Black Dog Watershed Management Commission

AGENDA
Wednesday, May 19, 2021
5:00 P.M.

COMMISSIONERS:
Curt Enestvedt, Chairperson
Mike Hughes, Vice-Chairperson
Scott Thureen, Secretary/Treasurer
Tom Harmening
Rollie Greeno
Frank Boyce, Alternate
Greg Helms, Alternate
Natalie Walker, Alternate

I. Approval of Agenda

II. Approval of Minutes – April 21, 2021

III. Approval of Accounts Payable

IV. Review Budget Performance Reports

V. Approve Liability Coverage Waiver Form

VI. Approve 2020 Annual Financial Statement

VII. Approve Draft 2022 Work Plan and Budget

VIII. Review a Summary of Land and Water Resources Inventory for the Watershed

IX. Miscellaneous

X. Adjournment

Black Dog Watershed Management Commission

Agenda Background
May 19, 2021

I. Approval of Agenda

Agenda enclosed.

Action Requested: A motion be considered to approve the Agenda.

II. Approval of Minutes from the April 21, 2021 Meeting

Minutes enclosed.

Action Requested: A motion be considered to approve the Minutes of the April 21, 2021 meeting.

III. Approval of Accounts Payable

Accounts payable list enclosed.

Action Requested: A motion be considered to approve the accounts payable list as submitted by staff.

IV. Review of Budget Performance Reports

Current Budget Performance Reports enclosed.

Action Requested: No formal action required

V. Approval of the Liability Coverage Waiver Form

Each year in conjunction with completing the BDWMO's insurance application the Commission is required to complete a Liability Coverage Waiver Form. This form states whether or not the WMO wishes to waive the statutory tort liability limits. Historically, the Black Dog WMO has chosen not to waive the monetary limits on tort liability established by MN statutes.

Action requested: A motion be considered to approve liability coverage waiver form not waiving the monetary limits on municipal tort liability established by MN Statutes 466.04.

VI. Approve the 2020 Annual Financial Statement

The annual financial statement is used to replace a financial audit. Staff will discuss the statement and once approved it will be added to the annual activity report and submitted to the Board of Soil and Water Resources

Action requested: Consider a motion approving the annual financial statement.

VII. Approval of Draft 2022 Work Plan and Budget

Enclosed is a "Draft" Work Plan and Budget for 2022. Per the BDWMO Joint Powers Agreement, the Commission is to send out a proposed budget for 2022 by July 1st.

Staff will provide an overview of the work plan and budget at the meeting and answer any questions Commissioners might have.

Action Requested: The Commission consider a motion approving the 2022 Budget and Work Plan for distribution to the member communities.

VIII. Review a Summary of Land and Water Resources Inventory for the Watershed

The inventory is enclosed in your packet and Barr staff will discuss this inventory with the Commission at the meeting. This process is part of the 10 year watershed plan update

Action Requested: Provide feedback to staff on the inventory

IX. Miscellaneous

Black Dog Watershed Management Commission

DRAFT MM
Meeting Minutes
April 21, 2021

MEMBERS PRESENT
Curt Enestvedt, Chair
Mike Hughes, Vice Chairperson
Scott Thureen, Secretary/Treasurer
Rollie Greeno
Tom Harmening
Frank Boyce, Alternate (late arrival 5:09)

MEMBERS ABSENT
Greg Helms, Alternate
Natalie Walker, Alternate

OTHERS PRESENT
Karen Chandler – Barr Engineering
Greg Williams – Barr Engineering
Joel Jamnik – Campbell Knutson
Daryl Jacobson – BDWMO Administrator
Marie Maczko – BDWMO Secretary

Curt Enestvedt, Chair, called the April 21, 2021, meeting to order at 5:02 pm via Zoom.

I. Approval of Agenda

Motion by Thureen, second by Hughes, to approve the April 21, 2021 Agenda as presented.

Ayes – Hughes, Thureen, Greeno, Harmening and Enestvedt
Nays – None

Motion Carried Unanimously

II. Approval of Minutes from the March 17, 2021 Meeting

Motion by Hughes, second by Greeno, to approve the March 17, 2021 Minutes as presented.

Ayes – Hughes, Thureen, Greeno, Harmening and Enestvedt
Nays – None

Motion Carried Unanimously

III. Approval of Accounts Payable

Motion by Harmening, second by Hughes, to approve payment to Barr Engineering in the amount of $15,238.00 for services from February 27, 2021 through April 2, 2021; and, to Campbell Knutson in the amount of $391.00 for February 2021 and March 2021 general services.

Ayes – Hughes, Thureen, Greeno, Harmening and Enestvedt
Nays – None

Motion Carried Unanimously

IV. Review Budget Performance Reports

Daryl Jacobson, BDWMO Administrator stated that the Burnsville Finance staff are in the middle of their annual audit and still in the process of working on the 2020 end of year financial statement for Black Dog. This will be included in the Annual Activity Report that will be submitted to the State. Burnsville Finance is confident that the report will be ready for the May meeting.

No Formal Action Required

V. Approval of the 2020 Annual Activity Report

The Commission is required by the Joint Powers Agreement to generate and distribute an Annual Activity Report. A draft of the 2020 Annual Activity Report was provided to the Commission for review prior to this meeting. Karen Chandler, Barr Engineering, briefly shared her screen and noted that there is a lot of information in the report, and is similar each year. One correction to the Annual Activity Report was found and will be corrected. Once the Annual Financial Statement is in from Burnsville the 2020 Annual Activity Report will be ready to go out to the appropriate parties.

Motion by Thureen, second by Harmening, to approve the Annual Activity Report with the correction and authorize staff to distribute it to the appropriate parties.

Ayes – Hughes, Thureen, Greeno, Harmening and Enestvedt
Nays – None

Motion Carried Unanimously

VI. Review Watershed Plan Update Items

Barr Engineering reviewed the current items related to the Watershed Plan Update. Curt Enestvedt asked if they had a significant amount of response from the Questionnaire. Greg Williams, Barr Engineering, said that there was 80 that took the on line survey. Chandler thanked the SWCD for the shout out on their Facebook page for the more in-depth meeting that follows at 5:30 p.m.

No Formal Action Required

VII. Miscellaneous

1. Next Meeting will be May 19, 2021 at 5 PM
2. Barr Engineering and Burnsville will be on draft budget and work plan to bring to the May meeting, it needs to be finalized in June.

VIII. Adjournment

Motion by Greeno, second by Harmening to adjourn at 5:22 pm.

Ayes – Hughes, Thureen, Greeno, Harmening and Enestvedt
Nays – None

Motion Carried Unanimously

BLACK DOG WATERSHED MANAGEMENT COMMISSION
100 Civic Center Parkway
Burnsville, MN 55337

Accounts Payable - May 19, 2021 Meeting

Barr Engineering - Services from April 3, 2021 through April 30, 2021

Engineering	$	1,296.00
Special Projects General Fund - Crystal Lake Mgmt Level Monitoring	$	854.54
Special Projects General Fund Reserve - Watershed Mgmt Plan Update	$	4,212.00
Water Quality Monitoring - Update Trend Analyses	$	312.50
Public Education - Annual Activity Report (BWSR)	$	888.00
	$	**7,563.04**

Dakota County SWCD - January - March 2021

Website Updates and Maintenance and Hosting Fee	$	680.00
	$	**680.00**

Accounts Payable Total $ 8,243.04

resourceful. naturally.
engineering and environmental consultants

BARR

May 11, 2021

Black Dog Watershed Management Commission
City of Burnsville
13713 Frontier Court
Burnsville, MN 55337-4720

Attn: Mr. Daryl Jacobson

RE: Engineering & Environmental Consulting Services

Invoice of Account with
BARR ENGINEERING COMPANY

For professional services during the period of April 3, 2021 through April 30, 2021

TOTAL PAYABLE THIS INVOICE:	**$ 7,563.04**
Allocation:	
Engineering	**$ 1,296.00**
Special Projects General Fund	
• **Crystal Lk Mgmt Level Monitoring**	**$ 854.54**
Special Projects General Fund Reserve	
• **Watershed Mgmt Plan Update**	**$ 4,212.00**
Water Quality Monitoring	
• **Update Trend Analyses**	**$ 312.50**
Public Education	
• **Annual Activity Report (BWSR)**	**$ 888.00**

Barr declares under the penalties of law that this account, claim, or demand is just and that no part of it has been paid.

Karen L. Chandler

Karen L. Chandler
Vice President

OK
Daryl Jacobson
5-11-21

BUDGET SUMMARY - 2021 FY
Black Dog Watershed Management Commission
through April 30, 2021

Work Description	Pre-2021 Costs	Barr Budget Brought Forward	Barr Budget Current Year	Barr Budget Total Barr Budget	Current Invoice	Spent This Year	Balance
Engineering	-----	0.00	31,000.00	31,000.00	1,296.00	9,124.50	21,875.50
Special Projects: General Fund							
Reporting on Orchard Lk 2020 Water Quality Monitoring	-----	0.00	4,500.00	4,500.00	0.00	4,126.00	374.00 #
Crystal Lake 2021 Mgmt Level Monitoring			18,800.00	18,800.00	854.54	1,043.54	17,756.46 #
Subtotal -- Special Projects: General Fund	-----	0.00	23,300.00	23,300.00	854.54	5,169.54	18,130.46
Special Projects: Capital Improvement Fund							
Keller Lake Alum Treatment			10,000.00	10,000.00	0.00	2,030.00	7,970.00 #
Subtotal -- Special Projects: Capital Improvement Fund	-----	0.00	10,000.00	10,000.00	0.00	2,030.00	7,970.00
Special Projects: General Fund Reserve							
Watershed Management Plan Update [1]	10,905.00		70,000.00	70,000.00	4,212.00	9,366.00	60,634.00
Subtotal -- Special Projects: General Fund Reserve	-----	0.00	70,000.00	70,000.00	4,212.00	9,366.00	60,634.00
Water Quality Monitoring							
Reporting on 2020 Keller Lake Habitat Monitoring	-----	0.00	8,000.00	8,000.00	0.00	7,983.50	16.50
2021 Kingsley Lake Habitat Monitoring		0.00	3,300.00	3,300.00	0.00	0.00	3,300.00
Update Trend Analyses	-----	0.00	2,000.00	2,000.00	312.50	2,000.00	0.00
Subtotal -- W.Q. Monitoring	-----	0.00	13,300.00	13,300.00	312.50	9,983.50	3,316.50
Public Education							
Watershed Annual Report	-----	0.00	4,300.00	4,300.00	0.00	3,519.00	781.00
Annual Activity Report (BWSR)	-----	0.00	2,000.00	2,000.00	888.00	1,313.50	686.50
Subtotal -- Public Education	-----	0.00	6,300.00	6,300.00	888.00	4,832.50	1,467.50
Total Services	-----	0.00	153,900.00	153,900.00	7,563.04	40,506.04	113,393.96

Notes:

[1] Plan Update budget=$98,200 ($97,000 authorized at 11/18/2020 meeting, additional $1,200 authorized at 1/20/2021 meeting), including $10,000 budgeted in 2020

INVOICE

Barr Engineering Co.
4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
Phone: 952-832-2600; Fax: 952-832-2601
FEIN #: 41-0905995 Inc: 1966

Mr. Daryl Jacobson
Black Dog WMO
City of Burnsville
13713 Frontier Court
Burnsville, MN 55337-4720

May 11, 2021
Invoice No: 23190374.21 - 4

Total this Invoice $2,184.00

Regarding: BDWMO 2021 Engineering Services

Professional Services from April 3, 2021 to April 30, 2021

Job: 2021 Engineering Services

Task: 001 Attend BDWMO Meetings

Labor Charges

	Hours	Rate	Amount	
Principal				
Chandler, Karen	1.20	185.00	222.00	
Engineer / Scientist / Specialist III				
Williams, Sterling	1.10	150.00	165.00	
	2.30		387.00	
Subtotal Labor				**387.00**
		Task Subtotal		**$387.00**

Task: 002 Miscellaneous Consulting

Labor Charges

	Hours	Rate	Amount	
Principal				
Chandler, Karen	3.40	185.00	629.00	
Support Personnel II				
Nypan, Nyssa	2.80	100.00	280.00	
	6.20		909.00	
Subtotal Labor				**909.00**
		Task Subtotal		**$909.00**

Task: 003 Annual BWSR Activity Report

Labor Charges

	Hours	Rate	Amount	
Principal				
Chandler, Karen	4.80	185.00	888.00	
	4.80		888.00	
Subtotal Labor				**888.00**

PLEASE REMIT TO ABOVE ADDRESS and INCLUDE INVOICE NUMBER ON CHECK.
Terms: Due upon receipt. 1 1/2% per month after 30 days. Please refer to the contract if other terms apply.

Task Subtotal	**$888.00**
Job Subtotal	**$2,184.00**
Total this Invoice	**$2,184.00**

	Current	Prior	Total	Received	A/R Balance
Invoiced to Date	**2,184.00**	**11,773.00**	**13,957.00**	**11,773.00**	**2,184.00**

Thank you in advance for the prompt processing of this invoice. If you have any questions, please contact Karen Chandler, your Barr project manager, at (952) 832-2813 or email at kchandler@barr.com.

INVOICE

Barr Engineering Co.
4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
Phone: 952-832-2600; Fax: 952-832-2601
FEIN #: 41-0905995 Inc: 1966

Mr. Daryl Jacobson
Black Dog WMO
City of Burnsville
13713 Frontier Court
Burnsville, MN 55337-4720

May 11, 2021
Invoice No: 23190375.21 - 4

Total this Invoice $854.54

Regarding: Management Level Water Quality Monitoring

Professional Services from April 3, 2021 to April 30, 2021

Job: CRY Crystal Lk 2021 Water Quality Monitoring

Task: 100 Monitoring Data Mgmt & Proj Mgmt

Labor Charges

	Hours	Rate	Amount	
Engineer / Scientist / Specialist III				
Menken, Kevin	.50	125.00	62.50	
Olson, Terri	.50	150.00	75.00	
Technician I				
Hankard, Madeline	2.10	85.00	178.50	
Melmer, David	3.30	90.00	297.00	
Support Personnel II				
Treanor, Margaret	.70	115.00	80.50	
	7.10		693.50	
Subtotal Labor				**693.50**

Unit Charges

Barr Owned Vehicle Use	0.5 days @ 90.00	45.00	
Canoe	0.5 days @ 32.00	16.00	
Ice (per bag)	2.0 ea @ 2.50	5.00	
Kemmerer Vertical Bottle Sampler	1.0 use @ 33.50	33.50	
Vehicle (Mileage)	34.0 miles @ 0.56	19.04	
Water Quality Meter (YSI 556 MPS)	0.5 days @ 85.00	42.50	
Subtotal Units			**161.04**
	Task Subtotal		**$854.54**
	Job Subtotal		**$854.54**
	Total this Invoice		**$854.54**

	Current	Prior	Total	Received	A/R Balance
Invoiced to Date	**854.54**	**4,315.00**	**5,169.54**	**4,315.00**	**854.54**

Thank you in advance for the prompt processing of this invoice. If you have any questions, please contact Kevin Menken, your Barr project manager, at (952) 832-2794 or email at kmenken@barr.com.

PLEASE REMIT TO ABOVE ADDRESS and INCLUDE INVOICE NUMBER ON CHECK.
Terms: Due upon receipt. 1 1/2% per month after 30 days. Please refer to the contract if other terms apply.

INVOICE

Barr Engineering Co.
4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
Phone: 952-832-2600; Fax: 952-832-2601
FEIN #: 41-0905995 Inc: 1966

Mr. Daryl Jacobson
Black Dog WMO
City of Burnsville
13713 Frontier Court
Burnsville, MN 55337-4720

May 11, 2021
Invoice No: 23190375.99 - 6

Total this Invoice $312.50

Regarding: Trend Analysis

Professional Services from April 3, 2021 to April 30, 2021

Job: 2021 2020 Data

Task: 100 Trend Analysis 2020 Data

Labor Charges

	Hours	Rate	Amount
Engineer / Scientist / Specialist III			
Menken, Kevin	2.50	125.00	312.50
	2.50		312.50
Subtotal Labor			**312.50**
		Task Subtotal	**$312.50**
		Job Subtotal	**$312.50**
		Total this Invoice	**$312.50**

	Current	Prior	Total	Received	A/R Balance
Invoiced to Date	**312.50**	**3,307.50**	**3,620.00**	**3,307.50**	**312.50**

Thank you in advance for the prompt processing of this invoice. If you have any questions, please contact Greg Wilson, your Barr project manager, at (952) 832-2672 or email at gwilson@barr.com.

PLEASE REMIT TO ABOVE ADDRESS and INCLUDE INVOICE NUMBER ON CHECK.
Terms: Due upon receipt. 1 1/2% per month after 30 days. Please refer to the contract if other terms apply.

INVOICE

Barr Engineering Co.
4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
Phone: 952-832-2600; Fax: 952-832-2601
FEIN #: 41-0905995 Inc: 1966

Mr. Daryl Jacobson
Black Dog WMO
City of Burnsville
13713 Frontier Court
Burnsville, MN 55337-4720

May 11, 2021
Invoice No: 23191455.00 - 5

Total this Invoice $4,212.00

Regarding: BDWMO 2022 Watershed Management Plan

Professional Services from April 3, 2021 to April 30, 2021

Job: 100 Stakeholder Engagement

Task: 003 Online Survey

Labor Charges

	Hours	Rate	Amount	
Support Personnel II				
Ungar, Lisa	.30	130.00	39.00	
	.30		39.00	
Subtotal Labor				**39.00**
			Task Subtotal	**$39.00**

Task: 007 Public Kickoff Meeting

Labor Charges

	Hours	Rate	Amount	
Principal				
Chandler, Karen	.50	185.00	92.50	
Engineer / Scientist / Specialist III				
Williams, Sterling	3.50	150.00	525.00	
	4.00		617.50	
Subtotal Labor				**617.50**
			Task Subtotal	**$617.50**
			Job Subtotal	**$656.50**

Job: 200 Draft Plan Development

Task: 001 Physical Environment Inventory

Labor Charges

	Hours	Rate	Amount
Principal			
Chandler, Karen	6.40	185.00	1,184.00
Engineer / Scientist / Specialist III			
Williams, Sterling	12.70	150.00	1,905.00

PLEASE REMIT TO ABOVE ADDRESS and INCLUDE INVOICE NUMBER ON CHECK.
Terms: Due upon receipt. 1 1/2% per month after 30 days. Please refer to the contract if other terms apply.

Engineer / Scientist / Specialist II				
Anderson, Edward	2.70	95.00	256.50	
Long, Colleen	2.10	100.00	210.00	
	23.90		3,555.50	
Subtotal Labor				**3,555.50**
			Task Subtotal	**$3,555.50**
			Job Subtotal	**$3,555.50**
			Total this Invoice	**$4,212.00**

	Current	Prior	Total	Received	A/R Balance
Invoiced to Date	**4,212.00**	**6,088.00**	**10,300.00**	**6,088.00**	**4,212.00**

Thank you in advance for the prompt processing of this invoice. If you have any questions, please contact Greg Williams, your Barr project manager, at (952) 832-2945 or email at gwilliams@barr.com.

DAKOTA COUNTY
SOIL & WATER
CONSERVATION DISTRICT

Invoice

Dakota County Soil & Water Conservation District

4100 220th Street West, Ste 102
651-480-7777
Farmington, MN 55024

DATE	INVOICE #
4/28/2021	3077

BILL TO

Black Dog WMO
Daryl Jacobson, Administrator
13713 Frontier Court
Burnsville, MN 55337

Reference	TERMS

ITEM CODE	DESCRIPTION	HOURS	RATE	AMOUNT
	January - March 2021			
Black Dog	Website Updates and Maintenance	8.5	80.00	680.00

OK
Daryl Jacobson
5/3/21

Thank you.

