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VADNAIS LAKES AREA WATER MANAGEMENT ORGANIZATION

WATERSHED MANAGEMENT PLAN

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ac	Acre(s)
AC-FT	Acre-feet
BMP	Best management practice
BWCSP	Board of Water Commissioners of the City of Saint Paul
BWSR	Minnesota Board of Water and Soil Resources
CAC	Citizen Advisory Committee
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFS	Cubic feet per second
Chl-a	Chlorophyll-a
CIP	Capital Improvement Project
CLMP	Citizen Lake Monitoring Program
CMP-A	Corrogated metal pipe arch
COE	United States Army Corps of Engineers
CSAH	County State Aid Highway
CWA	Clean Water Act
EAW	Environmental Assessment Worksheet
EIS	Environmental Impact Statement
Fe	Iron
FEMA	Federal Emergency Managemnet Agency
FT	Feet
GIS	Geographic Information System
HP	High Priority Protection Wetlands
ISTS	Individual Sewage Treatment System
JPA	Joint Powers Agreement
LGU	Local Government Unit
LWP	Local Water Plan
LWPA	Local Water Planning Authority
M.S.	Minnesota Statutes
MCES	Metropolitan Council Environmental Services
MDH	Minnesota Department of Health
mg/L	Milligram per liter
MGY	Million gallons per year
MM	Moderate Management Wetlands
MMCD	Metropolitan Mosquito Control District
MNDOT	Minnesota Department of Transportation
MnDNR	Minnesota Department of Natural Resources
MNRAM	Minnesota Routine Assessment Methodology
MOU	Memoradum of Understanding
MPCA	Minnesota Pollution Control Agency
MS4	Municipal Separate Storm Sewer System
MSL	Mean Sea Level
MUSA	Metropolitan Urban Service Area
NCHF	North Central Hardwoods Forest
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbility Units
NWI	National Wetland Inventory
NWL	Normal Water Level

OHWL	Ordinary High Water Level
P	Phosphrous
PC	Policy Committee
PLS	Pounds pure live seed
QA/QC	Quality assurance/ quality control
RCP	Reinforced concrete pipe
RCRA	Resource Conservation and Recovery Act
RSWCD	Ramsey Soil and Water Conservation District
SCWM WMC	Shingle Creek and West Mississippi Watershed Management Commissions
SDT	Secchi disk transparency
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
Si	Silica
SLMP	Sustainable Lake Management Program
SWCD	Soil and Water Conservation District
SWPPP	Storm Water Pollution Prevention Plan
TAC	Technical Advisory Committee
TMDL	Total maximum daily load
TN	Total nitrogen
TP	Total phosphorus
TP 40	Technical papers 40
TSI	Carson's trophic state index
U	Utilize wetlands
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VLAWMO	Vadnais Lake Area Management Organization
WCA	Wetland Conservation Act
WRAM	Wisconsin rapid assessment methodology
μg/L	Microgram per liter

LIST OF DEFINITIONS

"Board" – The Board of Commissioners of the Organization, consisting of one commissioner from each of the governmental units which is a party to this Agreement and which shall be the governing body of the Commission.

"Capital Improvement Program" or "capital improvement program" or "Works of Improvement" – An itemized program for at least a multi-year prospective period, and any amendments to it, subject to at least biennial review, setting forth the schedule, timing, and details of specific contemplated capital improvements by year, together with their estimated cost, the need for each improvement, financial sources, and the financial effect that the improvements will have on the governmental unit or watershed management organization.

"Commissioner" – That person appointed to the Board by each governmental unit which enters into this Agreement.

"Comprehensive Plan" or "comprehensive plan" – The meaning given it in Section 473.852, Subdivision 5.

"Council" – The governing body of a governmental unit which is a member of this Commission.

"Flood Prone" - Areas within the floodplain or the floodway.

"Governmental Unit" – Any city, town, county, school district, or other political subdivision as cited in M.S. 471.59, Subdivision 1.

