Burandt Lake TMDL Implementation Plan

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Introduction

The Burandt Lake Total Maximum Daily Load (TMDL) Implementation Plan addresses nutrient impairments in Burandt Lake located in the Carver Creek Watershed in Carver County, Minnesota.

Burandt Lake, a deep drainage lake located in the North Central Hardwood Forest (NCHF) ecoregion in the center of Carver County, Minnesota, was designated as an impaired water by the Minnesota Pollution Control Agency (MPCA) and the US Environmental Protection Agency (EPA) for total phosphorus concentrations that exceed State-established standards. The Carver County Water Management Organization (CCWMO) has completed a TMDL to quantify the pollutant reductions needed to meet the water quality standards for total phosphorus in the lake in accordance with Section 303(d) of the Clean Water Act. The TMDL and this Implementation Plan were prepared and modified with input and comments provided by the City of Waconia, local landowners, the County's Water Environment and Natural Resource Committee (WENR), and the County Board.

Lake	DNR Lake #	Affected Use	Pollutant or Stressor
Burandt Lake	10-0084	Swimming	Excess Nutrients

The implementation plan is the final step in the TMDL process; the Burandt Lake TMDL was on public notice from June 16th to July 16th, 2008. The TMDL was approved by the U.S. Environmental Protection Agency (EPA) in November 2008. The TMDL the County has one year after the EPA TMDL approval date to draft and adopt an implementation plan to meet the requirements of the TMDL.

1.0 Burandt Lake TMDL Summary

Burandt Lake is a deep, 92-acre lake located in the City of Waconia which is situated centrally within the County (figure 1.0). The entire Burandt Lake watershed consists of 7,823 acres of land which can be divided into three subwatersheds. The direct watershed, the area that drains directly to Burandt Lake without first passing through another lake, is 246 acres excluding the lake. The two indirect watersheds consist of 7,147 acres of land draining from Lake Waconia and another 430 acres flowing from Scheuble Lake (those watershed areas include the lakes). The majority of water flowing into Burandt Lake comes from Lake Waconia, and lesser amounts flow from the Scheuble Lake subwatershed and precipitation from the direct watershed.

The Burandt Lake direct watershed is primarily developed into residential areas while the indirect watershed areas are dominated by agricultural land use. By utilizing the Bathtub model and analyzing available watershed data (landuse, water quality data, etc.) it was determined that a majority of the excess total phosphorus is due to inflow from the Scheuble Lake watershed and the recirculation of nutrients already in the lake (internal load).

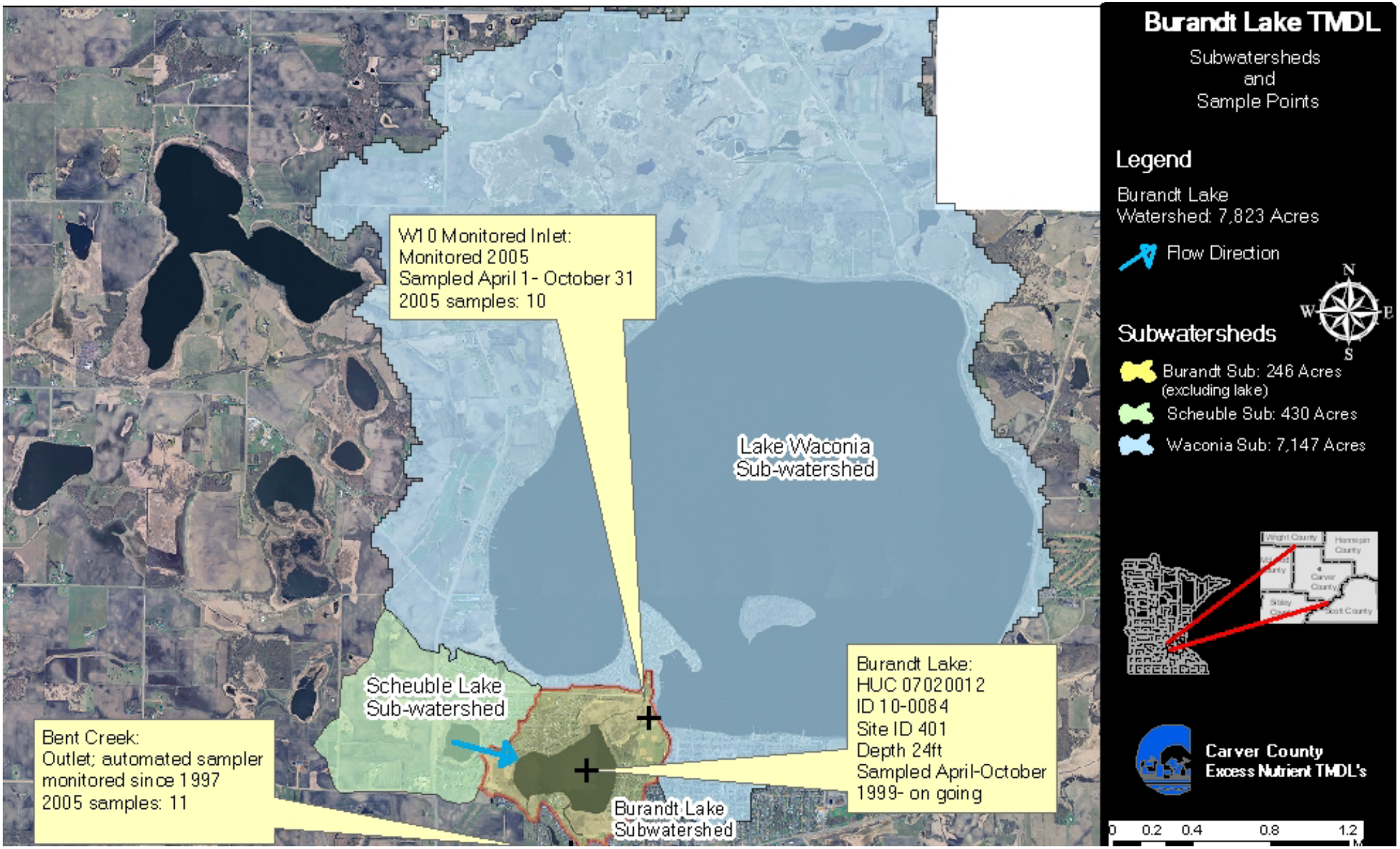

Figure 1.0 Map of Burandt Lake watershed, sub-watersheds and sample points.