Total **$680.00**

BLACK DOG WMO
CASH ACTIVITY REPORT 2021

Date	Description	Deposits		Check #	Check Amount	Monthly Cash Balance	Expenditures: General Engineering Support	Special Projects (General)	Special Projects (Capital)	Special Projects (Gen. Reserve)	Insurance	Legal & Audit	Admin Support	Public Education	Water Quality Monitoring	Conf Public	Contin-gency
	Balance as of 12/31/20					**572,983.92**											
20-Jan	Barr Engineering Co (2020)			1745	4,253.50		2,637.50	1,508.00	-	-					108.00		
20-Jan	Campbell Knutson (2020)			1746	85.00							85.00					
20-Jan	Met Council - Environ Services (2020)			1747	3,040.00										3,040.00		
31-Jan	Interest Income	9.67															
	01/31/20 Balance	9.67			7,378.50	**565,615.09**	2,637.50	1,508.00	-	-	-	85.00	-	-	3,148.00	-	-
17-Feb	Barr Engineering Co			1748	5,732.00		2,284.00	89.50	1,155.00	1,186.00				-	1,017.50		
17-Feb	Campbell Knutson			1749	340.00							340.00					
17-Feb	City of Burnsville (2020)			1750	19,101.21								19,101.21				
17-Feb	Dakota County Soil & Water (2020)			1751	2,765.00			2,250.00	-	-				515.00			
28-Feb	Interest Income	8.72															
	02/28/20 Balance	8.72			27,938.21	**537,685.60**	2,284.00	2,339.50	1,155.00	1,186.00	-	340.00	19,101.21	515.00	1,017.50	-	-
17-Mar	Barr Engineering			1752	11,973.00		1,912.00	2,084.00	525.00	1,232.00		-		483.50	5,736.50		
31-Mar	Interest Income	8.17															
	03/31/20 Balance	8.17			11,973.00	**525,720.77**	1,912.00	2,084.00	525.00	1,232.00	-	-	-	483.50	5,736.50	-	-
21-Apr	Barr Engineering			1753	15,238.00		3,632.50	2,141.50	350.00	2,736.00				3,461.00	2,917.00		
21-Apr	Campbell Knutson			1754	391.00							391.00					
30-Apr	Interest Income	4.22															
	04/30/20 Balance	4.22			15,629.00	**510,095.99**	3,632.50	2,141.50	350.00	2,736.00	-	391.00	-	3,461.00	2,917.00	-	-
	Total Revenue	30.78	**Total Expense**		62,918.71		10,466.00	8,073.00	2,030.00	5,154.00	-	816.00	19,101.21	4,459.50	12,819.00	-	-
	Less: 2020 A/R	-	**Less: 2020 A/P**		(29,244.71)		(2,637.50)	(3,758.00)	-	-	-	(85.00)	(19,101.21)	(515.00)	(3,148.00)	-	-
	Total YTD 2020 Revenue	30.78	**Total YTD 2021 Exp**		33,674.00		7,828.50	4,315.00	2,030.00	5,154.00	-	731.00	-	3,944.50	9,671.00	-	-
			2021 Budget		214,500.00		31,000.00	36,800.00	10,000.00	70,000.00	3,000.00	5,000.00	18,000.00	18,100.00	17,100.00	500.00	5,000.00
			Budget Remaining		180,826.00		23,172.00	32,485.00	7,970.00	64,846.00	3,000.00	4,269.00	18,000.00	14,155.50	7,429.00	500.00	5,000.00

BLACK DOG WATER MANAGEMENT COMMISSION

Budget Performance Report
April 30, 2021

	CURRENT MONTH	YEAR TO DATE			
	ACTUAL	GENERAL FUND BUDGET	CAPITAL IMPROVEMENT FUND BUDGET	ACTUAL	VARIANCE FAVORABLE (UNFAVORABLE)
Opening Fund Balance		$ 421,605	$ 122,135	$ 543,739	
REVENUES :					
Member Contributions:					
City of Apple Valley	$ -	$ 10,489	$ 1,773	$ -	$ (12,262)
City of Burnsville	-	93,924	16,133	-	(110,057)
City of Eagan	-	580	-	-	(580)
City of Lakeville	-	26,007	4,094	-	(30,101)
Total Member Contributions	-	131,000	22,000	-	(153,000)
Other Revenues:					
Interest	$ 4	$ 40	$ -	$ 31	$ (9)
Grant (State of MN BWSR)	-	-	-	-	-
Total Other Revenue	4	40	-	31	(9)
Total Revenues	$ 4	$ 131,040	$ 22,000	$ 31	$ (153,009)
EXPENDITURES :					
General Engineering Support	$ 3,633	$ 31,000	$ -	$ 7,829	$ 23,172
Special Projects - General Fund	2,142	36,800	-	4,315	32,485
Special Projects - Capital Improvement Fund	350	-	10,000	2,030	7,970
Special Projects - General Fund Reserve	2,736	70,000	-	5,154	64,846
Insurance	-	3,000	-	-	3,000
Legal and Audit	391	5,000	-	731	4,269
Administrative Support	-	18,000	-	-	18,000
Public Education	3,461	18,100	-	3,945	14,156
Water Quality Monitoring	2,917	17,100	-	9,671	7,429
Conference/Publications	-	500	-	-	500
Contingency	-	5,000	-	-	5,000
Total Expenditures	15,629	204,500	10,000	33,674	180,826
EXCESS OF REVENUES OVER (UNDER) EXPENDITURES	(15,625)	(73,460)	12,000	(33,643)	
EXCESS OF REVENUES OVER (UNDER) EXPENDITURES PLUS OPENING FUND BALANCE				510,096	

TOTAL CASH AVAILABLE 4/30/2021	510,096
Fund Balance 4/30/2021	$ 510,096

LEAGUE of MINNESOTA CITIES

LIABILITY COVERAGE – WAIVER FORM

Members who obtain liability coverage through the League of Minnesota Cities Insurance Trust (LMCIT) must complete and return this form to LMCIT before the member's effective date of coverage. Return completed form to your underwriter or email to pstech@lmc.org.

The decision to waive or not waive the statutory tort limits must be made annually by the member's governing body, in consultation with its attorney if necessary.

Members who obtain liability coverage from LMCIT must decide whether to waive the statutory tort liability limits to the extent of the coverage purchased. The decision has the following effects:

- *If the member does not waive the statutory tort limits*, an individual claimant could recover no more than $500,000 on any claim to which the statutory tort limits apply. The total all claimants could recover for a single occurrence to which the statutory tort limits apply would be limited to $1,500,000. These statutory tort limits would apply regardless of whether the member purchases the optional LMCIT excess liability coverage.

- *If the member waives the statutory tort limits and does not purchase excess liability coverage*, a single claimant could recover up to $2,000,000 for a single occurrence (under the waive option, the tort cap liability limits are only waived to the extent of the member's liability coverage limits, and the LMCIT per occurrence limit is $2,000,000). The total all claimants could recover for a single occurrence to which the statutory tort limits apply would also be limited to $2,000,000, regardless of the number of claimants.

- *If the member waives the statutory tort limits and purchases excess liability coverage*, a single claimant could potentially recover an amount up to the limit of the coverage purchased. The total all claimants could recover for a single occurrence to which the statutory tort limits apply would also be limited to the amount of coverage purchased, regardless of the number of claimants.

Claims to which the statutory municipal tort limits do not apply are not affected by this decision.

LMCIT Member Name: Black Dog Watershed Management Organization

Check one:

☐ The member **DOES NOT WAIVE** the monetary limits on municipal tort liability established by Minn. Stat. § 466.04.

☐ The member **WAIVES** the monetary limits on municipal tort liability established by Minn. Stat. § 466.04, to the extent of the limits of the liability coverage obtained from LMCIT.

Date of member's governing body meeting: _____

Signature:_____ Position: _____

BLACK DOG WATERSHED
MANAGEMENT ORGANIZATION

Statement of Net Position
as of December 31, 2020

	Governmental Activities 2020
Assets	
Cash and investments	572,983.92
Accounts receivable	-
Due from other governmental units	-
Prepaids	-
Capital assets	
Buildings	37,600.00
Equipment	110,138.00
Less accumulated depreciation	(134,578.00)
Total capital assets, net of accumulated depreciation	13,160.00
Total assets	586,143.92
Liabilities	
Accounts payable	4,338.50
Due to other governmental units	24,906.21
Unearned revenue	14,061.20
Total liabilities	43,305.91
Net position	
Net investment in capital assets	13,160.00
Restricted for capital improvements	108,073.33
Unrestricted	421,604.68
Total net position	542,838.01
Total liabilities and net position	586,143.92

-

Unaudited
Prepared by City of Burnsville

BLACK DOG WATERSHED
MANAGEMENT ORGANIZATION

Statement of Activities
Year Ended December 31, 2020

	Governmental Activities 2020
Expenses	
General government	
System operations	80,244.45
Administrative services	45,854.33
Depreciation	940.00
Total program expenses	127,038.78
Revenues	
General government	
Charges for services	
Management fees	153,000.00
Grants	
State of MN Board of Water and Soil Resources	-
General revenues	
Interest earnings	2,051.14
Total revenues	155,051.14
Change in net position	28,012.36
Net position	
Beginning of year	514,825.65
End of year	542,838.01

BLACK DOG WATERSHED
MANAGEMENT ORGANIZATION

Balance Sheet
Governmental Funds
Year Ended December 31, 2020

	General Fund	Capital Improvement Fund	Total Governmental Funds 2020
Assets			
Cash and investments	450,849.39	122,134.53	572,983.92
Liabilities			
Accounts payable	4,338.50	0.00	4,338.50
Due to other governmental units	24,906.21	0.00	24,906.21
Unearned revenue	0.00	14,061.20	14,061.20
Total liabilities	29,244.71	14,061.20	43,305.91
Fund balances			
Restricted for capital improvements	0.00	108,073.33	108,073.33
Assigned for subsequent year's budget deficit	73,460.00	0.00	73,460.00
Unassigned	348,144.68	0.00	348,144.68
Total fund balances	421,604.68	108,073.33	529,678.01
Total liabilities, deferred inflows of resources, and fund balances	450,849.39	122,134.53	572,983.92

Amounts reported for governmental activities in the Statement of Net Position differ because:	
Fund balances – governmental funds	529,678.01
Capital assets used in governmental activities are not financial resources and, therefore, are not reported as assets in governmental funds.	
Cost of capital assets	147,738.00
Less accumulated depreciation	(134,578.00)
Net position of governmental activities	542,838.01

Unaudited
Prepared by City of Burnsville

BLACK DOG WATERSHED
MANAGEMENT ORGANIZATION

Statement of Revenue, Expenditures, and Changes in Fund Balances
Governmental Funds
Year Ended December 31, 2020

	General Fund	Capital Improvement Fund	Total Governmental Funds 2020
Revenue			
Member assessments	131,000.00	22,000.00	153,000.00
Intergovernmental Revenue - Grants	-	-	-
Interest earnings	2,051.14	-	2,051.14
Total revenue	133,051.14	22,000.00	155,051.14
Expenditures			
General government			
System Operations			
Engineering	27,590.92	-	27,590.92
Special Projects	36,747.53	714.00	37,461.53
Insurance	2,301.00	-	2,301.00
Water quality monitoring	12,891.00	-	12,891.00
Administrative services			
Legal and audit	9,320.40	-	9,320.40
Administrative costs	19,101.21	-	19,101.21
Public education	17,292.00	-	17,292.00
Conferences, publications and reports	25.50	-	25.50
Contingency	115.22	-	115.22
Total expenditures	125,384.78	714.00	126,098.78
Expenditures	7,666.36	21,286.00	28,952.36
Other Financing Source (Uses)			
Transfers in	-	-	-
Transfers out	-	-	-
Total other financing sources (uses)	-	-	-
Net change in fund balances	7,666.36	21,286.00	28,952.36
Fund balances			
Beginning of year	413,938.32	86,787.33	500,725.65
End of year	421,604.68	108,073.33	529,678.01

Amounts reported for governmental activities in the Statement of Activities are different because:

Net change in fund balances – governmental funds	28,952.36
Capital outlays are reported as expenditures in governmental funds, but are allocated over the estimated useful lives of the capital assets as depreciation expense in the Statement of Activities.	
Depreciation expense	(940.00)
Change in net position of governmental activities	28,012.36

Unaudited
Prepared by City of Burnsville

BLACK DOG WATERSHED
MANAGEMENT ORGANIZATION

Statement of Revenue, Expenditures, and Changes in Fund Balances
Budget and Actual
General Fund
Year Ended December 31, 2020

	2020		
	Original and Final Budget	Actual	Over (Under) Final Budget
Revenue			
Management fees	131,000.00	131,000.00	-
Intergovernmental Revenue - Grants	-	-	-
Interest earnings	40.00	2,051.14	2,011.14
Total revenue	131,040.00	133,051.14	2,011.14
Expenditures			
General government			
System Operations			
Engineering	31,000.00	27,590.92	(3,409.08)
Special Projects	46,500.00	36,747.53	(9,752.47)
Insurance	3,000.00	2,301.00	(699.00)
Water quality monitoring	15,400.00	12,891.00	(2,509.00)
Administrative services			
Legal and audit	8,400.00	9,320.40	920.40
Administrative costs	18,000.00	19,101.21	1,101.21
Public education	17,900.00	17,292.00	(608.00)
Conferences, publications and reports	500.00	25.50	(474.50)
Contingency	5,000.00	115.22	(4,884.78)
Total expenditures	145,700.00	125,384.78	(20,315.22)
Expenditures	(14,660.00)	7,666.36	22,326.36
Other Financing Source (Uses)			
Transfers in	-	-	-
Transfers out	-	-	-
Total other financing sources (uses)	-	-	-
Net change in fund balances	(14,660.00)	7,666.36	22,326.36
Fund balances			
Beginning of year		413,938.32	
End of year		421,604.68	

BLACK DOG WATERSHED
MANAGEMENT ORGANIZATION

Statement of Revenue, Expenditures, and Changes in Fund Balances
Budget and Actual
Capital Improvement Fund
Year Ended December 31, 2020

	2020		
	Original and Final Budget	Actual	Over (Under) Final Budget
Revenue			
Management fees	22,000.00	22,000.00	-
Intergovernmental Revenue - Grants	-	-	-
Interest earnings	-	-	-
Total revenue	22,000.00	22,000.00	-
Expenditures			
General government			
System Operations			
Engineering	-	-	-
Special Projects	-	714.00	714.00
Insurance	-	-	-
Water quality monitoring	-	-	-
Administrative services			
Legal and audit	-	-	-
Administrative costs	-	-	-
Public education	-	-	-
Conferences, publications and reports	-	-	-
Contingency	-	-	-
Total expenditures	-	714.00	714.00
Excess (Deficiency) of Revenues Over (Under) Expenditures	22,000.00	21,286.00	(714.00)
Other Financing Source (Uses)			
Transfers in	-	-	-
Transfers out	-	-	-
Total other financing sources (uses)	-	-	-
Net change in fund balances	22,000.00	21,286.00	(714.00)
Fund balances			
Beginning of year		86,787.33	
End of year		108,073.33	

Black Dog Watershed Management Organization

2022 Goals & Work Plan

1. Continue work on updating the Black Dog WMO *Watershed Management Plan*, which expires in September 2022. The planning process usually takes between one and two years to complete; preliminary work began in 2020. The most intense work of the planning process will likely be in 2021 and work will extend through much of 2022. Work completed or planned in 2021 includes stakeholder engagement, issue identification and prioritization, and drafting of the plan document. Work in 2022 will include completing the draft plan document, navigating the formal plan review process, and obtaining approval from the Minnesota Board of Water and Soil Resources.
2. Participate in Metropolitan Council's Citizen Assisted Water Quality Monitoring Program (CAMP) for the following strategic water bodies:
    - Crystal Lake
    - Keller Lake
    - Kingsley Lake
    - Lac Lavon
    - Orchard Lake

    Complete water quality trend analyses on these lakes using the information gathered through CAMP and the more detailed monitoring on Lac Lavon.
3. Perform more detailed (management level) monitoring on Lac Lavon, as recommended in the Black Dog WMO Watershed Management Plan. Monitoring activities will include water quality monitoring and aquatic plant surveys. The water quality monitoring will consist of collecting samples on 11 occasions—ice-out and then May through September, twice per month. On each monitoring occasion, analytical samples will be collected at seven depths at the deepest spot in the lake—a surface sample, plus six samples at one-meter intervals from three to eight meters. All of the samples will be analyzed for total phosphorus. In addition, Secchi disc readings will be taken, and the surface samples will be analyzed for chlorophyll-a. Field measurements of temperature, dissolved oxygen, pH, redox potential, and specific conductivity will be taken at one meter intervals at the monitoring location. Turbidity field measurements will also be taken on the surface water sample at the monitoring location. Two aquatic vegetation surveys will be conducted on Lac Lavon (by a qualified subcontractor); one in June and one in August. In 2022, the work includes field work, lab work, QA/QC of lab data (including coordination with lab), entering data into EQuIS database, and submitting data to the MPCA (per guidance in the BDWMO Plan). . In 2023, work will include preparing the technical memo summarizing the monitoring results, and preparing a presentation for a Commission meeting.
4. Prepare the 2021 Crystal Lake technical memo summarizing the more detailed (management level) monitoring results and a presentation for a Commission meeting.
5. Continue implementing the Keller Lake alum treatment project (completion of the second phase of alum treatment will occur in fall 2021, while the first phase of alum treatment occurred in spring 2019), including grant administration. In 2022, this work will primarily include grant administration and final reporting. Keller Lake CAMP monitoring data will be used to understand the project impacts, with the collection of additional field data (temperature and dissolved oxygen) during each monitoring event, if possible. The Black Dog WMO received a $230,000 BWSR Clean Water Fund Grant (awarded in December 2018,

final contract execution in April 2019), which covers 80% of the project cost (grant requires a 20% local share).

6. Perform habitat monitoring of Orchard Lake. Monitoring is performed at one strategic water body per year, such that all five strategic water bodies will be completed over a five-year cycle. Monitoring includes a meandering survey around the entire lake as well as the previously established sample plots (in the emergent and upland buffer zones). The City of Lakeville will provide results of their 2022 aquatic vegetation surveys, which will be used to evaluate the submergent zone.
7. Prepare the 2021 Kingsley Lake habitat monitoring report and a presentation for a Commission meeting.
8. Conduct an annual evaluation of the watershed programs and report the results to member communities via a watershed annual report (this report is incorporated into the annual activity report submitted to the Minnesota Board of Water and Soil Resources).
9. Partner with the Dakota County SWCD by providing funding and technical support to install up to 18 water quality improvement projects through the Landscaping for Clean Water program for Black Dog WMO residents, consistent with SWCD cost share policies.
10. Partner with the Dakota County SWCD to fund two Landscaping for Clean Water workshops and two Landscaping for Clean Water Design Workshops (four evenings) in the Black Dog WMO area. Due to COVID-19, the SWCD held virtual workshops in 2020; in 2021, in-person or virtual workshops could be held.[KC1]
11. Complete the 2021 annual finance statement—statute changes allow the Black Dog WMO to perform audits every five years, rather than every year. As the last audit was prepared for year 2019; the next audit needs to be prepared in 2025 for year 2024. In the other years, an annual finance statement is prepared.
12. As budget allows, prepare up to two educational pieces/presentations for the Commission regarding new technology (e.g., new stormwater best management practices, new lake treatment technologies, etc.) and/or aquatic invasive species.
13. Apply for grants and/or assist member cities with grant applications.
14. Assist with BWSR watershed-based funding.
15. Formulate and approve the year 2023 Work Plan and Budget.
16. Review and respond to any issues and opportunities brought to the attention of the Black Dog WMO.
17. Maintain and update web site.
18. Respond to requests to partner with member communities and Dakota County on educational outreach programs.
19. Keep abreast of changes to the TMDL program, including additions to/removals from the impaired waters list and the listing criteria.
20. Review revisions to local water management and comprehensive plans as needed. No reviews are expected in 2022, as all member cities' plans have been reviewed and approved.
21. Continue implementing plan to accrue funds in 1) a Capital Improvement Fund, to be used for the current Keller Lake alum treatment project, and future BDWMO internal load reduction projects stemming from TMDLs for lakes with intercommunity shoreline (Crystal

Lake, Keller Lake, and Lac Lavon) and 2) a General Fund Reserve to be used for the BDWMO watershed plan ten-year update.

Black Dog Watershed Management Organization

2022 Budget

(For discussion at the 5/19/2021 BDWMO Meeting)

ITEM ***AMOUNT***

1. ENGINEERING **$31,000**

Projected cost of engineering consulting fees required for the general operation of the Black Dog WMO. Includes funding for engineering consultant to prepare for and attend meetings (additional meetings anticipated as part of watershed planning process); review/respond to issues and opportunities; apply for grants; assist with BWSR watershed-based funding; review/ comment on proposed projects, EAWs, revisions to local water management plans, comprehensive plans, and other plans; communications/ meetings with agencies and member cities; track and report on impaired waters and TMDL issues; and other miscellaneous consulting/reviews. As budget allows, this also includes the preparation of up to two educational pieces/presentations for the Commission regarding new technology (e.g., new stormwater best management practices, new lake treatment technologies, etc.) and/or aquatic invasive species.

2. SPECIAL PROJECTS – GENERAL FUND **$40,600**

(A) Lac Lavon Management Level Monitoring *$ 22,500*

2022 costs to conduct management level monitoring of the lake's water quality, per guidance in the BDWMO Plan. The 2022 monitoring would include water quality monitoring and aquatic vegetation surveys of Lac Lavon. The water quality monitoring will consist of collecting samples on 11 occasions—ice-out and then May through September, twice per month. On each monitoring occasion, analytical samples will be collected at seven depths at the deepest spot in the lake—a surface sample, plus six samples at one-meter intervals from three to eight meters. All of the samples will be analyzed for total phosphorus. In addition, Secchi disc readings will be taken, and the surface samples will be analyzed for chlorophyll-a. Field measurements of temperature, dissolved oxygen, pH, redox potential, and specific conductivity will be taken at one-meter intervals at the monitoring location. Turbidity field measurements will also be taken on the surface water sample at the monitoring location. Two aquatic vegetation surveys would be conducted on Lac Lavon (by a qualified subcontractor); one in June and one in August. The 2022 budget covers field work, lab work, QA/QC of lab data (including coordination with lab), entering data into EQuIS database, and submitting data to the MPCA (per guidance in the BDWMO Plan. In 2023, work will include preparing the technical memo summarizing the monitoring results, and preparing a presentation for a

ITEM ***AMOUNT***

Commission meeting. The 2023 work is estimated to be $4,600, bringing the total project cost to $27,100.

(B) Dakota County SWCD –Landscaping for Clean Water Implementation *$13,500*

Funds to partner with the Dakota County SWCD to provide cost share and technical assistance to landowners for up to 18 Landscaping for Clean Water projects including raingardens, native plantings and shoreline stabilization projects, consistent with SWCD cost share policies.

(C) Reporting on 2021 Crystal Lake Management Level Monitoring *$4,600*

Prepare the 2021 Crystal Lake technical memo summarizing the monitoring results and a presentation for a Commission meeting.

3. SPECIAL PROJECTS – CAPITAL IMPROVEMENT FUND **$5,000**

(A) Keller Lake Alum Treatment *$5,000*

Complete Keller Lake alum treatment project (the second phase of alum treatment will occur in fall 2021, while the first alum phase of alum treatment was in spring 2019). The Black Dog WMO received a $230,000 BWSR Clean Water Fund Grant (awarded in December 2018, final contract execution in April 2019), which covers 80% of the project cost (grant requires a 20% local share). In 2022, this work will include grant administration and final reporting. All of this work is reimbursable (up to 80%) by the BWSR grant.

The budget does not include the needed water quality monitoring for Keller Lake, as the CAMP monitoring data should be sufficient. However, it would be helpful if the CAMP volunteer or City of Apple Valley staff could collect additional field data (temperature and dissolved oxygen) during each monitoring event.

4. SPECIAL PROJECTS – GENERAL FUND RESERVE **$40,000**

(A) Watershed Management Plan Update *$ 40,000*

Continue work on updating the Black Dog WMO *Watershed Management Plan*, which expires in September 2022. The planning process usually takes

ITEM ***AMOUNT***

between one and two years to complete; preliminary work is set to begin later in 2020. The most intense work of the planning process will likely be in 2021 and work will extend through much of 2022. Work completed or planned in 2021 includes stakeholder engagement, issue identification and prioritization, and drafting of the plan document. Work in 2022 will include completing the draft plan document, navigating the formal plan review process, and obtaining approval from the Minnesota Board of Water and Soil Resources. .

5. INSURANCE **$3,000**

Cost of insurance policy for WMO. Cost is net of any rebates anticipated.

6. LEGAL AND AUDIT **$5,500**[ER1]

This represents legal consultant fees ($4,400).

7. ADMINISTRATIVE SERVICES **$19,000**

This represents charges from the City of Burnsville for providing administrative services to the Commission. It includes the Administrator's time, secretarial time, and accounting staff time (including preparing the annual finance statement in years when an audit not required), as well as postage and printing.

