2015 6/3/2015 10/7/2015 1/6/2016 2/10/2016 3/2/2016 8/3/2016 9/7/2016 11/2/2016	CROW Joint Powers Board Meetings in which progress/updates on the South Fork Crow TMDL were presented and/or preliminary results were discussed. Board Meetings are open to the public

Excerpted from the TMDL document

<u>A summary of significant comments and response is provided.</u>

An opportunity for public comment on the draft TMDL report was provided via a public notice in the State Register from April 16, 2018, to May 16, 2018. [Excerpted from the TMDL document]

One comment letter was received from the Minnesota Center for Environmental Advocacy. A brief summary of the comments received, the State's responses to those comments, and EPAs review of those responses, are include below.

Minnesota Center for Environmental Advocacy (MCEA).
Minnesota Pollution Control Agency (MPCA).

MCEA believes that the State should complete TMDLs for all applicable WQS, for all of the waterbodies identified as impaired at this time, including addressing those waterbodies designated as impaired based on indexes of biological integrity and narrative WQS.

MPCA responded that the State has the option to address a subset of the impairments at the present time while postponing addressing other impairments until a future date. MPCA is waiting on the finalization of numeric WQS for nitrates prior to completing any necessary nitrogen related TMDLs.

MCEA believes that the State should designate specific sources as point sources under MN State law that would not otherwise be included in this category under federal law.

MPCA responded that such sources are considered non-point sources and are covered by the load allocations.

MCEA does not feel that the level of assurance provided by the TMDL that non-point source reductions will be achieved is reasonable.

Citing the Watershed Restoration And Protection Strategy (WRAPS) approach required by the MN Clean Water Legacy Act (CWLA), MPCA responded that it believes that its level of assurance is reasonable, particularly in comparison to the level of detail and commitment typically seen in TMDLs from other parts of the country.

The EPA carefully reviewed the comments submitted during the public notice period, as well as the responses from MPCA. The EPA agrees that MPCA appropriately addressed the comments.

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

Section 12. Submittal Letter

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

Section 12 Review Comments:

A submittal letter is provided requesting formal review.

A submittal letter (see below) was included with the initial request for review and approval on October 5th, 2018. EPA subsequently returned the TMDL to the State via email to fix clerical errors on November 29th , 2018. The State resubmitted the TMDL via email on March 12, 2019. The original submittal letter of October 5th, 2018 remains valid for the purposes of this review.

The EPA finds that the submittal letter satisfies the requirements of the twelfth criterion.

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October 5, 2018

Linda Holst
Water Division Acting Director
U.S. Environmental Protection Agency
Region 5, W-15J
77 West Jackson Boulevard
Chicago, IL 60604-3507

RE: South Fork Crow River Total Maximum Daily Load Report Request for Final Approval

Dear Linda Holst:

I am pleased to submit the Total Maximum Daily Load (TMDL) study for impairments of turbidity, dissolved oxygen, bacteria, and nutrients for the South Fork Crow River to the U.S. Environmental Protection Agency (EPA) for final review and approval.

This TMDL study was open for public comment from April 16, 2018 to May 16, 2018. We are also including supporting documentation and information with this submittal, under Section 303(d) of the Clean Water Act.

Approval of this TMDL study is an important step towards reduction in the current level of turbidity, dissolved oxygen, bacteria, and nutrients pollutants in the South Fork Crow River of the Upper Mississippi River Basin. We look forward to receiving the EPA's decision document for final approval of this TMDL study.

Thank you for your consideration.

Sincerely,

Glenn Skuta

This document has been electronically signed.

Glenn Skuta, Division Director
Watershed Division

GS/SL:jdf

Enclosure

Section 13: Conclusions

After a full and complete review, EPA finds that the TMDL study satisfies all of the elements of an approvable TMDL. The EPA is approving thirty TMDLs for *E. coli*, DO consuming substances, Total Phosphorus and TSS. The waterbody pollutant combinations to which this approval applies are listed in the table below.

