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Upper Minnehaha Creek Watershed Nutrient and Bacteria TMDL Restoration Strategy Report

Prepared for:

MINNESOTA POLLUTION CONTROL AGENCY

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CLEAN WATER LAND & LEGACY AMENDMENT

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1.0 Introduction

1.1 Purpose

The purpose of this restoration strategy report is to outline the framework for implementation and identify potential activities to achieve the phosphorus and bacteria load reductions outlined in the *Upper Minnehaha Creek Watershed Nutrient and Bacteria TMDL Study* (TMDL). The complete TMDL study addresses nutrient impairments in twenty lakes in the Minnehaha Creek watershed, and an *E. coli* impairment in Painter Creek. The TMDL study quantified the load reductions required to meet state standards.

1.2 TMDL Summary

The water bodies addressed in the TMDL and this restoration strategy report are located within a distinct hydrologic basin within the Minnehaha Creek Watershed District (MCWD) referred to as the "Upper Watershed," which drains through agricultural land and suburbs west of Minneapolis to Lake Minnetonka, which outlets into Minnehaha Creek. Fifteen of the addressed lakes are defined as deep lakes for which the North Central Hardwood Forest ecoregion numeric water quality standards are a summer average total phosphorus concentration of 40 µg/L, 14 µg/L chlorophyll-*a*, and greater than 1.4 meter in Secchi depth. The other six lakes are shallow, for which the numeric water quality standards are a summer average total phosphorus concentration of 60 µg/L, 20 µg/L chlorophyll-*a*, and greater than one meter in Secchi depth.

Nutrient budgets and lake response models were developed for all twenty lakes to set the TMDL and Load and Wasteload Allocations. Wasteload reductions ranging from no reduction to a 96 percent reduction and load reductions ranging from no reduction to 76 percent reduction will be necessary to meet water quality standards.

Flow and bacteria monitoring data recorded in Painter Creek were used to establish a load duration curve meeting the *E. coli* numeric standard of no more than 126 organisms per 100 mL as a geometric mean of not less than five samples representative of conditions within any calendar month, nor more than 10% of all samples taken during any calendar month individually exceed 1,260 organisms per 100 mL. A TMDL, Wasteload Allocations, and Load Allocations were established for five flow categories: high flow, wet, mid-range, dry, and low flow. No reductions are necessary for high flow, wet, and mid-range flows. A 31 percent reduction will be necessary during dry conditions and a 37 percent reduction under low flow conditions to meet *E. coli* concentration standards.

To avoid repetition between the TMDL report and this restoration strategy document, the final TMDL report is incorporated by reference (Wenck 2014), and should be read in conjunction with this document to guide in the selection and implementation of appropriate best management practices (BMPs) to achieve State water quality standards in the impaired waterbodies.

2.0 Restoration Strategy Framework

The framework for restoration will guide all of the responsible parties in selecting appropriate activities for achieving the TMDL. In addition, the framework is meant to foster opportunities for partnerships among the stakeholders to address the TMDL and achieve the required load reductions. The focus will be on reducing the growing season phosphorus loads to the lakes and the bacteria load to Painter Creek. Sequencing of restoration activities, estimated load reductions, and the scale of implementation required are addressed in this section. Implementation will be a collaborative effort between state and local government and individuals, with the overall effort led by the Minnehaha Creek Watershed District (MCWD). Existing regulatory framework and relationships will be leveraged to generate support for implementation efforts and to maximize efficiency and cost savings.

2.1 Implementation Approach

This strategy document is meant to be a living document and provide the general strategies for restoration. While specific BMPs are presented, implementation will be conducted using adaptive management principles. Adaptive management is an iterative approach of implementation, evaluation, and course correction (see Figure 2.1). Adaptive management is appropriate because it is difficult to predict the lake and stream responses to load reductions. Future conditions and technological advances may alter the specific course of actions detailed in this document. Continued lake and stream water quality monitoring and course corrections responding to monitoring results offer the best opportunity for meeting the water quality goals established in the TMDL.

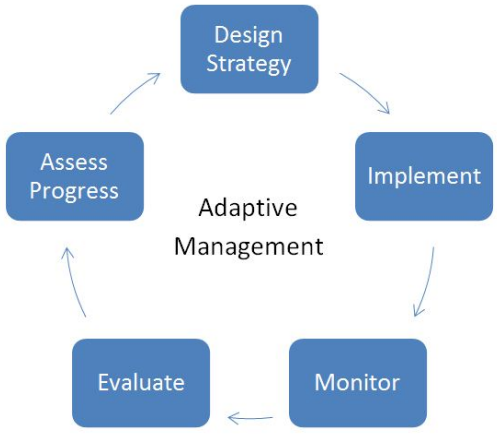

Figure 2-1. Adaptive Management

3.0 Pollutant Source Assessment & Management

To develop the appropriate strategies for restoring or protecting waterbodies, the stressors and/or sources impacting or threatening them must be identified and evaluated. The TMDL identifies potential sources contributing to the impaired water quality within the waterbodies assessed in the study. Both permitted and non-permitted sources are present within the watershed. There are also a number of factors that can influence the nutrient levels in a lake. A pollutant source summary is included in Section 3.6 of the TMDL. Pollutant sources must be managed to achieve in-lake water quality goals.

3.1 Permitted Source Management Practices

The restoration strategies presented in this document include BMPs to reduce watershed load from MS4 areas and regulated MS4 conveyance systems. The two major complimentary frameworks for achieving these load reductions are between the MPCA and regulated MS4s through the MPCA's NPDES Stormwater Program and between the MCWD and the LGUs within the TMDL study area through MCWD's Water Resources Management Plan and the LGU local water management plans. These programs are discussed in detail in Section 5.0 of the TMDL Study document. Sequencing of implementation activities within each lakeshed will be influenced by available funds and partnerships/cooperation amongst MS4s, LGUs, the MCWD, and other agencies.

For the purposes of the Upper Watershed TMDL, the baseline year for calculating cumulative load reductions will be the mid-range year of the data years used for the lake response modeling and development of the bacteria load duration curve. Any wasteload-reducing BMP implemented since the baseline year will be eligible to "count" toward an MS4's load reductions. If a BMP was implemented during or just prior to the baseline year, the MPCA is open to presentation of evidence by the MS4 permit holder that it should be considered as a credit.

The MCWD has approved a policy for distribution of pollutant reduction credit from district projects for the purpose of TMDL reporting. The policy distributes pollutant reductions achieved through District projects between MS4s based on financial contribution, project location, and other factors. The full MCWD policy is included as Appendix A.

3.1.1 Construction and Industrial Stormwater

BMPs for construction and industrial site stormwater are not specifically addressed in this document. Construction stormwater BMPs and control measures that should be implemented are defined in the State's NPDES/SDS General Stormwater Permit for Construction Activity (MNR100001). BMPs and other stormwater control measures that should be implemented at industrial sites are defined in the State's NPDES/SDS Industrial Stormwater Multi-Sector General Permit (MNR050000) or NPDES/SDS General Permit for Construction Sand & Gravel, Rock Quarrying and Hot Mix Asphalt Production facilities (MNG490000). It is expected that compliance with the permit requirements for construction and industrial stormwater will result in discharges consistent with the TMDL wasteload allocation.

3.2 Nonpoint Source Management Practices

Proposed restoration strategies also include BMPs to reduce watershed load from non-MS4 areas (i.e. agricultural land use areas, wetlands, etc.) and lake internal loading. For the nutrient TMDLs, implementation activities should be sequenced so that watershed loading is largely addressed prior to implementing in-lake reduction strategies like alum dosing and hypolimnetic withdrawal. However, internal loading from biological sources such as vegetation and/or rough fish (i.e. carp) should be evaluated and addressed concurrent with addressing the watershed load.

4.0 Restoration Strategies

Numerous governing units have water quality responsibilities in the watershed, including all MS4 permit holders and the MCWD. These agencies are focused on protecting water quality through implementation of their watershed and local plans as well as MS4 Stormwater Pollution Prevention Programs (SWPPPs). These plans and permits will continue to detail the activities to be undertaken by each governing unit including best management practices and capital improvements. This implementation strategy document will guide the governing units in the implementation of BMPs focused on achieving the TMDLs.

The restoration strategies presented in this document are expected to be further refined and applied by local working groups to target conservation practices, and spatially targeted using any number of tools available. Eventually, the refined restoration strategies will be reflected in local water plans, comprehensive watershed plans, and applications for federal and state clean water funds.

The restoration strategies are presented in tabular format. The tables were developed based on guidance from the MPCA and are grouped based on Minor Subwatersheds within the Upper Minnehaha Creek Watershed (HUC-10 ID 070102060). There are also two general key tables called Key Table-All Lakes and Key Table-Painter Creek.

Each overview table provides an overview of the TMDL and the general strategies that would be beneficial in reducing loads and improving water quality. Some of these strategies apply to all the lakes in a chain, while some are specific to a particular lake. This table also shows generally which stakeholders would be implementing or supporting those strategies. The specific BMPs tables provide specific actions, which may be projects, programs, ordinances, etc. The key tables provide more detailed narrative about the general strategies. For the nutrient impaired lakes, the identified strategies target both particulate and soluble phosphorus. There is very little soluble phosphorus water quality data available within the Upper Minnehaha Creek Watershed. Table 4-1 provides the average in-lake soluble phosphorus concentrations for lakes where data was available.