The TMDL concluded that in order for the lake to meet the identified State Standard, 40µg/L total phosphorus, a 32-66 percent reduction in total phosphorus must be made depending on yearly precipitation.

The following Implementation Plan details the activities the stakeholders in the watershed plan to undertake to attain the percent reductions, noted above, in order to meet the TMDL determined for the lake.

2.0 Water Quality Summary

A key aspect of a TMDL is the development of an analytical link between loading sources and the receiving water. To establish that link, historical in-lake water quality data was analyzed, along with a stepped-up monitoring program which included in-lake water quality sampling, tributary and outlet monitoring, in addition to fish population, shoreline and aquatic plant surveys. A detailed account of the monitoring procedures and results can be found in the Burandt Lake Excess Nutrients TMDL document. Figure 2.0 documents in-lake total phosphorus exceedances since 1999.

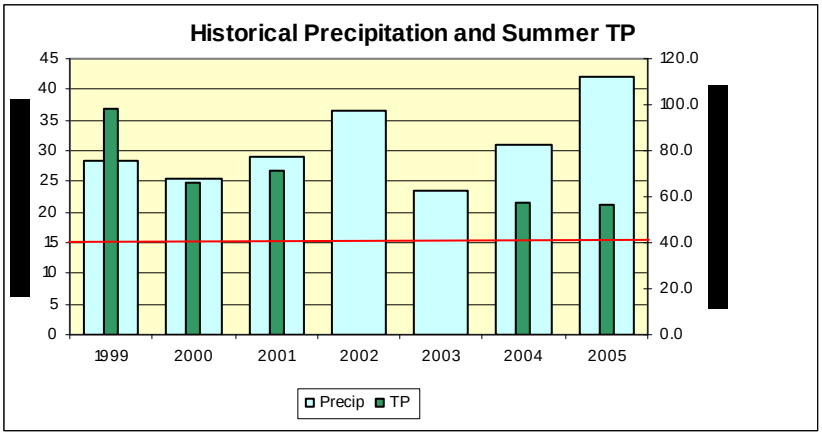

Figure 2.0. Summer growing season (June 1st-September 30th) Total Phosphorus levels since 1999 (no TP data available in 2002 and 2003) paired with precipitation. The red line is the State Standard and goal for Burandt Lake.

Total phosphorus violations have occurred since the onset of monitoring in 1999. However; the severity of the violation varies with yearly precipitation. Years of higher precipitation lead to increased dilution and subsequent Burandt Lake flushing downstream due to higher flows from Lake Waconia. Years with lower precipitation lead to lower flow from Lake Waconia, and increase the importance of internal phosphorus loading in Burandt Lake. Phosphorus pulses from land runoff during precipitation events are also more noticeable during dry years.

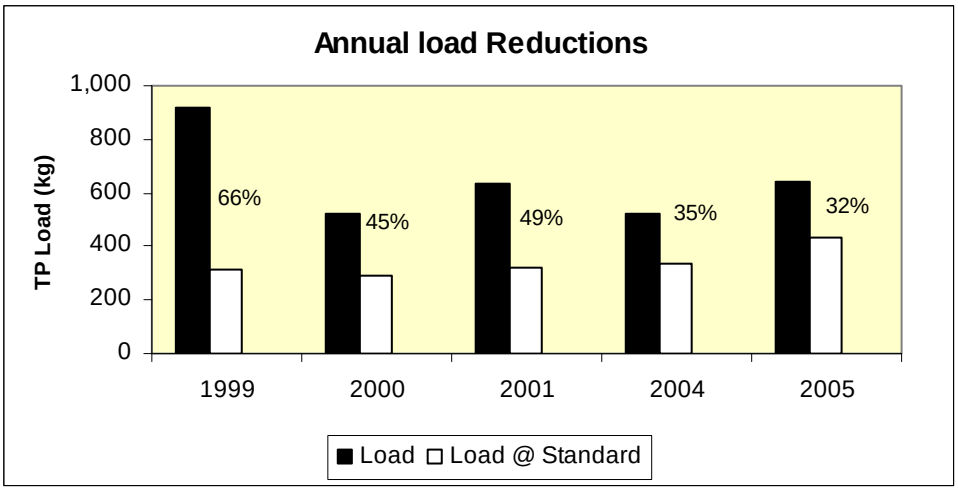

Figure 2.1 Estimated annual loads and predicted loads at the standard of 40 µg/L total phosphorus since the onset of regular monitoring. Percentages represent the necessary reductions needed to meet the standard.

Based on 1999 through 2005 modeling, Burandt Lake would have required a 32 to 66 percent total phosphorus reduction to meet the summer average water quality standard of 40 ug/L total phosphorus (Figure 2.1). The range of allowable annual phosphorus loads for those years was 288 kilograms to 436 kilograms, respectively

While modeling suggests that this TMDL will be protective of the phosphorus and Secchi water quality standards in Burandt Lake, lake responses do indicate that a larger reduction in phosphorus will be needed to result in meeting standards for chlorophyll-a. The chlorophyll-a response is the result of a high planktivore population leading to a decreased zooplankton population, which results in uncontrolled algae blooms. Secchi and chlorophyll-a responses to phosphorus concentrations will be monitored under adaptive management, and we are confident that the TMDL will result in a marked improvement in water quality.

The assimilative capacity of the lake varies with changes in the water load and, ultimately, precipitation amounts. To address these changes, in addition to the TMDL for an average precipitation year (Table 2.0), appropriate loadings were determined for dry (Table 2.1) and wet (Table 2.2) conditions. For the wet and dry years, the maximum and minimum allowable loads used were calculated using the Canfield-Bachmann equation. The wet and dry year loadings were calculated for the wettest and driest years with data available over the last ten years, 2005 and 2000 respectively. The loadings in Tables 2.1 and 2.2 represent the appropriate maximums for each of these conditions.

The critical condition for Burandt Lake is the summer growing season. Minnesota lakes typically demonstrate impacts from excessive nutrients during the summer recreation season (June 1 through September 31), including excessive algal blooms and fish kills.

Lake goals have focused on summer-mean total phosphorus, Secchi transparency and chlorophyll-a concentrations. Consequently, the lake response models are focused on the summer growing season as the critical condition. Loads are expressed both as annual and daily loads; however, an annual load better represents this TMDL because the growth of phytoplankton and aquatic plants respond to changes in the annual load and not the daily load. The TMDL is based on an average precipitation year (Table 2.0). The selected average precipitation year was 2001.