TMDLs Approved in this Decision Document			
Reach Name	**AUID**	**Impairment**	**POC**
Judicial Ditch 15	07010205-513	*E. coli*	*E. coli*
Buffalo Creek	07010205-638(2)	DO	O_2
South Fork Crow River	07010205-658(3)	TSS/Turbidity	TSS
South Fork Crow River	07010205-659(3)	TSS/Turbidity	TSS
South Fork Crow River	07010205-511	TSS/Turbidity	TSS
South Fork Crow River	07010205-508	Fecal coliform	*E. coli*
South Fork Crow River	07010205-508	TSS/Turbidity	TSS
Lake Name	**Lake ID**	**Impairment**	**POC**
Bear	43-0076	Nutrients	P
Belle	47-0049	Nutrients	P
Big Kandiyohi	34-0086	Nutrients	P
Boon	65-0013	Nutrients	P
Cedar	43-0115	Nutrients	P
Goose	47-0127	Nutrients	P
Green Leaf	47-0062	Nutrients	P
Hoff	47-0106	Nutrients	P
Johnson	34-0012	Nutrients	P
Kasota	34-0105	Nutrients	P
Lillian	34-0072	Nutrients	P
Little Kandiyohi	34-0096	Nutrients	P
Marion	43-0084	Nutrients	P
Minnetaga	34-0076	Nutrients	P
Mud	10-0094	Nutrients	P
Preston	65-0002	Nutrients	P
Rice	86-0032	Nutrients	P
Silver	43-0034	Nutrients	P

Star	47-0129	Nutrients	P
Thompson	47-0159	Nutrients	P
Wakanda	34-0169	Nutrients	P
Willie	47-0061	Nutrients	P
Winsted	43-0012	Nutrients	P

1) Oxygen demand accounts for the combination of SOD, NOD, and BOD as discussed in Section 3.6.2. and reflected in the TMDL document in Table 4-10. Buffalo Creek Dissolved Oxygen Total Maximum Daily Load.
2) Previously listed as segment 501 prior to 2016 303(d) list.
3) Previously listed as segment 540 prior to 2016 303(d) list.

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

Appendix A

TMDL Summary Tables for Phosphorus Impaired Lakes

South Fork Crow River Watershed Total Maximum Daily Load

EPA Final Decision Document

Tables 4-17 through 4-39 present the allocations for the impaired lakes in the South Fork Crow River Watershed.

Table 4-17. Preston Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Judicial Ditch 28A Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	3.5	0.01	3.5	0.01	0.0	**0%**
	Construction and Industrial Stormwater	3.5	0.01	3.5	0.01	0.0	**0%**
Load	**Total LA**	4,603.5	12.60	3,000.6	8.22	1,602.9	**35%**
	Drainage Areas	2,456.3	6.72	1,415.7	3.88	1040.6	**42%**
	Upstream Lake (Allie)	1,818.0	4.98	1,272.0	3.48	546.0	**30%**
	Atmosphere	152.1	0.42	152.1	0.42	0.0	**0%**
	Internal Load	160.8	0.44	160.8	0.44	0.0	**0%**
	SSTS	16.3	0.04	0.0	0.00	16.3	**100%**
MOS				333.8	0.91		
Total Load		**4,607.0**	**12.61**	**3,337.9**	**9.14**	**1,602.9**	**35%**

[1] Net reduction from current load to TMDL is 1,269.1 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 1,269.1 + 333.8 = 1,602.9 lbs/yr.
Model Calibration Years: 2008, 2009, 2010, and 2012