Please note that loading reduced from some implementation actions listed in the tables is creditable to the load allocation and some to the wasteload allocation. The strategy tables do not specify the applicable allocation categories.

Table 4-1: Soluble Phosphorus Concentrations

Lake	In Lake Soluble Phosphorus Percentage (of Total Phosphorus)
Dutch	23%
E. Auburn	--
Forest	11%
Gleason	13%
Holy Name	--
Langdon	8%
Long	13%
Halsted's Bay	7%
Jenning's Bay	7%
Stubb's Bay	10%
West Arm	6%
Mooney	--
Stone	--
Tamarack	--
Tanager	8%
Wolsfeld	--
Snyder	--
School	--
Hadley	--
Turbid	--
-- water quality data not available	

4.1 Stakeholder Involvement

A stakeholder participation process was undertaken for the TMDL to obtain input from, review results with, and take comments from the public and interested and affected agencies regarding the development of the TMDL. Section 8 of the TMDL discusses the stakeholder process in detail. As part of this process, the draft implementation strategy tables were presented to stakeholders at an August 17, 2013 stakeholder meeting with general strategies for reducing nutrient and bacterial loading identified. The draft tables were subsequently distributed to stakeholders on September 13, 2013 and the stakeholders were given the opportunity to provide more specificity to the tables by providing information on local projects and actions, both planned projects and load-reducing actions undertaken since the baseline year. The information collected from stakeholders, projects identified in MCWD's Capital Improvements Plan, as well as other identified BMPs are presented in the tables as restoration strategies.

4.2 Implementation Scope, Schedule, and Cost

The strategy tables identify estimates of the following for each potential BMP: scope of implementation required, potential load reduction, and cost. Costs to implement water quality practices are difficult to

quantify without exact designs. Exact costs per waterbody project will be determined through additional feasibility studies and design. However, reasonable estimates for the potential restoration strategies are provided as well as recommended timeframes for implementation, considering sequencing, and interim milestone targets.

As discussed in Section 5 of the TMDL, reduction targets were assigned to LGUs through MCWD's Comprehensive Water Resources Management Plan of 2007. These targets were generally less stringent than those identified in the TMDL and therefore are also recommended as interim goals for achieving State water quality standards.

4.3 Restoration Strategy Tables

There are a number of strategies that are common to many of the impaired waters. Such BMPs are described in the strategy key table for the impaired lakes; refer to the individual lake strategy tables for the locations where these BMPs are recommended. The strategy key table for Painter Creek also provides an overview of the BMPs recommended for achieving the bacteria TMDL. The subwatershed implementation strategy table includes specific details. All of the restoration strategy tables as described in this document are included in Appendix B.

5.0 Monitoring Plan

Section 6.0 of the Upper Minnehaha Creek Watershed Nutrient and Bacteria TMDL Study (TMDL Study) discusses MCWD's existing monitoring program and the TMDL monitoring plan. It is recommended that such monitoring activities continue in an effort to measure progress toward meeting the TMDL goals and to track the effectiveness of implemented BMPs. The restoration strategies proposed in this document also include recommendations for implementation of additional monitoring efforts within the Upper Watershed to further inform BMP selection. For example, there are waterbodies within the Upper Watershed where limited water quality data, if any, is available.

6.0 Literature Cited

Minnesota Department of Agriculture (MDA). 2012. The Agricultural BMP Handbook for Minnesota. September 2012.

Wenck Associates, Inc. 2007. Minnehaha Creek Watershed District Comprehensive Water Resources Management Plan. Wenck File 0185-4315

Wenck Associates, Inc. 2014. Upper Minnehaha Creek Watershed Nutrient and Bacteria TMDL Study. Wenck File 0147-243

Appendix A

MCWD Board Policy:
Distribution of Pollution Reduction Credit from District Projects for the Purpose of TMDL Reporting

Minnehaha Creek Watershed District
Board Policy

Distribution of Pollutant Reduction Credit from District Projects for the Purpose of TMDL Reporting

Policy

It is the policy of the Minnehaha Creek Watershed District (MCWD or District) that credit for pollutant reductions achieved through District projects be distributed, as specified below, among its member communities for the purpose of MS4 permit compliance associated with TMDLs.

Applicability

- This policy applies to the distribution of pollutant reduction credit for the purpose of MS4 permit compliance associated with TMDL requirements. It does not apply to or affect a municipality's phosphorus load reduction obligations assigned through the District's 2007 Comprehensive Water Resources Management Plan.
- It applies to pollutant reductions achieved through the District's capital improvement projects as well as cost-share projects to the extent that they are funded by the District. To the extent the District is able to quantify load reduction and the proper allocation of reduction credits for particular past projects, this includes such projects back to the baseline year identified in each TMDL. It does not apply to reductions achieved through the requirements of the District's regulatory program.
- It applies to phosphorus, *E. coli*, and any other pollutants identified through a TMDL study for which the District is able to quantify a load reduction achieved through its projects.

Distribution of Credit

Credit for pollutant reductions achieved through District projects will be distributed in the following order:

- First, to the extent that a project addresses non-regulated load sources (i.e. internal load, streambank erosion, or others defined in the TMDL), the reductions will be applied toward the reduction targets specified for those sources.
- Second, consistent with past practice, if an MS4 has partnered with the District and contributed funding towards a project, it will receive credit proportional to its percent financial contribution or as otherwise defined in the project cooperative agreement between the District and MS4(s). Eligible costs will be defined in the agreement but will generally include: design, construction, maintenance, and land purchases or value of land provided by the MS4. This policy will not supersede any allocation of credit made through project agreements already in place.
- Third, in areas where the District has a load reduction assigned to it through a TMDL (i.e., where there is a storm water conveyance that is owned or operated by the District), the credit will go toward achieving that reduction.

- Finally, the remaining credit will be distributed among all MS4 member communities within the drainage area of the impaired water using the same percentages that were used to partition the wasteload allocations for that particular TMDL. If an MS4 has already met its reduction needs for the TMDL, its portion of the credit will be distributed among the remaining MS4 communities.

Tracking and Reporting

- The reductions achieved through District projects will be determined by the District as part of project development, and the method of calculation will be documented.
- Beginning in 2014, the District will track and report annually, by May 30th, to the MS4s and MPCA a summary of the reductions achieved in the previous calendar year and the breakdown of credit by MS4.

Internal Policy*: This policy is adopted by the District Board of Managers to guide District practice and creates no right or expectation in any third party including any party explicitly intended to be benefited by the terms of the policy. The Board of Managers may deviate from this policy when in its judgment deviation is warranted, and may amend this policy from time to time. This disclaimer does not supersede or affect any commitment regarding the allocation of pollutant load reduction credits that the District has made in a project cooperative agreement or other legally binding form.*

Appendix B

Restoration Strategy Tables

Strategy Key Table
All Lakes

Strategy	Description
Evaluate pond efficiency and feasibility of iron enhanced filter benches.	As opportunities arise, retrofit stormwater treatment through a variety of BMPS. Pond expansion and pre-treatment of water before it reaches the ponds may be beneficial dependent on drainage area. Also, identify target areas for new stormwater pond installation. Address the dissolved phosphorus component through the installation of iron enhanced filter benches.
Explore opportunities to increase infiltration.	Encourage the use of rain gardens and similar features as a means of increasing infiltration and evapotranspiration. Opportunities may range from a single property owner to parks and open spaces.
Educate homeowners regarding urban stormwater BMPs.	Provide education and outreach on low-impact lawn care practices, and other topics to increase awareness of sources of pollutants.
Evaluate street sweeping program.	Identify target areas for increased frequency of street sweeping and consider upgrades to traditional street sweeping equipment.
Achieve goals in upstream lake.	Implement appropriate management activities as necessary to achieve water quality goals in upstream lake(s). For multiple lakes address in the TMDL, water quality goals in upstream lake(s) must be achieved in order to achieve water quality goals in the lake downstream.
Inspect open channels and swales.	Inspect open channels and swales within the watershed for erosion, animal access, and buffer as applicable and implement corrective actions as necessary.
Aquatic vegetation survey and appropriate management activities.	Conduct periodic aquatic plant surveys and prepare and implement vegetation management plans.
Fish survey and evaluate need for management activities.	Consider partnership with the DNR to monitor and manage the fish population. Conduct periodic fish surveys and evaluate options to reduce rough fish populations such as installation of fish barriers to reduce rough fish access and migration.
Evaluate whether additional internal load management is required following biologic evaluation/management activities.	Prior to internal load reduction strategy implementation, a technical review is recommended to evaluate the cost and feasibility of lake management techniques such as hypolimnetic withdrawal, alum treatment, and hypolimnetic aeration to manage internal nutrient sources. If determined feasible based on technical review, pump nutrient-rich water from the hypolimnion to an external location for phosphorus treatment and discharge treated water back into the lake. Or as an alternate option, aerate the hypolimnetic waters to maintain oxic condition (the anoxic condition of the hypolimnetic sediments is the contributor to the internal phosphorus load).
Evaluate wetland system phosphorus loading.	Evaluate inflow/outflow chemistry from the wetland system located in the watershed and address wetland system phosphorus loading based on the evaluation.