Table 2.0. TMDL as set for an average precipitation year, 2001 (29.11 inches).

	TMDL	WLA	LA	MOS	RC
kg/yr	321	48	273	Implicit	0
kg/day	0.88	0.13	0.75	Implicit	0

Table 2.1 Target loads for low precipitation year (25.39 inches)

	Total Load	Waste Load	Nonpoint Load
kg/yr	288	43	245
kg/day	0.79	0.12	0.67

Table 2.2 Target loads for high precipitation year (42.18 inches)

	Total Load	Waste Load	Nonpoint Load
kg/yr	436	67	369
kg/day	1.19	0.18	1.01

For purposes of implementation, the TMDL can be represented as a percent reduction needed by each of the contributing subwatersheds based on our knowledge of the watersheds, the ratio of the phosphorus load that it contributes, and the reduction deemed necessary and reasonable by all stakeholders to meet the TMDL. Table 2.3 shows the estimated percent reduction required by each subwatershed to meet the TMDL, and table 2.4 shows the phosphorus loading targets by subwatershed. The table is based on reductions for the most current conditions, a wet year (2005). Because lakes are uniquely

dynamic systems, a dry year may result in increases in internal loading while a wet year may result in increases of runoff from the surrounding land. Thus, actual watershed reductions may vary slightly from year to year.

Table 2.3 Required subwatershed phosphorus reductions based on 2005 modeling and data.

Sub-watershed	TMDL kg/yr	% Reduction
Lake Waconia	--	15%
Scheuble Lake	--	50%
Burandt Lake	--	25%
Internal		60%
Total	**288-436***	**32-66%****

***Dry-wet year range**

****Range for various years (Figure 2.1)**

Table 2.4. TMDL phosphorus load targets.

Sub-watershed	TMDL kg/yr	Target Load for Permitted Sources kg/yr	Target Load for Non-permitted Sources kg/yr	Atmospheric Deposition	Internal Load
Lake Waconia	--	36	147		
Scheuble Lake	--	3	13		
Burandt Lake	--	9	7		
Total	**321**	**48**	**167**	**7**	**99**

3.0 Implementation Plan Development

3.1 INTRODUCTION

The activities and BMPs identified in the implementation plan are the result of several stakeholder, landowner, and citizen advisory committee meetings led by Carver County Water Management staff.

The County has an excellent track record with inclusive participation of its citizens, as evidenced through the public participation in completion of the Carver County Water Management Plan, approved in 2001. The County has utilized stakeholder meetings, citizen surveys, workshops and permanent citizen advisory committees to gather input from the public and help guide implementation activities. The use of this public participation structure will aid in the development of this and other TMDLs in the County.

3.2 TECHNICAL ADVISORY COMMITTEE

The Water, Environment, & Natural Resource Committee (WENR) was established as a permanent advisory committee. The WENR is operated under the standard procedures of the County for advisory committees. The WENR works with staff to make recommendations to the County Board on matters relating to watershed planning.

The make-up of the WENR is as follows:

1 County Board Member
1 Soil and Water Conservation District Member
1 U of M Extension Member
5 citizens – (1 appointed from each commissioner district)
1 City of Chanhassen (appointed by city)
1 City of Chaska (appointed by city)
1 City of Waconia (appointed by city)
1 appointment from all other cities (County Board will appoint)
2 township appointments (County Board will appoint– must be on existing township board)
4 other County residents (1 from each physical watershed area – County)

The full WENR committee received updates on the TMDL process from its conception in 2004. At a meeting relating solely to the Burandt Lake TMDL on July 31st 2007, County staff presented the methods of TMDL development and phosphorus-loading allocations. The committee was provided with opportunities to give input on implementation scenarios between Carver County and the City of Waconia. Comments/remarks received included:

- Maybe the County WMO should assume all of the TMDL implementation responsibility.
- Cost sharing should definitely be the implementation approach.

- How is it determined which BMP provides how much load reduction? (limited research available)
- Contributions from other lakes and adjacent wetlands are key.
- Developers and landowners should be expected to contribute. The City of Waconia's plan for lake use should be factored in.
- Other considerations should be rough fish elimination, alum treatments, and city housekeeping (e.g. street sweeping).
- Not mowing to the waters edge and proper emergent/submergent plant management by lakeshore owners.

As part of the WENR committee, two sub-committees are in place and have held specific discussions on the Excess Nutrients TMDL. These are the Technical sub-committee and the Policy/Finance sub-committee. Sub-committee review meetings relating to Burandt Lake were held on: June 8, 2005, July 13, 2005, and January 30, 2006.

TMDL progress, methods, data results and implementation procedures were presented and analyzed at the WENR committee meetings mentioned. Committee members commented on carp removal possibilities, nutrient sources, internal loading rates, and future monitoring plans. All issues commented on during these meetings were considered during the development of the Draft TMDL.

3.3 PUBLIC SURVEYS/MEETINGS/INPUT

Stakeholders that would be impacted by the Burandt Lake TMDL were given the opportunity to voice their opinions on the Draft TMDL. Stakeholder involvement included the following components: A public survey; public meetings; and personal meetings with the City of Waconia and the City of Waconia consultants.

A lake user perception survey was sent out to landowners inquiring upon lake uses and perceptions in July of 2006. Due to the number of homes within the lake watershed and lack of a public access on the lake, only landowners within .25 miles of the lake were sent surveys. Nearly 400 surveys were sent out and 110 surveys were returned. Of the surveys returned, 36 percent were lakeshore owners. Many of the comments were incorporated throughout the TMDL. Below is a list of general comments and concerns respondents had for the lake, and thoughts on what may be causing excess nutrients in the lake.

- Should add a public access/boat landing as most of the lake is isolated from general public.
- Lake users would like to be able to swim without disturbance by milfoil.
- High speed boats/jet skis should be restricted due to noise and sediment disturbance.
- Runoff from fertilizer used in yards (lawns up to lakeshore), storm sewers and streets are causing pollution.
- Eurasian water milfoil is taking over the lake. Also, people kill weeds but don't remove them.

- Runoff from developments and agricultural/farming practices in the watershed are causing high nutrients.
- Sewage, which was discharged by the City of Waconia for years, is now built up in sediments.

A Burandt Lake TMDL open house was held on February 7th, 2008, at the Waconia City Hall for landowners within the Burandt Lake watershed. The open house was well attended with 46 attendees, 9 of whom were staff. There was a follow up meeting targeting aquatic plant management that took place on April 1st, 2008.