Table 4-18. Marion Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Buffalo Creek Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	5.8	0.02	5.8	0.02	0.0	**0%**
	Construction and Industrial Stormwater	5.8	0.02	5.8	0.02	0.0	**0%**
Load	**Total LA**	3,244.8	8.89	2,756.3	7.55	488.5	**15%**
	Drainage Areas	3,070.0	8.41	2603.8	7.13	466.2	**15%**
	Atmosphere	127.1	0.35	127.1	0.35	0.0	**0%**
	Internal Load	25.4	0.07	25.4	0.07	0.0	**0%**
	SSTS	22.3	0.06	0.0	0.00	22.3	**100%**
MOS				306.9	0.84		
Total Load		**3,250.6**	**8.91**	**3,069.0**	**8.41**	**488.5**	**15%**

[1] Net reduction from current load to TMDL is 181.6 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 181.6 + 306.9 = 488.5 lbs/yr.
Model Calibration Years: 2006, 2008, 2010, 2011, 2012, and 2013

Table 4-19. Big Kandiyohi Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Headwaters – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	1.9	0.005	1.9	0.005	0.0	**0%**
	Construction and Industrial Stormwater	1.9	0.005	1.9	0.005	0.0	**0%**
Load	**Total LA**	29,686.2	81.27	8,909.7	24.40	20,776.6	**70%**
	Drainage Areas	1,706.2	4.67	449.0	1.23	1,257.3	**74%**
	Upstream Lake (Wakanda)	9,124.6	24.98	1,204.6	3.30	7,920.0	**87%**
	Atmosphere	639.0	1.75	639.0	1.75	0.0	**0%**
	Internal Load	18,193.3	49.81	6,617.1	18.12	11,576.2	**64%**
	SSTS	23.1	0.06	0.0	0.00	23.1	**100%**
MOS				990.2	2.71		
Total Load		**29,688.1**	**81.28**	**9,901.8**	**27.12**	**20,776.6**	**70%**

[1] Net reduction from current load to TMDL is 19,786.4 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 19,786.4 + 990.2 = 20,776.6 lbs/yr.
Model Calibration Years: 2005 and 2006

Table 4-20. Johnson Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Headwaters – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	0.2	0.0005	0.2	0.0005	0.0	**0%**
	Construction and Industrial Stormwater	0.2	0.0005	0.2	0.0005	0.0	**0%**
Load	**Total LA**	493.7	1.35	127.1	0.35	366.7	**74%**
	Drainage Areas	205.9	0.56	77.4	0.21	128.6	**62%**
	Atmosphere	24.2	0.07	24.2	0.07	0.0	**0%**
	Internal Load	263.0	0.72	25.5	0.07	237.5	**90%**
	SSTS	0.6	0.002	0.0	0.00	0.6	**100%**
MOS				14.1	0.04		
Total Load		**493.9**	**1.35**	**141.4**	**0.39**	**366.7**	**74%**

[1] Net reduction from current load to TMDL is 352.4 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 352.4 + 14.1 = 366.7 lbs/yr.
Model Calibration Years: 2005 and 2006

Table 4-21. Kasota Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Headwaters – South Fork-Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	1.4	0.004	1.4	0.004	0.0	**0%**
	Construction and Industrial Stormwater	1.4	0.004	1.4	0.004	0.0	**0%**
Load	**Total LA**	13,748.5	37.63	1,571.0	4.30	12,177.5	**89%**
	Drainage Areas	2,491.7	6.82	612.1	1.68	1,879.6	**75%**
	Upstream Lake (Minnetaga)	1,625.6	4.45	541.9	1.48	1,083.7	**67%**
	Atmosphere	103.8	0.28	103.8	0.28	0.0	**0%**
	Internal Load	9,505.4	26.02	313.2	0.86	9,192.2	**97%**
	SSTS	22.0	0.06	0.0	0.00	22.0	**100%**
MOS				174.7	0.48		
Total Load		**13,749.9**	**37.63**	**1,747.1**	**4.78**	**12,177.5**	**89%**

[1] Net reduction from current load to TMDL is 12,002.7 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 12,002.7 + 174.7 = 12,177.5 lbs/yr.
Model Calibration Years: 2006 and 2007