Strategy Key Table
All Lakes

Strategy	Description
Shoreline restoration.	Evaluate shoreline conditions and encourage property owners to restore their shoreline with native plants and install/enhance shoreline buffers.
Streambank Stabilization/Buffer Enhancement on tributary streams.	Stabilize with native vegetation to filter runoff and minimize bank erosion.
Lake specific strategy.	Lake specific recommendations are defined in the implementation strategy tables.
Evaluate upstream lake impacts.	Collect upstream lake outlet concentration data and evaluate impacts on the downstream waterbody. Implement management practices upstream as necessary.
Education and cooperation with golf course.	Evaluate role of golf course runoff in phosphorus loading. Educate and cooperate with local golf course owners on appropriate BMP implementation.
Septic System Inspection Program	Although not a significant source of nutrients, Hennepin and Carver Counties should continue to inspect and order upgrades of existing septic systems; prioritizing properties near surface waters.
Pasture Management	Livestock exclusion from public waters, creating alternate livestock watering systems, rotational grazing, and vegetated buffer strips between grazing land and surface water bodies.
Incorporate BMPs during linear transportation projects	Stormwater BMPs should be incorporated during major highway and road construction (or re-construction). Member cities should also incorporate BMPs during local street improvement projects.
Educate property owners regarding agricultural BMPs.	Provide educational and outreach opportunities about proper fertilizer use, manure management, grazing management, and other topics to encourage good individual property management practices.

Strategy Key Table
Painter Creek

Strategy	Description
Additional Study	Collect and analyze additional data within the watershed regarding bacteria sources to inform BMP implementation.
Streambank Stabilization/Buffer Enhancement	Stabilize native vegetation to filter runoff from pastures adjacent to the stream. A recommended goal is at least 50 feet of buffer on 100% of both sides of the stream.
Education	Provide educational and outreach opportunities about proper fertilizer use, manure management, grazing management, and other topics to encourage good individual property management practices.
Pasture Management	Livestock exclusion from public waters, creating alternate livestock watering systems, rotational grazing, and vegetated buffer strips between grazing land and surface water bodies.
Manure Management	Reduction of winter spreading, eliminate spreading near open inlets, apply at agronomic rates, erosion control practices, and manure stockpile runoff controls.
Septic System Inspection Program	Although not a significant source of bacteria, Hennepin County should continue to inspect and order upgrades of existing septic systems; prioritizing properties near surface waters.
Limit Animal Access	Limit animal access to the stream by installing fencing in pastures where access is unimpeded and installing buffer vegetation where existing fencing is directly adjacent to the stream bank.
Pet Waste Management	Review member cities local ordinances and associated enforcement and fines for residents who do not clean up pet waste. Increase enforcement and education about compliance with such an ordinance.

Subwatershed Implementation Strategies
Gleason Lake Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Hennepin County MS4	Minnehaha Creek WD MS4	Minnetonka City MS4	MNDOT Metro District MS4	Plymouth City MS4	Wayzata City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Gleason Lake	All	-	-	-	-	-	-	Evaluate pond efficiency and feasibility of iron enhanced filter benches.	0-10 years	Complete performance evaluation and feasibility study.	25 ponds	$25,000 - $37,500						X	X		X	X	50%	-
										Pre-treatment	5 ponds; 10-25 lbs/yr	$50,000						X	X		X	X		
										Install iron enhanced filter benches.	5 ponds; 12-24 lbs/yr	$50,000						X	X		X	X		
										Expanded Gleason Lake North Pond to increase removal efficiency.	Completed; TBD, estimated to increase removal efficiency by 15-35%	$100,000	X											
								Incorporate BMPs during linear transportation projects	0-10 years	Install sump catch basins.	10 structures throughout watershed; 0-10 lbs/yr	$50,000					X		X	X	X	X	50%	
										Install rain gardens.	10 rain gardens throughout watershed; 5-10 lbs/yr	$30,000 - $60,000					X		X		X	X		
										Install hydrodynamic separators.	2 structures throughout watershed; 0-5 lbs/yr	$30,000					X		X	X	X	X		
								Explore opportunities to increase infiltration.	0-10 years	Complete evaluation.	Watershed wide; NA	$50,000	X				X	X	X		X	X	50%	
										Install infiltration BMPs.	10 BMPs; 0-10 lbs/yr	$100,000 - $200,000	X				X	X	X		X	X		
								Educate homeowners regarding urban stormwater BMPs.	0-5 years	Implement outreach and education.	Watershed wide; unknown	$2,000 - $10,000	X						X		X	X	100%	
								Evaluate street sweeping program.	0-5 years	Complete evaluation.	Watershed wide; NA	$2,500 - $5,000							X		X	X	100%	
										Replace/supplement street sweeping equipment	Watershed wide; unknown	$75,000 - $150,000							X		X	X		
										Increase sweeping activities.	Watershed wide; unknown	$6,000 - $26,000							X		X	X		
	Snyder Lake 27-0108-00	TP	57 11 ____ 69	39 [18] 8 [4] 2 [0] 49 [22]	72	60	2007	Achieve goals in upstream lake (Kreatz Lake).	10-30 years	Evaluate internal load and implement management activities as necessary.	Kreatz Lake; 18 lbs/yr	$10,000 - $50,000	X								X		20% reduction in TP conc in Kreatz (118 ug/L to 94 ug/L)	2045
	Gleason Lake 27-0095-00	TP	531 325 ____ 856	291 [240] 118 [207] 22 [0] 431 [447]	98	60	2008	Achieve goals in upstream lake (Snyder Lake.)	10-30 years	See Above			X				X				X		10% reduction in TP Conc in Snyder(77 ug/L to 70 ug/L)	2045
								Inspect open channels and swales.	0-5 years	Inspect 1.5 miles of open channels/swales.	Watershed wide; NA	$1,000 - $3,000						X			X		100%	
										Establish buffers.	1,000 LF; 0-12 lbs/yr	$30,000						X			X			
								Evaluate wetland system phosphorus loading.	5-10 years	Complete evaluation.	GLC-3, GLC-4, GLC-5; NA	$25,000	X								X		25%	
										Alter wetland outlet structure/hydrology.	GLC-3, GLC-4, GLC-5; 3-15 lbs/yr	$200,000 - $400,000	X								X			
								Aquatic vegetation survey and appropriate management activities.	0-5 years	Complete vegetation survey.	Gleason Lake; NA	$3,000 - $5,000		X							X		100%	
										Prepare vegetation management plan.	Gleason Lake; NA	$3,000 - $5,000		X							X			
										Treat curly leaf pondweed.	Gleason Lake; unknown	$3,000 - $5,000		X							X			
								Fish survey and evaluate need for management activities.	0-5 years	Complete fish survey.	Gleason Lake; NA	$10,000 - $15,000	X	X							X		100%	
										Install fish barriers	Gleason Lake; unknown	$10,000 - $15,000	X	X							X			
								Evaluate whether additional internal load management is required following biologic evaluation/management activities.	10-20 years	Complete Evaluation.	Gleason Lake; NA	$25,000 - $30,000	X	X									5%	
										Alum treatment or other internal load management project.	Gleason Lake; project dependent	$200,000 - $300,000	X	X							X			

