

# **Wirth Lake**

## **Final TMDL Implementation Plan**

**Prepared for  
Minnesota Pollution Control Agency**

***September 2010***



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# Wirth Lake TMDL Implementation Plan

## Table of Contents

1.0	Introduction.....	1
1.1	Purpose.....	1
1.2	Geographical Extent.....	1
1.3	Water Quality Goals .....	2
1.4	Source Identification.....	2
1.5	Required Load Reductions.....	4
1.6	Implementation Strategies .....	5
1.7	Specific Projects/Practices .....	6
1.8	Responsible Parties .....	8
1.9	Tracking and Effectiveness Monitoring.....	9
1.10	Adaptive Management .....	10

## List of Tables

Table 1	Existing Wirth Lake Phosphorus Budget .....	3
Table 2	Wirth Lake Total Phosphorus Budgets and Wasteload and Load Allocations .....	5
Table 3	Wirth Lake TMDL Implementation Strategies .....	7

## List of Acronyms

BCWMC = Bassett Creek Watershed Management Commission

BMPs = Best Management Practices

MPRB = Minneapolis Park and Recreation Board

Mn/DOT = Minnesota Department of Transportation

MPCA = Minnesota Pollution Control Agency

MS4 = Municipal Separate Storm Sewer System

NPDES = National Pollutant Discharge Elimination System

NCHF = North Central Hardwood Forest

SWPPP = Stormwater Pollution Prevention Plan

TMDL = Total Maximum Daily Load

# 1.0 Introduction

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## 1.1 Purpose

This document presents the Implementation Plan for the Wirth Lake Total Maximum Daily Load (TMDL). Wirth Lake is listed on the 2008 Minnesota Section 303(d) List of Impaired Waters due to impairment of aquatic recreation by excess nutrients (phosphorus) and a TMDL has been developed (MPCA, 2010).

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) requires states to develop TMDLs for water bodies that are not meeting designated uses under technology-based controls. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and instream conditions. By following the TMDL process, states can establish water quality-based controls to reduce pollution from both point and non-point sources and restore and maintain the quality of their water resources.

Once a TMDL is established, an Implementation Plan must be developed. The Implementation Plan is designed to ensure that the management actions identified by the TMDL will be carried out. The Implementation Plan provides information on management measures and regulatory controls; timelines for implementation of management measures and attainment of water quality standards; a monitoring plan designed to determine the effectiveness of implementation actions; and description of adaptive management procedures should water quality standards not be met.

## 1.2 Geographical Extent

Wirth Lake (Lake Assessment Unit ID: 27-0037-00) is located in the City of Golden Valley, Hennepin County, Minnesota. The Wirth Lake watershed drains land from two different municipalities, Golden Valley and Minneapolis and from two transportation agencies (Hennepin County and Mn/DOT) that are served by MS4s. The outlet of Wirth Lake is tributary to Bassett Creek.

Wirth Lake is approximately 38 surface acres in size, with a maximum depth of 26 feet. Wirth Lake has a 347-acre watershed consisting of low density residential, State Highway right of way and park

land uses. Stormwater from approximately 77 percent of the Wirth Lake watershed currently drains through some form of wet detention before it enters the lake.

### **1.3 Water Quality Goals**

Water quality standards for Wirth Lake are specified in Minnesota Rule 7050.0222 Subp. 4 for Lakes and Reservoirs in the NCHF region. These include:

- Phosphorus, total: 40 µg/L
- Chlorophyll *a*: 14 µg/L
- Secchi disc transparency: not less than 1.4 m

The primary numerical water quality target for the Wirth Lake is the average growing season total phosphorus concentration of 40 µg/L. The TMDL has been developed to meet the 40 µg/L target. The growing season average for the period (1999 to 2008) is 41 µg/L.

The secondary numerical water quality target for this TMDL is the average growing season Secchi depth criterion of 1.4 m. Water quality data for the period 1999 to 2008 indicate that the Secchi disc was 2.0 meters, so this criterion is generally being met currently. Compliance with the total phosphorus target and the Secchi depth target would constitute compliance with the applicable water quality standards and attainment of the beneficial uses.