8. PUBLIC EDUCATION **$20,050**

(A) Watershed Annual Report (Newsletter) *$4,300*

Funds to prepare draft and final versions of annual report/newsletter, and to produce annual report/newsletter. Electronic distribution only of draft and final report.

(B) Dakota County SWCD Landscaping for Clean Water Workshop Support *$10,200*

Funds to partner with the Dakota County SWCD to conduct two Landscaping for Clean Water Intro Workshops (two evenings) and to conduct two Landscaping for Clean Water Design Workshops (four evenings) in the BDWMO area. Due to COVID-19, the SWCD held virtual workshops in 2020; in 2021, workshops could be held in-person or virtual.

(C) Maintain Web Site *$3,550*

ITEM ***AMOUNT***

Funds paid to Dakota County SWCD to maintain and update the BDWMO web site.

(D) Annual Activity Report (to BWSR) *$2,000*

Funds for engineering consultant to prepare draft and final annual activity report (submitted to BWSR), including coordination with BDWMO administrator and updating water quality summaries in the appendices.

9. WATER QUALITY MONITORING **$17,200**[ER2]

(A) Metropolitan Council Lake Monitoring (CAMP) *$3,800*

Black Dog WMO payment for local communities to enroll all strategic water bodies in the Metropolitan Council's Citizen Assisted (lake) Monitoring Program (CAMP) - 5 sites @ $760. The strategic water bodies are Crystal Lake, Keller Lake, Kingsley Lake, Lac Lavon, and Orchard Lake.

(B) Habitat Monitoring *$11,400*

1. *2022 Orchard Lake Habitat Monitoring* *$2,200*
   2022 costs to perform habitat monitoring of Orchard Lake. Monitoring includes a meandering survey around the entire lake as well as the previously established sample plots (in the emergent and upland buffer zones. The City of Lakeville will provide results of their 2022 aquatic vegetation surveys, which will be used to evaluate the submergent zone. In 2023, work will include preparing the report and a presentation for a Commission meeting. The 2023 work is estimated to be $9,300, bringing the total project cost to $11,500.

2. *Reporting on 2021 Kingsley Lake Habitat Monitoring* *$9,200*
   Prepare the 2021 Kingsley Lake habitat monitoring report and a presentation for a Commission meeting.

(C) Update Trend Analysis on Strategic Water Bodies *$2,000*

Funding to analyze 2021 data, coordinate with Metropolitan Council regarding CAMP data, and update tables and figures for inclusion in annual activity report and water quality monitoring report.

10. CONFERENCE/ PUBLICATIONS **$500**

Funds allocated to reimburse Commissioners for training, education, etc.

Black Dog Watershed Management Organization

2022 Budget – Page 5

ITEM ***AMOUNT***

11. CONTINGENCY **$5,000**

These funds are not allocated to a particular project and can be used for unexpected expenses and/or new program opportunities that may come up during the course of the year which the WMO wishes to pursue.

TOTAL EXPENSES **$186,850**

REVENUES

INTEREST	**$40**
MEMBER CONTRIBUTIONS	**$131,000**
MEMBER CONTRIBUTIONS - CAPITAL IMPROVEMENT FUND	**$22,000**
GRANTS	**$0**
TOTAL REVENUES	**$153,040**

Anticipated Fund Balance at the end of 2022 = **$490,171**

PLANNED CHANGES IN FUND BALANCE

1. Capital Improvement Fund **$17,000**

The cities of Apple Valley, Burnsville, and Lakeville pay into this fund (established in 2016). The accrued funds are allocated for the current Keller Lake alum treatment project, and future projects including BDWMO internal load reduction projects stemming from TMDLs for lakes with intercommunity shoreline (Crystal Lake, Keller Lake, and Lac Lavon).

2. General Fund Reserve **($50,810)**

Use of fund balance in the general fund.

TOTAL PLANNED INCREASE IN (USE OF) FUND BALANCE **($33,810)**

1.0 Land and Water Resources Inventory

This section summarizes the land and water resources located within the BDWMO. It contains information on climate and precipitation, topography and drainage, land use, soils, geology, groundwater, surface waters, natural areas, habitat, and rare species, recreation, and potential pollutant sources. Land and water resource information is important because it describes the condition of the watershed that may impact decisions about infrastructure, development, and resource management.

1.1 Climate and Precipitation

The climate of the seven county Twin Cities Metropolitan Area is a humid continental climate, characterized by moderate precipitation (normally sufficient for crops), wide daily temperature variations, large seasonal variations in temperature, warm humid summers, and cold winters with moderate snowfall. Climate data is often presented according to 30-year "climate normal" periods, the most recent spanning the period from 1991-2020. Several of the wettest years on record have been observed during the most recent climate normal period, including several wet years since 2010. Climate trends are discussed in Section 1.1.2. Climate data presented in this section is based on the 30-year period from 1991 through 2020, unless otherwise noted.

The mean annual temperature as measured at the Minneapolis-St. Paul international airport (MSP) is 46.6°F (1991-2020). Mean monthly temperatures vary from 15.9°F in January to 74.1°F in July (1991-2020). For the 1991-2020 climate normal period, the average frost-free period (growing season) is approximately 160 days.

Table 1-1 summarizes monthly precipitation data for the approximate centroid of the BDWMO, based on the Minnesota Climatology Working Group gridded precipitation dataset for the most recent complete climate normal period (1991-2020) and 10-year period (2011-2020). Average total annual precipitation is 34.6 inches (1991-2020). The mean monthly precipitation varies from 5.1 inches in June to 1.0 inches in January and February (1991-2020). From May to September, the growing season months, the average rainfall (1991-2020) is 22.0 inches, or 64% of the average annual precipitation. Snowfall averaged 52 inches annually at the MSP station during the 1991-2020 climate normal period.

Additional information about local and regional climate is available from the Minnesota Department of Natural Resources (MDNR) State Climatology office and NOAA at:

- Minnesota State Climatology Office: https://www.dnr.state.mn.us/climate/index.html
- National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC): https://www.ncdc.noaa.gov/cdo-web/

Table 1-1 Monthly Precipitation Data (Climate Normal and 10-year Average)

Month	1981-2010 Precipitation (inches)	1991-2020 Precipitation (inches)	2011-2020 Precipitation (inches)
January	0.92	0.98	0.90
February	0.79	0.97	1.29
March	1.96	1.86	1.75
April	2.71	2.96	3.52
May	3.79	4.45	5.54
June	4.56	5.05	5.62
July	4.16	4.42	5.09
August	4.86	4.82	4.17
September	3.40	3.30	2.80
October	2.61	2.81	2.85
November	1.80	1.66	1.44
December	1.12	1.35	1.63
Total	**32.79**	**34.62**	**36.60**

Source: Minnesota Climatology Working Group gridded precipitation dataset

1.1.1 Precipitation-Frequency Data (Atlas 14)

The amount, rate, and type of precipitation are important in determining flood levels and stormwater runoff rates. While average weather poses little risk to human health and property, extreme precipitation events may result in flooding that threatens infrastructure and public safety. NOAA published Atlas 14, Volume 8, in 2013. Atlas 14 is the primary source of information regarding rainfall amounts and frequency in Minnesota. Atlas 14 provides estimates of precipitation depth (i.e., total rainfall in inches) and intensity (i.e., depth of rainfall over a specified period) for durations from 5 minutes up to 60 days. Atlas 14 supersedes publications Technical Paper 40 (TP-40) and Technical Paper 49 (TP-49) issued by the National Weather Bureau (now the National Weather Service) in 1961 and 1964, respectively. Atlas 14 improvements in precipitation estimates include denser data networks, longer (and more recent) periods of record, application of regional frequency analysis, and new techniques in spatial interpolation and mapping. Comparison of precipitation depths between TP-40 and Atlas 14 indicates increased precipitation depths for more extreme (i.e., less frequent) events. Table 1-2 lists selected rainfall events within the BDWMO. Note that member cities typically use Atlas 14 design precipitation depths specific to their jurisdictions. *Confirm with cities.*

Runoff from spring snowmelt is not provided in Atlas 14 and current regional snowmelt runoff data is not available (Minnesota Stormwater Manual, 2019). Older estimates of snowmelt runoff come from the

Hydrology Guide for Minnesota (USDA Soil Conservation Service – NRCS, 1975, see Table 1-2). Snowmelt and rainstorms occurring during snowmelt in early spring are significant in this region. The volumes of runoff generated, although they occur over a long period, can have significant impacts where the contributing drainage area to a lake or pond is large and the outlet is small.

Table 1-2 Selected Rainfall Events Used for Design Purposes

Type	Frequency	Duration	Depth (in)
Rainfall	2-year	24 hour	2.82
	5-year	24 hour	3.50
	10-year	24 hour	4.18
	25-year	24 hour	5.30
	50-year	24 hour	6.30
	100-year	24 hour	7.42
	10-year	10 day	6.77
	100-year	10 day	10.1
Snowmelt	10-year (10%)	10 day	4.7
	25-year (4%)	10 day	5.7
	50-year (2%)	10 day	6.4
	100-year (1%)	10 day	7.1

Source: NOAA Atlas 14 – Volume 8 interpolated to approximate centroid of BDWMO; depths reflect the 50% exceedance limit. Snowmelt values from Hydrology Guide for Minnesota (USDA Soil Conservation Service – NRCS) and reported as liquid water.

1.1.2 Climate Trends and Future Precipitation

There are typically wide variations in climate conditions in the BDWMO. However, climatologists found four significant recent climate trends in the Upper Midwest (NOAA, 2013):

- Warmer winters—decline in severity and frequency of severe cold; warming periods leading to mid-winter snowmelt
- Higher minimum temperatures
- Higher dew points
- Changes in precipitation trends – more rainfall is coming from heavy thunderstorm events and increased snowfall

According to NOAA's 2013 assessment of climate trends for the Midwest, annual and summer precipitation amounts in the Midwest are trending upward, as is the frequency of high intensity storms. Annual precipitation in the BDWMO averaged 34.6 inches from 1991-2020, a 1.8 inch increase over the

1981-2010 climate normal period (32.8 inches). Annual precipitation exceeded the previous climate normal average (34.6 inches) in 7 of 10 years since 2010.

Higher intensity precipitation events typically produce more runoff than lower intensity events with similar total precipitation amounts; higher rainfall intensities are more likely to overwhelm the capacity of the land surface to infiltrate and attenuate runoff. Precipitation data from the Mississippi River-Twin Cities basin dating back to 1895 (available from the MDNR climate trends website) indicates that annual precipitation, averaged over 30-year climate normal periods, is increasing (see Figure 2-1).

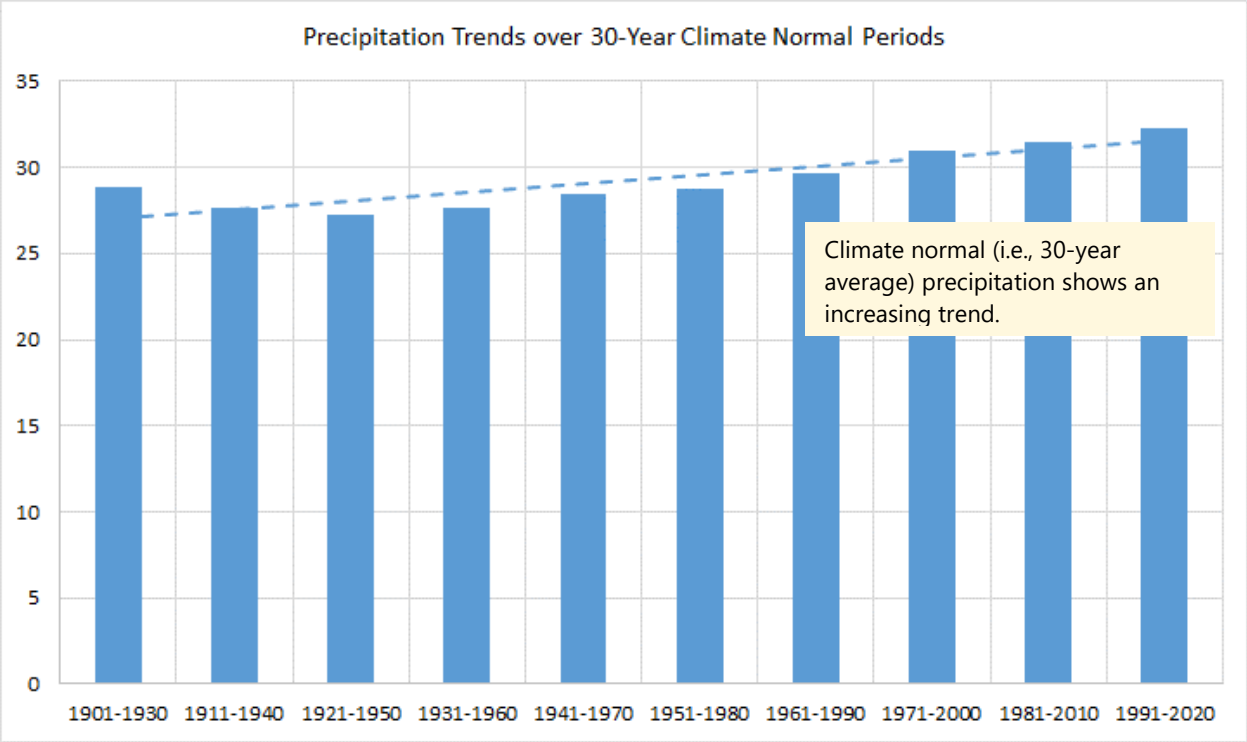


Figure 1-1 Trends in Average Annual Precipitation (Twin Cities Region)

Work completed by the University of Minnesota (Moore et al., 2016) provides information useful to consider long-term extreme weather trends in the region. The study of long-term extreme weather trends found that precipitation amounts are predicted to increase significantly over what is historically used in floodplain assessments and infrastructure design. The study identified a range of estimates for the mid-21st century 100-year 24-hour rainfall event. The lower estimate for the mid-21st century 100-year, 24-hour rainfall estimate was approximately 7.3 inches, which is similar to the current mean 100-year rainfall depth published in Atlas 14 (7.8 inches). The middle estimate is 10.2 inches, which is similar to the upper limits of the Atlas 14 90-percent confidence limits for the 100-year rainfall depth (10.4 inches). Upper estimates of mid-21st century 100-year 24-hour rainfall exceed the 90-percent confidence limits of Atlas 14.

Additional information about climate change is available from NOAA and the Minnesota Department of Natural Resources (MDNR) at:

- https://www.noaa.gov/categories/climate-change
- https://www.dnr.state.mn.us/climate/climate_change_info/index.html

1.2 Topography and Drainage

The topography of the watershed consists of rolling to hilly terrain and generally slopes from the southwest to the north towards the Minnesota River and east to the Credit River. At the southern end of the watershed, an upland ridge slopes down to Crystal Lake. High ground in the southwest of the watershed separates the area draining north to the Minnesota River and the area draining west to the Credit River. Continuing north, the upland transitions into an undulating glacial outwash plain. This area is pitted with shallow depressions surrounded by mounds of glacial till. Further north, the pitted outwash plain gives way to an outwash terrace, just above the Minnesota River floodplain. This transition corresponds roughly to the jurisdictional boundary between the BDWMO and the Lower Minnesota River Watershed District.

The highest point within the watershed is Buck Hill, in the City of Burnsville, at an elevation of 1,195 above mean sea level (MSL). The lowest point within the watershed is approximately 720 feet MSL at the northern boundary of the BDWMO. Figure 1-2 presents LiDAR elevation data collected in 2011 by the MDNR. Local topography creates some landlocked basins for which outlets have not been constructed. Lac Lavon is a significant waterbody that is landlocked under normal hydrologic conditions. *Confirm with cities.*

The BDWMO includes areas that drain to the Minnesota River (north of the BDWMO) and the Credit River watershed (west of the BDWMO). The area of the BDWMO is subdivided among watersheds of varying levels of detail as defined by the MDNR and USGS. The BDWMO further subdivided the watershed for water resource planning purposes. Figure 1-2 presents BDWMO planning level subwatersheds.

Bloomington
HENNEPIN COUNTY
MINNESOTA RIVER
DAKOTA COUNTY
River Hills
Eagan
East
Central
Burnsville
Sunset Pond Outlet
West
Savage
Sunset Pond
Earley Lake
Twin Lake
Wood Pond
Apple Valley
Keller Lake
Murphy Hanrehan
Lac Lavon
Crystal Lake
Lee Lake
Kingsley Lake
SCOTT COUNTY
Orchard Lake
Credit River
Lakeville
Aerial Imagery: USDA FSA NAIP 2019

BDWMO Boundary
Watershed Boundary
County Boundary
Municipal Boundary
River

Elevation (ft)
High : 1,210 ft
Low : 700 ft

N
0 1,750 3,500
Feet

Topography Source: MnDNR 3-meter DEM

TOPOGRAPHY AND DRAINAGE PATTERNS
BDWMO Watershed Management Plan
FIGURE A-2

1.3 Population, Demographics, and Land Use

The BDWMO is located within the Twin Cities Metropolitan Area, in northwest Dakota County. Land use within the watershed (2016 data provided by the Metropolitan Council) is summarized in Table 1-4 and Figure 1-3.

Over time, the land within the BDWMO has been transformed from a natural landscape (see Section 1.8), first to agricultural land use and, over time, to more urban and suburban land uses. Agricultural land use now occupies approximately less than 1% of the watershed. Residential land use occupies approximately 54% of the watershed; approximately 94% of residential land use is single-family. The watershed is mostly developed, with approximately 1,480 acres (about 9% of the watershed) remaining undeveloped. Higher intensity land uses (typically commercial and industrial development) are clustered along I-35W, County Road 42 and Highway 13. Most of the remaining undeveloped areas are concentrated in the City of Lakeville. Some areas currently identified as undeveloped may not be suitable for future development.

Development of the watershed has coincided with population growth among the member cities. Population within the BDWMO member cities by grew by approximately 400% between 1970 and 2000. Since 2000, population within the BDWMO has increased by approximately 10% per decade. Continued population grown of between 5% and 10% per decade is anticipated through 2040. In addition to population increase, the population within the BDWMO (and greater Dakota County) is expected to age and grow more racially and ethnically diverse (Dakota County, 2019). Additional information about population and demographic trends is available in the comprehensive plans of the BDWMO member cities and Dakota County.

The conversion of natural areas and vegetation over time for residential, commercial, and other land uses increases the amount of impervious surfaces (i.e., surfaces through which water cannot infiltrate), resulting in increases in stormwater runoff volume and associated pollutant loading. Thus, local governmental units' (LGU's) continued implementation of stormwater management performance standards for development and redevelopment are key to addressing water quality and water quantity issues.

Because much of the watershed is already developed, most land use changes and construction activity within the watershed will likely occur through redevelopment. Figure 1-4 presents the estimated 2040 land use, as available from the Metropolitan Council. Redevelopment presents an opportunity to implement stormwater best management practices previously omitted or augment existing practices. Major redevelopment opportunities anticipated by BDWMO member cities include, but are not limited to:

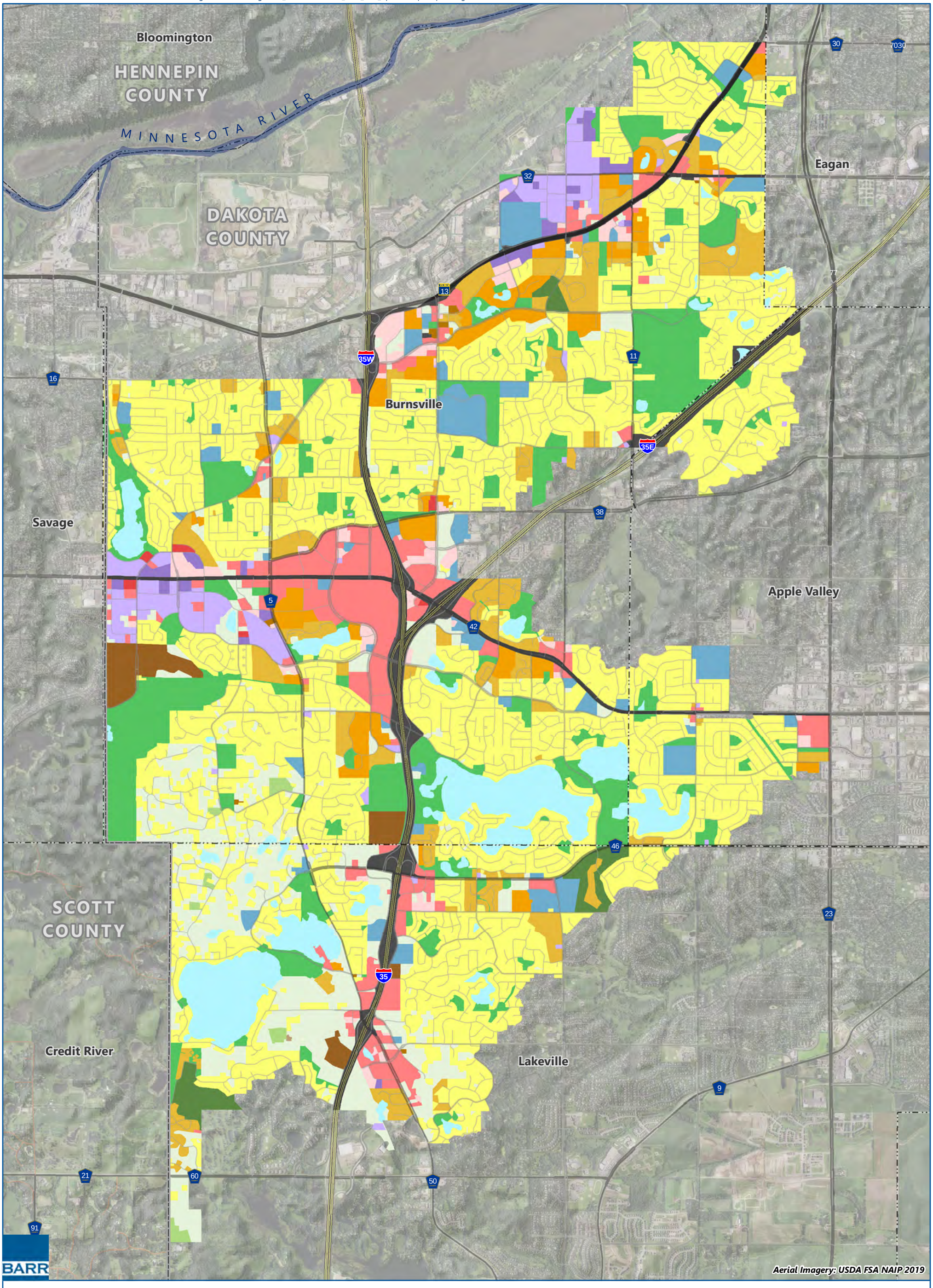
- Need information from Cities

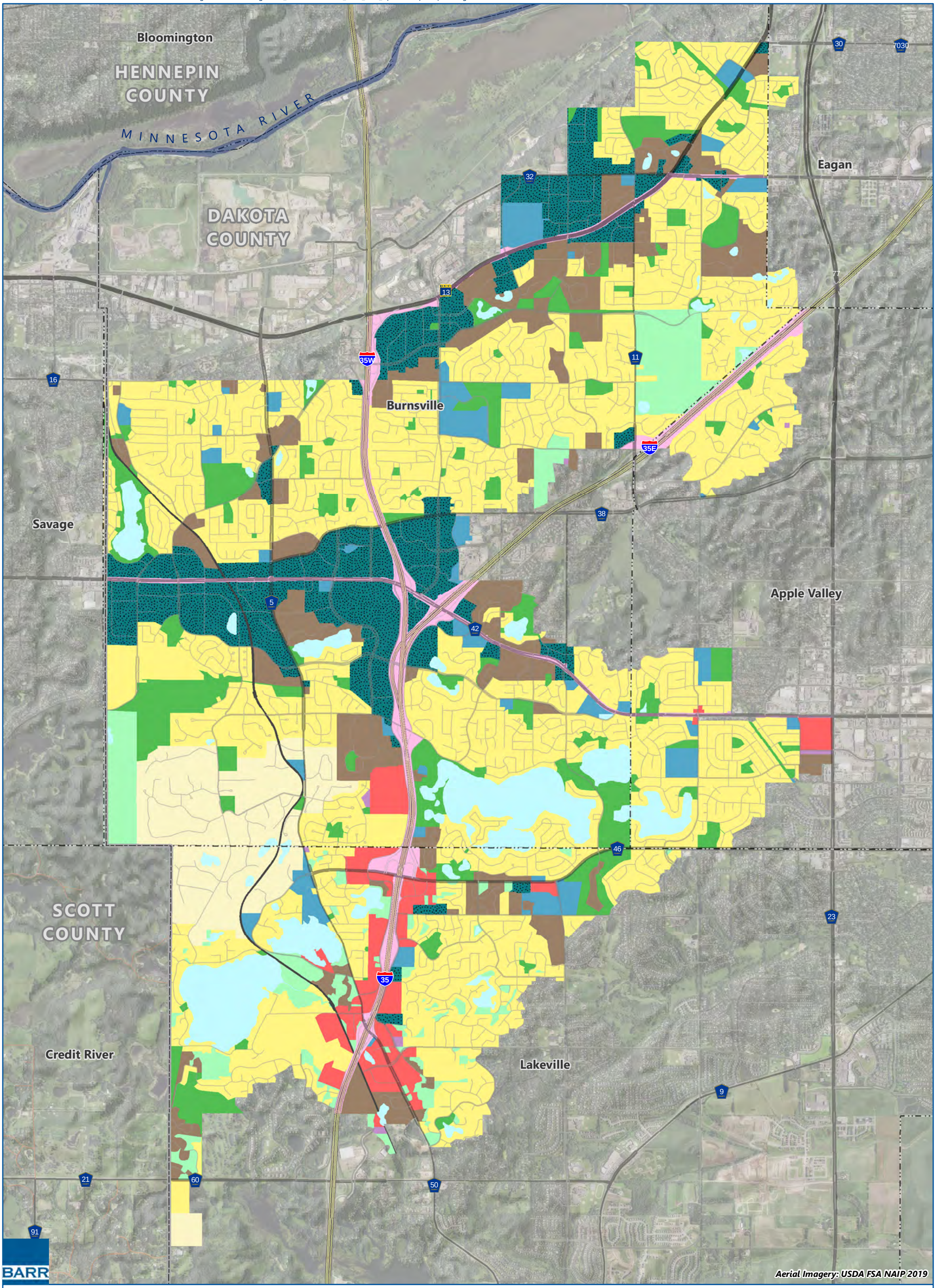
More detailed information about current and future land use, anticipated population growth, and land development is presented in the 2040 comprehensive plans for the BDWMO member cities.

Table 1-3 Existing Land Use (2016)

Land Use	Acres	Percent Area
Agricultural or Farmstead	44	0.3%
Commercial or Retail	918	5.5%
Office	246	1.5%
Golf Course	156	0.9%
Industrial and Utility	425	2.6%
Institutional	562	3.4%
Mixed Use	148	0.9%
Open Water	998	6.0%
Park, Recreational, or Preserve	1,864	11.2%
Residential, Single Family	8,387	50.5%
Residential, Multifamily	525	3.2%
Transportation (Highway, Rail, Airport)	677	4.1%
Undeveloped	1,476	8.9%
Other	194	1.2%
Total	16,620	100%

Source: Metropolitan Council


Bloomington
HENNEPIN COUNTY
MINNESOTA RIVER
DAKOTA COUNTY
Eagan
Burnsville
Savage
Apple Valley
SCOTT COUNTY
Credit River
Lakeville
Aerial Imagery: USDA FSA NAIP 2019
County Boundary
Municipal Boundary
River
Existing Land Use
Farmstead
Seasonal/Vacation Single Family Detached
Manufactured Housing Park
Single Family Attached
Multifamily
Retail and Other Commercial
Office
Mixed Use Residential
Mixed Use Industrial
Mixed Use Commercial and Other
Industrial and Utility
Institutional
Park, Recreational or Preserve
Golf Course
Major Highway
Agricultural
Undeveloped
Water
N
0
1,750
3,500
Feet
Data Source: Generalized Land Use 2016, Metropolitan Council, 2016.
CURRENT LAND USE
BDWMO Watershed Management Plan
FIGURE A-3



County Boundary
Municipal Boundary
River

Future Land Use

Agricultural
Rural or Large-Lot Residential
Single Family Residential
Multifamily Residential
Commercial
Industrial
Institutional
Mixed Use
Multi-Optional Development
Park and Recreation
Open Space or Restrictive Use
Rights-of-Way (i.e., Roads)
Railway (inc. LRT)
Airport
Vacant or Unknown
Open Water

N

0 1,750 3,500
Feet

FUTURE LAND USE
BDWMO Watershed Management Plan

FIGURE A-4

Data Source: Regional Planned Land Use - Twin Cities Metropolitan Area, Metropolitan Council, 2020.

1.4 Soils

Soil composition and slope are important factors affecting the rate and volume of stormwater runoff. The shape and stability of aggregates of soil particles—expressed as soil structure—influence the permeability, infiltration rate, and erodibility (i.e., potential for erosion) of soils. Slope is important in estimating stormwater runoff rates and susceptibility to erosion.

Prevalent soil series located within the watershed are described in the Dakota County Soil Survey, available online from the Natural Resources Conservation Service (NRCS). General soil map units prevalent in the BDWMO portion of Dakota county include:

The **Waukegan-Wadena-Hawick** unit includes well drained soils on glacial outwash plains and terraces. These soils vary from level to very steep. These soils are formed in loamy or silty sediments and generally underlain by sandy outwash. These soils are well suited for agricultural land use and building but are sensitive to groundwater pollution.

The **Kingsley-Mahtomedi** unit includes well drained soils that range from gently sloping to very steep. These soils are formed in loamy and sandy glacial till and outwash in uplands and outwash plains. Soils within this unit are complex and intermixed. These soils are not well suited to agricultural land use and can be subject to erosion on steeper slopes.

Detailed mapping of soil series present in Dakota County and the BDWMO is available from the NRCS Web Soil Survey at: https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Soil infiltration capacity affects the amount of direct runoff resulting from rainfall. Higher infiltration rates result in lower potential for runoff, as more precipitation is able to enter the soil. Conversely, soils with low infiltration rates produce high runoff volumes and high peak discharge rates, as most or all of the rainfall moves as overland flow. The NRCS (formerly the Soil Conservation Service) has established four general hydrologic soil groups (HSGs). These groups are:

Hydrologic Soil Group A— (Low runoff potential): Group A soils have a high infiltration rate and are typically composed of more than 90% sand and gravel.

Hydrologic Soil Group B— (Moderately low runoff potential): Group B soils have a moderate infiltration rate and are typically composed of 50-90% sand.

Hydrologic Soil Group C— (Moderately high runoff potential): Group C soils have a slow infiltration rate and are composed of less than 50% sand.

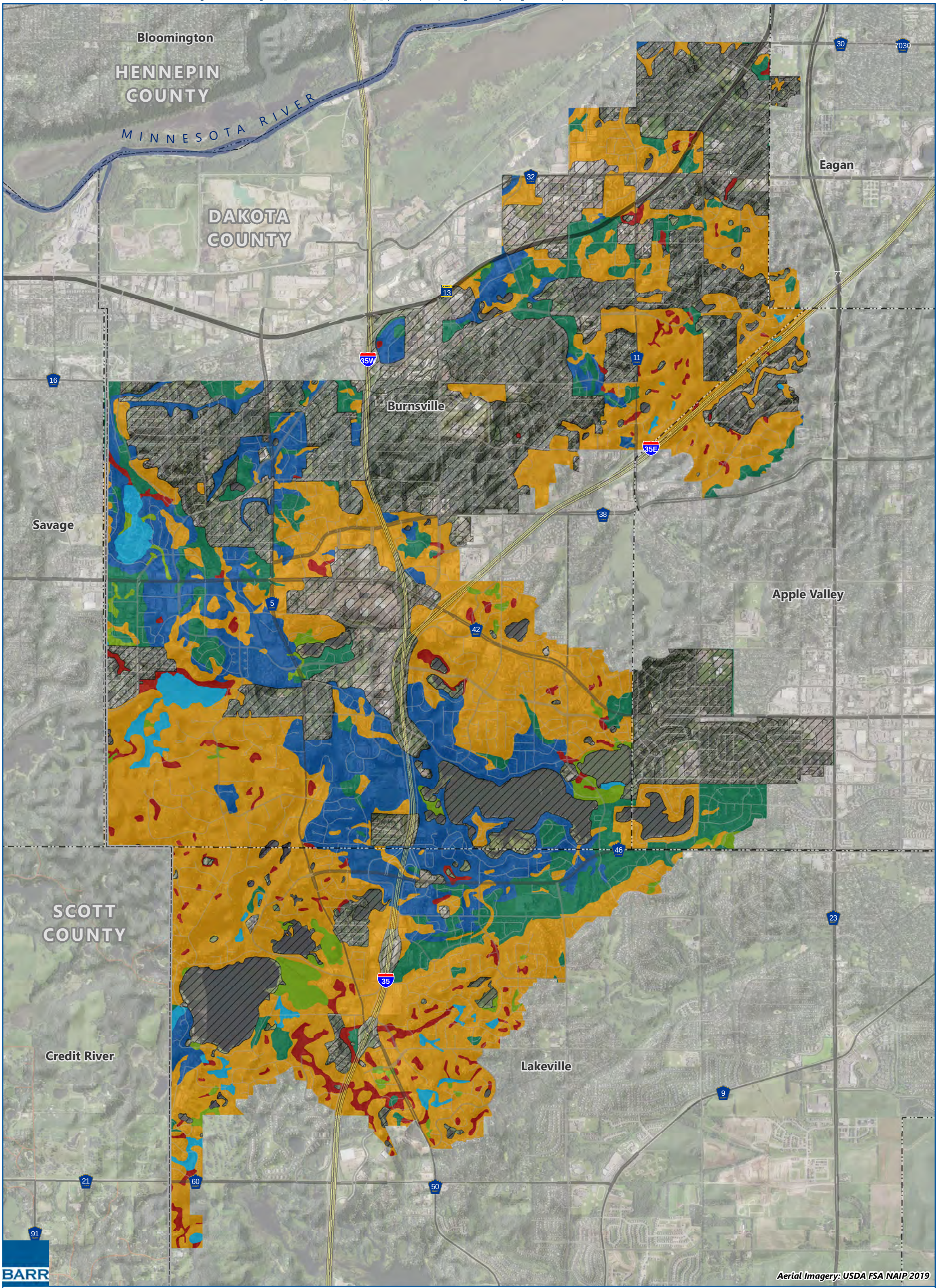
Hydrologic Soil Group D— (High runoff potential): Group D soils have a very slow infiltration rate and are composed of more than 40% clay. These soils have a combination of high swelling potential, a permanently high water table, and a clay layer at or near the surface.

Dual HSGs (types A/D, B/D, and C/D) are soils that are considered D soils primarily because of a high water table. However, if the soil were drained it would be classified into a different group. The second

group listed for dual HSG soils is for an undrained condition. For the purpose of evaluating infiltration capacity, dual HSGs are usually considered as D soils. Figure 1-5 presents the most current HSG data within the watershed, which are based on the Soil Survey Geographic dataset (SSURGO) from the NRCS.

Large areas concentrated in the northern part of the watershed are not rated with respect to HSG. The "Not Rated/Not Available" classification is typically assigned to areas where development has altered the existing soil, or data were unavailable prior to development. Development may increase the potential for high volumes of runoff. As land is developed for urban use, much of the soil is covered with impervious surfaces, and soils in the remaining areas are significantly disturbed and altered. Development often results in consolidation of the soil and tends to reduce infiltration capacity of otherwise permeable soils, resulting in significantly greater amounts of runoff. Grading, plantings, and tended lawns tend to dominate the pervious landscape in urbanized areas and may become more important factors in runoff generation than the original soil type.

Figure 1-5 provides general guidance about the infiltration capacity of soils. Site specific data such as geologic borings, piezometers, and other engineering studies are necessary to evaluate soil infiltration capacity for individual project sites.



County Boundary
Municipal Boundary
River

Hydrologic Soil Group

A
A/D
B
B/D
C
C/D
Not Rated

N

0 1,750 3,500
Feet

HYDROLOGIC SOIL GROUPS
BDWMO Watershed Management Plan
FIGURE A-5

Data Source: Soil Survey Staff, NRCS USDA, Soil Survey Geographic (SSURGO) Database. Accessed 2/26/2021.

1.5 Geology

1.5.1 Surficial Geology

The geology of the watershed includes consolidated bedrock formations overlain by unconsolidated glacial and non-glacial sediments (also known as quaternary deposits). Unconsolidated glacial sediments are from glacial deposits left from the quaternary geologic period and modified by post-glacial erosion and soil formation processes. Most of the quaternary deposits in the watershed were deposited approximately 12,000 to 20,000 years ago by the Superior lobe and Des Moines lobe of the Wisconsin Glaciation (the most recent local glacial episode) (Hobbs, Aranow, Patterson, 1990). Glacial till underlies most of the BDWMO, with loamy till more common in the south and sandy till more common in the north.

The depth of the surficial deposits varies across the watershed, but generally ranges from 100 to 200 feet think. Areas of surficial deposits less than 50 feet occur in the northwest of the BDWMO. Thicker surficial deposits (in excess of 300 feet) occur in minor buried bedrock valleys present in the watershed; there is little to no relationship between surface topography and the location of buried bedrock valleys.

More information about the surficial geology of the BDWMO is available from the Dakota County Geologic Atlas at: https://conservancy.umn.edu/handle/11299/58494

1.5.2 Bedrock Geology

Consolidated bedrock formations (bedrock deposits) are much older than, and lie below, the glacial deposits. They include overlapping sequences of sandstones, limestones, dolostones, and shales from the Cambrian or Ordovician series. The uppermost layer of bedrock varies with location within the watershed and includes:

- Platteville and Glenwood dolostone, limestone, and shale (youngest)
- St. Peter sandstone
- Prairie du Chien dolomite
- Jordan sandstone
- St. Lawrence shale (oldest)

These bedrock units are sedimentary rocks deposited by shallow seas during late Cambrian and Ordovician times, approximately 500 million years ago. The bedrock formations form part of a gently sloping bowl-like structure centered under the Minneapolis-St. Paul metropolitan area, known as the Twin Cities basin. Bedrock characteristics are summarized in Table 1-5.

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Table 1-4 Bedrock geology characteristics

Geologic Unit	Approximate Thickness (feet)	Description	Approximate Subcropping Locations	Water-Bearing Characteristics
Glacial Drift	<50 to 300+	Till, sand, gravel, lake deposits	Present throughout watershed, varying in thickness by location	May yield small supplies for domestic use
Platteville and Glenwood Formation	0-40	Fine-grain dolostone and limestone over green, sandy shale	Portions of Burnsville and eastern Lakeville	Low yield; acts as a confining layer
St. Peter sandstone	0-160	Fine to medium-grain quartzose sandstone, underlain by siltstone and shale	Present throughout, but concentrated in the eastern BDWMO	Widely used for domestic wells
Prairie du Chien dolomite	150-300	Thin-bedded with thin beds of sandstone and chert	Far northern portion of the BDWMO and Muphy-Hanrehan subwatershed	Major high-capacity aquifer
Jordan Sandstone	100	Medium- to coarse-grain quartzose sandstone	Does not subcrop within the BDWMO	Major high-capacity aquifer
St. Lawrence Formation	100-200	Dolomitic siltstone and sandstone	Does not subcrop within the BDWMO	Confining bed with little yield

Source: Dakota County Geologic Atlas (plates 2 and 4)

More information about the surficial geology of the BDWMO is available in the Dakota County Geologic Atlas at: https://conservancy.umn.edu/handle/11299/58494

1.6 Groundwater

The glacial and bedrock deposits form layered sequences of aquifers and confining units. An aquifer is a geologic formation capable of supplying sufficient quantities of water to a well. A confining unit is a geologic deposit that impedes the flow of water between aquifers.

The uppermost aquifers in the BDWMO are glacial deposits. Glacial aquifers (also known as surficial aquifers) include the water table and buried glacial aquifers, which are primarily used for domestic and irrigation purposes in Dakota County. The elevation of the surficial (or quaternary) water table beneath the watershed generally ranges from approximately 900 to 1,000 feet; less in the north, and greater in the south. The depth of the water table ranges widely from tens of feet (e.g., around Crystal Lake) to upwards of 200 feet (e.g., areas of high ground elevation) (Palen, 1990). Glacial aquifers are variable in location and yield. Water yield from surficial aquifers in the BDWMO ranges from less than 5 gallons per minute in the eastern portion of the watershed to between 50 and 250 gallons per minute in the western portion of the watershed. Groundwater quality in glacial aquifers is often correlated to the quality of the water that is infiltrating at the surface; these aquifers are not used locally for public water supplies due to their susceptibility to contamination (Palen, 1990).

Surficial groundwater may be a source or a sink for local surface waters depending on relative elevation, soil conditions, and other factors. For many landlocked basins, seepage to groundwater may be significant. Generally, data characterizing the relationship between surficial groundwater and surface water features in the BDWMO is limited due in part to the lack of surficial aquifer use within the watershed (Palen, 1990). Are there GW/SW interactions the member cities want to specifically note?

Most high-capacity wells draw water from bedrock aquifers. Below the surficial aquifers, six bedrock aquifers are present under the BDWMO. The major bedrock aquifers are, in order of use and development:

1. Prairie du Chien-Jordan
2. Mount Simon-Hinckley
3. St. Lawrence-Tunnel City
4. Wonewoc
5. St. Peter
6. Platteville

The aquifer used most often for water supply in the area is the Prairie du Chien-Jordan aquifer. The Prairie du Chien-Jordan aquifer is high yielding, more easily tapped than deeper aquifers, has very good water quality, and is continuous throughout most of the area.

Groundwater levels in the Prairie du Chien-Jordan aquifer range from than 700 feet MSL to more than 900 feet MSL (Palen, 1990). The aquifer is recharged in areas where thin permeable drift overlies the limestone layers. Some recharge of this aquifer occurs locally from percolation through the overlying glacial deposits or St. Peter sandstone. Local recharge to the aquifer is generally low. Regional recharge of the Prairie du Chien-Jordan aquifer occurs to the south, in Freeborn and Mower Counties. Groundwater movement in the aquifer is generally from south to north, toward the Minnesota and Mississippi Rivers.

The aquifer with the highest water quality and highest possible yields is the Mt. Simon-Hinckley aquifer, but it is more expensive to use than the Prairie du Chien-Jordan aquifer because of its greater depth; also, there are limitations to its use. Minnesota statutes limit appropriations from the Mt. Simon-Hinckley aquifer to potable water uses, where there are no feasible or practical alternatives, and where a water conservation plan is incorporated with the appropriations permit. The water level of the Mt. Simon-Hinckley aquifer is approximately 700 feet MSL. Recharge of the Mt. Simon-Hinckley aquifer takes place far north of the watershed, where the bedrock is closer to the surface, and occurs by percolation through the overlying drift and bedrock. Groundwater movement in the aquifer is generally to the southeast.

Municipal water supply wells within Apple Valley, Burnsville, Eagan, and Lakeville draw drinking water from a combination of the Prairie du Chien – Jordan and the Mount Simon Hinckley aquifers. Users of groundwater meeting certain use criteria are required to obtain a water appropriation permit from the MDNR; more information is available from:
https://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/index.html

The Metropolitan Council completed the Regional Water Supply, Enhanced Groundwater Recharge, and Stormwater Capture and Reuse Study for the Southeast Metro Study Area in 2016. Groundwater modeling performed as part of the study estimates future drawdown of local aquifers from continued development of groundwater sources, as well as potential recovery if other water sources are developed. The study estimates continued development of the Prairie du Chien – Jordan aquifer may result in 20 to 40 feet of drawdown by 2040. Conversely, scenarios including reduced groundwater development show similar levels of aquifer recovery.

Additional information about the aquifers within the watershed is available from the following sources:

- Dakota County Geologic Atlas (MGS, 1990), available at: https://conservancy.umn.edu/handle/11299/58494
- Metropolitan Council Water Supply Planning, available at: https://metrocouncil.org/Wastewater-Water/Planning/Water-Supply-Planning.aspx

1.6.1 Groundwater Recharge

Recharge to groundwater occurs throughout the watershed. The local surficial geologic characteristics affect the rate, volume, and distribution of recharge. Water infiltrates most rapidly into sandy deposits and flows easily through sandy materials; clay deposits tend to slow and impede infiltration and subsurface flows. Relative to natural conditions, impervious surfaces (e.g., buildings, streets, parking lots) in developed areas have reduced the amount of open space and decreased the amount of land available to infiltrate runoff and recharge groundwater.