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Hennepin County MS4	Medina City MS4	Orono City MS4	Plymouth City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Hadley Lake	All	-	-	-	-	-	-	Aquatic vegetation survey and appropriate management activities.	0-5 years	Complete vegetation survey.	Mooney Lake, Hadley Lake; NA	$3,000 - $5,000 (each lake)	X	X				X	X	X	100%	-
										Prepare vegetation management plan.	Mooney Lake, Hadley Lake; NA	$3,000 - $5,000 (each lake)	X	X				X	X	X		
										Treat curly leaf pondweed.	Mooney Lake, Hadley Lake; Unknown	$3,000 - $5,000 (each lake)	X	X				X	X	X		
								Incorporate BMPs during linear transportation projects	0-10 years	Install sump catch basins	10 structures throughout watershed; 0-5 lbs/yr	$25,000					X	X	X	X	50%	
										Install rain gardens	10 rain gardens; 5-10 lbs/yr	$30,000 - $60,000					X	X	X	X		
										Install hydrodynamic separators	2 structures throughout watershed; 0-5 lbs/yr	$30,000					X	X	X	X		
								Fish survey and evaluate need for management activities.	0-5 years	Complete fish survey.	Mooney Lake, Hadley Lake; NA	$10,000 - $15,000 (each lake)	X	X				X	X	X	100%	
										Install fish barriers	Mooney Lake, Hadley Lake; Unknown	$10,000 - $15,000 (each lake)	X	X				X	X	X		
	Mooney Lake 27-0134-00	TP	144 65 209	121 [23] 7 [58] 7 [0] 134 [81]	78	60	2007	Evaluate street sweeping program.	0-5 years	Complete evaluation.	Watershed wide; NA	$2,500 - $5,000						X	X	X	100%	2030
										Replace/supplement street sweeping equipment	Watershed wide; Unknown	$75,000 - $150,000						X	X	X		
										Increase sweeping activities.	Watershed wide; Unknown	$3,000 - $5,000						X	X	X		
								Inspect open channels and swales.	5-10 years	Complete evaluation.	Watershed wide; NA	$5,000						X	X	X	50%	
								Shoreline restoration.	0-5 years	Evaluate shoreline condition.	Mooney Lake Shoreline; NA	$1,500 - $3,000	X					X	X	X	100%	
										Native plantings and buffer establishment.	1,700 LF of Mooney Lake Shoreline; 0-3 lbs/yr	$25,500	X					X	X	X		
								Evaluate pond efficiency and feasibility of iron enhanced filter benches.	5-10 years	Complete feasibility study.	10 ponds; NA	$10,000 - $15,000							X	X	50%	
										Pre-treatment	2 ponds; 4-10 lbs/yr	$20,000							X	X		
										Construct additional stormwater pond in LLC-21.	1 pond; 3-6 lbs/yr	$50,000 - $100,000						X	X	X		
								Lake specific strategy: For Mooney Lake, evaluate need for maintenance of upstream stormwater ponds.	0-5 years	Complete evaluation.	8 ponds; NA	$10,000 - $15,000								X	100%	
										Excavate accumulated sediment.	10,000 CY; Unknown	$150,000 - $350,000								X		
								Explore opportunities to increase infiltration.	0-5 years	Complete evaluation.	Watershed wide; NA	$50,000	X					X	X	X	100%	
										Install infiltration BMPs.	2 BMPs; 8-16 lbs/yr	$40,000 - $60,000	X					X	X	X		

Subwatershed Implementation Strategies
Hadley Lake Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality				Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility								Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
			Loading		Waterbody Concentration								Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Hennepin County MS4	Medina City MS4	Orono City MS4	Plymouth City MS4		
			Current Loading o Load o Wasteload o Total (lbs/year)	TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Current (µg/L)	Goal (µg/L)																
0701020606 (Upper Minnehaha Creek Watershed) / Hadley Lake	Hadley Lake 27-0109-00	TP	96 61 157	49 [47] 36 [25] 4 [0] 89 [72]	58	40	2007	Evaluate wetland system phosphorus loading.	0-5 years	Complete evaluation.	HL-1; NA	$25,000	X							X	50%	2030
										Alter wetland outlet structure/hydrology.	HL-1; 3-18 lbs/yr	$200,000 - $400,000	X							X		
								Inspect open channels and swales.	0-5 years	Inspect 0.5 miles of open channels/swales.	Watershed wide; NA	$1,000 - $1,500								X	100%	
										Establish buffers.	500 LF; 0-3 lbs/yr	$15,000								X		
								Educate homeowners regarding urban stormwater BMPs.	0-5 years	Implement outreach and education.	Watershed wide; Unknown	$2,000 - $10,000	X							X	100%	
								Lake specific strategy: For Hadley Lake, collect additional lake data, such as bathymetry, to inform internal lake processes and subsequent implementation actions.	5-10 years	Collect additional data.	Hadley Lake; NA	$3,500 - $5,000	X	X						X	50%	
								Evaluate whether additional internal load management is required following biologic evaluation/management activities.	10-15 years	Complete evaluation.	Hadley Lake; NA	$25,000 - $30,000	X	X						X	5%	
										Alum treatment or other internal load management project.	Hadley Lake; Project Dependent	$25,000 - $50,000	X	X						X		

Subwatershed Implementation Strategies
Tanager Lake Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Hennepin County MS4	Medina City MS4	Orono City Ms4	Long Lake City MS4	MNDOT Metro District MS4	Plymouth City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Tanager Lake	All	-	-	-	-	-	-	Incorporate BMPs during linear transportation projects	0-10 years	Install sump catch basins.	11 structures throughout watershed; 0-11 lbs/yr	$55,000					X	X	X	X	X	X	100%	-
										Install rain gardens.	10 rain gardens in urban watershed areas; 5-10 lbs/yr	$30,000 - $60,000						X	X	X		X		
										Install hydrodynamic separators.	2 structures throughout watershed; 0-5 lbs/yr	$30,000					X	X	X	X	X	X		
	School Lake 27-0151-00	TP	202 39 242	58 [144] 8 [32] 3 [0] 69 [176]	158	60	2009	Evaluate upstream lake impacts (Swamp Lake).	5-10 years	Implement water quality monitoring and evaluation program in Swamp Lake.	Swamp Lake; NA	$20,000	X			X							25%	2035
								Education and cooperation with golf course.	0-5 years	Evaluate golf course runoff.	LLC-2; NA	$6,000 - $12,000	X					X					100%	
										Implement outreach and education.	LLC-2; Unknown	$5,000	X					X						
								Fish survey and evaluate need for management activities.	5-10 years	Complete fish survey.	School Lake; NA	$10,000 - $15,000		X				X					50%	
										Install fish barriers	School Lake; Unknown	$10,000 - $15,000	X	X				X						
								Aquatic vegetation survey and appropriate management activities.	5-10 years	Complete vegetation survey.	School Lake; NA	$3,000 - $5,000		X				X					50%	
										Prepare vegetation management plan.	School Lake; NA	$3,000 - $5,000		X				X						
										Treat curly leaf pondweed.	School Lake; Unknown	$3,000 - $5,000	X	X				X						
								Evaluate whether additional internal load management is required following biologic evaluation/ management activities.	10-15 years	Complete evaluation.	School Lake; NA	$25,000	X	X				X					5%	
										Alum treatment or other internal load management project.	School Lake; Project Dependent	$15,000 - $30,000	X	X				X						

Subwatershed Implementation Strategies
Tanager Lake Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Hennepin County MS4	Medina City MS4	Orono City MS4	Long Lake City MS4	MNDOT Metro District MS4	Plymouth City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Tanager Lake	Wolsfeld Lake 27-0157-00	TP	265 96 ____ 361	112 [153] 17 [79] 7 [0] 136 [232]	80	40	2007	Achieve goals in upstream lake (School Lake).	15-20 years	See above.			X					X					10% reduction in in conc. In School (157.7 ug/L to 142
								Evaluate upstream lake impacts (Krieg Lake).	5-10 years	Krieg Lake; NA	MCWD, MPCA	$20,000	X			X							50%
								Septic system inspection program.	5-10 years	Continue septic system inspection program.	Watershed wide; NA	$25,000 - $30,000 (County Wide Program)			X		X						100%
										Repair failing septic systems	1 septic system; 3 lbs/yr	$3,000 - $10,000			X		X						
								Pasture management.	0-5 years	Develop pasture management plans and educate regarding rotational grazing.	Throughout watershed; NA	$5,000 - $25,000	X		X								100%
								Inspect open channels and swales.	0-5 years	Inspect 1 mile of open channels/swales.	Watershed wide; NA	$5,000	X					X					100%
										Establish buffers.	500 LF; 0-5 lbs/yr	$15,000	X					X					
								Lake specific strategy: Evaluate Wolsfeld Woods Scientific Natural Area (SNA) for trail erosion.	0-5 years	Complete evaluation.	3 miles of trail.	$1,500 - $5,000	X	X	X								100%
										Repair erosion.	0.5 miles of trail.	$5,000 - $10,000	X	X	X								
								Fish survey and evaluate need for management activities.	0-5 years	Complete fish survey.	Wolsfeld Lake; NA	$10,000 - $15,000	X	X									100%
										Install fish barriers.	Wolsfeld Lake; Unknown	$10,000 - $15,000	X	X									
								Aquatic vegetation survey and appropriate management activities.	0-5 years	Complete vegetation survey.	Wolsfeld Lake; NA	$3,000 - $5,000	X	X									100%
										Prepare vegetation management plan.	Wolsfeld Lake; NA	$3,000 - $5,000	X	X									
										Treat curly leaf pondweed.	Wolsfeld Lake; Unknown	$3,000 - $5,000	X	X									
	Holy Name Lake 27-0158-00	TP	418 32 ____ 450	99 [319] 1 [31] 5 [0] 106 [350]	150	60	2007	Educate property owners regarding agricultural BMPs.	0-5 years	Implement outreach and education.	Watershed wide; Unknown	$5,000 - $10,000	X		X			X					100%
								Educate homeowners regarding urban stormwater BMPs.	0-5 years	Implement outreach and education.	Watershed wide; Unknown	$2,000 - $10,000	X		X			X				X	100%
								Aquatic vegetation survey and appropriate management activities.	5-10 years	Complete vegetation survey.	Holy Name Lake; NA	$3,000 - $5,000	X	X				X					75%
										Prepare vegetation management plan.	Holy Name Lake; NA	$3,000 - $5,000	X	X				X					
										Treat curly leaf pondweed.	Holy Name Lake; Unknown	$3,000 - $5,000	X	X				X					
								Fish survey and evaluate need for management activities.	5-10 years	Complete fish survey.	Holy Name Lake; NA	$10,000 - $15,000	X	X				X					100%
										Install fish barriers.	Holy Name Lake; Unknown	$10,000 - $15,000	X	X				X					
								Lake specific strategy: Evaluate feasibility of whole lake drawdown to address biologic contributors and internal load management.	10-15 years	Complete Evaluation.	Holy Name Lake; NA	$25,000 - $50,000	X	X				X					5%
										Whole lake drawdown.	Holy Name Lake; Unknown	$500,000 - $1,000,000	X	X				X					