"Local Government Unit" or "local government unit" – The meaning given it in Section 473.853.

"Non-degradation" - No signification increase in storm water runoff or pollutant loads from 2005/2006 numerical standards.

"Organization" – The organization created by the Agreement, the full name of which is the "Vadnais Lake Area Water Management Organization" and is abbreviated VLAWMO. It shall be a public agency of its members.

"Redevelopment" – Alterations of a property that change the "footprint" of a site or building in such a way that results in the disturbance of equal to or greater than 1 acre of land.

"St. Paul Water Utility" "St. Paul Regional Water Service"- Board of Water Commissioners of the City of Saint Paul.

"Vadnais Lake Area Watershed" – The area contained within a line drawn around the extremities of all terrain whose surface drainage is tributary to Vadnais Lake.

EXECUTIVE SUMMARY

The Vadnais Lakes Area Water Management Organization (VLAWMO) Watershed Management Plan describes how the VLAWMO will address water management over the next 10 years. VLAWMO was organized by a Joint Powers Agreement (JPA) (**Error! Reference source not found.**) in 1983 in response to the Minnesota Metropolitan Surface Water Act of 1982 (Minnesota Statutes {M.S.} Section 473.875 to 473.883). The first VLAWMO Watershed Management Plan was prepared, approved, and adopted in 1987.

The Metropolitan Surface Water Management Program (M.S. 103B) and Watershed Act requires the VLAWMO to review and update its Water Management Plan (the Plan) every ten years. The second generation plan was prepared and adopted in 1995. That plan expired in 2006. This current Plan represents a third generation plan and will be effective from 2007 to 2016. In addition to complying with the aforementioned laws, this Plan meets the requirement of Minnesota Rules 8410, 8420, and 8750. The Plan includes management standards and procedures for addressing surface water, wetland, and groundwater issues.

Plan Organization

This Plan document is about the Vadnais Lakes Area Watershed and its management, and therefore, much of the information presented is technical. Background information regarding scientific terms and processes is provided where practical. An acronym list is also provided. Readers are encouraged to consult area professionals or professional references for more information.

The Plan is divided into the following sections:

Executive Summary: Provides an overview of the plan.

Section 1.0 – Introduction: Summarizes State statutes, plan requirements, and the organization and history of VLAWMO.

Section 2.0 – Land and Water Resource Inventory: Presents current and historic background and inventory information regarding the physical, hydrological, biological, and human environment of the watershed.

Section 3.0 – Issues Identification/Assessment of Problems: Provides an overview of the issues identified during the planning process, identifies priorities, and assesses the adequacy of existing controls and identifies potential management gaps.

Section 4.0 – Goals, Policies, and Management Strategies: Presents the management framework (goals, policies, and management strategies and standards) adopted by the VLAWMO Board (Board) to address the priority issues and management gaps.

Section 5.0 – Administration: Presents the administrative functions of the VLAWMO and Local Water Planning authorities with respect to regulation, financing, and administering implementation of the program described in Section 6.0.

Section 6.0 – Implementation Program: Describes the implementation elements of the Plan and its impact on residents and local governments. This section provides an implementation program table and preliminary annual budgets and provides a table of measurable outcomes for each program year.

Watershed Issues

Watershed issues are problems or concerns that have been identified by both the Board and citizens from member communities and need attention and implementation of corrective measures. Partnership meetings were held in North Oaks, White Bear Lake, and Vadnais Heights. In addition, White Bear Township, Gem Lake, and Lino Lakes were contacted to solicit input. Eleven issues were identified in Section 3.0.

- Potable Water Supply from Groundwater
- Groundwater Quality: Threatened and Impaired
- Potable Water Supply from Surface Water
- Development Occurred Before Implementations
- Additional Development is Expected
- Data Needs/Limitations
- Public Awareness
- Sensitive Resources
- Lake Water Quality: Threatened or Impaired
- Exotic Species Infestations
- Localized Flooding

These issues are also prioritized in Section 3.0. It is interesting to note that both the Board's and the public's priorities of the identified issues were similar. Issues dealing with water quality and habitat were of the greatest concern and flooding, while an important issue, was ranked as one of their least concerns.