Carver County staff, along with MPCA staff, invited the City of Waconia Planners along with their engineers to a meeting and comment session regarding the WLA to the City as a MS4 in February 2007. City staff were presented with the TMDL development methods and the TMDL allocations. As a result the County worked with the City of Waconia to meet the load reductions needed as outlined earlier.

In addition to the WENR committee, the City of Waconia has played a major role in the development of the Burandt Lake Implementation Plan. The City has held a series of lake forums for residents that are intended to help educate the citizens of the city on various water quality and quantity issues. On top of the "Lake Forum" meetings, Carver County gave presentations to the City Council on July 7, 2008 to review the draft TMDL and associated Implementation Plan to get their comments. The City included the Burandt TMDL in their Local Water Management Plan, and will be an active partner in storm water management in the Burandt Lake TMDL.

As a final effort to gather input for the Implementation Plan each resident, within the boundaries affected by this plan, was sent a postcard instructing them that the plan was available. At that point they could comment on the plan via email, internet, or by contacting the CCWMO office directly. The Implementation Plan also addresses the comments of the City of Waconia Staff and their engineering consultants.

3.4 PLAN DEVELOPMENT PROCESS

The first task in developing the implementation plan was determining the allocation of load reductions to the users in the watershed based on information gathered during the TMDL study. The City of Waconia is designated as a Mandatory Municipal Separate Storm Sewer System (MS4) by the MPCA. As a result, the county and the City of Waconia have accepted the responsibility of the entire phosphorus load to Burandt Lake. The stakeholders agreed that implementation should be a joint effort, with CCWMO taking the lead in ongoing coordination, identification of BMPs, general education and appropriate monitoring activities. To reach the reduction goals, Carver County will rely largely on its current Water Management Plan which identifies the Carver SWCD as the local agency for implementing best management practices. The City of Waconia will work with Carver County to select and incorporate BMPs into their Stormwater Pollution Prevention Program (SWPPP).

Stormwater discharges that are regulated under NPDES permits and allocations of phosphorus reductions are considered wasteloads, and must be allocated to the permit holders. Current and future discharges regulated by NPDES permits and classified as Municipal Separate Storm Sewer Systems (MS4s) in the Burandt Lake watershed include the City of Waconia, Carver County, and MnDOT Metro District. As a result, the target phosphorus reductions associated with the MS4s have been designated as a Wasteload Allocation (WLA). The unique permit numbers assigned to MS4s are as follows;

- City of Waconia- MS400232
- Carver County- MS400070
- MnDOT Metro District- MS400170

The strategies listed below will be utilized to assist in reducing pollutant loads. It is difficult to predict nutrient reductions that would occur from each strategy. Because of this, surface water monitoring of Burandt Lake, its tributaries, and in some instances specific BMPs, will need to be carried out after the implementation of each strategy (discussed in section 5.5), then the principles of adaptive management will be applied. The application and use of BMPs based on cost of implementation and the area of land being treated. BMP effectiveness (and cost effectiveness) will be based on the MPCA Stormwater Manual, as well as any current or future research. Section 4 presents the best management practices identified through the Burandt Lake TMDL development process:

4.0 Recommended Phosphorus Management Strategies

4.0 INTRODUCTION

Based on the Burandt Lake TMDL, it will be necessary to address the internal and external loading when considering how to manage Burandt Lake for water quality improvement. As previously stated, to meet the goals of the TMDL a 32-66 percent reduction in the Burandt Lake phosphorus load is needed. With the right staffing, funding, BMPs and management options, this is a feasible effort.

A combination of all these factors is estimated to reduce the phosphorus loading to the lake by up to 66 percent will allow us to reach our ultimate goal of 40 ug/L. The interim goal for Burandt Lake is to have in-lake phosphorus levels at 60 ug/L and it is the goal of the implementation plan to meet that standard following 10 years of initiating the plan.

External Load

Because Lake Waconia and Burandt Lake are connected, any phosphorus loading (especially direct runoff from the Burandt Lake watershed and the Scheuble Lake subwatershed) will decrease the quality of water in Burandt Lake. Thus, areas of main implementation focus will include the Scheuble Lake watershed and direct inflow while maintaining, or slightly improving, the water quality from Lake Waconia.

Internal Load

Internal sources of phosphorus have the largest impact on water quality in Burandt Lake. That being said, we must also be aware that we must first attack external sources of phosphorus. Attacking and controlling external factors first will give us a better opportunity to achieve the goals in the implementation plan and corresponding TMDL.

Although the CCWMO will be the lead on the implementation of the Burandt Lake Excess Nutrient TMDL, in some instances individual stakeholders (City of Waconia) will be ultimately responsible for implementing the identified BMPs. These activities will be included in the NPDES Phase II Permits that the stakeholders hold (both CCWMO and City of Waconia), and activities will be reported annually.

CCWMO realizes that each of the following tasks relate to corresponding reduction strategies and that the tasks must be completed based on acceptance, staff and funding availability. Hence, this implementation plan's activities will commence upon the availability of funding. To accomplish this, the tentative timelines (listed as follows) were set for each task to correspond with the project goals. The timelines are defined as: Short Term 0-5 years from the inception of the plan, Medium Term 5-12 years from the inception of the plan and Long Term greater than 12 years or on-going from the inception of the plan.

4.1 EXTERNAL LOADING REDUCTION STRATEGIES

External loading reduction strategies include a variety of agricultural and urban BMPs. Examples of agricultural BMPs are reduced tillage, buffer strips, nutrient management, manure management, grassed waterways, contour farming, and terraces. Urban BMP examples include stormwater detention basins, street sweeping, rain gardens, shoreline restoration, aquatic plant management and enhanced infiltration (one example is core aeration of grassy areas).

Buffer strips along ditches, streams, wetlands and lakes can reduce nutrient runoff from agricultural cropland. Areas of high erosion potential, or wetland restorations identified (primarily) in the Burandt Lake and the Scheuble Lake subwatersheds and secondarily in the Waconia Lake subwatersheds, will be targeted for buffer strips.

Areas with the greatest potential to pollute surface water will be targeted for BMP establishment first. In non-MS4 areas, BMP establishment will be on a voluntary basis. State and federal grant monies will be solicited by CCWMO to cost share BMP establishment and incentives as needed.