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Hennepin County MS4	Medina City MS4	Orono City MS4	Long Lake City MS4	MNDOT Metro District MS4	Plymouth City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Tanager Lake	Long Lake 27-0160-00	TP	800 665 ___ 1465	468 [332] 255 [411] 38 [0] 761 [742]	61	40	2008	Achieve goals in upstream lake (Wolsfeld and Holy Name Lakes).	20-30 years	See above.			X				X	X	X			X	10% reduction in TP conc. In Wolsfeld (80.1 ug/L to 72 ug/L) and 20% reduction in TP conc. In Holy Name (149.5 ug/L to 120 ug/L)	2045
								Explore opportunities to increase infiltration.	0-5 years	Complete evaluation.	Watershed wide; NA	$30,000	X				X	X	X	X	X		100%	
										Install infiltration BMPs.	10 BMPs; 0-10 lbs/yr	$100,000 - $200,000	X				X	X	X	X	X			
								Evaluate pond efficiency and feasibility of iron enhanced filter benches.	0-10 years	Complete performance evaluation and feasibility study.	50 ponds; NA	$50,000 - $75,000						X	X				50%	
										Pre-treatment	5 ponds; 10-25 lbs/yr	$50,000						X	X					
										Install iron enhanced filter benches.	15 ponds; 20-45 lbs/yr	$150,000						X	X					
								Inspect open channels and swales.	0-5 years	Inspect 2 miles of open channels/swales.	Watershed wide; NA	$1,000 - $3,000						X	X				100%	
										Establish buffers.	1,000 LF; 0-7 lbs/yr	$30,000						X	X					
								Education and cooperation with golf course.	0-5 years	Evaluate golf course runoff.	LLC-17, 18, 24, and 41; NA	$6,000 - $12,000						X	X				100%	
										Implement outreach and education.	LLC-17, 18, 24, and 41; Unknown	$5,000						X	X					
								Shoreline restoration.	0-5 years	Evaluate shoreline condition.	Long Lake shoreline; NA	$2,000 - $5,000											100%	
										Native plantings and buffer establishment.	2,000 lineal feet on Long Lake shoreline; 0-13 lbs/yr	$30,000	X						X	X				
								Lake specific strategy: Evaluate effectiveness of previous alum treatment and the feasibility of re-treatment for internal load management.	5-10 years	Complete evaluation.	Long Lake	$25,000 - $50,000	X	X					X	X			50%	
										Alum treatment.	Long Lake	$400,000	X	X					X	X				

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Hennepin County MS4	Medina City MS4	Orono City MS4	Long Lake City MS4	MNDOT Metro District MS4	Plymouth City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Tanager Lake	Tanager Lake 27-0141-00	TP	1003 174 ____ 1178	356 [647] 68 [106] 22 [0] 447 [753]	92	40	2008	Achieve goals in upstream lake (Long Lake).	20-30 years	See above.			X				X	X	X	X	X	X	10% reduction in TP conc. In Long Lake (61.4 ug/L to 55 ug/L)	2050
								Lake specific strategy: Re-visit project recommendations from Long Lake Creek Corridor feasibility study to guide future implementation phases.	5-10 years	Complete re-assessment	Long Lake Creek; NA	$25,000 - $50,000	X						X	X			Complete re-assessment	
								Streambank stabilization/buffer enhancement on tributary streams.	0-10 years	Long Lake Creek Corridor Improvements - Phase I (Wayzata Blvd streambank stabilization)	To Be Constructed; 2.1 lbs/yr	$66,313	X										100%	
										Long Lake Creek Corridor Improvements - Phase I (Brown Rd streambank stabilization)	To Be Constructed; 6.7 lbs/yr		X											
								Evaluate wetland system phosphorus loading.	5-10 years	Long Lake Creek Corridor Improvements - Phase I (Wetland restoration)	To Be Constructed; 4.9 lbs/yr		X										100%	
										Long Lake Creek Corridor Improvements - Phase II (Long Lake Wastewater Treatment Pond restoration)	NA; TBD	$561,029	X											
								Fish survey and evaluate need for management activities.	0-5 years	Complete fish survey.	Tanager Lake: NA	$10,000 - $15,000	X	X					X	X			100%	
										Install fish barriers.	Tanager Lake: Unknown	$10,000 - $15,000											
								Aquatic vegetation survey and appropriate management activities.	0-5 years	Complete vegetation survey.	Tanager Lake	$3,000 - $5,000	X	X					X	X			100%	
										Prepare vegetation management plan.	Tanager Lake	$3,000 - $5,000	X	X					X	X				
										Treat curly leaf pondweed.	Tanager Lake	$3,000 - $5,000	X	X					X	X				
								Evaluate whether additional internal load management is required following biologic evaluation/management activities.	5-10 years	Complete evaluation.	Tanager Lake: NA	$25,000 - $50,000	X	X									25%	
										Alum treatment or other internal load management project.	Tanager Lake: Project dependent.	$50,000 - $75,000	X	X										

Subwatershed Implementation Strategies
Stubbs Bay Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Hennepin County MS4	MNDOT Metro District MS4	Orono City Ms4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Minnetonka (Stubbs Bay)	Minnetonka (Stubbs Bay) 27-0133-12	TP	309 275 ___ 585	252 [57] 134 [142] 20 [0] 406 [199]	50	40	2008	Septic system inspection program.	0-5 years	Continue septic system inspection program.	Watershed wide; NA	$25,000 - $30,000 (County Wide Program)			X		X			100%	2030
										Repair failing septic systems.	8 septic systems; 46 lbs/yr	$24,000 - $80,000			X		X				
								Incorporate BMPs during linear transportation projects	0-10 years	Install sump catch basins.	2 structures throughout watershed; 0-2 lbs/yr	$10,000					X	X	X	50%	
										Install rain gardens.	4 rain gardens in urban watershed areas; 2-4 lbs/yr	$15,000 - $25,000			X				X		
								Evaluate wetland system phosphorus loading.	5-10 years	Complete evaluation.	SB-1, SB-2, CLC-1, CLC-2, CLC-3; NA	$10,000 - $20,000	X						X	25%	
										Alter wetland outlet structure/hydrology.	SB-1, SB-2, CLC-1, CLC-2, CLC-3; 30-100 lbs/yr	$200,000 - $400,000	X						X		
								Inspect open channels and swales (Classen Creek channel).	0-10 years	Inspect 1 mile of open channels/swales	Classen Creek; NA	$1,000 - $5,000	X						X	100%	
										Buffer establishment	500 Lineal Feet; 0-4 lbs/yr	$15,000	X						X		
								Educate property owners regarding agricultural BMPs.	0-5 years	Implement outreach and education.	Watershed wide; Unknown	$5,000 - $10,000	X		X					100%	
								Evaluate pond efficiency and feasibility of iron enhanced filter benches.	5-10 years	Complete performance evaluation and feasibility study.	10 ponds; NA	$10,000 - $15,000	X						X	25%	
										Excavation of Swan Lake impoundment along Classen Creek to increase removal efficiency.	Complete; 40 lbs/yr	$150,000	X								
								Shoreline restoration.	5-10 years	Evaluate shoreline condition.	Stubb's Bay; NA	$1,000 - $5,000							X	25%	
										Native plantings and buffer establishment.	2,500 lineal feet on Stubb's Bay shoreline; 0-2 lbs/yr	$37,500							X		