Watershed Management Framework

Section 4.0 presents the management framework for the Plan in terms of goals, policies, and management strategies and standards. Development of this framework took into consideration the issues and problems identified, their priority, and the adequacy of existing controls and management efforts. Fundamental principles in developing the framework include:

- VLAWMO is not the only organization with responsibilities for water management in the watershed. This is a shared responsibility between State, local governments and the public.
- Available VLAWMO resources should focus on priorities. Several efforts done well is better than numerous efforts done poorly or incompletely.
- That VLAWMO efforts should build on, improve, or enable existing controls/efforts before starting duplicate efforts.
- Management efforts will possibly vary by subwatershed.

To address management at a subwatershed scale, VLAWMO has divided the watershed into seven separate subwatersheds and identified goals for each issue/problem by subwatershed. The subwatersheds are as follows:

- Subwatershed 1 - Lambert Creek
- Subwatershed 2 - Birch Lake
- Subwatershed 3 - Tamarack/Wilkinson
- Subwatershed 4 - Pleasant/Charley/Deep
- Subwatershed 5 – East Vadnais/Sucker (reservoir)
- Subwatershed 6 - Gem Lake
- Subwatershed 7 – West Vadnais Lake

The following goals have been established by VLAWMO (the order does not reflect rank within the watershed):

1. Prevent flooding
2. Protect and improve surface water quality

3. Protect groundwater quality and quantity
4. Protect wetland resources
5. Protect and improve waters for wildlife habitats and recreation
6. Enhance public participation and stewardship
7. Optimize public resources
8. Analyze and use alternative funding sources
9. Make and enable informed decisions
10. Improve communications

Plan Implementation

Four different implementation elements and associated sub-elements are identified in Section 6.0. These include:

Administrative/Managerial Efforts: This includes staffing, day-to-day operations, and funding for audits, reporting, training, and contingency.

Local Water Plan Development and Implementation: This includes working with local communities to complete Local Water Plans (LWP). This will be a significant effort the first two years of the Plan implementation. Other then the Wetland Conservation Act (WCA), LWPs are viewed as the primary mechanism for implementing policies and strategies that incorporate standards and regulations. These standards/regulations include:

- Floodplain and shoreland ordinances
- Rate control standards
- Landlocked basin standards
- Storm water standards
- Standards to control soil loss on small construction sites in shoreland areas
- Wetland protection standards

Some of these standards, such as the floodplain and shoreland ordinance requirements, are already met by member communities. Others are met, to some degree, by local community requirements. Wherever possible, VLAWMO tried to build-on existing standards from State or Federal requirements to minimize duplication.

In addition to standards, other specific expectations for inclusions in LWPs by various communities are described in Section 6.0.

Studies and Programs: Implementation elements include seven different sub-elements as follows:

- Lower Lambert Creek Flood Reduction Study
- County Road E and Highway 61 Storm Water Study
- Development of Sustainable Lake Management Plans (SLMP)
- Financial incentives and cost-sharing
- Public information and education
- Data analysis and monitoring
- WCA and appropriations permitting