While attainment of the chlorophyll *a* levels in Wirth Lake is not a numerical target for this TMDL, attainment of the total phosphorus target is expected to result in lower chlorophyll *a* levels in Wirth Lake. Continued monitoring will track progress towards all three parameters.

### **1.4 Source Identification**

All known sources of phosphorus to Wirth Lake were considered in the development of the TMDL and Implementation Plan. These sources include:

- Stormwater runoff from MS4s
- Permitted point sources other than MS4s
- Backflow from Bassett Creek during flood periods

- Atmospheric deposition
- Internal loading

Stormwater from approximately 77 percent of the Wirth Lake watershed currently drains through some form of wet detention before it enters Wirth Lake. A significant untreated source of phosphorus to Wirth Lake occurs when flood flows in Bassett Creek overflow to Wirth Lake. Other sources include runoff from highway right of way and sediment release of phosphorus.

There are no permitted discharges directly to Wirth Lake other than MS4s.

Atmospheric deposition is a significant contributor of phosphorus to Wirth Lake and was accounted for in the TMDL. However, the Implementation Plan does not call for any reductions in this load because of the limited ability to control the source.

**Table 1 Existing Wirth Lake Phosphorus Budget**

Source	Total Phosphorus Load, 2005-06 Water Year (lbs)
Direct Tributary Watershed (MS4s include Mn/DOT, Hennepin County, and the Cities of Golden Valley and Minneapolis [see Figure 6])	66
Bassett Creek Backflow (upstream MS4s include Mn/DOT, Hennepin County, and the Cities of Plymouth, Medina, Minnetonka, Medicine Lake, New Hope, Crystal, Robbinsdale, St. Louis Park, Golden Valley and Minneapolis [shown in Figure 6])	55
Atmospheric Deposition	6
Internal Load	20
Total Load	147

## 1.5 Required Load Reductions

For purposes of implementation, the TMDL equation is described as four different components: Wasteload Allocation (WLA); Load Allocation (LA); Margin of Safety (MOS); and Reserve Capacity (RC). The WLA represents phosphorus loading from point sources such as permitted stormwater discharge from the various MS4s. The LA represents phosphorus from nonpoint sources such as atmospheric deposition and internal loading. A portion of the TMDL is allocated to the MOS to account for uncertainty associated with modeling estimates and environmental variation. The RC represents the portion of the load that is set aside to account for future development.

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS} + \text{Reserve Capacity}$$

Where:

WLA	=	Wasteload Allocation to Point Sources
LA	=	Load Allocation to NonPoint Sources
MOS	=	Margin of Safety
Reserve Capacity	=	Load set aside for future allocations from growth or changes

**Table 2 Wirth Lake Total Phosphorus Budgets and Wasteload and Load Allocations**

<b>Watershed TP Sources</b>	<b>Existing Annual TP Load (lbs/yr)</b>	<b>Annual TMDL Wasteload Allocation</b>	<b>Daily TMDL Wasteload Allocation</b>	<b>Percent Reduction of Existing TP Load (Percent)</b>
		<b>(WLA) (lbs/yr)</b>	<b>(WLA) (lbs/day)</b>	
Direct Tributary Watershed Mn/DOT MS4 (#MS400170)	28	28	0.077	0
Direct Tributary Watershed Categorical MS4s (Hennepin County, Golden Valley and Minneapolis)	38	38	0.104	0
Bassett Creek Backflow MS4s (shown in Figure 6 & Table 4)	55	0	0	100
<b>Total Load Sources</b>	<b>121</b>	<b>66</b>	<b>0.181</b>	<b>45</b>
<b>Internal and Atmospheric Sources</b>	<b>Existing Annual TP Load (lbs/yr)</b>	<b>Annual TMDL Load Allocation</b>	<b>Daily TMDL Load Allocation</b>	<b>Percent Reduction of Existing TP Load (Percent)</b>
		<b>(LA) (lbs/yr)</b>	<b>(LA) (lbs/day)</b>	
Internal Sources	20	20	0.055	0
Atmospheric Sources	6	6	0.016	0
<b>Total Load Sources</b>	<b>26</b>	<b>26</b>	<b>0.071</b>	<b>0</b>
Margin of Safety (MOS)	NA	7	0.019	NA
<b>Overall Source Total</b>	<b>147</b>	<b>99</b>	<b>0.271</b>	<b>33</b>