Subwatershed Implementation Strategies
West Arm Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading (o Load, o Wasteload, o Total (lbs/year))	Water Quality: Loading: TMDL Allocation [Reduction] (o Load, o Wasteload, o MOS, o Total (lbs/year))	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Three Rivers Park District	Hennepin County MS4	Minnetrista City MS4	Mound City MS4	Independence City MS4	Maple Plain City MS4	Medina City MS4	Orono City MS4	Spring Park City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Minnetonka (West Arm)	All	-	-	-	-	-	-	Fish survey and evaluate need for management activities.	0-5 years	Complete fish survey.	Dutch Lake, Jennings Bay, Forest Lake, West Arm; NA	$10,000 - $15,000 (each lake)	X	X					X	X				X	X	100%	-
										Install fish barriers.	Dutch Lake, Jennings Bay, Forest Lake, West Arm; Unknown	$10,000 - $15,000 (each lake)	X	X					X	X				X	X		
								Aquatic vegetation survey and appropriate management activities.	0-5 years	Complete vegetation survey.	Dutch Lake, Jennings Bay, Forest Lake, West Arm; NA	$3,000 - $5,000 (each lake)	X	X					X	X				X	X	100%	
										Prepare vegetation management plan.	Dutch Lake, Jennings Bay, Forest Lake, West Arm; NA	$3,000 - $5,000 (each lake)	X	X					X	X				X	X		
										Treat curly leaf pondweed.	Dutch Lake, Jennings Bay, Forest Lake, West Arm; Unknown	$3,000 - $5,000 (each lake)	X	X					X	X				X	X		
								Incorporate BMPs during linear transportation projects	0-10 years	Install sump catch basins.	20 structures throughout watershed; 0-20 lbs/yr	$100,000						X	X	X	X	X	X	X	X	75%	
										Install rain gardens.	20 rain gardens in urban watershed areas; 5-20 lbs/yr	$100,000 - $200,000						X	X	X	X	X	X	X	X		
										Install hydrodynamic separators.	6 structures in urban watershed areas; 0-15 lbs/yr	$90,000						X	X	X	X	X	X	X	X		
								Shoreline restoration.	5-10 years	Evaluate shoreline condition.	Dutch Lake, Forest Lake, Jennings Bay, and West Arm Shoreline.	$7,000 - $15,000	X						X	X				X	X	50%	
										Dutch Lake native plantings and buffer establishment.	1,000 lineal feet of shoreline; 0-3 lbs/yr	$15,000	X							X							
										Forest Lake native plantings and buffer establishment.	2,500 lineal feet of shoreline; 0-5 lbs/yr	$37,500	X											X			
										Jennings Bay native plantings and buffer establishment.	4,500 lineal feet of shoreline; 0-8 lbs/yr	$67,500	X						X	X				X			
										West Arm native plantings and buffer establishment.	7,500 lineal feet of shoreline; 0-8 lbs/yr	$112,500	X							X				X	X		
	Dutch Lake 27-0181-00	TP	272 319 ____ 591	203 [69] 126 [193] 17 [0] 347 [262]	55	40	2008	Evaluate wetland system phosphorus loading.	5-10 years	Complete evaluation.	DL-1, 2, 3, and 4; NA	$25,000 - $50,000	X						X							50%	2030
										Alter wetland outlet structure/hydrology.	DL-1, 2, 3, and 4; 20-100 lbs/yr	$200,000 - $400,000	X						X								
								Educate homeowners regarding urban stormwater BMPs.	0-5 years	Implement outreach and education.	Watershed wide; unknown	$2,000 - $10,000	X						X	X						100%	
								Educate property owners regarding agricultural BMPs.	0-5 years	Implement outreach and education.	Watershed wide; unknown	$5,000 - $10,000	X		X				X	X						100%	
								Lake specific strategy: Evaluate role of runoff from Camp Christmas Tree in phosphorus loading. Educate and cooperate with the camp on appropriate BMP implementation.	5-10 years	Evaluation complete.	DL-5; unknown	Unknown	X						X							100%	
								Lake specific strategy: Stabilize erosion	0-5 years	Concrete curbing and stabilized outlet.	TBD; Game Farm Road south of Kingswood Road	$8,000						X							100%	
								Evaluate pond efficiency and feasibility of iron enhanced filter benches.	Complete	Installed an iron filing filter berm on a tributary to Dutch Lake to provide particulate and dissolved phosphorus reduction.	Project complete (DL-3); 25-30 lbs/yr	$265,000	X													100%	
								Lake specific strategy: Dutch Lake Phosphorus Reduction Plan.	0-5 years	Flocculation Treatment System.	1,825 acres; 24 lbs/yr	$400,000	X						X							100%	
								Septic System Inspection Program	0-5 years	Continue septic system inspection program.	Watershed wide; NA	$25,000 - $30,000 (County Wide Program)			X											100%	
										Repair failing septic systems.	8 septic systems; 46 lbs/yr	$24,000 - $80,000			X			X									

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Three Rivers Park District	Hennepin County MS4	Minnetrista City MS4	Mound City MS4	Independence City MS4	Maple Plain City MS4	Medina City MS4	Orono City MS4	Spring Park City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Minnetonka (West Arm)	Minnetonka (Jennings Bay) 27-0133-15	TP	1346 2159 3505	391 [955] 596 [1563] 52 [0] 1039 [2518]	97	40	2008	Achieve goals in upstream lake (Dutch Lake).	15-20 years	See above.			X	X	X	X		X	X	X						50%	2045
								Inspect open channels and swales (Painter Creek and tributaries).	0-5 years	Inspect 11 miles of Painter Creek and tributaries.	Watershed wide; NA	$5,000 - $10,000	X				X		X	X	X	X	X	X		100%	
								Lake specific strategy: Stabilize and restore eroded streambanks (Painter Creek and tributaries).	10-20 years	Streambank restoration.	2 miles of streambank; 0-135 lbs/yr	$300,000 - $500,000	X				X		X	X	X	X	X	X		5%	
								Evaluate wetland system phosphorus loading.	Complete	Remeandered Painter Creek through wetland to restore hydrology and enhance phosphorus removal.	Complete	$200,000	X													100%	
								Lake specific strategy: Conversion of cropland to prairie, woodland, and wetland.	Complete	Created 3-celled wetland to filter runoff and converted 20 acres of row crops to prairie and woodland.	Complete	$200,577	X					X								100%	
								Pasture Management	Complete	Placed conservation easement over property adjacent to Painter Marsh that restricts number of horses and requires 80% vegetative cover.	Complete	TBD	X													100%	
								Educate property owners regarding agricultural BMPs.	0-5 years	Implement outreach and education.	Watershed wide; unknown	$5,000 - $10,000	X		X				X		X		X	X		100%	
								Education and cooperation with golf course.	0-5 years	Evaluate golf course runoff.	PC-16	$3,000 - $6,000														100%	
										Implement outreach and education.	PC-16; NA	$5,000							X								
								Lake specific strategy: Evaluate the feasibility of a phosphorus load reduction project in Painter Creek near the outlet to Jenning's Bay.	5-10 years	Jennings Bay Wet Detention Pond (MCWD CIP)	To Be Determined	$150,000	X						X							50%	
								Lake specific strategy: Stabilize erosion	0-5 years	Erosion repair	Complete (Ravine along Minneapolis Ave); TBD	$100,000						X								100%	
										Drainageway stabilization and stormwater pond installation.	Between 1350 and 1360 Morningview Drive; TBD	$200,000						X									
										Restore drainageway.	Near 810 County Road 110 N.; TBD	$25,000						X									
								Lake specific strategy: Jennings Bay Phosphorus Reduction Plan	0-5 years	Flocculation Treatment System.	2,079 acres; 31 lbs/yr	$450,000						X								100%	
								Explore opportunities to increase infiltration.	0-5 years	Complete evaluation.	Watershed wide; NA	$30,000						X								100%	
										Raingarden	1455 Westwood Drive; 2 lbs/yr	$15,000						X									
								Evaluate whether additional internal load management is required following biologic evaluation/ management activities.	10-20 years	Jennings Bay Internal Load Management Project (MCWD CIP)	To Be Determined	$500,000 - $2,000,000	X													5%	

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Three Rivers Park District	Hennepin County MS4	Minnetrista City MS4	Mound City MS4	Independence City MS4	Maple Plain City MS4	Medina City MS4	Orono City MS4	Spring Park City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Minnetonka (West Arm)	Forest Lake 27-0139-00	TP	134 194 ___ 327	102 [31] 78 [116] 9 [0] 189 [147]	59	40	2008	Evaluate wetland system phosphorus loading.	5-10 years	Complete evaluation.	FL-1 and 3; NA	$25,000 - $50,000	X						X					X		50%	2040
										Alter wetland outlet structure/hydrology.	FL-1 and 3; 10-50 lbs/yr	$200,000 - $400,000	X						X					X		
								Educate homeowners regarding urban stormwater BMPs.	0-5 years	Implement outreach and education.	Watershed wide; unknown	$2,000 - $10,000	X						X					X		100%
								Education and cooperation with golf course.	0-5 years	Evaluate golf course runoff.	FL-2 and 3; NA	$3,000 - $6,000													100%
										Implement outreach and education.	FL-2 and 3; unknown	$5,000							X					X		
								Evaluate whether additional internal load management is required following biologic evaluation/ management activities.	10-20 years	Complete evaluation.	Forest Lake; NA	$25,000 - $50,000	X	X												5%
										Alum treatment or other internal load management project.	Forest Lake; Project dependent	$75,000 - $125,000	X	X										X		
	Minnetonka (West Arm) 27-0133-14	TP	3265 156 ___ 3421	1800 [1465] 19 [137] 96 [0] 1915 [1602]	60	40	2008	Achieve goals in upstream lake (Jennings Bay and Forest Lake).	20-30 years	See above.			X	X	X	X	X	X	X	X	X	X	X		30%	2050
								Educate homeowners regarding urban stormwater BMPs.	0-5 years	Implement outreach and education.	Watershed wide; unknown	$2,000 - $10,000	X							X			X	X	100%	
								Lake specific strategy: Further evaluate the interaction between Jennings Bay and West Arm and the effect on West Arm in-lake concentrations.	5-10 years	Complete evaluation.	Jennings Bay/West Arm; NA	$30,000 - $50,000	X	X												50%	
								Evaluate whether additional internal load management is required following biologic evaluation/ management activities.	10-15 years	Complete evaluation.	West Arm; NA	$25,000 - $50,000	X	X												5%	
										Alum treatment or other internal load management project.	West Arm; Project dependent	$500,000 - $1,000,000	X	X												