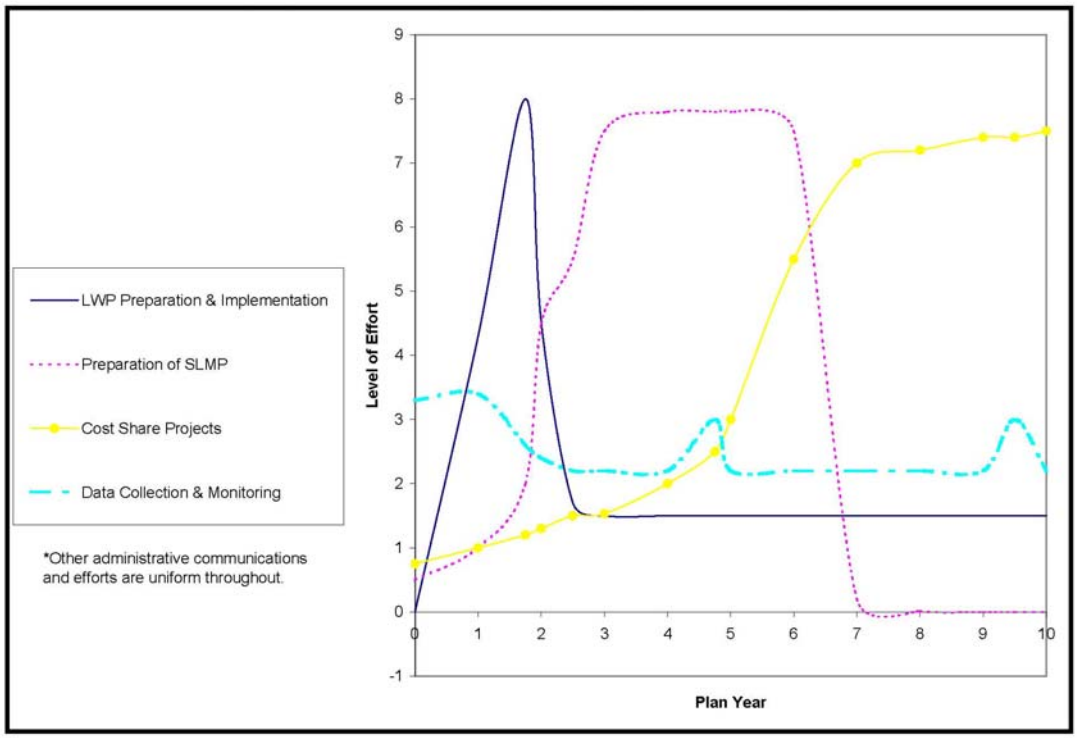
Capital Improvements Projects: The Plan includes projects listed below. Additional projects can be added with biannual reviews and minor amendments.

- Lambert Creek Stream Restoration and Stabilization
- Lambert Creek Flume Replacement
- Goose Lake Sediment Treatment and Rough Fish Removal.
- Aluminum/Ferric Chemical Feed to Grass Weir
- Lambert Creek Total Maximum Daily Load (TMDL) Project
- Tamarack Lake Restoration
- Branch 4 – North Storm Water Quality Pond
- Branch 4 – Northeast Quadrant of Vadnais Heights City Center Storm Water Quality Pond

Many implementation efforts, such as administration and WCA permitting, are on-going. Other elements are scheduled more specifically over the course of the 10-year program. The intent is to try to balance efforts over those 10 years.

As shown in Graph ES 1, the primary implementation elements shift from a focus on completion of LWPs, to the completion of SLMPs, during middle years, to habitat and other water quality improvements through financial incentives and cost-sharing in later years.

GRAPH ES 1
VLAWMO IMPLEMENTATION EFFORTS



Measurable Outcomes

The primary outcome measurements for judging effectiveness of this Plan are the numerical water quality standards established for some lakes and the non-degradation standard established for all lakes through modeling effort. Other products/outcomes are identified and tabled by year in Section 6.0, such as the completion of LWPs or a number of SLMPs. These outcomes will be tracked on an annual basis, used to develop annual workplans, and listed in annual reports as a means of tracking implementation of the Plan.

1.0 INTRODUCTION

Vadnais Lake Area Water Management Organization (VLAWMO) was organized by a Joint Powers Agreement (JPA) in 1983 in response to the Minnesota Metropolitan Surface Water Act of 1982 (Minnesota Statutes {M.S.}, Section 473.875 to 473.883). This act required that watershed management organizations be established throughout the seven county metropolitan area to, among other goals, reduce flooding, improve water quality, prevent erosion, promote ground water recharge, and to provide for wildlife habitat. VLAWMO's JPA provides VLAWMO with the authority and the duty to prepare and implement a watershed management plan for the Vadnais Lakes Area Watershed (watershed). The first VLAWMO Watershed Management Plan was prepared, approved, and adopted in 1987.