Groundwater recharge reaches the water table (i.e., quaternary or surficial aquifer) at a fast rate through sandy geologic deposits. The presence of sandy soils within portions of the BDWMO creates potential for high local infiltration rates and associated groundwater contamination from pollutants carried from the ground surface. Groundwater sensitivity to pollution is presented in Figure 1-6.

Surficial aquifers usually have higher static water levels than deeper aquifers, indicating that water flows downward into the aquifer system and that surficial aquifers help recharge deeper aquifer systems. Deeper bedrock aquifers are recharged through bedrock valleys, leakage through confining layers, fractures in tills and confining layers, improperly constructed wells, and other areas where good hydraulic connections and unforeseen flow paths exist within upper aquifer units.

The Metropolitan Council's Regional Water Supply, Enhanced Groundwater Recharge, and Stormwater Capture and Reuse Study for the Southeast Metro Study Area (Metropolitan Council, 2016) considered opportunities for enhanced recharge within Dakota County based on infiltration rate and depth of the water table. The study identified approximately 900 acres of priority infiltration areas in the BDWMO, located primarily in the western portion of the BDWMO, north of Orchard Lake.

1.6.2 Drinking Water Supply, Wellhead Protection, and Pollution Prevention

Residents within the BDWMO obtain their drinking water entirely from groundwater via municipal groundwater wells as well as private domestic wells (correct?). Municipal wells serving the BDWMO member cities tap the Mt. Simon-Hinckley and Prairie du Chien – Jordan aquifers.

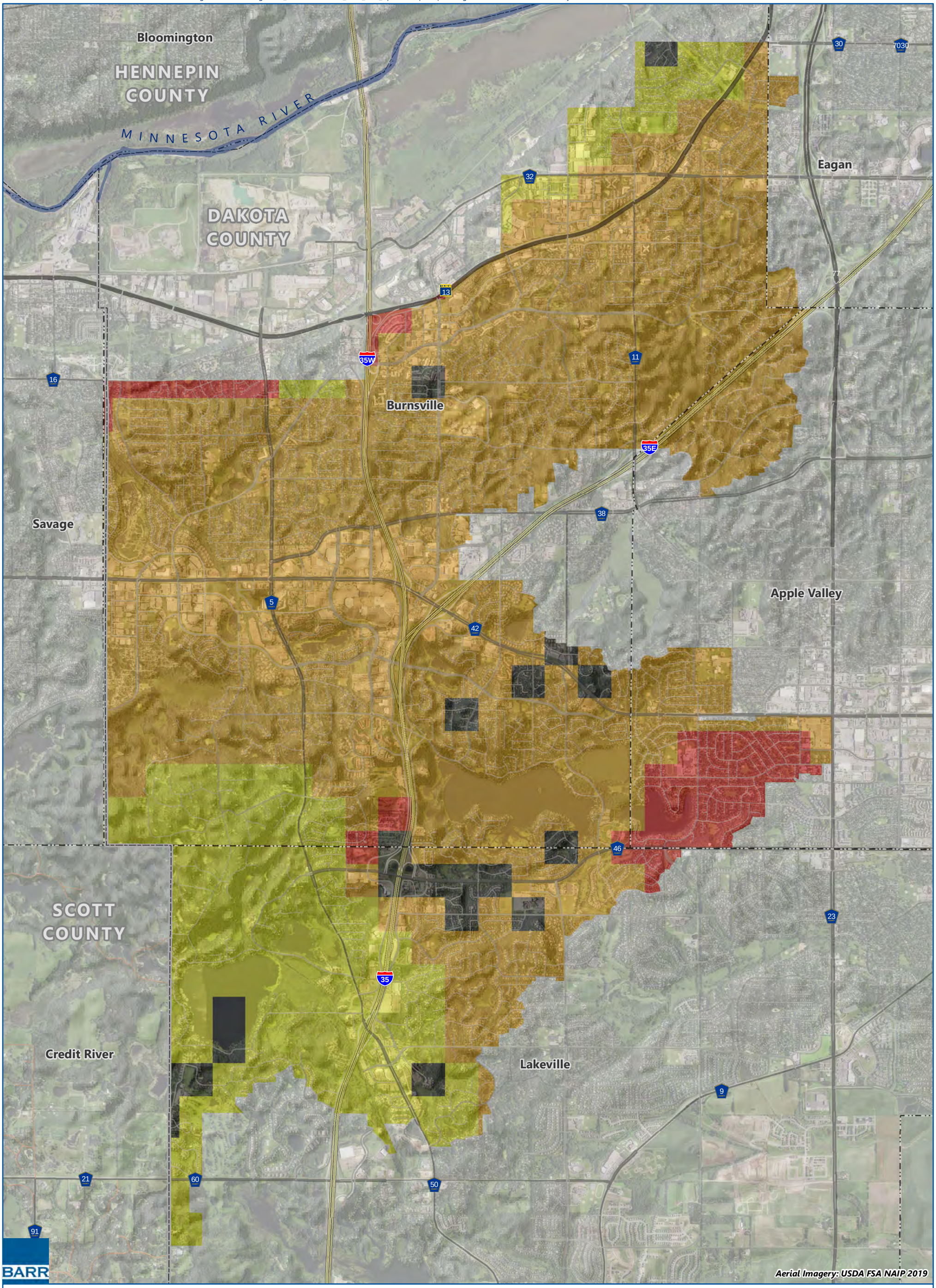
In 1989 the state of Minnesota instituted the Minnesota Groundwater Protection Act, which identified the Minnesota Department of Health (MDH) as responsible for the protection of groundwater quality. Through its wellhead protection program, the MDH administers and enforces the Minnesota Water Well Code, which regulates activities such as well abandonment and installation of new wells. The MDH also administers the Wellhead Protection Program, which is aimed at preventing contaminants from entering the recharge zones of public well supplies. In 1997, the Wellhead Protection Program rules (Minnesota Rules 4720.5100 to 4720.5590) went into effect.

Some public water suppliers are required to prepare wellhead protection plans (WHPPs), including the BDWMO member cities of Apple Valley, Burnsville, Eagan, and Lakeville. Through these wellhead protection plans, public water suppliers delineate drinking water supply management areas (DWSMA) for groundwater wells, assess the water supply's susceptibility to contamination from activities on the land surface, and establish management programs, such as identification and sealing of abandoned wells and education/public awareness programs. The DWSMA represents the boundaries of the recharge area to the well and is the area to be protected and managed by the wellhead protection plan. Figure 1-7 presents the DWSMAs located within the BDWMO.

The BDWMO and its cities rely on infiltration practices to improve water quality and reduce stormwater runoff volumes. Thus, the BDWMO and its member cities will continue to consider the possible impacts of infiltrated stormwater on groundwater quality. The MDH and Minnesota Pollution Control Agency (MPCA) also provide guidance for evaluating infiltration projects in areas with vulnerable groundwater supplies; the guidance considers the presence of wellhead protection areas, aquifer characteristics, land use, and other factors. For example, infiltration is not allowed within DWSMA emergency response zones. Infiltration guidance is available from the MPCA website: https://stormwater.pca.state.mn.us/index.php/Stormwater_and_wellhead_protection

Additional information regarding groundwater resource protection and management is available from the following sources:

- 2020-2030 Dakota County Groundwater Plan available at: https://www.co.dakota.mn.us/Environment/WaterResources/WellsDrinkingWater/Pages/groundwater-plan.aspx
- Metropolitan Council Water Supply Planning, available at: https://metrocouncil.org/Wastewater-Water/Planning/Water-Supply-Planning.aspx



County Boundary
Municipal Boundary
River

Groundwater Contamination Susceptibility

- Lowest Susceptibility
- Low Susceptibility
- Medium Susceptibility
- High Susceptibility
- Highest Susceptibility
- Insufficient Data to Rank

Data Source: Ground Water Contamination Susceptibility in Minnesota, Minnesota Pollution Control Agency and Land Management Information Center, 1989.

N

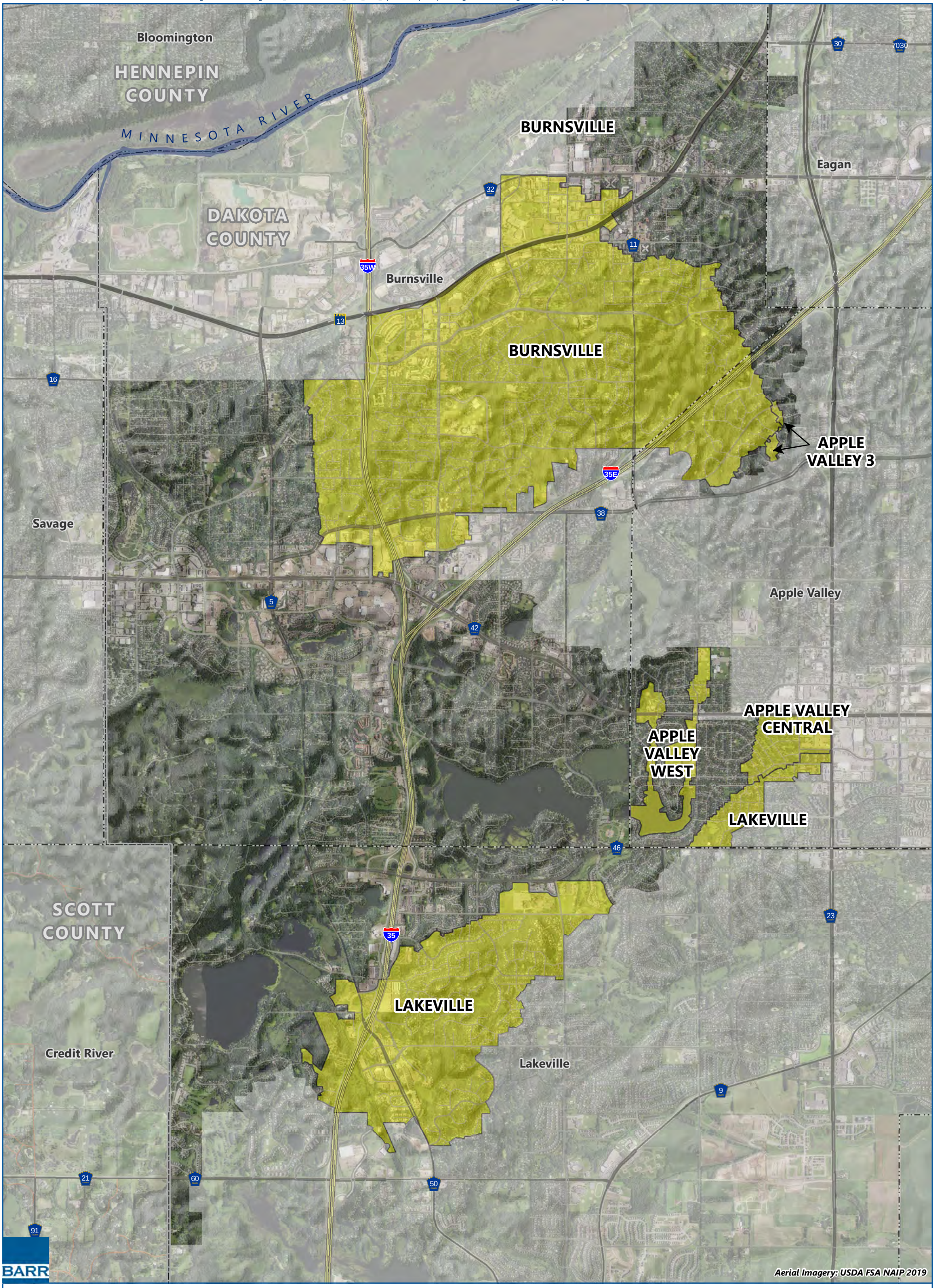
0 1,750 3,500

Feet

GROUNDWATER SENSITIVITY TO POLLUTION

BDWMO Watershed Management Plan

FIGURE A-6



County Boundary

Municipal Boundary

River

Drinking Water Supply Management Area

N

0 1,750 3,500

Feet

DRINKING WATER SUPPLY MANAGEMENT AREAS

BDWMO Watershed Management Plan

FIGURE A-7

Data Source: Minnesota Department of Health, Drinking Water Supply Management Areas, 2019.

1.6.4 Groundwater Monitoring and Groundwater Quality

Limited groundwater monitoring data is available within the watershed and includes data collected by Dakota County, the Minnesota Department of Agriculture, MPCA, U.S. Geological Survey (USGS), and others. Pesticide and nitrate concentrations within northwest Dakota County and the BDWMO are low (Dakota County, 2021). Figure 1-10 presents groundwater quality monitoring locations within the BDWMO. Groundwater quality monitoring information and data is available online from the MPCA at: https://www.pca.state.mn.us/water/groundwater-monitoring

Potential sources of groundwater contamination in the watershed include commercial and industrial waste disposal, landfills, leaking petroleum tanks, unsealed wells, non-compliant subsurface sewage treatment systems (SSTS), fertilizer/pesticide applications, animal waste, and road salt application (see also Section 1.10). Emerging contaminants include pharmaceuticals, industrial effluents, personal care products, fire retardants, and other items that are washed down drains and not able to be processed by municipal wastewater treatment plants or septic systems.

The MDNR also coordinates an observation well network and collects static groundwater-level data to assess groundwater resources, determine long term trends, interpret impacts of pumping and climate, plan for water conservation, and evaluate water conflicts. The observation well network includes X wells located within the BDWMO (see Figure 1-10). More information is available from the MDNR at: https://www.dnr.state.mn.us/waters/cgm/program.html

1.7 Surface Water Resources

Figure 1-2 shows the major watersheds, tributary areas, and drainage patterns within the BDWMO. Development of the land within the BDWMO member cities has resulted in alterations to the natural hydrologic system. To facilitate development, natural drainages were diverted or piped, wetlands were drained or filled, and stormwater infrastructure was constructed.

Figure 1-8 shows the surface waters classified by the MDNR as public waters. The MDNR designates certain water resources as public waters to indicate those lakes, wetlands, and watercourses over which the MDNR has regulatory jurisdiction. By statute, the definition of public waters includes "public waters basins" (i.e., lakes), "public waters watercourses" (i.e., rivers and streams) and "public waters wetlands." The collection of public waters and public waters wetlands designated by the MDNR is generally referred to as the public waters inventory, or PWI.

Public waters are all water basins (i.e., lakes, ponds, wetlands) and watercourses (i.e., streams, rivers) that meet the criteria set forth in Minnesota Statutes, Section 103G.005, Subd. 15 that are identified on public water inventory maps and lists authorized by Minnesota Statutes, Section 103G.201. The regulatory boundary of public waters and public water wetlands is called the ordinary high water level (OHWL). For watercourses, the OHWL is generally the elevation of the top of the bank of the channel. A MDNR permit is required for work within designated public waters. Additionally, shoreland development requirements may exist for public waters with shoreland classifications. Table 1-5 summarizes the public waters located

within the watershed. PWI maps and lists are available on the MDNR's website: http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html.

Table 1-5: Summary of BDWMO PWI and Physical Characteristics

BDWMO Water Body	Municipality	Downstream Receiving Water	MDNR Identification		Physical Characteristics								
			MDNR Public Waters ID Number	PWI Class	Water Area (acre)	Perimeter (mi)	Littoral Area (acre)	Average Depth (feet)	Max Depth (feet)	Direct Watershed Area, including Lake Surface Area (acre)	Total Watershed Area including All Upstream Lakes (acre)	Normal Water Level (ft MSL)	100-Year Flood Elevation (ft MSL)
Lakes													
Crystal	Burnsville & Lakeville	Minnesota River	19-0027	P	292	5.3	208	10	35	2013	3852	933.5	935.8
Keller	Burnsville	Minnesota River	19-0025	P	52	1.2	52.0	4.8	8	1447	1447	934.3	938.6
Orchard	Lakeville	Credit River	19-0031	P	243	4.7	177	10	33	2045	2260	N/A	979.1
Kingsley	Lakeville	Credit River	19-0030	P	51	3.0	51.0	N/A	10.2	216	216	N/A	982.4
Lac Lavon	Apple Valley & Burnsville	Minnesota River	19-0446	N/A	60	2.1	39	N/A	32	184	184	Landlocked	933.1
Sunset Pond	Burnsville	Minnesota River	19-0451	N/A	60.0	2.5	60.0	N/A	10.5	1019	6311	N/A	854.8
Lee	Lakeville	Minnesota River	19-0029	P	19.0	1.2	19.0	7.0	15	206	206	948.5/ 947.0	951.9
Earley	Burnsville	Minnesota River	19-0033	P	23.3	1.1	23.3	3.8	7.8	757	5292	905	910.1
Horseshoe	Lakeville	Credit River	19-0032	P	11.7	0.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wetlands													
Wood Pond	Burnsville	Minnesota River	19-0024	W	14.0	0.6	14.0	10	14	110	110	1000.9	1003.6
Twin (South)	Burnsville	Minnesota River	19-0028	W	11.7	1.0	11.7	3.6	11	574	4536	918	920.2
Twin (North)					5.1		5.1	6.6	12				
Unnamed (Cam Ram Wetland)	Burnsville	Credit River	19-0380	W	51.2	2.3	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0113	W	5.6	0.5	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0114	W	6.9	0.7	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0115	W	4.7	0.5	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0116	W	4.3	0.5	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0152	W	3.3	0.4	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0170	W	3.0	0.3	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0171	W	1.0	0.2	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0172	W	2.5	0.3	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0174	W	2.2	0.2	--	--	--	--	--	--	--
Unnamed	Burnsville & Eagan	Minnesota River	19-0191	W	8.6	0.8	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0192	W	2.5	0.4	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0193	W	5.7	0.5	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0194	W	2.4	0.3	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0195	W	3.4	0.3	--	--	--	--	--	--	--
Unnamed	Burnsville	Credit River	19-0197	W	0.2	0.1	--	--	--	--	--	--	--

Table 1-5: Summary of BDWMO PWI and Physical Characteristics

BDWMO Water Body	Municipality	Downstream Receiving Water	MDNR Identification		Physical Characteristics								
			MDNR Public Waters ID Number	PWI Class	Water Area (acre)	Perimeter (mi)	Littoral Area (acre)	Average Depth (feet)	Max Depth (feet)	Direct Watershed Area, including Lake Surface Area (acre)	Total Watershed Area including All Upstream Lakes (acre)	Normal Water Level (ft MSL)	100-Year Flood Elevation (ft MSL)
Unnamed	Burnsville	Minnesota River	19-0210	W	4.2	0.3	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0211	W	1.2	0.2	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0359	W	5.7	0.5	--	--	--	--	--	--	--
Unnamed (Goose Lake)	Lakeville	Minnesota River	19-0360	W	5.3	0.4	--	--	--	--	--	--	--
Unnamed	Lakeville	Minnesota River	19-0361	W	3.2	0.3	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0362	W	4.9	0.5	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0363	W	11.4	0.9	--	--	--	--	--	--	--
Unnamed	Burnsville	Minnesota River	19-0364	W	7.3	0.4	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0365	W	2.9	0.3	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0369	W	5.8	0.5	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0371	W	10.1	1.2	--	--	--	--	--	--	--
Unnamed	Burnsville	Credit River	19-0381	W	2.3	0.2	--	--	--	--	--	--	--
Unnamed	Burnsville	Credit River	19-0382	W	2.2	0.4	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0383	W	6.9	0.5	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0384	W	2.4	0.4	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0385	W	3.3	0.3	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0386	W	2.6	0.4	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0387	W	11.2	1.3	--	--	--	--	--	--	--
Unnamed	Lakeville	Credit River	19-0388	W	2.7	0.3	--	--	--	--	--	--	--

Bloomington
HENNEPIN COUNTY
MINNESOTA RIVER
DAKOTA COUNTY
Eagan
Burnsville
Savage
Apple Valley
Lakeville
Credit River
SCOTT COUNTY
Krenz Lake
Earley Lake
Wood Pond
North Twin
South Twin
Keller Lake
Crystal Lake
Lac Lavon
Horseshoe Lake
Lee Lake
Kingsley Lake
Orchard Lake
19-015200W
19-017000W
19-017200W
19-017100W
19-017400W
19-019100W
19-011300W
19-019300W
19-019400W
19-011400W
19-019200W
19-019500W
19-019700W
19-021000W
19-021100W
19-011600W
19-011500W
19-036400W
19-003300P
19-002400W
19-002801W
19-002802W
19-038000W
19-038100W
19-038200W
19-002500P
19-002700P
19-035900W
19-003200P
19-038300W
19-036100W
19-036000W
19-002900P
19-038400W
19-038500W
19-003000P
19-003100P
19-036200W
19-036300W
70-000900P
70-001101P
19-038600W
19-036500W
19-038700W
70-001102P
19-037100W
19-036900W
19-038800W
35W
35E
Aerial Imagery: USDA FSA NAIP 2019

County Boundary
Municipal Boundary
Public Water Inventory Basin
Public Water Inventory Watercourse
Strategic Waterbodies

N
0 1,750 3,500
Feet

PUBLIC WATERS
BDWMO Watershed Management Plan

FIGURE A-8

Data Source: Minnesota Department of Natural Resources, Public Waters (PW) Basin and Watercourse Delineation, 2020.

1.7.1 Lakes and Ponds

This section summarizes some of the lakes and ponds of local significance within the BDWMO. The BDWMO has classified some of these waterbodies as strategic waterbodies to aid in prioritizing BDWMO activities (see Section X – Implementation Section).

Note: the issue and resource prioritization process will be used to confirm or revise the list of strategic waterbodies, as needed. The text included in this iteration of the Land and Water Resources Inventory assumes no changes to the strategic waterbodies list (see also Section 1.9.1).

1.7.1.1 Crystal Lake (19-0027P)

Crystal Lake is a 292-acre lake located in the cities of Burnsville and Lakeville in the southern portion of the BDWMO. The lake is a major recreational resource for the area. A public beach and public boat landing provide opportunities for swimming, fishing, water skiing and aesthetic viewing. Crystal Lake is a BDWMO strategic water body and is classified as a deep lake by the MPCA. The MPCA listed Crystal Lake as impaired in 2002 due to excessive nutrients, leading to the completion of the *Crystal, Keller, Lee and Earley Lakes Total Maximum Daily Load* (TMDL) (MPCA, 2011). Crystal Lake was removed from the impaired waters list in 2018 following improved water quality achieved in part by actions taken by the BDWMO and member cities.