## 1.6 Implementation Strategies

To begin with, TMDL implementation will focus on continuing nonstructural practices in the watershed; maintain existing structural BMPs and eliminating Bassett Creek backflow as a source of



phosphorus to Wirth Lake. To meet the standards under the NCHF ecoregion, the overall phosphorus load to Wirth Lake will need to be reduced by 48 pounds per year (33%) in order to achieve the TMDL allocation of 99 pounds per year. It should be noted that eliminating Bassett Creek backflow alone will achieve the required reductions.

Load reductions for construction stormwater activities are not specifically targeted in this TMDL. It should be noted that construction stormwater activities are considered in compliance with provisions of the TMDL if they obtain a Construction General Permit under the NPDES program and properly select, install and maintain all BMPs required under the permit, including any applicable additional BMPs required in of the Construction General Permit for discharges to impaired waters, or meet local construction stormwater requirements if they are more restrictive than requirements of the State General Permit.

## **1.7 Specific Projects/Practices**

Phosphorus load reduction project(s) will be implemented in a stepwise manner, with implementation of structural backflow prevention as the main objective to go along with nonstructural practices that are either ongoing or have already occurred prior to this report. It is anticipated that it will take up to 5 years to implement the project involving structural modifications to the Wirth Lake outlet, which will be required to achieve the annual load reductions prescribed in the allocations. The modifications would include replacing the existing bulkhead in the outlet structure with a fabricated steel lift gate. The lift gate would be operated with an electric motor and controls that would operate based on water levels in the creek. The gate would close during periods when water levels in the creek would result in backflows to Wirth Lake. The estimated cost of steel lift gate is \$80,000 and the cost of the controls is estimated to be \$70,000. The total estimated capital construction cost to modify the Wirth Lake outlet and install the gate and controls is \$200,000.

Maintenance of existing structural practices in the watershed has been ongoing and will continue to be documented in the MS4 SWPPPs. Implementation and maintenance of structural and nonstructural practices in the watershed will be performed to maintain existing loads.

Completed and future implementation practices designed to further reduce phosphorus loading in Wirth Lake are detailed in Table 3. These elements are based on the BCWMCs watershed planning efforts and may be modified and/or further evaluated as needed.

**Table 3 Wirth Lake TMDL Implementation Strategies**

Management Practice	Timeline/ Frequency
<b>The top priority practice required to ensure compliance with the TMDL is construction of a lake outlet structure to prevent backflow from Bassett Creek and minimize additional phosphorus loading to Wirth Lake.</b>	<b>Implement within 5 years of TMDL approval</b>
Best Management Practices (BMPs) that achieve a level of removal of phosphorus and suspended solids that would be equal or greater than the level of removal that would be achieved by a permanent pool that provides for storage of 2.5 inches of runoff volume from the entire development site is required for all new development and redevelopment. This requirement, and the requirement that the quality of stormwater runoff cannot be degraded, has been in effect for all new development and redevelopment in the watershed since 1994.	Apply to new development and redevelopment projects
Consider a policy that would require that all new development and redevelopment infiltrate the first one inch of rainfall from all impervious, surfaces where feasible. Opportunities to implement extended detention basins, infiltration basins, biofiltration basins, grit chambers, and other BMPs will continue to be identified as part of new development, redevelopment, and maintenance projects where they will provide a water quality benefit to the Lake.	Apply to new development and redevelopment projects
As new BMPs and water quality improvement technologies are developed they will be evaluated to determine if they can provide a water quality benefit to the Lake and they will be implemented if determined to be reasonable and practicable.	As needed/ identified
The existing program to promote the development of shoreline buffers will be continued.	Ongoing
Existing BMPs will be monitored and maintained to insure that they continue to provide the water quality benefits that they were intended to provide.	Ongoing
The city street sweeping program will continue and as new technology and new techniques are developed they will be evaluated to determine if they would provide a water quality benefit to the Lake and implemented if found to be reasonable and practicable.	Ongoing