The Metropolitan Surface Water Management Program (M.S. 103B) requires the VLAWMO to review and update its Water Management Plan (the Plan) every ten years. The second generation VLAWMO plan was prepared and adopted in 1995. That plan expired in 2006. The current Plan will be effective starting in 2007 and shall be updated by the year 2017. In addition to complying with the above laws, this Plan meets the requirements of Minnesota Rules 8410, 8420, and 8750. The Plan includes management standards and procedures for surface water, wetland, and groundwater issues.

The Plan also includes an inventory of existing physical and hydrological conditions and anticipated land use through the year 2030. This inventory, together with the general purposes of the Metropolitan Surface Water Management Act and input from the public, State and local agencies, were used to determine water resources goals, water resources policies, management strategies, and development of the implementation programs and priorities.

The current State rules require the Plan to include the following:

1. Protect, preserve, and use natural surface and groundwater storage and retention system;
2. Minimize public capital expenditures needed to correct flooding and water quality problems;
3. Identify and plan for means to effectively protect and improve surface water 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; and
8. Secure the other benefits associated with the proper management of surface water and groundwater.

As regulations change, VLAWMO will amend the existing sections or add new sections to the Plan. These changes will be made following the amendment procedures outlined in this Plan.

There are 11 separate governmental units within VLAWMO: five cities, one township, one water commission, two counties and two special purpose districts. The City of Shoreview also occupies a small portion of the watershed. These governmental units are listed in Table 1-1 and Figure 1-2. VLAWMO comprises approximately 23.5 square miles of area and generally follows the natural watershed boundaries. It extends over portions of Ramsey and Anoka counties, with greater surface area located in Ramsey County. The watershed is bounded on the north, west, and east by the Rice Creek Watershed District, on the southwest by the Grass Lake Watershed Management Organization and on the southeast by Ramsey-Washington Metro Watershed District (Figure 1-1).

TABLE 1-1
GOVERNMENTAL UNITS IN VLAWMO

Counties	Cities/Townships
Anoka County	Lino Lakes
	*Anoka County Soil and Water Conservation District
Ramsey County	Gem Lake
	North Oaks
	Vadnais Heights
	White Bear Lake
	Board of Water Commissioners of the City of St. Paul
	White Bear Township
	*Ramsey County Soil and Water Conservation District
*Special Purpose Districts	

Parties to the JPA include the cities of Lino Lakes, Gem Lake, North Oaks, Vadnais Heights, White Bear Lake, and White Bear Township.

FIGURE 1-1
VICINITY MAP – NORTH METRO VLAWMO

FIGURE 1-2
GOVERNMENTAL UNITS IN VLAWMO

2.0 LAND AND WATER RESOURCE INVENTORY

This section summarizes existing land and water resources data. The information is based on available records and publications gathered from public sources. The publications, surveys, and reports referenced are available for review at the VLAWMO office. Much of the information is presented by subwatershed. Subwatersheds used are shown in Figure 2-1. This was done to facilitate the development of the implementation portions of this Plan, presented in subsequent sections using a subwatershed framework.

2.1 PRECIPITATION

Rainfall data for predicting hydrology and designing hydraulic structures and facilities is presented in Table 2-1. It shows rainfall for various return periods (frequency) and durations for the metropolitan area, commonly taken from the U.S. Department of Commerce, Weather Bureau Technical Paper No. 40 (TP-40). This statistically derived data is useful for determining critical storms and computing peak rates of runoff.