Table 4-22. Lillian Lake TP TMDL summary (shallow lake, WCBP major subwatershed, located in the Headwaters – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	1.8	0.005	1.8	0.005	0.0	**0%**
	Construction and Industrial Stormwater	1.8	0.005	1.8	0.005	0.0	**0%**
Load	**Total LA**	8,112.3	22.20	4,749.7	13.00	3,362.7	**41%**
	Drainage Areas	888.5	2.43	888.5	2.43	0.0	**0%**
	Upstream Lakes	6,213.8	17.01	2,851.2	7.81	3,362.6	**54%**
	Atmosphere	267.4	0.73	267.4	0.73	0	**0%**
	Internal Load	742.6	2.03	742.6	2.03	0	**0%**
MOS				527.9	1.45		
Total Load		**8,114.1**	**22.21**	**5,279.4**	**14.45**	**3,362.7**	**41%**

[1] Net reduction from current load to TMDL is 2,834.7 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 2,834.7 + 527.9 = 3,362.7 lbs/yr.
Model Calibration Years: 2008 and 2009

Table 4-23. Little Kandiyohi Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Headwaters – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	1.6	0.005	1.6	0.005	0.0	**0%**
	Construction and Industrial Stormwater	1.6	0.005	1.6	0.005	0.0	**0%**
Load	**Total LA**	12,267.5	33.59	2,328.1	6.73	9,939.4	**81%**
	Drainage Areas	1,458.4	3.99	692.0	1.89	766.4	**53%**
	Upstream Lakes (Kasota)	5,772.9	15.81	1,252.7	3.43	4,520.2	**78%**
	Atmosphere	160.0	0.44	160.0	0.44	0.0	**0%**
	Internal Load	4,568.9	12.51	223.4	0.61	4,345.5	**95%**
	SSTS	307.3	0.84	0.0	0.00	307.3	**100%**
MOS				258.9	0.71		
Total Load		**12,269.1**	**33.60**	**2,588.6**	**7.08**	**9,939.4**	**81%**

[1] Net reduction from current load to TMDL is 9,680.6 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 9,680.6 + 258.9 = 9,680.5 lbs/yr.
Model Calibration Years: 2006, 2007 and 2008

Table 4-24. Minnetaga Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Headwaters – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	3.2	0.01	3.2	0.01	0.0	**0%**
	Construction and Industrial Stormwater	3.2	0.01	3.2	0.01	0.0	**0%**
Load	**Total LA**	10,237.3	28.03	1,949.9	5.34	8,287.3	**81%**
	Drainage Areas	3,744.0	10.25	1,499.6	4.11	2,244.4	**60%**
	Atmosphere	183.1	0.50	183.1	0.50	0.0	**0%**
	Internal Load	6,310.2	17.28	267.2	0.73	6,042.9	**96%**
MOS				217.0	0.59		
Total Load		**10,240.5**	**28.04**	**2,170.1**	**5.94**	**8,287.3**	**81%**

[1] Net reduction from current load to TMDL is 8,070.3 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 8,070.3 + 217.0 = 8,287.3 lbs/yr.
Model Calibration Years: 2008 and 2009

Table 4-25. Thompson Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Headwaters – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	1.1	0.003	1.1	0.003	0.0	**0%**
	Construction and Industrial Stormwater	1.1	0.003	1.1	0.003	0.0	**0%**
Load	**Total LA**	1,796.1	4.91	675.9	1.84	1,120.2	**62%**
	Drainage Areas	1,381.3	3.78	487.4	1.33	893.9	**65%**
	Atmosphere	52.2	0.14	52.2	0.14	0.0	**0%**
	Internal Load	337.9	0.92	136.3	0.37	201.6	**60%**
	SSTS	24.74	0.07	0.0	0.00	24.7	**100%**
MOS				75.2	0.21		
Total Load		**1,797.2**	**4.91**	**752.2**	**2.05**	**1,120.2**	**62%**