Our interim goal of the external reductions strategies to reduce phosphorus in each of the Burandt Lake subwatersheds by an aggregate total of 30% of the total external load and having an in-lake total phosphorus level of 60 ug/L.

It is the final goal of the external reduction strategies to reduce phosphorus in the Burandt Lake subwatershed by 50% of the total external load and meeting our ultimate final goal of 40 ug/L.

Target Watersheds: Burandt, Scheuble and Waconia Lake Subwatersheds
Timeline: 1/2010 – 12/2030 (20 years)
Estimated total cost of all tasks: $723,000

4.1.1 Agricultural Cropland Runoff control and storage BMPs

Task 1. Identify and prioritize key erosion/restoration areas within the Burandt, Scheuble, and Waconia Lake watersheds. Identification will be based on monitoring results and/or visual inspections of field conditions.

1) Responsible Parties: CCWMO, Carver SWCD, NRCS
2) Timeline: Short Term (2010-2015)
3) Estimated Cost: $1500

Task 2. Identify and educate landowners through meetings, brochures, Carver County quarterly newspaper (The Citizen), Carver County Website, and various workshops.

1) Responsible Parties: CCWMO, Carver SWCD
2) Timeline: Long Term (2010-2030)
3) Estimated Cost: $5,000

Task 3. Design and implement cropland BMPs to reduce phosphorus inputs to Burandt Lake. BMPs will be targeted on land identified as a significant contributor of phosphorus and sediment. Based mainly on this consideration, agricultural BMPs will be designed and implemented to reduce sediment and nutrients into Burandt Lake. Examples could be, but are not limited to, nutrient management, crop residue management, and other practices utilized by the Carver SWCD and NRCS and identified in the NRCS field handbook available electronically at www.nrcs.usda.gov/technical/efotg/

1) Responsible Parties: CCWMO, Carver SWCD, NRCS
2) Timeline: Long Term (2010-2030)
3) Estimated Cost: $50,000

Task 4. Design and implement practices that will reduce sediment and nutrients into Burandt Lake by installing buffer strips, wetland restorations, alternate rock inlets or other water retention devices or practices identified by qualified staff.

1) Responsible Parties: CCWMO, Carver SWCD, NRCS
2) Timeline: Long Term (2010-2030)
3) Estimated Cost: $30,000

4.1.2 Animal Waste/Feedlot Management

Animal waste (manure management) and, to a lesser extent, feedlot run-off will be examined, and appropriate measures will be taken to ensure that these activities do not result in a phosphorus load entering Burandt Lake via either Scheuble Lake or the Lake Waconia subwatersheds. Many of the practices are also outlined in the NRCS field handbook, and will be utilized again to control any problem areas that are encountered or previously identified in our modeling.

Task 1. Identify potential areas and contact landowners to inform them of funding and projects that they can initiate to benefit the lake and their properties in Scheuble Lake and key areas in the Waconia Lake watershed.

1) Responsible Parties: CCWMO, Carver SWCD
2) Timeline: Long Term (2010-2030)
3) Estimated Cost: $1,500

Task 2. Identify and educate landowners through meetings, brochures, Carver County quarterly newspaper (The Citizen), Carver County Website, and various workshops.

1) Responsible Parties: CCWMO, Carver SWCD
2) Timeline: Long Term (2010-2030)
3) Estimated Cost: $5,000

Task 3. Work directly with the landowners that have feedlots or land application of manure on their properties. For active feedlots the MINNFARM computer software will be used to identify potential pollution problems. Current NRCS technical practices and standards will be used for feedlot pollution abatement and manure application.

1) Responsible Parties: CCWMO, Carver SWCD
2) Timeline: Long Term (2010-2030)
3) Estimated Cost: $40,000

4.1.3 Urban/Development Runoff

It was agreed that improved management of urban runoff, particularly from lakeshore properties and those properties within the Burandt Lake direct watershed and Scheuble

Lake Watershed, would reduce phosphorus loading to Burandt Lake. Urban/developed phosphorus runoff management will include, but is not limited to, the following components; installation of rain gardens, street sweeping, removal of leaf litter from streets, installation of shoreline buffers, stabilization of eroding lakeshore, infiltration/detention ponds, erosion and sediment control and utilizing low impact development techniques.

Urban development brings about increased runoff because of additional impervious surface due to new roads, rooftops, parking lots, and an increase in semi-pervious surface resulting from soil compaction during development resulting in the potential for increased channelization attributed to increased flows. The impervious surfaces do not let rain water soak into the ground so massive amounts of water run into storm sewers which empty into nearby water bodies or streams when impervious surfaces are connected to the stormwater conveyance system. In addition, monitoring and modeling has indicated that urban pollutant loads are directly related to watershed imperviousness. CCWMO requires filtration/bioretention treatment for new development and promotes and encourages reduction in runoff and increased infiltration in re-development and retrofits. CCWMO addresses the uses of components such as infiltration ponds, silt fencing and minimization of new impervious surfaces in the County Water Management Plan and Rules. CCWMO will continue to take the lead on ensuring that preventative measures are installed during construction, as well as retrofits, and will evaluate increased standards in the update of its Plan and Rules.

Task 1. Utilize Carver County's GIS to identify potential project areas and "hotspots" within the Burandt Lake sub-watersheds (i.e. areas with no current stormwater management). Then research and identify what practices from the tasks above, or from the Minnesota Stormwater BMP Manual, should be considered.

1) Responsible Parties:	CCWMO, Carver SWCD, City of Waconia
2) Timeline: Short Term	(2010-2015)
3) Estimated Cost:	$10,000

Task 2. Identify and educate landowners through meetings, brochures, Carver County quarterly newspaper (The Citizen), Carver County Website, and various workshops.

1) Responsible Parties:	CCWMO, Carver SWCD, City of Waconia
2) Timeline: Long Term	(2010-2030)
3) Estimated Cost:	$10,000

Task 3. Design and implement urban BMPs where needed to reduce phosphorus inputs to Burandt Lake based on watershed priorities, the interest of identified landowners, and available money. BMPs including, but not limited to, rain

gardens, shoreline restorations and urban BMPs will be designed and implemented to reduce phosphorus and sediment inflows into Burandt Lake.

1) Responsible Parties: CCWMO, Carver SWCD, City of Waconia
2) Timeline: Long Term (2010-2030)
3) Estimated Cost: $500,000

Task 4. Identify current street sweeping schedules that the City of Waconia has in place, and if necessary, conduct a load analysis to determine the optimal level of street sweeping necessary. If necessary, work with the city to implement a continual spring and fall schedule for sweeping within the sub-watersheds. The City has identified this BMP in both the Local Water Management Plan and the SWPPP.