The Ramsey Soil and Water Conservation District (RSWCD) maintains a database of rainfall information for Ramsey County. The rainfall readings, which have been maintained since 1988, are recorded and reported by volunteer residents of Ramsey County within RSWCD's network of gages. Their data is sent to the National Weather Service, Department of Commerce. The Board of Water Commissioners of the City of St. Paul (BWCSP) has been collecting rainfall data for over 30 years.

TABLE 2-1
RAINFALL IN MINNEAPOLIS/ST. PAUL AREA

Return Frequency	24-Hour (inches)	12-Hour (inches)	6-Hour (inches)	3-Hour (inches)	2-Hour (inches)	1-Hour (inches)	30-Minute (inches)	15-Minute (inches)
1-Year	2.3	2.0	1.7	1.5	1.4	1.2	0.9	0.6
2-Year	2.8	2.4	2.1	1.7	1.7	1.4	1.1	0.7
5-Year	3.6	3.1	2.7	2.3	2.2	1.8	1.4	1.0
10-Year	4.2	3.7	3.1	2.6	2.5	2.1	1.7	1.3
25-Year	4.6	4.2	3.5	3.0	2.8	2.3	1.9	1.4
50-Year	5.3	4.6	4.0	3.4	3.1	2.7	2.1	1.5
100-Year	5.9	5.0	4.4	3.8	3.5	2.9	2.4	1.7

Note: Precipitation listed here is for the Minneapolis-St. Paul Metropolitan Area. Precipitation can vary greatly within a small geographic area. Volunteers have been collecting some precipitation data within the VLAWMO area. That data is available at the VLAWMO office.

FIGURE 2-1
SUBWATERSHEDS

2.2 WATERSHED CHARACTERISTICS

2.2.1 GENERAL GEOLOGY

The watershed geology can be subdivided into two basic classifications: unconsolidated glacial sediments and consolidated bedrock formations. These deposits also form a sequence of aquifers and confining units that comprise the hydrogeologic setting.

The unconsolidated glacial sediments consist of glacial deposits. Glacial deposits refer to unconsolidated gravel, sand, silt, and clayey material deposited by glacial action. Typically, the glacial deposits found in the watershed are in the form of outwash, till, stream, and lake sediments. Outwash is composed of sand and gravel deposited by former glacial meltwater streams. They form a widespread mantle of sediment which overlays bedrock formations. The glacial sediments were deposited during the Quaternary geologic period by the actions of glaciers and modified by post-glacial erosion and soil formation processes. The Grantsburg and Superior sublobes laid down a large portion of the uppermost glacial deposits between 12,000 and 20,000 years ago in the watershed.

There are two prominent geomorphic regions located in the watershed: the North Ramsey Mounds and the Anoka Sand Plain.

North Ramsey Mounds: The surface till is a highly variable, complex mixture of sandy till (Superior sublobe) and clayey fill (Grantsburg sublobe) sediments that are horizontally layered in places. Mixing is intensified on the upglacier sides of obstacles beneath the ice and near the ice margin. The till is somewhat homogeneous in the subsurface. Many small shallow channels were incised into the moraine by Grantsburg meltwater. These channels are very subtle but commonly contain peat and stream and lake sediments that were deposited during the Holocene period.

Anoka Sand Plain: This area contains fine sand that was deposited as the Grantsburg Sublobe melted. The environment of deposition varied from broad outwash plain to a large shallow lake. The lake extended through the gaps in the North Ramsey Mound as narrow fingers. Sediments in former offshore positions of the lake include laminated lake clay, silt, and fine sand. Near-shore sediments of the lake are coarser.

All bedrock formations in the watershed are entirely marine sedimentary rocks of early Paleozoic age, a time when shallow seas covered southeastern Minnesota land and the surrounding region. The bedrock formations lie immediately beneath unconsolidated glacial deposits. The uppermost

bedrock formations in the region are the St. Peter Sandstone, Jordan Sandstone, and Prairie du Chien Sandstone. A small area within the watershed is founded on Platteville and Glenwood formations which lie on top of the St. Peter Sandstone.