[1] Net reduction from current load to TMDL is 1,045.0 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 1,045.0 + 75.2 = 1,120.2 lbs/yr.
Model Calibration Years: 2009 and 2010

Table 4-26. Wakanda Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Headwaters - South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	4,014.0	10.99	2,515.1	6.89	1,498.8	**37%**
	Construction and Industrial Stormwater	12.9	0.04	12.9	0.04	0.0	**0%**
	Willmar City MS4	4,001.1	10.95	2,502.2	6.85	1,498.8	**37%**
Load	**Total LA**	11,998.4	32.85	4,496.7	12.32	7,501.8	**63%**
	Drainage Areas	5,699.0	15.60	3,564.2	9.76	2,134.9	**37%**
	Atmosphere	441.0	1.21	441.0	1.21	0.0	**0%**
	Internal Load	5,801.3	15.88	491.5	1.35	5,309.8	**92%**
	SSTS	57.1	0.16	0.0	0.00	57.1	**100%**
MOS				779.1	2.13		
Total Load		**16,012.4**	**43.84**	**7,790.9**	**21.34**	**9,000.6**	**56%**

[1] Net reduction from current load to TMDL is 8,221.5 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 8,221.5.0 + 779.1 = 9,000.6lbs/yr.
Model Calibration Years: 2005

Table 4-27. Cedar Lake TP TMDL summary (shallow lake, NCHF ecoregion, located in the Hutchinson – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	2.1	0.01	2.1	0.01	0.0	**0%**
	Construction and Industrial Stormwater	2.1	0.01	2.1	0.01	0.0	**0%**
Load	**Total LA**	5,964.1	16.32	2,231.9	6.12	3,732.2	**63%**
	Drainage Areas	2,779.3	7.61	929.7	2.55	1,849.6	**67%**
	Upstream Lakes	175.8	0.48	162.8	0.45	13.0	**7%**
	Atmosphere	442.9	1.21	442.9	1.21	0.0	**0%**
	Internal Load	2,521.5	6.90	696.5	1.91	1,825.0	**72%**
	SSTS	44.6	0.12	0.0	0.00	44.6	**100%**
MOS				248.2	0.68		
Total Load		**5,966.2**	**16.33**	**2,482.2**	**6.81**	**3,732.2**	**63%**

[1] Net reduction from current load to TMDL is 3,484.0 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 3,484.0 + 248.2 = 3,732.2 lbs/yr.
Model Calibration Years: 2006 and 2008

Table 4-28. Greenleaf Lake TP TMDL summary (shallow lake, NCHF ecoregion, located in the Hutchinson – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	0.2	0.001	0.2	0.001	0.0	**0%**
	Construction and Industrial Stormwater	0.2	0.001	0.2	0.001	0.0	**0%**
Load	**Total LA**	693.2	1.90	439.4	1.21	253.8	**37%**
	Drainage Areas	172.8	0.47	83.5	0.23	89.3	**52%**
	Atmosphere	57.3	0.16	57.3	0.16	0.0	**0%**
	Internal Load	451.5	1.24	298.6	0.82	152.9	**34%**
	SSTS	11.6	0.03	0.0	0.00	11.6	**100%**
MOS				48.9	0.13		
Total Load		**693.4**	**3.77**	**488.5**	**1.34**	**253.8**	**37%**

[1] Net reduction from current load to TMDL is 204.9 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 204.9 + 48.9 = 253.8lbs/yr. Model Calibration Years: 2007 and 2008

Table 4-29. Goose Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Hutchinson – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	Total WLA	0.2	0.0005	0.2	0.0005	0.0	0%
	Construction and Industrial Stormwater	0.2	0.0005	0.2	0.0005	0.0	0%
Load	Total LA	2,260.7	6.19	162.3	0.44	2,098.4	93%
	Drainage Areas	411.5	1.13	76.2	0.21	335.3	81%
	Atmosphere	23.4	0.06	23.4	0.06	0.0	0%
	Internal Load	1,822.2	4.99	62.7	0.17	1,759.5	97%
	SSTS	3.6	0.01	0.0	0.00	3.6	100%
MOS				18.1	0.05		
Total Load		2,260.9	6.19	180.6	0.49	2,089.4	93%