Subwatershed Implementation Strategies
Langdon Lake Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Hennepin County MS4	Minnetrista City MS4	Mound City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Langdon Lake	Langdon Lake 27-0182-00	TP	228 166 393	188 [40] 121 [44] 16 [0] 325 [84]	65	60	2010	Evaluate upstream lake impacts (Saunders Lake).	0-5 years	Implement water quality monitoring and evaluation program in Saunders Lake.	Saunders Lake; NA	$20,000	X			X				100%	2030
								Incorporate BMPs during linear transportation projects	0-10 years	Install sump catch basins.	3 structures; 0-3 lbs/yr	$15,000					X	X	X	100%	
										Install hydrodynamic separators.	2 structures; 0-5 lbs/yr	$30,000					X	X	X		
								Evaluate pond efficiency and feasibility of iron enhanced filter benches.	5-10 years	Complete performance evaluation and feasibility study.	10 ponds; NA	$10,000 - $15,000						X	X	75%	
										Pre-treatment.	2 ponds; 2-5 lbs/yr	$20,000						X	X		
										Install iron enhanced filter benches.	2 ponds; 8-14 lbs/yr	$20,000						X	X		
								Educate homeowners regarding urban stormwater BMPs.	0-5 years	Implement outreach and education.	Watershed wide; unknown	$2,000 - $10,000	X					X	X	100%	
								Explore opportunities to increase infiltration.	5-10 years	Langdon-Saunders Raingarden Project: Constructed curb-cut raingardens in the South Saunders Neighborhood.	4 rain gardens; 4 lbs/yr	$22,064	X				X	X	X	75%	
								Lake specific strategy: Evaluate commercial areas in the City of Mound for retrofit potential or BMP selection during redevelopment.	5-10 years	Complete evaluation and select BMPs.	Within City of Mound; NA	$10,000 - $20,000	X						X	50%	
										Install infiltration BMP.	Within City of Mound; 0-10 lbs/yr	$30,000 - $50,000	X						X		
								Fish survey and evaluate need for management activities.	0-5 years	Complete fish survey.	Langdon Lake; NA	$10,000 - $15,000		X					X	100%	
										Install fish barriers.	Langdon Lake; unknown	$10,000 - $15,000		X					X		
								Aquatic vegetation survey and appropriate management activities.	0-5 years	Complete vegetation survey.	Langdon Lake; NA	$3,000 - $5,000		X					X	100%	
										Prepare vegetation management plan.	Langdon Lake; NA	$3,000 - $5,000		X					X		
										Treat curly leaf pondweed.	Langdon Lake; unknown	$3,000 - $5,000		X					X		
								Evaluate whether additional internal load management is required following biologic evaluation/management activities.	5-10 years	Complete evaluation.	Langdon Lake; NA	$25,000 - $50,000	X	X					X	25%	
										Alum treatment or other internal load management project.	Langdon Lake; Project dependent	$150,000 - $200,000	X	X					X		

Subwatershed Implementation Strategies
Tamarack Lake Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality				Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Governmental Units with Primary Responsibility								Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets	Interim 10-yr Milestones
			Loading		Waterbody Concentration					Minnehaha Creek Watershed District	MNDNR	Carver County SWCD / NRCS	MPCA	Carver County MS4	Chanhassen City MS4	MNDOT Metro District MS4	Victoria City MS4			
			Current Loading o Load o Wasteload o Total (lbs/year)	TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Current (µg/L)	Goal (µg/L)														
0701020606 (Upper Minnehaha Creek Watershed) / Tamarack Lake	Tamarack Lake 10-0010-00	TP	67 6 ___ 73	67 [0] 6 [0] ___ 73 [0]	39	40	2008	Consider partnership with the Minnesota Landscape Arboretum Horticultural Research Center for BMP education and implementation.	0-10 years	X		X					X	100%	NA	Ongoing effort
								Incorporate BMPs during linear transportation projects	0-10 years					X	X	X	X	100%		Ongoing effort
								Educate homeowners regarding urban stormwater BMPs.	0-10 years	X					X		X	100%		Ongoing effort
								Regular monitoring of biologic community and in-lake concentrations to maintain in-lake water quality below state standards.	0-10 years	X	X		X					100%		Ongoing monitoring

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality				Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility													Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
			Loading		Waterbody Concentration								Minnehaha Creek Watershed District	MNDNR	Carver County SWCD / NRCS	MPCA	Three Rivers Park District	Hennepin County MS4	Laketown Township MS4	Minnetrista City MS4	MNDOT Metro District MS4	Victoria City MS4	Carver County MS4	Minnehaha Creek WD MS4	Mound City MS4	St Bonifacius City MS4		
			Current Loading o Load o Wasteload o Total (lbs/year)	TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Current (µg/L)	Goal (µg/L)																					
0701020606 (Upper Minnehaha Creek Watershed) / Six Mile Creek & Halsteds Bay	All	-	-	-	-	-	-	Aquatic vegetation survey and appropriate management activities.	0-5 years	Complete vegetation survey.	Stone Lake, East Auburn Lake, Turbid Lake, Halsteds Bay; NA	$3,000 - $5,000 (each lake)	X	X					X	X		X			X		100%	-
										Prepare vegetation management plan.	Stone Lake, East Auburn Lake, Turbid Lake, Halsteds Bay; NA	$3,000 - $5,000 (each lake)	X	X					X	X		X			X			
										Treat curly leaf pondweed.	Stone Lake, East Auburn Lake, Turbid Lake, Halsteds Bay; unknown	$3,000 - $5,000 (each lake)	X	X					X	X		X			X			
								Incorporate BMPs during linear transportation projects	0-10 years	Install sump catch basins.	25 structures throughout watershed; 0-25 lbs/yr	$125,000						X	X	X	X	X	X	X	X	X	100%	
										Install rain gardens.	25 rain gardens in urban watershed areas; 12-25 lbs/yr	$75,000 - $150,000						X	X	X		X	X	X	X	X		
										Install hydrodynamic separators.	5 structures throughout watershed; 0-25 lbs/yr	$75,000						X	X	X	X	X	X	X	X	X		
	Stone Lake 10-0056-00	TP	171 34 206	142 [29] 34 [0] 9 [0] 186 [29]	43	40	2006	Fish survey and evaluate need for management activities.	0-5 years	Complete fish survey.	Stone Lake; NA	$10,000 - $15,000	X	X						X		X					100%	2025
										Install fish barriers.	Stone Lake; unknown	$10,000 - $15,000	X	X						X		X						
								Evaluate whether additional internal load management is required following biologic evaluation/management activities.	5-10 years	Complete evaluation.	Stone Lake; NA	$25,000	X	X														50%	
										Alum treatment or other internal load management project.	Stone Lake; Project dependent	$75,000 - $100,000	X	X															