Management Practice	Timeline/ Frequency
The Bassett Creek Watershed Management Commission will work with County and State agencies to initiate a highway load reduction program which will consist of the construction of permanent BMPs and highway sweeping. Mn/DOT currently sweeps curbed highways once per year in the spring.	Ongoing as highway drainage system improvement project(s) are completed
The water quality education program will continue to work with watershed residents to increase their understanding of practices that would reduce the amount of pollutants entering the Lake.	Ongoing

## 1.8 Responsible Parties

The BCWMC will initially take the lead role in implementing the Wirth Lake Outlet project to achieve the WLA defined in this TMDL. However, other entities are expected to continue to fulfill their existing responsibilities in stormwater management to help meet the goals of this TMDL. Particularly, because these are “waters of the state”, the project partners and other local units of government will pursue state and federal assistance, wherever possible.

Specifically, work in the Wirth Lake watershed will:

- Continue to implement volume and runoff rate reduction BMPs on all development and redevelopment projects to comply with BCWMC standards.
- Look for opportunities to implement projects through the Capital Improvements Programs to reduce runoff and nutrient export wherever possible, taking advantage of (cost-share or land acquisition) programs for water quality improvements.
- Continue to implement SWPPPs and to improve public works maintenance practices wherever possible.

## 1.9 Tracking and Effectiveness Monitoring

As BMPs are implemented, phosphorus reductions will be estimated and tracked. To track WLA achievement, the MS4s will be responsible for tracking and evaluating the implementation of BMPs and submitting this to MPCA via permit requirements. When implementation activities necessary to meet the target reductions have been implemented, the WLA will be considered achieved.

The water quality in Wirth Lake has been monitored for over 30 years, and will continue to be monitored for the foreseeable future. The MPRB will continue to monitor the water quality on an annual basis. The typical lake sampling protocol is to visit the lakes 8 to 10 times between April and September. The following water quality parameters are measured at each visit. All parameters except Secchi disc and chlorophyll *a* are measured at various depths in the water column (every 1 to 2 meters.)

- Secchi disc
- Dissolved Oxygen
- Temperature
- Total Phosphorus
- Chlorophyll *a*

Though not a requirement of what is called for in the TMDL monitoring plan, it is recommended that stakeholders monitor the long-term effectiveness of the water quality improvement project(s) proposed for Wirth Lake and its watershed. The primary TMDL monitoring activity will be evaluating the backflow prevention structure to ensure that it is functioning properly and minimizing phosphorus loading. Documentation of installed BMPs and testing of removal efficiencies of representative phosphorus reduction BMPs should be conducted, where possible.

Comprehensive phytoplankton, zooplankton, macrophyte and fisheries surveys should be considered for the lake during at least one of the years that surface water quality monitoring is being accomplished. As part of this survey, carp populations would be enumerated by size class using a catch-tag-release-recapture method or similar approach for producing reliable estimates of fish populations.

The comparison between future monitoring data and the modeling results in this study can be conducted as follows:

1. Using monitoring results (flow and water quality sampling data), calculate the annual load (or the load over some other time period) of phosphorus leaving the basins.
2. Run the in-lake models for same time period and calculate the load that the model predicts for pre-project conditions.
3. Compare the two loads, and calculate the percent reduction that was achieved over the time period of interest.

## **1.10 Adaptive Management**

Management measures to meet the Wirth Lake TMDL are focused on installing a structural backflow prevention on Bassett Creek. Other implementation projects will likely include numerous projects of varying size and will be distributed throughout the watershed. Predictions of load reductions from individual projects are limited in terms of their accuracy and precision. Therefore, monitoring, as discussed in Section 1.9, will be required to assess progress towards meeting the necessary load reductions and water quality goals. Also, an adaptive management decision-making process will provide a means of continually tracking progress and informing subsequent implementation projects.

It is important that all activities or projects in the watershed that reduce phosphorus loads to Wirth Lake be documented and tracked.