Crystal Lake consists of five basins: Bluebill Bay, Mystic Bay, Maple Island Bay, Buck Hill Bay, and the main lake basin. The lake outlet is located at the northwest end of the lake in Buck Hill Bay and consists of a box weir with an overflow elevation of 933.5 feet NGVD29. The lake has 5.3 miles of shoreline, a mean depth of 10 feet, and a maximum depth of 35 feet. The area of the lake shallow enough (15 feet deep or less) for aquatic plants to grow (the littoral area) is approximately 210 acres. Crystal Lake is a dimictic lake – it mixes two times per year (during the spring and fall turnover events). The lake thermally stratifies during the growing season.

Crystal Lake receives runoff from a 3,852-acre tributary watershed that includes the direct watershed and the watersheds of Keller Lake, Lee Lake, and Lac Lavon (Lac Lavon's 185-acre watershed is typically landlocked). The tributary watershed to Crystal Lake includes portions of the cities of Apple Valley, Burnsville, and Lakeville. Crystal Lake receives outflows from Keller Lake and Lee Lake and drains northwest through a series of storm sewer pipes to Twin and Earley Lakes, ultimately reaching the Minnesota River via Sunset Pond.

The Crystal Lake watershed (including the Keller and Lee Lake watersheds) is almost fully-developed, with only a few small parcels available for new development. Low density residential land use is the major land use (41%), followed by highway (20%) and open water (11%). Other land uses include medium density residential, natural, park, and open space, commercial, developed parks, golf course, high density residential, institutional, and industrial/office. The portion of the watershed located in Lakeville has developed significantly since 2000, with the most intense development occurring along I-35, where the undeveloped land was converted to commercial use. For the commercial area of Lakeville within the

Crystal Lake watershed, the city restricts the maximum amount of impervious cover to 70% for new development sites. (confirm with City of Lakeville)

The BDWMO began operating a ferric chloride treatment system in 1996 to remove phosphorus from the deepest part of Crystal Lake. The treated water was discharged to a nearby storm sewer and conveyed to Keller Lake. The project was a cooperative venture of the BDWMO, the MPCA, and the United States Environmental Protection Agency (U.S. EPA) under the Clean Lakes Program (CLP). The system operated during the 1996 and 1997 recreation seasons and half of the 1998 season. Operation was suspended in July 1998 after strong neighborhood opposition to the odor (a side effect of the treatment). Operation was discontinued in April 1999 with consideration for public input, operating costs, and marginal water quality benefit during the summer.

A recommendation of the Crystal & Keller Lake Use Attainability Analysis (UAA) (Barr, 2003) was to modify the ferric chloride treatment system to withdraw surface waters and resume operating the system. The BDWMO implemented the recommendation to reduce the total phosphorus concentration and suppress the growth of curly-leaf pondweed in Keller Lake in an effort to reduce the phosphorus loading to Crystal Lake.

The BDWMO resumed operation of the ferric chloride treatment system for varying time periods during the summers of 2003, 2004, 2005, 2006, 2007, and 2008, following the recommendation in the *Crystal & Keller Lake Use Attainability Analysis* (UAA) (Barr, 2003). In 2009, the BDWMO again decided to terminate operation of the ferric chloride system because of concerns over operating costs and limited benefits.

Lake monitoring data indicate that operation of the ferric chloride treatment system was successful in reducing the total phosphorus concentration in the deepest portions of Crystal Lake but had negligible impact on overall lake water quality, including phosphorus concentrations measured at the lake surface or water clarity measured during the summer season. The operation of the hypolimnetic withdrawal system did maintain water levels and improve water quality in Keller Lake.

1.7.1.2 Keller Lake (19-0025P)

Keller Lake is an approximately 50-acre lake located in the cities of Burnsville and Apple Valley in the southern portion of the BDWMO. The lake is used primarily for fishing, canoeing, and wildlife viewing by the local residents. There is a park on the south side of Keller Lake but no beach or public access. Keller Lake is a BDWMO strategic water body and is considered a shallow lake by the MPCA. The MPCA listed Keller Lake as impaired in 2002 due to excessive nutrients and remains on the impaired waters list. This impairment was evaluated in the completion of the *Crystal, Keller, Lee and Earley Lakes Total Maximum Daily Load* (TMDL) (MPCA, 2011). An alum and sodium aluminate treatment was conducted on Keller Lake in Spring 2019, resulting in improved water quality in 2019 and 2020 compared to the previous decade. A phase II alum treatment is planned for the fall of 2021.

Keller Lake discharges to the northeast side of Crystal Lake over a weir structure, at an elevation of 934.3 feet NGVD29, through a 72-inch diameter RCP arch pipe. Keller Lake has an average depth of 4.8 feet and a maximum depth of about 8 feet. Because the lake is so shallow, aquatic plants can grow

over the entire lake bed and thermal stratification typically does not occur during the summer. The lake is polymictic (mixes several times per year) due in part to intermittent wind mixing.

The Keller Lake watershed is 1,447 acres (including the lake surface area). The Keller Lake watershed is fully-developed. Analysis performed as part of the TMDL found that runoff from 46% of the drainage area reached Keller Lake without first passing through some form of water quality treatment. Need to update to reflect projects by BDWMO or cities since TMDL treating additional area. Low density residential land use is the primary land use within the watershed (52.6%), followed by highway (20.5%) and natural, park, and open space (8%). Other land uses include medium density residential, open water, commercial, developed parks, high density residential, and institutional. There is a large wetland area adjacent to the southwest side of Keller Lake.

1.7.1.3 Orchard Lake (19-0031P)

Orchard Lake is a 243-acre lake located in Lakeville, in the southwest portion of the BDWMO. The lake is used primarily for fishing, but swimming, boating and aesthetic and wildlife viewing are also popular recreational uses of the lake. Over seventy private homes are located on the lake. Three city parks are located on Orchard Lake: a public boat access on the south shore (Orchard Lake Park), a public beach on the west shore (Orchard Lake Beach), and Wayside Park. Orchard Lake is a BDWMO strategic water body and is classified as a deep lake by the MPCA. Orchard Lake is not currently listed as impaired by the MPCA.

Orchard Lake's maximum depth is 33 feet, and its average depth is 10 feet. The littoral area (the portion less than 15 feet deep where submerged aquatic plants can grow) covers approximately 75 percent of the lake. The total watershed area tributary to Orchard Lake is 2,260 acres and includes the Kingsley Lake watershed. The lake outlet is located on the west shore and discharges to the Credit River watershed through Murphy-Hanrehan Park Reserve.

Current land use within the watershed includes a mixture of residential, commercial, institutional, park, golf course and undeveloped land. The commercial and high-density residential land uses are in the central portion of the watershed. Much of the Orchard Lake watershed is developed at low density. The portion of the watershed along the I-35 corridor has undergone recent development, but portions of the watershed remain undeveloped.

1.7.1.4 Kingsley Lake (19-0030P)

Kingsley Lake is a 51-acre lake located in Lakeville in the southwest portion of the BDWMO. There is no public beach or access on Kingsley Lake, but the lake provides boating and canoeing opportunities for shoreline residents. Kingsley Lake is a BDWMO strategic water body and is considered a shallow lake by the MPCA. Kingsley Lake is not currently listed as impaired by the MPCA.

Kingsley Lake has a maximum depth of about 10 feet and the littoral area (the portion over which submerged aquatic plants can grow) covers the entire lake. A summer thermocline does not develop in Kingsley Lake due to its shallow depth. Kingsley Lake flows to Orchard Lake and ultimately to the

Minnesota River via the Credit River watershed. The City of Lakeville constructed the current outlet from Kingsley Lake in 1993.

The watershed area tributary to Kingsley Lake 216-acres. Existing land use conditions in the Kingsley Lake watershed include low density residential, undeveloped, commercial, and a small amount of institutional and very low density residential. Undeveloped land in the watershed is expected to convert to institutional and commercial land uses. Confirm with City of Lakeville.

1.7.1.5 Lac Lavon

Lac Lavon is a 60-acre lake occupying a former gravel pit. The lake is located on the border of Burnsville and Apple Valley. Lac Lavon is used primarily for fishing, swimming, and wildlife and aesthetic viewing. The City of Burnsville Park, with ballpark, tennis courts, paved trails, picnic shelter, play equipment and boat access, and the City of Apple Valley Park, with a fishing pier, canoe rack and access, picnic shelter, paved trails, and children's play equipment provide for most of the lake's recreational use. Because Lac Lavon is a former gravel pit, it is not part of the original MDNR public waters inventory. Lac Lavon is a BDWMO strategic water body and is classified as a deep lake by the MPCA. Lac Lavon continues to demonstrate excellent water quality and is not currently listed as impaired by the MPCA.

Lac Lavon is a landlocked basin under normal hydrologic conditions. The only surface water outlet from Lac Lavon is a 12-inch diameter emergency overflow outlet to Keller Lake. A valve controls the flows in the overflow pipe; under normal conditions the valve is closed. Water levels are primarily maintained by groundwater outflow.

The area tributary to Lac Lavon is 184 acres and includes portions of the cities of Apple Valley and Burnsville. Current land use in the watershed is primarily low-density residential and park land, which results in little pollutant loading to Lac Lavon. Significant land use changes in the Lac Lavon watershed are not anticipated.

1.7.1.6 Sunset Pond

Sunset Pond is a 60-acre stormwater pond located in Burnsville in the western portion of the BDWMO. Sunset Pond is located at the downstream end of a series of water bodies that includes Keller Lake, Lee Lake, Lac Lavon, Crystal Lake, Wood Pond, Twin Lake, and Earley Lake.

Sunset Pond functions as a stormwater detention basin. A city park is located on the southeast side of Sunset Pond and the pond is entirely surrounded by a walking trail. Aquatic recreation facilities are not present with the exception of a fishing pier. The MDNR manages Sunset Pond as a youth fishing pond through its Fishing in the Neighborhood (FiN) program. Sunset Pond is not a BDWMO strategic waterbody. Sunset Pond is not classified as a lake by the MPCA because it is a constructed waterbody, although it meets the physical criteria of a shallow lake.

The City of Burnsville created Sunset Pond in 1983 by constructing a dam along the northern end of a natural low marshy depression. The pond is shallow (with a maximum depth of about 10.5 feet) and includes areas of open water, islands, and aquatic plants. The littoral area covers the entire lake. The

Sunset Pond outlet is located on the north side of the pond. Outflows flow into Willow Creek and drain north out of the BDWMO, through the Kraemer Nature Preserve (in the Lower Minnesota River Watershed District) towards the Minnesota River.

The direct watershed to Sunset Pond is 1,019 acres and includes land in Burnsville and a small amount of land in Savage (outside of the BDWMO jurisdictional boundary). The total area tributary to Sunset Pond is 6,311 acres (6,127 acres excluding the Lac Lavon watershed, which is typically landlocked). Current land use within the direct watershed is a mixture of industrial, low density residential and park land. The City of Burnsville intends to maintain the park areas around Sunset Pond as a nature preserve.

1.7.1.7 Lee Lake (19-0029P)

Lee Lake is an approximately 19-acre water body located entirely within the City of Lakeville in the southern portion of the BDWMO. Lee Lake is surrounded by privately owned property and has no public access. The BDWMO did not classify Lee Lake as a strategic water body based on the lack of public access. It is classified as a shallow lake by the MPCA. The MPCA listed Lee Lake as impaired due to excess nutrients in 2002. Lee Lake was removed from the impaired waters list in 2014 based on water quality data that indicate the lake supports its intended recreational and aquatic life uses.

Prior to 1993, Lee Lake was landlocked and experienced periodic flooding. The City of Lakeville constructed a gated outlet discharging to Crystal Lake in 1993. The Lee Lake outlet is located on the east side of the lake and is a stop log weir (at elevation 948.5 feet NGVD29) followed by a 36-inch wide gated structure (at an elevation of 947 feet NGVD29). Water level monitoring shows that lake levels are typically one to two feet below the outlet invert elevation (948.5 feet NGVD29). The average lake depth is 7 feet and the maximum depth is about 15 feet. Lee Lake is dimictic; it mixes two times each year (during the spring and fall turnover events). The lake thermally stratifies throughout the growing season.

The watershed tributary to Lee Lake watershed is 206 acres. The Lee Lake watershed is nearly fully-developed. Low density residential land use is the major land use (38%), followed by highway (29%) and open water (12%). Other land uses include natural, park, and open space, commercial, and institutional.

1.7.1.8 Earley Lake (19-0033P)

Earley Lake is an approximately 23-acre lake located in the City of Burnsville in the central portion of the BDWMO. Recreational uses of Earley Lake primarily include aesthetics and wildlife viewing, as there are no public beaches or boat access. Day Park is located on the southwest side of the lake and a walking trail surrounds the lake. The BDWMO did not classify Earley Lake as a strategic waterbody. The MPCA classifies Earley Lake as a shallow lake. The MPCA previously listed Earley Lake as impaired due to excess nutrients. Early Lake was removed from the impaired waters list in 2010 based on water quality data.

Earley Lake is a shallow lake, with a mean depth of 3.8 feet and a maximum depth of 7.8 feet. Because of the shallow conditions, macrophyte growth is prevalent throughout most of the lake, and the entire lake is littoral area. The lake outlet consists of a three-sided box weir, with a total length of 12 feet and an overflow elevation of 905.0 feet above MSL (NGVD29). Earley Lake discharges to the southwest into the

Sunset Pond watershed; the discharge from the lake is conveyed westward through a 36-inch diameter RCP pipe to Judicial Pond prior to reaching Sunset Pond.

The direct watershed tributary to Earley Lake is approximately 757 acres. Earley Lake also receives inflows from the Lee Lake, Keller Lake, Crystal Lake, Lac Lavon, Wood Pond, and Twin Lake watersheds, bringing the total tributary area to 5,108 acres (excluding Lac Lavon, which is typically landlocked). The Earley Lake watershed is characterized by heavy commercial land use (including all of Burnsville Center), as well as low-, medium-, and high-density residential use.

1.7.1.9 Wood Pond (19-0024W)

Wood Pond is approximately 14 acres and is located in the City of Burnsville in the central portion of the BDWMO. Wood Pond is used for canoeing, fishing, aesthetic viewing and wildlife habitat. Wood Park is located along the northeast shoreline of Wood Pond. There is no public boat or swimming access on the lake. In 2007, a public fishing dock was constructed at Wood Park, as part of the MDNR FiN Program. The BDWMO did not classify Wood Pond as a strategic water body. The MDNR classifies Wood Pond as a public water wetland.

Wood Pond is a shallow water body. The average water depth is 10 feet and the maximum depth is 14 feet (the littoral area covers the entire lake). The water level in the lake is controlled at elevation 1000.9 ft MSL (NGVD29) by an 18-inch diameter inlet/outlet pipe located at the west side of the lake. The trunk storm sewer system conveys discharge from the lake south beneath Portland Avenue and eventually into Twin Lake.

The Wood Pond watershed is approximately 110 acres and is fully developed, with no significant changes in land use classification expected for the foreseeable future. The Wood Pond watershed includes predominantly low- and medium-density residential land use. There is also some right-of-way land use in the watershed as well as some commercial land use southeast of the lake along County Road 42.

1.7.1.10 Twin Lake (19-0028W)

Twin Lake is approximately 17 acres and includes north and south basins separated by Southcross Drive. North Twin Lake and South Twin Lake are approximately 5 acres and 12 acres, respectively. The lake is located within the City of Burnsville in the central portion of the BDWMO. Twin Lake is used for canoeing, fishing, aesthetic viewing and wildlife habitat. Twin Lake Park surrounds the north basin and it borders the north shore of the south basin. There is no public beach or boat access on the lake. The BDWMO did not classify Twin Lake as a strategic water body. The MDNR classifies Twin Lake as a public water wetland.

Twin Lake is a shallow water body. South Twin has a mean depth of 3.6 feet and a maximum depth of 11 feet. North Twin Lake has a mean depth of 6.6 feet and a maximum depth of 12 feet. Because of the shallow conditions, macrophyte growth is often prevalent throughout both basins.

Outflows from Crystal Lake and local stormwater runoff enter on the south side of South Twin Lake via a 48-inch diameter RCP storm sewer. Twin Lake is also downstream of Wood Pond; Wood Pond is typically landlocked and discharges to Twin Lake only under extreme high water conditions. The outlet from Twin

Lake is located at the southwest side of the north basin and consists of a three-sided box weir, with a total length of 12 feet and an overflow elevation of 918.0 feet above MSL (NGVD29). Discharge from Twin Lake is conveyed in a westward direction through a 36-inch diameter RCP to Earley Lake.

South Twin Lake and North Twin Lake are connected by a 36-inch diameter culvert underneath Southcross Drive which acts as an equalizer pipe. Typically, water flows from the south basin to the north basin. During significant storm events, however, runoff to the north basin can exceed discharge capacity and stormwater can backup and flow to the south basin.

The direct watershed tributary to Twin Lake watershed covers approximately 574 acres (excluding the Wood Pond watershed). The total watershed that flows to Twin Lake includes the areas tributary to Lee Lake, Keller Lake, Lac Lavon, Crystal Lake, and Wood Pond and is 4,352 acres (excluding the area to Lac Lavon, which is typically landlocked). Land use is the watershed is predominantly residential and park land, with the exception of a large commercial area between I-35W and I-35E that drains to North Twin Lake.

1.7.2 Streams and Open Channels

Although there are many lakes and wetlands throughout the BDWMO, there are very few natural streams within the watershed. Much of the watershed is fully-developed and flows that were once conveyed through surface drainages and streams now flow through underground storm sewer.

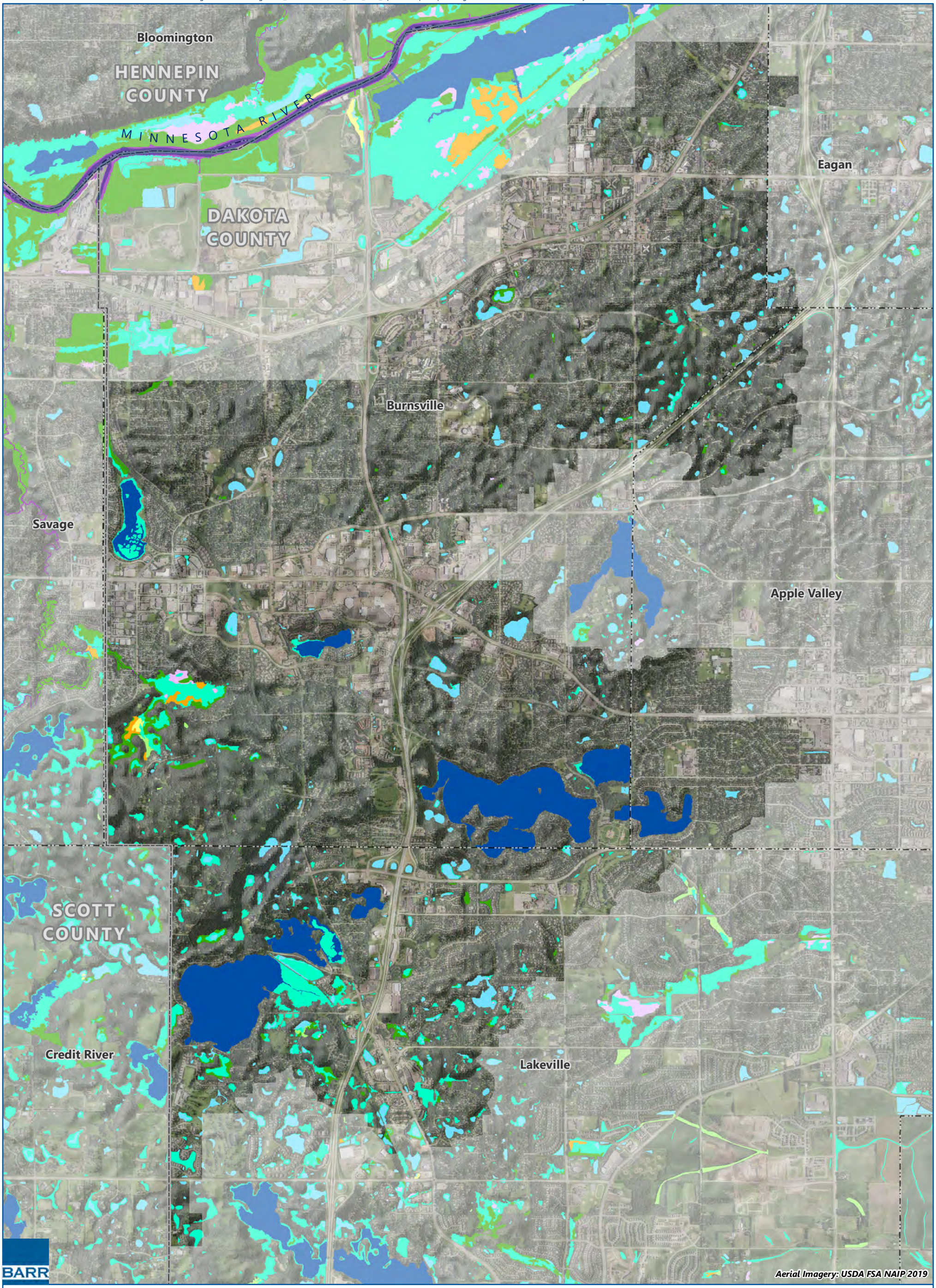
Flows from the southwestern portion of the BDWMO that pass through Kingsley Lake, Orchard Lake, and the Cam Ram Wetland ultimately reach the Credit River (MDNR ID 07020012-517) in the Scott WMO. Flows from the remainder of the BDWMO discharge to the Minnesota River (MDNR ID 07020012-505) in the Lower Minnesota River Watershed District (LMRWD). In addition, flows from the northern portion of the watershed (ID the subwatersheds) reach two MDNR-designated trout streams (in the LMRWD) that flow into Black Dog Lake and eventually the Minnesota River.