Bedrock aquifers found in the watershed are the Platteville Formation, St. Peter Sandstone, and Prairie du Chien Group. Bedrock confining layers include clayey glacial till, Glenwood Formation, and basal St. Peter Sandstone. These bedrock aquifers are not evenly distributed and do not have similar physical attributes. For detailed aquifer parameters, see the Ramsey County Groundwater Quality Protection Plan.

For more detailed information on geomorphic regions, see the Ramsey County Geologic Atlas. The atlas contains the most current and comprehensive assessment of the geologic and hydrogeologic characteristics. Additional geologic and topographic data may be found in the local water management plans of Lino Lakes, Vadnais Heights, and North Oaks.

2.2.2 SOIL DATA

There are two dominant glacial parent materials in the watershed, those soils formed in glacial till and those formed in glacial outwash.

Hayden-Urban Land: Soil map units conclude this area is composed of soils formed in glacial till. These soils are typically well-drained and their slopes range from undulating to steep. Urban land soil components consist of residential developments and provide good support for building foundations and for fill materials used to support structures.

Zimmerman-Urban Land-Rifle and Urban Land-Chetek-Mahtomedi: Soil map units conclude this area is composed of soils formed in glacial outwash. These soils are underlain by fine sand to gravelly, coarse sand and urban land on uplands. The soils are generally well-drained to excessively-drained. Rifle soils are very deep organic units.

Soils found within the watershed are summarized in Table 2-2 for Ramsey County and Table 2-3 for Anoka County (Figure 2-2). These tables present soil name, map symbol, and the hydrologic group assigned by the Soil Conservation Services. The hydrologic groups are used to estimate runoff from precipitation. They are rated according to infiltration capacity and assigned to one of four groups. Group A has the highest infiltration rate and Group D has the lowest infiltration rate.

Detailed descriptions of soils, such as physical, chemical, and mechanical properties, as well as development limitations, are found in the Soil Survey of Washington and Ramsey counties, Minnesota and the Soil Survey of Anoka County, Minnesota, published by the U.S. Department of Agriculture Soil Conservation Service (currently the Natural Resources Conservation Service). Maps depicting soil map units are included in those documents. These county soil surveys are available for review at the VLAWMO office.

A study of sediment stratigraphy along the Lambert Creek portion of the watershed was completed in November 1991. The study evaluated the potential for sediments in the riparian wetlands of Lambert Creek to release and/or retain phosphorous. The study examined Sobota Slough, Rice Lake, Grass Lake, and Lambert Lake for phosphorous content in the sediment cores and relative phosphorous contribution to the downstream system (see *Sediment Storage Basins of the Lambert Creek/Vadnais Lake Watershed*).

2.2.3 DRAINAGE PATTERNS

Subwatersheds and general drainage patterns are shown in Figure 2-1 and are briefly described below by subwatershed:

- Subwatershed 1 - Lambert Creek: From its headwaters in the highly residential area of White Bear Lake, west of Highway 61 and Goose Lake, this former County Ditch 14 flows southwest through White Bear Township and Vadnais Heights to Vadnais Lake. County Ditch 13 drains the White Bear Lake portion into Sobota Slough, the first in a series of wetlands along County Ditch 14. Rice Lake and Grass Lake in White Bear Township and Vadnais Heights, respectively, are the next two wetlands in the chain. The final large wetland in the Lambert Creek Basin is Lambert Lake. Several branch ditches feed Lambert Creek either in Lambert Lake or just downstream of it. The final section of Lambert Creek tends to be deep and narrow as it winds through another residential area. It enters East Vadnais Lake about midway on the eastern side.

- Subwatershed 2 – Birch Lake: Birch Lake Subwatershed drains north to the Tamarack/Wilkinson Subwatershed. This subwatershed is within the City of White Bear Lake and White Bear Township. The subwatershed drains north to Subwatershed 3, Tamarack/Wilkinson.