Subwatershed Implementation Strategies
Halsted Bay Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Carver County SWCD / NRCS	MPCA	Three Rivers Park District	Hennepin County MS4	Laketown Township MS4	Minnetrista City MS4	MNDOT Metro District MS4	Victoria City MS4	Carver County MS4	Minnehaha Creek WD MS4	Mound City MS4	St Bonifacius City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Six Mile Creek & Halsteds Bay	East Auburn Lake 10-0044-02	TP	854 1245 2099	639 [215] 835 [410] 78 [0] 1551 [626]	49	40	2010	Achieve goals in upstream lake (Church and Wassermann).	15-25 years	Meet the TMDL Allocations Established for Wassermann Lake in the *MCWD Lakes TMDL* (EOR, February 2011).	Wassermann Lake; 201 lbs/yr	Unknown	X						X			X	X				40%	2040
										Evaluate Church Lake internal and watershed loading and implement management activities as necessary.	Church Lake, SMC-8, SMC-9; 27 lbs/yr	Unknown	X									X	X					
								Septic System Inspection Program	0-5 years	Continue septic system inspection program.	Watershed wide; NA	$25,000 - $30,000 (County Wide Program)			X								X				100%	
										Repair failing septic systems.	1 septic system; 6 lbs/yr	$3,000 - $10,000			X								X					
								Evaluate wetland system phosphorus loading.	5-10 years	Six Mile Marsh Infiltration SMC-1 (MCWD CIP)	SMC-1; unknown	$800,000	X														50%	
										Wassermann Phase I Culvert/Stream/Wetland Restoration (MCWD CIP)	Wassermann Lake Watershed; unknown	$700,000	X															
										Wassermann Phase II Wetland Restoration (MCWD CIP)	Wassermann Lake Watershed; unknown	$700,000	X															
										Six Mile Marsh Infiltration SMC-11 (MCWD CIP)	SMC-11; unknown	$700,000	X															
								Educate homeowners regarding urban stormwater BMPs.	0-5 years	Implement outreach and education.	Watershed wide; NA	$2,000 - $10,000	X								X						100%	
								Evaluate upstream lake impacts (Sunny Lake).	5-10 years	Implement water quality monitoring and evaluation program in Sunny Lake.	Sunny Lake; NA	$20,000	X			X											25%	
								Lake specific strategy: Evaluate carp reproduction potential in open water areas of the wetland by fish surveys or winterkill evaluations. Also monitor carp movement between East Auburn and Sunny Lakes and install barrier as necessary	5-10 years	Complete evaluation.	East Auburn Lake Watershed; NA	$15,000 - $25,000	X	X			X										50%	
										Install fish barriers.	East Auburn Lake Watershed; unknown	$10,000 - $15,000	X	X			X											
	Turbid Lake 10-0051-00	TP	244 5 249	108 [137] 4 [1] 6 [0] 117 [138]	67	40	2006	Septic System Inspection Program	0-5 years	Continue septic system inspection program.	Watershed wide; NA	$25,000 - $30,000 (County Wide Program)			X								X				100%	2035
										Repair failing septic systems.	3 septic systems; 15 lbs/yr	$9,000 - $30,000			X								X					
								Evaluate wetland system phosphorus loading.	5-10 years	Turbid/Lunsten Laketown Rd Wetland Restoration (MCWD CIP)	Unknown	$500,000	X														50%	
										Turbid/Lunsten Hwy 5 Wetland Restoration (MCWD CIP)	Unknown	$2,000,000	X															
								Educate property owners regarding agricultural BMPs.	0-5 years	Implement outreach and education.	Watershed wide; unknown	$5,000 - $10,000	X		X				X								100%	
								Lake specific strategy: Evaluate carp movement and reproduction potential in the lake and remove carp if deemed appropriate.	5-10 years	Complete evaluation.	Turbid Lake; NA	$15,000 - $25,000	X	X													50%	
										Install fish barriers.	Turbid Lake; unknown	$10,000 - $15,000	X	X														
								Evaluate whether additional internal load management is required following biologic evaluation/management activities.	10-15 years	Complete evaluation.	Turbid Lake; NA	$25,000	X	X													5%	
										Alum treatment or other internal load management project.	Turbid Lake; Project Dependent	$30,000 - $50,000	X	X														

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading o Load o Wasteload o Total (lbs/year)	Water Quality: Loading: TMDL Allocation [Reduction] o Load o Wasteload o MOS o Total (lbs/year)	Water Quality: Waterbody Concentration: Current (µg/L)	Water Quality: Waterbody Concentration: Goal (µg/L)	Baseline Year	Strategies (See key in "Strategy Key Table; All Lakes")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Carver County SWCD / NRCS	MPCA	Three Rivers Park District	Hennepin County MS4	Laketown Township MS4	Minnetrista City MS4	MNDOT Metro District MS4	Victoria City MS4	Carver County MS4	Minnehaha Creek WD MS4	Mound City MS4	St Bonifacius City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Six Mile Creek & Halsteds Bay	Minnetonka (Halsted Bay) 27-0133-09	TP	3314 2858 ____ 6171	1190 [2123] 771 [2087] 103 [0] 2064 [4210]	89	40	2008	Educate property owners regarding agricultural BMPs.	0-5 years	Implement outreach and education.	Watershed wide; Unknown	$5,000 - $10,000	X		X				X	X				X			100%	2035
								Shoreline restoration.	5-10 years	Evaluate shoreline condition.	Halsted Bay Shoreline; NA	$3,000 - $6,000	X							X					X		25%	
										Native plantings and buffer establishment.	4,000 LF of Halsted Shoreline; 4-6 lbs/yr	$60,000	X							X				X	X			
								Educate homeowners regarding urban stormwater BMPs.	0-5 years	Complete evaluation.	Six Mile Marsh; NA	$25,000 - $50,000	X							X						X	100%	
								Evaluate wetland system phosphorus loading.	5-10 years	Six Mile Marsh Improvement Project: Installation of a storm water treatment pond, infiltration and irrigation system, and stabilization of erosion problems at the downstream end of the subwatershed.	101 acres; 20 lbs/yr	$600,000								X								50%	
										Mud Lake/Six Mile Creek Water Quality Improvements: Construction of a flocculation treatment infiltration system that will remove phosphorus from Mud Lake and Six Mile Creek prior to discharge into 6 Mile Marsh.	566 acres; 25 lbs/yr	$550,000								X									
										Alter wetland outlet structure/hydrology.	Six Mile Marsh; 50-100 lbs/yr	$200,000 - $400,000	X							X				X				
								Lake specific strategy: Monitor and evaluate carp movement. Consider carp passage barrier between Mud Lake and Halsted Bay.	0-5 years	Complete evaluation.	SMC-61, SMC-66, Halsted Bay; unknown	$15,000 - $25,000	X	X						X				X			100%	
										Install fish barriers.	SMC-61, SMC-66, Halsted Bay; unknown	$10,000 - $15,000	X	X						X				X				
								Lake specific strategy: Conversion of cropland to prairie, woodland, and wetland.	Complete	Six Mile Marsh Prairie Restoration: Converted 130 acres of cropland to native prairie and woodland and restored/created 6 wetlands.	Complete; 120-130 lbs/yr	$329,974	X														100%	
								Evaluate whether additional internal load management is required following biologic evaluation/management activities.	10-15 years	Halsteds Bay Internal Load Management/Tributary Alum Injection System (MCWD CIP)	To Be Determined	$5,000,000 - $14,000,000	X							X							50%	

Subwatershed Implementation Strategies
Painter Creek Subwatershed

HUC-10 Subwatershed / Minor Subwatershed	Waterbody	Parameter (incl. non-pollutant stressors)	Water Quality: Loading: Current Loading by Flow Regime o High o Wet o Mid o Dry o Low (Billions of Organisms/Day)	Water Quality: Loading: TMDL Allocation by Flow Regime [Reduction %] o High o Wet o Mid o Dry o Low (Billions of Organisms/Day)	Baseline Year	Strategies (See key in "Strategy Key Table; Painter Creek")	Sequencing	Specific BMP Implementation	Estimated Scale of Adoption Needed; Estimated Load Reduction	Estimated Cost	Governmental Units with Primary Responsibility: Minnehaha Creek Watershed District	MNDNR	Hennepin County Environmental Services / NRCS	MPCA	Medina City MS4	Orono City MS4	Hennepin County MS4	Independence City MS4	Maple Plain City MS4	Minnetrista City MS4	Interim 10-yr Milestones (goal percentage of the estimated scale of adoption and estimated load reduction to be achieved within the first 10 years)	Timeline for Achievement of Water Quality Targets
0701020606 (Upper Minnehaha Creek Watershed) / Painter Creek	Painter Creek 07010206-700	Bacteria (*E. coli*)	30.8 15.5 20.5 4.99 0.0636	110 [0%] 51.0 [0%] 21.9 [0%] 3.45 [31%] 0.0401 [37%]	2006	Additional Study	0-10 years	Complete evaluation.	Watershed wide; unknown	$50,000	X	X	X								75%	2035
						Streambank Stabilization/Buffer Enhancement	5-10 years	Streambank restoration with buffer establishment.	2 miles of streambank on Painter Creek and tributaries; unknown	$300,000 - $500,000	X		X			X		X		X	75%	
								Cover/Perennial crop establishment in floodplains.	500 acres; unknown	$20,000	X		X			X		X		X		
						Education	0-10 years	Implement outreach and education regarding agricultural best management practices. Specifically regarding practices identified in The Minnesota Department of Agriculture (MDA) document *The Agricultural BMP Handbook for Minnesota.*	Watershed wide; NA	$10,000	X	X	X								100%	
						Pasture Management	0-10 years	Placed conservation easement over property adjacent to Painter Marsh that restricts number of horses and requires 80% vegetative cover.	Completed; TBD	TBD	X										100%	
								Rotational grazing plan development and implementation.	25 pastures; unknown	$10,000 - $15,000	X		X									
						Manure Management	0-10 years	Manure management plan development and implementation.	25 manure management plans; unknown	$7,500 - $10,000	X		X								50%	
								Livestock waste management; runoff control practices.	10 sites; unknown	$100,000 - $500,000	X		X									
						Septic System Inspection Program	0-10 years	Continue septic system inspection program.	Watershed wide; NA	$25,000 - $30,000 (County wide program)			X				X				100%	
								Repair failing septic systems.	4 septic systems; 400 Billions of Organisms per Month	$12,000 - $40,000			X				X					
						Limit Animal Access	0-10 years	Livestock exclusion fencing installation.	25 pastures; unknown	$150,000			X			X		X		X	25%	
						Pet Waste Management	0-10 years	Education and outreach regarding pet waste management.	Watershed wide; NA	$5,000 - $10,000					X	X		X	X	X	100%	
								Increase enforcement of pet waste ordinances.	Watershed wide; limit mismanaged pet waste to 5%; 30,000 - 40,500 Billions of Organisms per Month	$5,000 - $10,000					X	X		X	X	X		