1.7.3 Wetlands

Wetlands in the BDWMO are important community and ecological assets. Wetlands provide recreational value, runoff storage and retention, nutrient and sediment reduction, groundwater recharge, and wildlife habitat benefits. To protect these valuable resources, the BDWMO and its member cities cooperate to manage wetlands to achieve no net loss of acreage, functions, and value. Within the watershed, the member cities serve as the Local Government Units (LGUs) responsible for administration of the Wetland Conservation Act (WCA) (except for on Minnesota Department of Transportation projects). More information about WCA guidance is provided at the BWSR website: https://bwsr.state.mn.us/wetlands-regulation-minnesota

The US Fish and Wildlife Service (USFWS) maintains an inventory of wetlands known as the National Wetland Inventory (NWI). Figure 1-9 presents the wetlands identified in the NWI. The NWI is periodically updated and was last updated for the area of the BDWMO in 20XX. The Cities of Apple Valley, Burnsville, and Lakeville have also developed city-wide wetland inventories with wetland classification systems based on the Minnesota Rapid Assessment Method (MnRAM) or similar framework. Does Eagan have a city-wide inventory?

Within all BDWMO member cities, wetlands are inventoried on an individual basis as part of development proposals. Confirm with cities. The BDWMO requires functional values assessment of wetlands to be performed using the Minnesota Routine Assessment Method for Evaluating Wetland Functions (MnRAM), version 3.2, or similar methodology. Information about wetland functional assessment is available from BWSR are: www.bwsr.state.mn.us/wetlands/mnram/index.html.



County Boundary
Municipal Boundary
River

National Wetlands Inventory

Freshwater Emergent Wetland
Freshwater Forested Wetland
Freshwater Forested/ Emergent Wetland
Freshwater Forested/ Shrub Wetland
Freshwater Pond
Freshwater Shrub Wetland
Freshwater Shrub/ Emergent Wetland
Lake
Riverine

N

0 1,750 3,500
Feet

NATIONAL WETLANDS INVENTORY
BDWMO Watershed Management Plan
FIGURE A-9

Data Source: National Wetlands Inventory, MnDNR, 2019.

1.7.4 Stormwater Systems

The area within the BDWMO is suburban and rural land use (see Section 1.3). In developed areas, pre-settlement drainage patterns have been significantly altered as part of development activity, resulting in networks of stormwater management infrastructure designed to collect stormwater and convey it downstream. The stormwater system includes pipes, ponds, lakes, wetlands, ditches, streams, swales, and other drainageways. Most stormwater in the BDWMO is ultimately routed to the Minnesota River. Public stormwater systems within the BDWMO are presented in Figure 1-12.

Various units of government and private entities have jurisdiction over different parts of the stormwater system within the watershed. The Minnesota Department of Transportation (MNDOT) is responsible for maintaining the stormwater systems within their rights-of-way, such U.S. highways (e.g., Interstate 35), and state highways. Dakota County is responsible for maintaining at least part of the stormwater systems within their rights-of-way, such as county roads and county state aid highways.

Each city within the BDWMO has jurisdiction and maintenance responsibility over its own stormwater management systems. These systems include lateral (also called primary) stormwater systems (i.e., street gutters, pipes, and ditches) and outflow (also called main, trunk, or secondary) conveyors, which collect flows from city lateral systems and move the water downstream. Cities generally design lateral stormwater systems with capacity to convey runoff from 5- or 10-year frequency storms without significant flooding and protect public health and safety for storms up to the 100-year frequency interval (these design levels are sometimes referred to as "level of service" and "level of protection"). City stormwater management systems are described in greater detail in each City's local water management plan.

Each city within the BDWMO must obtain Municipal Separate Storm Sewer System (MS4) permit coverage from the MPCA. The MS4 Stormwater Program is designed to reduce the amount of sediment and pollution that enters surface water and groundwater from storm sewer systems. As a requirement of the permit, each city must develop and maintain a stormwater pollution prevention program (SWPPP) which outlines programs and practices to minimize pollutant loading and water quality impacts resulting from stormwater management. The SWPPP contains six areas of focus, known as minimum control measures, including:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-Construction Stormwater Management
- Pollution Prevention/Good Housekeeping for Municipal Operations

The MPCA issued a new general MS4 permit in November 2020. Each member city will revise its MS4 program, if needed, to meet current MS4 permit and SWPPP requirements. Each MS4 permittee submits a report to the MPCA annually documenting the implementation of its SWPPP. The BDWMO is not required to obtain MS4 permit coverage because it does not own stormwater management infrastructure. The

MPCA periodically updates the MS4 General Permit. More information is available from the MPCA at: https://www.pca.state.mn.us/water/municipal-stormwater-ms4

Owners of private stormwater systems in the BDWMO are generally responsible for maintaining their facilities. Member cities require maintenance agreements for private systems as part of project permitting. Confirm with cities

Placeholder for:

Figure 1-10 Stormwater Systems

Figure not complete – need to confirm most updated data with GDF, BJB, Burnsville

1.8 Water Quality Monitoring & Studies

Surface water quality data exists for many of the water bodies within the watershed. Several organizations have performed monitoring based on particular needs and priorities, including:

- BDWMO
- BDWMO member cities
- Metropolitan Council
- MPCA
- USGS

Monitoring parameters vary by monitoring program, but may include:

- Water chemistry (e.g., phosphorus, total suspended solids, chloride)
- Biological data (e.g., indices of biological integrity, macroinvertebrates, fish inventories)
- Habitat data (e.g., vegetation, physical conditions)
- Hydrologic data (e.g., flow, water level)

Monitoring locations within the watershed are presented in Figure 1-11. Much of the historical monitoring data for the watershed is available from the MPCA's Environmental Data Access (EDA) database at: https://www.pca.state.mn.us/eda-surface-water-data

1.8.1 BDWMO Monitoring Programs

The BDWMO monitors the water quality for all strategic water resources through its consultants or partners. The following sections describe the various types of water body monitoring programs.

1.8.1.1 Survey Level Water Quality Monitoring

The BDWMO survey level water quality monitoring program is equivalent to the Metropolitan Council's Citizen Assisted Monitoring Program (CAMP) (see Section 1.8.2). The BDWMO performs or funds (via CAMP) survey level monitoring of all BDWMO strategic waterbodies annually.

An aquatic plant survey should be completed as part of the survey level monitoring that focuses on identifying exotic invasive aquatic plants. Is this done by the member cities?

1.8.1.2 Management Level Water Quality Monitoring

The BDWMO management level monitoring program involves collecting surface water samples on 11 occasions—ice-out and then May through September, twice per month. similar to survey/CAMP level monitoring. Management level monitoring, however, includes more detailed total phosphorus sampling (i.e., samples at depths throughout the water column and more precise results), field measurements of temperature, dissolved oxygen, pH, redox potential, specific conductivity and turbidity, and performing aquatic plant surveys. This type of monitoring is needed to assess problems (diagnostic) and is appropriate for regular monitoring (e.g., every three years) of the BDWMO strategic water bodies.

1.8.1.3 Intensive Water Quality Monitoring

The BDWMO intensive water quality monitoring program involves more sample collection dates and analyzing additional parameters at depth (besides total phosphorus) than the management level monitoring. This type of monitoring is not regularly scheduled but may be needed to calibrate water quality models and to perform targeted resource studies.

1.8.2 Citizen Assisted Monitoring Program (CAMP)

The Metropolitan Council's Citizen Assisted Monitoring Program (CAMP) has been collecting water quality data on a number of Twin Cities metropolitan area lakes since 1980. Through CAMP, volunteers collect water samples from the top 0-2 meters of the lake and measure water clarity approximately 7 to 14 times between April and October. Collected samples are analyzed by the Metropolitan Council for nutrients and other parameters.

Several waterbodies within the BDWMO have been monitored as part of the CAMP program including Crystal Lake, Keller Lake, Orchard Lake, Kingsley Lake, Lac Lavon, Sunset Pond, Lee Lake, Horseshoe Lake, Earley Lake, Wood Pond, Twin Lake, and Goose Lake. CAMP monitoring of BDWMO waterbodies is typically funded by the BDWMO (for strategic waterbodies) and member cities (for non-strategic waterbodies).

More information is available from the Metropolitan Council at: https://metrocouncil.org/Wastewater-Water/Services/Water-Quality-Management/Lake-Monitoring-Analysis/Citizen-Assisted-Monitoring-Program.aspx

1.8.3 Member City Lake Monitoring

The BDWMO member cities are responsible for managing non-strategic Category I and II lakes and ponds to achieve the cities' goals. City management of these water bodies includes classifying, monitoring, tracking trends, conducting studies, and implementing other lake water quality management actions. Are Category I and II classifications still appropriate and provide benefit for City and WMO activities?

The member cities have outlined their water quality monitoring programs in their approved local water management plans (see Section X). The City of Apple Valley participates in the CAMP program, monitoring water quality in all of their priority water bodies. The City of Burnsville water quality monitoring program includes involvement in the CAMP program including the following BDWMO water bodies: Keller, Crystal, Lac Lavon, Wood Pond, Earley Lake, Twin Lake, and Sunset Pond. The City of Lakeville has developed monitoring and management plans, including participation in the CAMP program, for their priority lakes, which include Orchard, Lee, and Kingsley Lakes in the BDWMO. Confirm with cities this is still accurate.

1.8.4 Other Programs and Water Quality Studies

The BDWMO, member cities, and other entities have periodically performed additional monitoring beyond regular water quality monitoring of lakes and ponds.

1.8.4.1 WOMP Monitoring

The BDWMO, in cooperation with the Metropolitan Council, began operating a Watershed Outlet Monitoring Program (WOMP) station on Willow Creek in spring 1999. The station was located downstream of Sunset Pond along a primary discharge route from the BDWMO. This station collected data on the volume and quality of stormwater runoff discharging from a large portion of the BDWMO. The BDWMO operated the Willow Creek WOMP station through 2003. Operation of the WOMP station were turned over to the LMRWD in 2004 and the site was operated through 2009. Additional information about WOMP monitoring is available from the Metropolitan Council at: https://metrocouncil.org/Wastewater-Water/Services/Water-Quality-Management/Stream-Monitoring-Assessment.aspx

1.8.4.2 Sediment Core Analysis

In additional to phosphorus loading from stormwater runoff, the release of phosphorus from lake sediments under anoxic conditions (i.e., internal loading) can negatively impact water quality. To better understand the impact of internal loading on lake water quality, the BDWMO has collected and analyzed sediment cores for the following lakes from 2006-2010:

- 2006: Earley Lake, Twin Lake
- 2007: Wood Pond
- 2009: Keller Lake, Crystal Lake, Lee Lake
- 2010: Lac Lavon
- 2019: Keller Lake

The internal loading data collected from the above analyses were used to support the development of the *Crystal, Keller, and Lee Lakes Nutrient Impairment TMDL Report and Earley Lake Water Quality Assessment* and design the alum treatment initiated in Keller Lake in 2019.

1.8.4.3 MPCA Citizen Lake Monitoring Program

The MPCA's Citizen Lake Monitoring Program (CLMP) is a cooperative program combining the technical resources of the MPCA and the volunteer efforts of citizens who collect water quality data on their lakes. This program provides low-cost Secchi discs to participants for measuring water clarity on an approximate weekly basis. Additional information is available from the MPCA at: https://www.pca.state.mn.us/water/citizen-water-monitoring

1.8.4.4 Water Quality Studies

The BDWMO, member cities, and cooperators have completed water quality studies for a number of waterbodies within the watershed. These include:

- *Orchard Lake Diagnostic Feasibility Study* (August, 1998); prepared for the City of Lakeville by Barr Engineering
- *Crystal and Keller Lake Use Attainability Analysis* (July 2003); prepared for the BDWMO by Barr Engineering

- *Twin and Earley Lake Use Attainability Analyses* (December 2007); prepared for the City of Burnsville by Barr Engineering
- *Wood Pond Use Attainability Analysis* (September 2008); prepared for the City of Burnsville by Barr Engineering
- *Crystal, Keller, and Lee Lakes Nutrient Impairment Total Maximum Daily Load Report and Earley Lake Water Quality Assessment* (November 2011); prepared for BDWMO and the MPCA by Barr Engineering
- *Crystal, Keller, and Lee Lake TMDL Implementation Plan* (November 2011); prepared for BDWMO and the MPCA by Barr Engineering
- *Lac Lavon Water Quality Assessment* (January 2011); prepared for the BDWMO by Barr Engineering
- *Keller Lake Alum Treatment Feasibility Study* (2018); prepared for the BDWMO by Barr Engineering
- *Newer City Studies??*

Bloomington
HENNEPIN COUNTY
MINNESOTA RIVER
DAKOTA COUNTY
Eagan
Burnsville
Savage
Apple Valley
SCOTT COUNTY
Credit River
Lakeville
30
7030
32
77
13
35W
11
16
35E
38
5
42
46
23
9
21
60
50
91
35
Aerial Imagery: USDA FSA NAIP 2019

County Boundary
Municipal Boundary
FEMA 100-Year Flodplain

N

0 1,750 3,500
Feet

FLOODPLAINS (FEMA)
BDWMO Watershed Management Plan

FIGURE A-11

Data Source: National Flood Hazard Layer, Federal Emergency Management Agency.

Yellow highlight indicates content subject to change/revision/clarification.
Red text indicates internal questions/comments for Commissioners/City staff.

1.9 Water Quality and BDWMO Management Classification

1.9.1 BDWMO Classification System

The BDWMO established criteria for determining those water bodies to be managed by the BDWMO; these are identified as **strategic waterbodies**. Strategic waterbodies are waterbodies of broad watershed significance that are important to a larger population than just the municipalities in which they are located. Strategic waterbodies meet four of the following five criteria (summarized in Table 1-6):

- Major subwatershed includes more than one city (i.e., intercommunity drainage area)
- Important recreational resource (i.e., swimming, boating, or adjacent park) or wildlife/natural resource
- Discharges to a downstream resource of significance (e.g., Minnesota River)
- Surface area of at least 50 acres
- Average or better water quality (grade of "C" or better based on 2017-2019 CAMP grades)

Note that the previous plan included the above 5 criteria. Strategic waters needed to meet 4 of 5 criteria. Application of the same criteria (and footnoted exceptions) in 2020 would result in the same strategic waterbodies. Criteria for strategic waterbodies will be evaluated as part of resource prioritization. We recommend considering eliminating the water quality criterion, as both high quality waters AND impaired waters are likely to be a priority, and this criterion alone does not determine whether any waterbodies are or are not identified as strategic.

Table 1-6 Strategic Waterbody Criteria

Waterbody (bold indicates Strategic Waterbody)	Criteria to be classified as BDWMO Strategic Waterbody				
	Major sub-watershed includes multiple cities	Important regional resource for 1) recreation[1], or 2) wildlife/ natural resource reasons	Directly discharges into a significant downstream resource[2]	Surface area at least 50 acres	Has average or higher water quality[3]
Crystal Lake (19-0027)	X	X		X	Yes (B-B-C)
Keller Lake (19-0025)	X	X	X	X	No (C-D-C)
Kingsley Lake (19-0030)		X	X	X[4]	Yes (A-A-A)
Lac Lavon	X	X		X	Yes (A-A-A)
Orchard Lake (19-0031)	X[5]	X		X	Yes (A-A-A)
Sunset Pond	--[6]	X		X	Yes (B-NA-NA)
Earley Lake (19-0033)		X			Yes (NA-NA-B)
Horseshoe Lake (19-0032)	X				Unknown (NA-NA-NA)
Lee Lake (19-0029)			X		Yes (C-C-B)
Twin Lakes (19-0028)		X			Yes (B-B-B)
Wetland 19-0381 (CamRam)		X		X	Unknown (NA-NA-NA)
Wood Lake (19-0024)		X		X	Yes (C-C-B)

Note(s):
(1) Recreational factors include swimming, boating, or adjacent regional park
(2) Significant downstream resources include Minnesota River, trout streams, or others identified as significant
(3) Based on average of "C" or better from 2017, 2018, and 2019 CAMP monitoring letter grades
(4) Including wetland areas around lake
(5) Tributary watershed to Orchard Lake includes portion of Credit River Township (outside of BDWMO jurisdictional boundary)
(6) Only receives a very minor amount of runoff from the City of Savage

The BDWMO manages the strategic waterbodies while the member cities are primarily responsible for managing non-strategic lakes, ponds and wetlands in the BDWMO, including Sunset Pond, Earley Lake, Lee Lake, Wood Pond and Twin Lake.

The BDWMO classifies the strategic resources (Category I – IV) based on their existing and projected future use, water quality, and/or ecologically or biologically unique resources, as follows:

Category I – these water bodies support swimming and other direct contact recreational activities, such as water skiing, scuba diving, and snorkeling. These water bodies have the highest/best water quality and are usually the most popular water bodies with the public.

Category II – these water bodies support indirect recreational activities such as boating and fishing. These water bodies have poorer water quality than Category I water bodies, but are still popular with the public.

Category III – these water bodies provide wildlife habitat, aesthetic enjoyment, and possibly warm water fishing, provided winter kill does not occur. Summer algal blooms are more common in Category II and Category III water bodies than in Category I water bodies.

Category IV – Water bodies classified as Category IV are typically water quality ponds used as nutrient and sediment traps to reduce downstream loading of sediment and/or phosphorus and other nutrients that contribute to degradation of water quality.

Table 1-7 includes a summary of BDWMO classifications and MPCA water quality standards. More information about the MPCA classification and impaired waters is included in Section 1.9.3.

Table 1-7 Strategic Waterbody Classifications and MPCA Water Quality Standards

MPCA Lake Classification and associated water quality standards[1]	BDWMO Waterbody Classifications				Non-strategic Waterbodies
	I Direct Contact Recreation	II Non-contact Recreation	III Habitat, Aesthetics, Fishing	IV Nutrient and Sediment Treatment	
Deep Lakes (15 feet or more)					
Total Phosphorus < 40 ug/L Chlorophyll a < 14 ug/L Secchi Disc > 1.4 m	Crystal Lake Orchard Lake Lac Lavon				
Shallow Lakes (less than 15 feet)					
Total Phosphorus < 60 ug/L Chlorophyll a < 20 ug/L Secchi Disc > 1.0 m		Kingsley Lake	Keller Lake		Lee Lake Earley Lake Horseshoe Lake
Not classified as lakes					
					Sunset Pond Twin Lake Wood Lake CamRam Wetland

Note(s):
(1) MPCA water quality standards are summer average values (June – September)

1.9.2 Lake Water Quality, Trend Analysis, and Action Levels

The BDWMO and member cities perform monitoring to assess the water quality of BDWMO lakes. Water quality for BDWMO strategic waterbodies averaged over the 10-year period from 2011 to 2020 is presented in Table 1-8. The most current water quality information is summarized in the BDWMO annual reports available from the BDWMO website at: http://www.blackdogwmo.org/

Table 1-8 Average Lake Water Quality (2011-2020)

Waterbody	Summer Average Total Phosphorus (ug/L)	Summer Average Chlorophyll a (ug/L)	Summer Average Secchi Transparency (m)	Significant Trends
Crystal Lake (19-0027)	25.9	13.8	6.7	No trend
Keller Lake (19-0025)	86	48	1.3	Improving Chl a
Kingsley Lake (19-0030)	16.8	2.4	3.0	Worsening Chl a
Lac Lavon	13.3	3.0	4.1	No Trend
Orchard Lake (19-0031)	21.7	6.1	2.5	Improving Secchi

Note(s): Trends based on most recent 10-year summer average (June – September) data

1.9.2.1 Water Quality Trend Analyses & Action Levels

As part of its annual reporting, the BDWMO performs water quality trend analyses on the strategic water bodies. The trend analysis performed for each of the water quality parameters (total phosphorus, chlorophyll-a, and Secchi disc transparency) is the linear least squares regression method, and it determines if the changes in the water quality over the past 10 years are statistically significant – trends are identified based on significant differences from a slope of zero (no trends in water quality over time) determined at the 90 percent confidence level.

The change in water quality is deemed significant if a statistically significant trend is observed in total phosphorus and at least one other parameter (chlorophyll-a or Secchi disc transparency). Statistically significant trends are presented in water quality for strategic waterbodies are presented in Table 1-8. Based on data from 2011 to 2020, no statistically significant trends in total phosphorus are observed.

The BDWMO uses water quality data and trend analyses to establish action levels for the strategic water bodies. The action level is based on Secchi depths and defines the threshold when additional management activities may be needed for a given waterbody. Action levels for each lake and are calculated as follows:

Action level = 25^{th} percentile of 10-year average Secchi transparency or MPCA water quality standard, whichever is greater (i.e., more stringent)

Action level may be revisited as part of updating implementation program.

Section 4.X and Table 4-X summarize the potential management actions the BDWMO may implement when average summer Secchi disc transparency is below the action level.

1.9.3 MPCA Impaired Waters

The federal Clean Water Act (CWA) requires states to adopt water quality standards to protect the nation's waters. Water quality standards designate beneficial uses for each waterbody and establish criteria that must be met to support its designated use(s). In Minnesota, the MPCA has established lake eutrophication criteria based on several factors, including the ecoregion of Minnesota in which the lake is located and the lake's classification as a shallow or deep lake. The MPCA defines shallow lakes as lakes with a maximum depth of 15 feet or a littoral area (area of lake 15 feet deep) of 80 percent or more. The BDWMO is entirely located in the North Central Hardwood Forest (NCHF) ecoregion of Minnesota. Applicable lake eutrophication water quality standards are presented in Table 1-7.

Section 303(d) of the CWA requires each state to identify and establish priority rankings for impaired waters that do not meet the water quality standards. The MPCA maintains the list of impaired waters, sometimes called the 303(d) list, and updates the list every 2 years. For impaired waterbodies, the CWA requires an assessment that addresses the causes and sources of the impairment. This process is known as a total maximum daily load (TMDL) analysis.

A TMDL is a threshold calculation of the amount of a pollutant that a waterbody can receive and still meet water quality standards. A TMDL establishes the pollutant loading capacity for a waterbody and develops an allocation scheme amongst the various contributors, which include point sources, nonpoint sources and natural background, as well as a margin of safety. As a part of the allocation scheme, a waste load allocation (WLA) is developed to determine allowable pollutant loadings from individual point sources (including loads from storm sewer networks in MS4 communities), and a load allocation (LA) establishes allowable pollutant loadings from nonpoint sources and natural background levels in a waterbody.