1) Responsible Parties: CCWMO, Carver SWCD, City of Waconia
2) Timeline: Short Term (20010-2015)
3) Estimated Costs: $20,000

Task 5. Identify current stormwater pond clean-out schedules within the subwatershed to ensure proper operation and maintenance schedules are in place. A maintenance plan is included in the City's Local Water Management Plan. If necessary, work with the City to develop and implement a schedule that will adequately treat the run-off leaving these areas. In addition, we will identify and retrofit current stormwater ponds within the Burandt Lake watershed that could be retrofitted to meet the current standards.

1) Responsible Parties: CCWMO, Carver SWCD, City of Waconia
2) Timeline: Medium Term (2010-2022)
3) Estimated Costs: $50,000

Task 6. All currently undeveloped land within the Burandt Lake Watershed will be required to meet current and amended stormwater standards, including volume reduction and runoff treatment. Review and updates of both the CCWMO plan and ordinances will include the pollutant reduction methods needed for the Burandt TMDL. The City plan and SWPPP will need to be updated to meet revised CCWMO plans and ordinances. Additional Low Impact Development (LID) practices will be encouraged during the site design and review process. Incentives will be considered in order to promote these practices.

1) Responsible Parties: CCWMO, Carver SWCD, City of Waconia
2) Timeline: Long Term (2010-2030)
3) Estimated Costs: $25,000

Task 7. On going monitoring of Burandt Lake and tributaries as outlined in section 6.5.

1) Responsible Parties: CCWMO
2) Timeline: Long Term (2010-2030)
3) Estimated Costs: $50,000

4.2 INTERNAL LOADING REDUCTION STRATEGIES

Based on the TMDL monitoring efforts, modeling results, and meetings, it has been determined that controlling/reducing internal loading (mainly the recycling of phosphorus) will play a major role in meeting the required reductions. Burandt Lake human-induced nutrient build-up has been occurring for years due to past land use(s) and the City of Waconia WWTP contributions (which were discontinued in the 70's).

Internal phosphorus loading will be reduced by the implementation of the following measures: Rough fish control (via fish barriers etc.), removal of invasive aquatic plants and establishment of native vegetation, motorized boat wake restrictions, and in-lake alum treatment. Furthermore, reductions to the external load will aid in diluting and flushing out of the nutrient rich sediments from Burandt Lake.

CCWMO will partner with the Minnesota Department of Natural Resources (MDNR) to determine possible fish barrier sites and evaluate other rough fish strategies. Possible barrier sites include the lakes two inlets and the outlet. The proposed new outlet control structure could be designed to secondarily function as a fish barrier. The purpose would be to prevent carp from utilizing surrounding wetland areas as spawning areas. In addition to the barriers, CCWMO will coordinate with the MDNR to determine if rough fish removal is necessary.

Native aquatic plants would promote improved water quality by minimizing re-circulation of bottom sediments, competing with algae for nutrients, and providing habitat for zooplankton (which eat algae). Currently Burandt Lake is dominated by invasive species including Eurasion Watermilfoil and curlyleaf pondweed, and there are many instances where lakeshore residents spray chemicals to clear aquatic vegetation. CCWMO and the Carver SWCD will form a partnership with the MDNR to reduce the invasive species currently present, and establish a healthy native aquatic plant population in areas of the lake less than 15 feet in depth.

Motorized boat traffic wake restrictions could aid in the reduction of in-lake nutrient re-circulation and sediment resuspension. Wind and wave action on shallow areas, rough fish rooting and boat motors in areas less than 10 feet in depth all contribute to sediment/nutrient resuspension. Although there is no public access on Burandt Lake, homeowners have identified that lake use by motor boats is heavy on the weekends, and restricting speed near the shoreline may yield a reduction in sediment/nutrient re-suspension in shallow areas of the lake. This restriction would also reduce the shoreline

erosion impacts attributed to boat-generated wave action. This restriction will have to be looked at more closely.

Aluminum sulfate (Alum) is a chemical addition that forms a non-toxic precipitate with phosphorus. The alum binds with water column phosphorus, precipitates the phosphorus and becomes part of the lake sediments hence that phosphorus is not available for algal growth. Alum also forms a barrier between lake sediments and the water to restrict phosphorus release from the sediments. CCWMO will inquire if alum or other internal loading treatments are a viable option and if so, will delineate the treatment area and dosing rates.

It is the interim goal of the internal reduction strategies to reduce the internal phosphorus load in Burandt Lake to 130 kg/year by the midpoint (2020) of the project.

It is the final goal of the internal reduction strategies to reduce the internal phosphorus load in Burandt Lake to 99 kg/year which is approximately a 60 percent reduction.

Target Locations: Burandt and Scheuble Subwatersheds
Timeline: 1/2010 – 12/2030 (20 years)
Estimated total cost of all tasks: $254,000

4.2.1 In-Lake Strategies

Task 1. Identify fish barrier sites, the possibility of rough fish removal, and evaluate the resultant water quality improvement.

1) Responsible Parties	CCWMO, MDNR
2) Timeline: Short Term	(2010-2015)
3) Estimated Cost:	$3000

***Task 2*.** Chemical or mechanical removal of invasive aquatic plant species and replacement with diverse native aquatic plant species.

1) Responsible Parties	CCWMO, Carver SWCD, MDNR
2) Timeline: Long Term	(2010-2030)
3) Estimated Cost:	$25,000

***Task 3*.** Determine if the designation of near-shore wake-restricted zones are necessary, and determine appropriate actions and steps for implementation, including signage and education.

1) Responsible Parties	CCWMO
2) Timeline: Medium Term	(2010-2022)
3) Estimated Cost:	$1000

Task 4. Treat Scheuble and Burandt lakes with aluminum sulfate (or similar) to reduce internal phosphorus loading. Also, consider and schedule long term treatment options as suggested by state agencies and/or consultants.

1) Responsible Parties	CCWMO, MDNR
2) Timeline: Long Term	(2010-2030)
3) Estimated Cost:	$175,000

Task 5. Determine the feasibility of drawing down the lake or other viable mechanical options (aeration, barley straw, etc.) to reduce phosphorus loading in Burandt and Scheuble lakes.