[1] Net reduction from current load to TMDL is 2,071.3 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 2,071.3+ 18.1 = 2,089.4 lbs/yr.
Model Calibration Years: 2012 and 2013

Table 4-30. Hoff Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Hutchinson – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	Total WLA	4.8	0.01	4.8	0.01	0.0	0%
	Construction and Industrial Stormwater	4.8	0.01	4.8	0.01	0.0	0%
Load	Total LA	7,910.8	21.66	5,296.2	14.51	2,614.6	33%
	Drainage Areas	3,025.2	8.28	1,808.2	4.95	1,217.0	40%
	Upstream Lakes	4,391.1	12.02	2,997.0	8.21	1,394.1	32%
	Atmosphere	36.1	0.10	36.1	0.10	0.0	0%
	Internal Load	454.9	1.25	454.9	1.25	0.0	0%
	SSTS	3.5	0.01	0.0	0.00	3.5	100%
MOS				589.0	1.61		
Total Load		7,915.6	21.67	5,890.0	16.13	2,614.6	33%

[1] Net reduction from current load to TMDL is 2,025.6 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 2,025.6 + 589.0 = 2,614.6 lbs/yr.
Model Calibration Years: 2010 and 2011

Table 4-31. Star Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Hutchinson – South Fork Crow Major Subwatershed)(This lake is not on the 2016 303(d) list, however is proposed on the 2018 list.)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	Total WLA	0.7	0.002	0.7	0.002	0.0	67%
	Construction and Industrial Stormwater	0.7	0.002	0.7	0.002	0.0	0%
Load	Total LA	2,196.7	6.01	1,113.9	3.05	1,082.8	49%
	Drainage Areas	1,040.2	2.85	306.1	0.84	734.1	71%
	Atmosphere	132.2	0.36	132.2	0.36	0.0	0%
	Internal Load	1,024.3	2.80	675.6	1.85	348.7	34%
MOS				34.0	0.09		
Total Load		2,197.4	6.01	1,148.6	3.14	1,082.8	49%

[1] Net reduction from current load to TMDL is 1,048.8 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 1,048.8 + 34.0 = 1,082.8 lbs/yr.
Model Calibration Years: 2009 and 2010

Table 4-32. Belle Lake TP TMDL summary (deep Lake, NCHF ecoregion, located in the Hutchinson – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	Total WLA	0.05	0.0001	0.05	0.0001	0.0	0%
	Construction and Industrial Stormwater	0.05	0.0001	0.05	0.0001	0.0	0%
Load	Total LA	2,035.4	5.56	1,038.4	2.84	997.0	49%
	Drainage Areas	490.6	1.34	25.2	0.07	465.4	95%
	Upstream Lakes	77.1	0.21	77.1	0.21	0.0	0%
	Atmosphere	219.6	0.60	219.6	0.60	0.0	0%
	Internal Load	1,228.3	3.36	716.5	1.96	511.8	42%
	SSTS	19.8	0.05	0	0	19.8	100%
MOS				115.4	0.32		
Total Load		2,035.5	5.56	1,153.9	3.16	997.0	49%

[1] Net reduction from current load to TMDL is 881.6 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 881.6 + 115.4 = 997.0 lbs/yr.
Model Calibration Years: 2008, 2009, and 2013