Over the years, several water bodies within the BDWMO have been listed on the MPCA impaired waters (303(d)) list for a variety of impairments, including excess nutrients. Crystal Lake, Lee Lake, and Earley Lake, once listed as impaired due to excess nutrients, have been "delisted" following improvements in water quality. As of 2021, impaired waters within the BDWMO include:

- **Keller Lake** – listed as impaired for excess nutrients in 2002; this impairment is addressed by the *Crystal, Keller, and Lee Lakes TMDL* (MPCA, 2011)
- **Orchard Lake** and **Lac Lavon** – listed as impaired due to mercury in fish tissue; this impairment is addressed by the statewide mercury TMDL (MPCA, 2008)

Completed TMDLs and associated implementation plans may contain actionable steps for the BDWMO and its member cities. The BDWMO and member cities have completed some actions recommended in the applicable TMDLs and will continue to implement actions to improve Keller Lake water quality. The BDWMO will continue to review completed TMDLs and TMDL implementation plans and incorporate recommended actions into the BDWMO implementation plan, where appropriate. See Sections 3.1.3 and

Section 4.1 for a more detailed discussion about the role of the BDWMO in the TMDL analyses required for those water bodies listed on the MPCA impaired waters list.

Current impaired waters listings are available from the MCPA website:
https://www.pca.state.mn.us/water/minnesotas-impaired-waters-list

1.10 Water Quantity and Flooding

Water quantity monitoring, such as lake level monitoring and flow monitoring, has been performed periodically by the BDWMO, member cities, and state agencies. Water level data is available for the following BDWMO strategic and non-strategic waterbodies:

- Crystal Lake,
- Keller Lake,
- Lac Lavon,
- Lee Lake,
- Wood Pond,
- Twin Lake,
- Earley Lake,
- Goose Lake,
- Kingsley Lake, and
- Orchard Lake.

Water level data is available from the MDNR's LakeFinder website at:
https://www.dnr.state.mn.us/lakefind/index.html

Continuous flow monitoring was performed from 1999 to 2009 at a location on Willow Creek downstream of Sunset Pond as part of the Metropolitan Council's WOMP network (see Section 1.8.4.1).

Each of the BDWMO member cities have developed and maintain hydrologic and hydraulic models. These models estimate stormwater runoff based on continuous or event-based precipitation records. These models vary in platform (e.g., HydroCAD, SWMM) and level of detail (e.g., subwatershed level vs. catch basin level). Model outputs reported by member cities may include 100-year water levels, peak flow rates, flow direction, and more. Member cities use these models to evaluate the impact of development proposals, infrastructure improvements, and other relevant activities. More information is available in the local water management plans of the BDWMO member cities.

1.10.1 Floodplains and Floodplain Management

Floodplains are lowland areas adjacent to lakes, wetlands, and rivers that are susceptible to inundation of water during a flood. For regulatory purposes, the term "floodplain" refers to the area inundated during a flood or storm event with a 1 percent chance of occurring in any year (i.e., a 100-year event).

The Federal Emergency Management Agency (FEMA) performs flood insurance studies (FIS) and develops Flood Insurance Rate Maps (FIRMs) to identify areas prone to flooding during 100-year storm events. The

water level corresponding to the 100-year flood event is referred to as the Base Flood Elevation (or BFE) and is the basis for the mapped floodplain extent. Figure 1-11 presents floodplains delineated by FEMA.

Each of the cities within the BDWMO has a FIS. The FIS, together with a city's floodplain ordinance, allow the city to take part in the national flood insurance program (NFIP). Homeowners within FEMA-designated floodplains are required to purchase flood insurance. NFIP is implemented independently of the BDWMO and are described herein for informational purposes. A county-wide FIS has also been completed for Dakota County. FEMA-established floodplains and 100-year flood levels are available from FEMA at: https://msc.fema.gov/portal/home

1.10.2 Local Flooding Issues

High water levels on some BDWMO lakes have periodically been reported, including on Crystal Lake, Keller Lake, and Twin Lakes. Generally, these high-water issues have not threatened habitable structures. In addition to flooding adjacent to waterbodies, excessive runoff can overwhelm storm sewer infrastructure, resulting in localized nuisance flooding issues (e.g., standing water in streets, flooding in backyard swales). The BDWMO member cities have prepared local water management plans containing more detailed information regarding high water levels, localized flooding issues, and associated management actions.

The performance standards of the BDWMO and member cities include stormwater volume and rate control requirements to limit negative flooding impacts. Performance standards include criteria for minimum building elevations relative to the 100-year flood levels.

Bloomington
HENNEPIN COUNTY
MINNESOTA RIVER
DAKOTA COUNTY
Eagan
Burnsville
Savage
Apple Valley
SCOTT COUNTY
Credit River
Lakeville
Aerial Imagery: USDA FSA NAIP 2019

County Boundary
Municipal Boundary
River

Surface Water Monitoring Station
- Discharge
- Lake
- Stream
- Wetland

0 1,750 3,500
Feet

MONITORING LOCATIONS
BDWMO Watershed Management Plan

FIGURE A-12

Data Source: Minnesota Pollution Control Agency, Surface Water Stations - MPCA Environmental Data Access, Accessed 3/5/2021.

1.11 Natural Communities and Rare Species

Through its Natural Heritage and Nongame Research Program (NHNRP), the MDNR collects, manages, and interprets information about rare natural features, native plants and plant communities, and nongame animals, including endangered, threatened, and special concern species. As part of the NHNRP, the MDNR maintains the Natural Heritage Information System (NHIS) as a statewide database of these resources. The MDNR limits publication of spatial attributes and locations of these items to protect rare features or species from damage or collection. Additional information about rare, threatened, and endangered species is available from the NHNRP at: https://www.dnr.state.mn.us/nhnrp/index.html

The MDNR's Minnesota County Biological Survey for Dakota County (1994) identifies pre-settlement vegetation. Prior to settlement, the BDWMO was covered by a mixture of brush prairie, oak openings and barrens, aspen-oak land, and upland deciduous forest known as the "Big Woods." Elm, sugar maple, and basswood are representative Big Woods tree species.

Do any member cities have natural area and/or wildlife preserve areas worth noting?

The Minnesota County Biological Survey also identifies sites of biodiversity significance. Several sites of moderate and outstanding biodiversity significance are present within the BDWMO (see Figure 1-12). Areas of moderate biodiversity occur in a residential neighborhood located south of Alimagnet Lake and a small undeveloped area north of Wolk Park, both in the City of Burnsville. A large area of outstanding biodiversity occurs along the western edge of the BDWMO, within the Murphy-Hanrehan Park Reserve. The Black Dog Scientific and Natural Area (SNA), calcareous fens and additional rare plants and animals are located just outside BDWMO, in the LMRWD.

Additional information is available from the Minnesota Biological Survey at:
https://www.dnr.state.mn.us/mbs/index.html

Significant portions of the BDWMO are classified as ecological corridors (see Figure 1-12). The MDNR has prioritized these areas for the implementation of conservation actions in cooperation with private partners.

The BDMWO member cities have also identified and prioritized natural and rare features for local management. The *City of Burnsville Natural Resources Master Plan* (2021 - pending) defined a number of resource management areas (RMUs) within the BDWMO as high priority sites. Sites with a high number of native communities, sites with rare species, and/or sites with complete community structure were given this designation. These include:

- Crystal Lake, Keller Lake, Lac Lavon and neighboring areas (Crystal/Keller RMU)
- Cam Ram Wetland, nearby areas, and Horseshoe Lake (Southwest RMU)
- Park within the City Center RMU
- Terrace Oaks Park and neighboring areas (Terrace Oaks RMU)
- Sunset Pond and nearby areas (Sunset RMU)

Bloomington
HENNEPIN COUNTY
MINNESOTA RIVER
DAKOTA COUNTY
Eagan
Burnsville
Savage
Apple Valley
SCOTT COUNTY
Credit River
Lakeville
Aerial Imagery: USDA FSA NAIP 2019

County Boundary
Municipal Boundary
River
Native Plant Community[1]
Ecological Corridor[2]

MBS Sites of Biodiversity Significance[3]
Outstanding
Moderate
Below

Data Sources: 1. Native Plant Communities, Minnesota Department of Natural Resources- Division of Ecological and Water Resources- Biological Survey, 2020.
2. MLCCS Ecological Corridor, Minnesota Department of Natural Resources, 2008
3. MBS Sites of Biodiversity Significance, Minnesota Department of Natural Resources- Division of Ecological and Water Resources- Biological Survey, 2020.

N
0 1,750 3,500
Feet

NATURAL AREAS
BDWMO Watershed Management Plan

FIGURE A-13

1.12 Fish and Wildlife Habitat

Many lakes and the adjacent shorelines provide habitat for fish and wildlife. The MDNR periodically performs fishery surveys on select BDWMO lakes to identify the species and relative quantities present. The MDNR also stocks fish in some BDWMO waterbodies, including:

- Crystal lake with tiger muskellunge and black crappie
- Orchard Lake with tiger muskellunge and walleye
- Lac Lavon with smallmouth bass and lake herring
- Sunset Pond with black crappie, bluegill, northern pike and yellow bullhead
- Wood Pond with lack crappie, bluegill, walleye, yellow perch, and largemouth bass

The MDNR manages Sunset Pond and Wood Pond as part of its "Fishing in the Neighborhood" (FiN) program. More information is available at: https://www.dnr.state.mn.us/fishing/fin/index.html

The MDNR historically stocked Lac Lavon with rainbow trout but discontinued this effort in 2000. While not managed as a fishery, Kingsley Lake is home to nesting loons, a rarity in southern Minnesota. Lake-specific fish stocking and fishery survey information is available from the MDNR LakeFinder website at: https://www.dnr.state.mn.us/lakefind/index.html

Are there other local fish management activities we should include?

1.12.1 BDWMO Habitat Monitoring Program

The BDWMO began implementing a habitat monitoring program for strategic water resources within the watershed in 2003. The program includes monitoring of biological and physical indicators, such as upland and aquatic vegetation, buffer zones, erosion, sedimentation, and non-native species as well as recommending management actions based on monitoring results.

The monitoring program was revised in 2010-2011 based on feedback from city staff. The revisions aimed to provide more effective monitoring, more useful and holistic results, and to reduce the monitoring costs. Starting in 2011, the habitat monitoring cycle was revised to include monitoring of each strategic waterbody on a five-year cycle, allowing for more detailed assessment that is used to develop an individual habitat management report for each water body. The habitat monitoring schedule is included in the discussion of BDWMO monitoring in Section X (implementation section).

The BDWMO continually seeks to improve the efficiency and usefulness of its monitoring efforts and may further revise the habitat monitoring program to better suit the needs of the member cities. Habitat monitoring reports and a summary of the habitat monitoring included in the BDWMO annual report are available from the BDWMO website at: http://www.blackdogwmo.org/index.html

1.12.2 Macrophyte Monitoring

Aquatic plants, or macrophytes, are a natural and integral part of most lake communities. A lake's aquatic plants, generally located in the shallow areas near the shoreline of the lake provide habitat for fish, insects,

and small invertebrates, provide food for waterfowl, fish and wildlife, produce oxygen, provide spawning areas for fish, help stabilize and protect shorelines from wave erosion, and provide nesting sites for waterfowl.

Macrophyte surveys have been completed in a number of the water bodies within the BDWMO. The planned schedule for macrophyte monitoring is included in the discussion of BDWMO monitoring in Section X (implementation section).

Curly-leaf pondweed is an invasive aquatic macrophyte that displaces native aquatic species. Because of the timing of its growth and die-back cycle, curly-leaf pondweed can be a significant source of phosphorus in a lake during the mid-summer months. Eurasian watermilfoil is another invasive macrophyte that can displace native species and significantly interfere with the recreational uses of a lake by forming dense mats at the water surface. Curly-leaf pondweed and/or Eurasian watermilfoil have been identified in the following BDWMO waterbodies:

- Curly-leaf pondweed:
  - Crystal Lake
  - Keller Lake
  - Lee Lake
  - Orchard Lake
  - Lac Lavon
  - Earley Lake
- Eurasian watermilfoil:
  - Crystal Lake
  - Keller Lake
  - Lac Lavon
  - Sunset Pond
  - Earley Lake
  - Twin Lake

The member cities and the MDNR have periodically managed macrophytes in certain BDWMO waters through mechanical harvesting and chemical treatment.

1.12.3 Wetland Health Evaluation Program

Dakota County coordinates the Wetland Health Evaluation Program (WHEP). Through the program, volunteers are trained and work as part of a community-based team to collect data on wetland plants and macroinvertebrates using sampling methods and evaluation metrics developed by the MPCA to evaluate wetland health. The wetland sampling efforts began in 1997 and each BDWMO member city has participated in the program at some point. WHEP monitoring sites within the BDWMO are presented in Figure 1-10, along with the other water quality and quantity monitoring locations. Cities within the BDWMO utilize WHEP data as baseline data for specific sites to monitor changes over time.

1.13 Open Space and Recreation Areas

Approximately 11% of the watershed is occupied by park, open space, or preserve land uses. Open space and recreational areas are presented in Figure 1-13 and include regional and municipal parks. These areas provide opportunities for residents and people who recreate in the watershed to appreciate and connect with local water and natural resources. Major parks located within the watershed include:

- Terrace Oaks Park
- Crystal Lake West Park
- Lac Lavon Park
- Murphy-Hanrehan Park Reserve
- Others to list specifically?

Popular recreational opportunities within the BDWMO include activities like boating, fishing, hiking, walking, biking, and others. There are several public water access points within the watershed, including parks and/or public access adjacent to all BDWMO strategic waterbodies. Dakota County Parks maintains a listing and maps of trail systems throughout the county.

Parks and other open spaces may also provide stormwater management opportunities for the BDWMO and its member cities. In addition to providing physical space for BMPs, these spaces are often in an ideal location situated between the non-point pollutant source (e.g., urban development) and the receiving water (e.g., lakes, ponds, wetlands). Implementing BMPs in parks and other areas frequented by the public can further enhance demonstration and education benefits.

Bloomington
HENNEPIN COUNTY
MINNESOTA RIVER
DAKOTA COUNTY
Eagan
Burnsville
Savage
Apple Valley
SCOTT COUNTY
Credit River
Lakeville
35W
35E
35
13
32
30
7030
77
11
16
38
5
42
46
23
9
21
60
50
91
BARR

Aerial Imagery: USDA FSA NAIP 2019

County Boundary
Municipal Boundary
River

Recreation/Conservation Areas
City Park
Conservation Area
Regional Park

N

0 1,750 3,500
Feet

RECREATIONAL AREAS
BDWMO Watershed Management Plan

FIGURE A-14

Data Source: Metro Parks Collaborative, 2020

1.14 Pollutant Sources

The sources of water pollution in the BDWMO are many and varied. Potential pollutant sources in the watershed include permitted pollutant sources, potentially contaminated sites, leaking above- and below-ground storage tanks, unsealed wells, non-functioning subsurface sewage treatment systems (SSTS), and non-point sources.

The MPCA maintains a database of potential environmental hazards, which includes permitted sites (air, industrial stormwater, construction stormwater, wastewater discharge), hazardous waste generating sites, leak sites, petroleum brownfields, tank sites, unpermitted dump sites, and sites enrolled in the Voluntary Investigation and Cleanup (VIC) program. This information is available online through the MPCA's What's in My Neighborhood program. Sites identified in this database are presented in Figure 1-14.

The presence of potentially contaminated or hazardous waste sites should be considered as sites are redeveloped and BMPs are implemented. The presence of soil contamination at many of these sites, if not removed, may limit or prevent infiltration as a stormwater management option.

More information about potential pollutant sources is available from the MPCA website: http://www.pca.state.mn.us/index.php/data/wimn-whats-in-my-neighborhood/whats-in-my-neighborhood.html

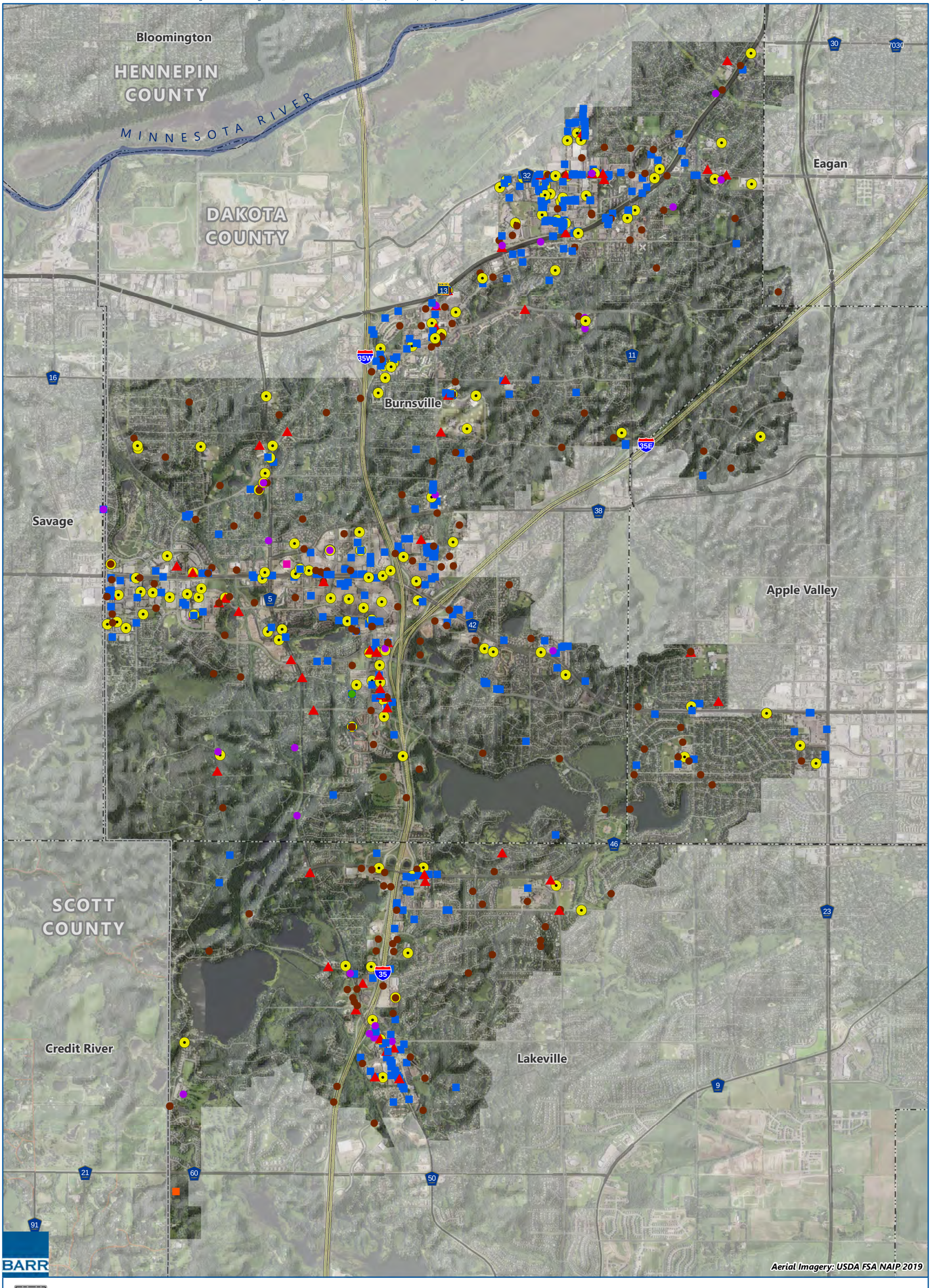
There are approximate 350 properties within the BDWMO that are still served by SSTS. Failing, non-functioning, or substandard SSTS may be a non-point source of pollutants. Improperly sited, installed or maintained systems may achieve inadequate treatment of sewage. Untreated or inadequately treated sewage poses a risk to public health (e.g., contamination of wells) and can leach excess nutrients, contributing to eutrophication if discharged into water bodies. The MPCA implements an SSTS regulatory program to manage the environmental and public health impacts of SSTS.

In addition to point sources of pollution, stormwater runoff can be a significant source of some pollutants (see Table 1-9). Each city within the BDWMO maintains a stormwater pollution prevention program (SWPPP) which outlines programs and practices to minimize pollutant loading and water quality impacts resulting from stormwater management (see Section 1.7.5).

Table 1-9 Pollutants Commonly Found in Stormwater

Stormwater Pollutant	Examples of Sources	Related Impacts
Nutrients: Nitrogen, Phosphorus	Decomposing grass clippings, leaves and other organics, animal waste, fertilizers, failing septic systems, atmospheric deposition	Algal growth, reduced clarity, other problems associated with eutrophication (oxygen deficit, release of nutrients and metals from sediments)
Sediments: Suspended and Deposited	Construction sites, other disturbed and/or non-vegetated lands, eroding streambanks and shorelines, road sanding	Increased turbidity, reduced clarity, lower dissolved oxygen, deposition of sediments, smothering of aquatic habitat including spawning sites, and benthic toxicity
Organic Materials	Leaves, grass clippings	Algal growth, reduced clarity, other problems associated with eutrophication (oxygen deficit, release of nutrients and metals from sediments)
Pathogens: Bacteria, Viruses	Domestic and wild animal waste, failing septic systems	Human health risks via drinking water supplies, contaminated swimming beaches
Hydrocarbons: Oil and Grease, PAHs (Naphthalenes, Pyrenes)	Tar-based pavement sealant, industrial processes, automobile wear, emissions and fluid leaks, waste oil.	Toxicity of water column and sediment, bioaccumulation in aquatic species and throughout food chain
Metals: Lead, Copper, Cadmium, Zinc, Mercury, Chromium, Aluminum, others	Industrial processes, normal wear of auto brake linings and tires, automobile emissions & fluid leaks, metal roofs	Toxicity of water column and sediment, bioaccumulation in aquatic species and through the food chain, fish kill
Pesticides: PCBs, Synthetic Chemicals	Pesticides (herbicides, insecticides, fungicides, rodenticides, etc.), industrial processes	Toxicity of water column and sediment, bioaccumulation in aquatic species and through the food chain, fish kill
Chlorides	Road salting and uncovered salt storage	Toxicity of water column and sediment
Polycyclic Aromatic Hydrocarbons (PAH's)	Tar based pavement sealant	Carcinogenic to humans
Trash and Debris	Litter washed through storm drain networks	Degradation of the beauty of surface waters, threat to wildlife

Based on *Minnesota Urban Small Sites BMP Manual* (Barr Engineering Co, 2001).



County Boundary
Municipal Boundary
River

Potential Pollution Sources

- Multiple Programs
- Air Quality
- Feedlots
- Hazardous Waste
- Investigation and Cleanup
- Solid Waste
- Stormwater
- Tanks
- Water Quality

N

0 1,750 3,500
Feet

POTENTIAL POLLUTANT SOURCES
BDWMO Watershed Management Plan

FIGURE A-15

Data Source: What's In My Neighborhood Sites, Minnesota Pollution Control Agency, 2021.