1) Responsible Parties	CCWMO, MDNR
2) Timeline: Long Term	(2010-2030)
3) Estimated Cost:	$50,000

4.3 PROJECT TIMELINE AND MEASUREABLE MILESTONES

4.3.1 Timeline

The first priority of the implementation plan will be to address each of the short term goals identified in the external and internal reduction strategies, followed by medium and long term goals. Many of the tasks involved in implementing these goals will overlap and complement one another while others may not need to be completed after initial assessment or pertinent information is made available. Each task will ultimately be completed as resources and opportunities present themselves, which could allow some long and medium term tasks to be completed sooner rather than later.

4.3.2 Measurable Milestones

As noted above, our measure milestone will be ultimately bringing Burandt Lake into compliance with state water quality standards by 2030. Along the way our first milestone will be measured in-lake phosphorus concentration at 60 ug/L by the year 2020 and long term positive trend indicating that changes being made are working.

As we progress through implementation and it appears that our completed tasks are not providing enough treatment to reach our interim and final goals we would utilize Bathtub (as outlined in the Burandt Lake TMDL) with up to date data and land use information to identify new hot spots and problem areas that may not have been previously addressed. If discrepancies are identified the implementation plan will be updated.

5.0 Reasonable Assurance

5.1 INTRODUCTION

When establishing a TMDL, reasonable assurances must be provided demonstrating the ability to reach and maintain water quality endpoints. Several factors control reasonable assurances, including a thorough knowledge of the ability to implement BMPs, as well as the overall effectiveness of the BMPs. Carver County is positioned to implement the TMDL and ultimately achieve water quality standards.

5.2 CARVER COUNTY

The Carver County Board of Commissioners (County Board), acting as the Water Management Authority for the former Bevens Creek (includes Silver Creek), Carver Creek, West Chaska Creek, East Chaska Creek, and South Fork Crow River watershed management organization areas, has established the "Carver County Water Resource Management Organization" (CCWMO). The purpose of establishing the CCWMO is to fulfill the County's water management responsibilities under Minnesota Statute and Rule. The County chose this structure because it will provide a framework for water resource management as follows:

- Provides a sufficient economic base to operate a viable program.
- Avoids duplication of effort by government agencies.
- Avoids creation of a new bureaucracy by integrating water management into existing County departments and related agencies.
- Establishes a framework for cooperation and coordination of water management efforts among all of the affected governments, agencies, and other interested parties.
- Establishes consistent water resource management goals and standards for at least 80% of the county.

The County Board is the "governing body" of the CCWMO for surface water management and the entire county for groundwater management. In function and responsibility, the County Board is essentially equivalent to a joint powers board or a watershed district board of managers. The Burandt Lake watershed is part of the CCWMO.

In order to fulfill legislative requirements on surface and groundwater, Carver County developed a Water Management Plan that was adopted in 2001. The goal of the Plan is to protect, preserve and manage the county's surface and groundwater systems in the midst of rapid growth and intensive agricultural activity. The plan presents sustainable and equitable methods to reach that goal by providing guidance and specific standards for decision-makers, residents, landowners, educators, and implementation staff at the local level. Within the Water Management Plan, there are twelve priority areas the county has identified needing immediate and continued action. These include: Subsurface Sewage Treatment Systems (SSTS), Feedlots (includes manure management), Construction Site

Erosion and Sediment Control, Stormwater Management, Land Use Practices for Urban and Rural Areas, Water Quality Assessment, Wetland Management, Groundwater, Natural Resource Management, Education, Total Maximum Daily Loads (TMDLs), and Solid Waste.

Multiple county departments help implement the CCMWO plan. The Carver County Board of Commissioners is the governing board. The Water, Environment, and Natural Resources (WENR) Committee acts as the citizen advisory board. The Planning & Water Management department is responsible for administration, implementation and coordination. Implementation is also the responsibility of Environmental Services, University of Minnesota Extension, and the Carver Soil & Water Conservation District (SWCD).

The County is uniquely qualified through its zoning and land use powers to implement corrective actions to achieve TMDL goals. The County has stable funding for water management each year, but will likely need assistance for full TMDL implementation in a reasonable time frame, and will continue its baseline-monitoring program. Carver County has established a stable source of funding through a watershed levy in the CCWMO taxing district (adopted 2001). This levy allows for consistent funding for staff, monitoring, and engineering costs, as well as on-the-ground projects. The County has also been very successful in obtaining grant funding from local, state and federal sources due to its organizational structure.

Carver County recognizes the importance of the natural resources within its boundaries, and seeks to manage those resources to attain the following goals:

1. Protect, preserve, and manage natural surface and groundwater storage and retention systems.
2. Effectively and efficiently manage public capital expenditures needed to correct flooding and water quality problems.
3. Identify and plan for means to effectively protect and improve surface and groundwater quality.
4. Establish more uniform local policies and official controls for surface and groundwater management.
5. Prevent erosion of soil into surface water systems.
6. Promote groundwater recharge.
7. Protect and enhance fish and wildlife habitat and water recreational facilities.
8. Secure the other benefits associated with the proper management of surface and ground water.

Water management involves the following County agencies: Carver County Land and Water Services Division; Carver County Extension; and the Carver Soil and Water Conservation District (SWCD). The County Land and Water Services Division is responsible for administration of the water plan and coordinating implementation. Other departments and agencies will be called upon to perform water management duties that fall within their area of responsibility. These responsibilities may change as the need

arises. The key entities meet regularly as part of the Joint Agency Meeting (JAM) process to coordinate priorities, activities, and funding.

5.3 REGULATORY APPROACH

5.3.1 Watershed Rules

Water Management Rules establish standards and specifications for the common elements relating to watershed resource management including: Water Quantity; Water Quality; Natural Resource Protection; Erosion and Sediment Control; Wetland Protection; Shoreland Management; and Floodplain Management. Of particular benefit to nutrient TMDL reduction strategies are the stormwater management and infiltration standards which are required of new development in the CCWMO. The complete water management rules are contained in the Carver County Code, Section 153. The Rules will be evaluated, updated and enforced along with the watershed plan to address TMDLs where needed.