Table 4-33. Willie Lake TP TMDL summary (shallow lake, NCHF ecoregion, located in the Hutchinson – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	Total WLA	4.7	0.01	4.7	0.01	0.0	0%
	Construction and Industrial Stormwater	4.7	0.01	4.7	0.01	0.0	0%
Load	Total LA	2,623.9	7.18	2,302.7	6.30	321.1	12%
	Drainage Areas	2,335.5	6.39	2,079.1	5.69	256.4	11%
	Upstream Lake (Greenleaf)	211.2	0.58	171.2	0.47	39.9	19%
	Atmosphere	44.7	0.12	44.7	0.12	0.0	0%
	Internal Load	7.7	0.02	7.7	0.02	0	0%
	SSTS	24.8	0.07	0.0	0.00	24.8	100%
MOS				256.4	0.70		
Total Load		2,628.6	7.19	2,563.8	7.01	321.1	12%

[1] Net reduction from current load to TMDL is 64.8 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 64.8 + 256.4 = 321.1 lbs/yr.
Model Calibration Years: 2010 and 2011

Table 4-34. Bear Lake TP TMDL summary (shallow lake, NCHF ecoregion, located in the Lester Prairie – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/da y	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	Total WLA	0.2	0.001	0.2	0.001	0.0	0%
	Construction and Industrial Stormwater	0.2	0.001	0.2	0.001	0.0	0%
Load	Total LA	1,622.1	4.44	219.9	0.60	1,402.2	86%
	Drainage Areas	272.8	0.75	91.3	0.25	181.5	67%
	Atmosphere	37.6	0.10	37.6	0.10	0.0	0%
	Internal Load	1,311.3	3.59	91.0	0.25	1,220.3	93%
	SSTS	0.4	0.001	0.0	0.00	0.4	100%
MOS				24.5	0.07		
Total Load		1,622.3	4.44	244.6	0.67	1,402.2	86%

[1] Net reduction from current load to TMDL is 1,377.7 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 1,377.7 + 24.5 = 1,402.2 lbs/yr.
Model Calibration Years: 2011

Table 4-35. Boon Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Lester Prairie – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	Total WLA	2.2	0.01	2.2	0.01	0.0	0%
	Construction and Industrial Stormwater	2.2	0.01	2.2	0.01	0.0	0%
Load	Total LA	6,356.0	17.41	1,700.2	4.66	4.655.8	73%
	Drainage Areas	1,590.7	4.36	978.4	2.68	612.3	38%
	Atmosphere	182.5	0.50	182.5	0.50	0.0	0%
	Internal Load	4,556.9	12.48	539.3	1.48	4,017.6	88%
	SSTS	25.9	0.07	0.0	0.00	25.9	100%
MOS				189.2	0.52		
Total Load		6,358.2	17.42	1,891.6	5.19	4,655.8	73%

[1] Net reduction from current load to TMDL is 4,466.6 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 4,466.6 +189.2= 4,655.8 lbs/yr.
Model Calibration Years: 2008 and 2009

Table 4-36. Silver Lake TP TMDL summary (shallow lake, WCBP ecoregion, located in the Lester Prairie – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	Total WLA	0.8	0.002	0.8	0.002	0.0	0%
	Construction and Industrial Stormwater	0.8	0.002	0.8	0.002	0.0	0%
Load	Total LA	6,108.3	16.73	874.2	2.4	5,234.2	86%
	Drainage Areas	519.8	1.42	334.3	0.92	185.5	36%
	Atmosphere	100.6	0.28	100.6	0.28	0.0	0%
	Internal Load	5,484.9	15.02	439.3	1.20	5045.7	92%
	SSTS	3.0	0.008	0.0	0.00	3.0	100%
MOS				97.2	0.27		
Total Load		6,109.1	16.73	972.2	2.67	5,234.2	86%

[1] Net reduction from current load to TMDL is 5,137.0 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 5,137.0 + 97.2 = 5,234.2 lbs/yr.
Model Calibration Years: 2006 and 2011