5.3.2 NPDES Permits

The MPCA issues NPDES permits for Point Source discharges into waters of the state. These permits have both general and specific limits on pollutants that are based on water quality standards. Permits regulate discharges with the goals of protecting public health and aquatic life, and assuring that every facility treats wastewater. More information about permits, water quality data, and other MPCA programs can be found on the agency's Web site: http://www.pca.state.mn.us/water

MS4s that have been designated by the MPCA for permit coverage under Minn. R. ch. 7090 are required to obtain a NPDES/SDS stormwater permit. The stormwater program for MS4s is designed to reduce the amount of sediment and pollution that enters surface and ground water from storm sewer systems to the maximum extent practicable. As part of the permit, the City of Waconia will be required to develop and implement a stormwater pollution prevention program (SWPPP) to reduce the discharge of pollutants from their storm sewer system. The SWPPPs are required to cover six "minimum control measures" to ensure adequate stormwater management and pollution prevention. Measures include:

1) Public education and outreach.
2) Public participation/involvement.
3) Illicit discharge, detection and elimination.
4) Construction site runoff control.
5) Post-construction site runoff control, and
6) Pollution prevention/good housekeeping.

The MS4 permit also requires that the SWPPP be consistent with any TMDL Wasteload Allocation.

For more information visit the MPCA Web site:
http://www.pca.state.mn.us/water/stormwater/stormwater-ms4.html

5.4 NON-REGULATORY APPROACH

5.4.1 Education

The implementation of this Plan relies on three overall categories of activities: Regulation, Incentives, and Education. For most issues, all three means must be part of an implementation program.

The County has taken the approach that regulation is only a supplement to a strong education and incentive based program to create an environment of low risk. Understanding the risk through education can go a long way in preventing problems. In addition, education, in many cases, can be a simpler, less costly and more community-friendly way of achieving goals and policies. Education efforts can provide the framework for more of a "grass roots" community plan implementation, while regulation and incentives traditionally follow a more "top-down" approach. It is recognized, however, that education by itself will not always meet intended goals, has certain limitations, and is characteristically more of a long-term approach. To this end, Carver County created the Environmental Education Coordinator position in 2000. This position has principal responsibility for development and implementation of the water education work plan.

Several issues associated with the water plan were identified as having a higher priority for educational efforts. These were identified through discussions with the advisory committees, based on ease of immediate implementation and knowledge of current problem areas and existing programs. The higher-priority objectives are not organized in any particular order. The approach to implement the Burandt Lake TMDL will mimic the education strategy in the water plan. Each source reduction strategy will need an educational component, and will be prioritized based on the number of landowners, type of source, and coordination with existing programs.

5.4.2 Incentives

Many of the existing programs on which the water management plan relies are incentive-based programs offered through the County and the Carver SWCD. Some examples include: state and federal cost share funds directed at conservation tillage, crop nutrient management, rock inlets, conservation buffers, and low-interest loan programs for SSTS upgrades. Reducing nutrient sources will need to rely on a similar strategy of incorporating incentives into implementing practices on the ground. After the approval of the TMDL by the EPA and the County enters the implementation phase, it is anticipated that we will apply for monies to assist landowners in the application of BMPs identified in the Implementation Plan.

5.5 EFFECTIVENESS MONITORING OVERVIEW

Regular bi-weekly in-lake monitoring of Burandt Lake from April-October of each year will continue as identified in the Water plan. Volunteer monitoring will be encouraged in order to more effectively gather as much data as possible. All volunteer monitoring is done via the Metropolitan Councils CAMP program protocol, and the data is also entered into the PCA's CLMP program. Additionally, the Metropolitan Council submits all lake data collected in its Citizen Assisted Monitoring Program (CAMP) program for entry into STORET (short for STOrage and RETrieval).

In addition to the volunteer monitoring that focuses on Burandt Lake in-lake surface water (0-1 meter) sampling, Carver County Land and Water Services will conduct more intensive sampling at least once every 3 years in order to more accurately assess the Burandt Lake internal load. Carver County's in-lake sampling will include: (1) Secchi Disk measurement, (2) water column profiles of temperature and dissolved oxygen, (3) water sample collection from the surface (0-1 meter composite) for TP, Chl-a, and (4) TP samples at the thermocline, when stratified, and ½ meter off the bottom. Adaptive management relies on the County conducting additional monitoring as BMPs are implemented in order to determine if the implementation measures are effective, and how effective they are.

Additional areas that will be monitored when economically feasible and justified include Scheuble Lake and its corresponding outlet not monitored during the initial TMDL study, additional sampling at the major inlet to the lake (Lake Waconia outlet), sediment samples to further account for internal loading, and land use change monitoring. Inflow monitoring will be initiated during and after implementation of the TMDL to quantify external load reductions. Sample stations will be explored on the two primary inflow streams. These stations would collect continuous flow and composite samples collected during rainfall runoff events. Samples will be analyzed for total phosphorus, total nitrogen and total suspended solids. The flow and water quality data will be used to estimate phosphorus loading to the lake to confirm the TMDL reductions.

Furthermore, assessment of the stormwater discharge may be monitored to better grasp the nutrient loads caused by runoff from surrounding land. This monitoring will assist in evaluating the success of projects and identify changes needed in management strategies. Revision of management and monitoring strategies will occur as needed.

6.0 ADAPTIVE MANAGEMENT

The phosphorus allocations represented in this TMDL represent aggressive goals; consequently, implementation will be conducted using adaptive management principles. These principals are a systematic process for continually improving management policies

and practices by learning from the outcomes of previously employed policies and practices. In active adaptive management, managers design practices so as to discriminate between alternative models, and thus reveal the "best" management action. This sometimes involves testing practices that differ from "normal", in order to determine how indicators will respond over a range of conditions. In passive adaptive management, managers select the "best" management option, assuming that the model on which the predictions are based is correct. Both passive and active adaptive management require careful implementation, monitoring, evaluation of results, and adjustment of objectives and practices. Active adaptive management usually allows more reliable interpretation of results, and leads to more rapid learning.

The criteria outlined in section 4.0 of the implementation plan will rely on monitoring for measuring our progress towards active adaptive management, while some passive adaptive management will be tracked through modeling efforts.

Adaptive management is appropriate because it is difficult to predict the phosphorus reduction that will occur from implementing strategies with the scarcity of information available to demonstrate expected reductions. Limited reduction research is available for BMP's at this time, but this is expected to change in the next several years as state agencies and local experience provide more accurate reduction data. The County has and will continue to look at viable tools that will help to predict and measure the actual reductions that installation of a particular BMP may have.

Future technological advances may alter the specific course of actions detailed here. Continued targeted monitoring based on a project work plan and "course corrections" responding to monitoring results are the most appropriate strategy for attaining the water quality goals established in this TMDL.