Table 4-37. Winsted Lake TP TMDL summary (shallow lake, NCHF ecoregion, located in the Lester Prairie – South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	3.9	0.01	3.9	0.01	0.0	**0%**
	Construction and Industrial Stormwater	3.9	0.01	3.9	0.01	0.0	**0%**
Load	**Total LA**	15,448.0	42.29	1,950.4	5.35	13,497.6	**87%**
	Drainage Areas	10,812.8	29.60	1,744.3	4.78	9,068.5	**84%**
	Upstream Lake (South)	901.1	2.47	93.8	0.26	807.3	**90%**
	Atmosphere	86.4	0.24	86.4	0.24	0.0	**0%**
	Internal Load	3,628.1	9.93	25.9	0.07	3,602.2	**99%**
	SSTS	19.6	0.05	0.0	0.00	19.6	**100%**
MOS				217.1	0.59		
Total Load		**15,451.9**	**42.30**	**2,171.4**	**5.95**	**13,497.6**	**87%**

[1] Net reduction from current load to TMDL is 13,280.5 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 13,280.5 + 217.1 = 13,497.6 lbs/yr.
Model Calibration Years: 2008 and 2010

Table 4-38. Mud Lake TP TMDL summary (shallow lake, NCHF ecoregion, located in the South Fork Crow River Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	331.0	0.90	91.9	0.25	239.1	**72%**
	Construction and Industrial Stormwater	1.3	0.003	1.3	0.003	0.0	**0%**
	Minnetrista City MS4	329.7	0.90	90.6	0.25	239.1	**73%**
Load	**Total LA**	2,342.8	6.42	573.6	1.57	1,769.1	**76%**
	Drainage Areas	1,700.8	4.66	467.8	1.28	1,233.0	**72%**
	Upstream Lakes	221.5	0.61	39.8	0.11	181.7	**82%**
	Atmosphere	52.9	0.14	52.9	0.14	0.0	**0%**
	Internal Load	367.3	1.01	13.1	0.04	354.1	**96%**
	SSTS	0.3	0.0007	0.0	0.00	0.3	**100%**
MOS				73.9	0.20		
Total Load		**2,673.8**	**7.32**	**739.4**	**2.02**	**2,008.2**	**75%**

[1] Net reduction from current load to TMDL is 1,934.3 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 1,934.3 + 73.9 = 2,008.2 lbs/yr.
Model Calibration Years: 2010 and 2011

Table 4-39. Rice Lake TP TMDL summary (shallow lake, NCHF ecoregion, located in the S South Fork Crow Major Subwatershed)

		Existing TP Load		Allowable TP Load		Estimated Load Reduction	
		lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr[1]	%
Wasteload	**Total WLA**	1,162.1	318	214.0	0.58	948.0	**82%**
	Construction and Industrial Stormwater	0.6	0.002	0.6	0.002	0.0	**0%**
	Independence City MS4	755.5	2.07	138.7	0.38	616.8	**82%**
	Maple Plain City MS4	43.7	0.12	8.1	0.02	35.5	**82%**
	Minnetrista City MS4	362.3	0.99	66.6	0.18	295.7	**82%**
Load	**Total LA**	2,578.0	7.06	274.5	0.75	2,303.5	**89%**
	Drainage Areas (Non-MS4)	263.0	0.72	48.2	0.13	214.8	**82%**
	Upstream Lakes[2]	484.4	1.33	182.6	0.50	301.8	**62%**
	Atmosphere	33.9	0.09	33.9	0.09	0.0	**0%**
	Internal Load	1,743.2	4.77	9.8	0.03	1,733.4	**99%**
	SSTS	53.5	0.15	0.0	0.00	53.5	**100%**
MOS				54.3	0.15		
Total Load		3,740.0	10.23	542.8	1.49	**3,251.5**	87%

[1] Net reduction from current load to TMDL is 3,197.2 lbs/yr; but the gross load reduction from all sources must accommodate the MOS as well, and hence is 3,197.2 + 54.3 = 3,251.5 lbs/yr.

[2] Upstream lakes incorporated in the model include Independence, Oak, Mud, Irene, Robina, Whaletail (North)

Model Calibration Years: 2010 and 2011