- Subwatershed 3 – Tamarack/Wilkinson: Tamarack/Wilkinson Subwatershed has drainage from Amelia Lake to the north and Gilfillan Lake to the south that discharges to the Pleasant/Charley/Deep Lake Subwatershed, just west of Wilkinson Lake. This large subwatershed includes the far northern part of VLAWMO, including Lake Amelia in Lino

Lakes. Ditches connect Amelia, Wilkinson, and Black Lake in North Oaks. Gilfillan Lake just north of County Road 96 is at the southern extent of the subwatershed.

- Subwatershed 4 – Pleasant/Charley/Deep: Pleasant Lake and Charley Lake are part of the BWCSP water supply chain. The subwatershed generally drains south, discharging to the Vadnais/Sucker Subwatershed. There are also hydrologic connections (pipelines) owned by the BWCSP that can take water from Otter Lake and Centerville Lake in the Rice Creek Watershed and from the Mississippi River. Diversions from Rice Creek are infrequent and have not been needed for a number of years. Diversions from the Mississippi River are continuous and average approximately 70 percent of the supply to the BWCSP system.
- Subwatershed 5 – East Vadnais/Sucker (reservoir): East Vadnais/Sucker Subwatershed drains to the south. The BWCSP maintains an intake for the City of Saint Paul water supplies on East Vadnais Lake (there is no connection between East and West Vadnais Lake).
- Subwatershed 6 – Gem Lake: Gem Lake Subwatershed is surrounded by homes on large lots. The subwatershed is contained and does not discharge to other subwatersheds.
- Subwatershed 7 - West Vadnais Lake Subwatershed: West Vadnais Lake Subwatershed drains south to Gervais Lake and west to Grass Lake. Again this lake is not hydrologically connected to East Vadnais Lake.

In general, all water diverted or flowing through the watershed to East Vadnais Lake is diverted to the BWCSP system such that there is no discharge from the watershed.

TABLE 2-2
RAMSEY COUNTY
SOIL NAME, SYMBOL, AND HYDROLOGIC GROUP

Map Symbol	Soil Name	Hydrologic Group	Hydric Soil
75	Bluffton*	C/D	Yes
123	Dundas	B/D	Yes
132	Hayden**	B	No
155	Chetek**	B	No
158	Zimmerman**	A	No
159	Anoka**	B	No
161	Isanti*	A/D	Yes
162	Lino* **	B	No
169	Braham**	B	No
170	Blomford*	B/D	Yes
177	Gotham**	A	No
225	Nessel	B	No
265	Soderville**	A	No
302	Rosholt	B	No
342	Kingsley**	B	No
453	Demontreville**	B	No
454	Mahtomedi**	A	No
541	Rifle Muck*	A/D	Yes
542	Markey Muck*	A/D	Yes
544	Cathro Muck*	A/D	Yes
552	Kerston Muck*	A/D	Yes
860	Kingsley**	B	No
896	Mahtomedi**	A	No

Survey of Washington and Ramsey Counties Minnesota
(Available through the VLAWMO office or the RSWCD office)

* *poorly drained*
** *easily erodible*

TABLE 2-3
ANOKA COUNTY
SOIL NAME, SYMBOL, AND HYDROLOGIC GROUP

Map Symbol	Soil Name	Hydrologic Group	Hydric Soil
AnC	Anoka**	B	No
Bm	Blomford	B/D	Yes
Bt	Braham**	B	No
Cb	Cathro-muck*	A/D	Yes
Du	Dundas*	B/D	No
Gc	Glencoe	D	Yes
Hd	Hayden**	B	No
Km	Kingsley**	B/D	No
Kr	Kratka	B	Yes
LnA	Lino* **	B	No
NeA	Nessel	B	No
No	Nowen	B/D	No
Rf	Rifle*	A/D	Yes
SoA	Soderville**	A	No
Wb	Webster	B/D	Yes
Zm	Zimmermann**	A	No

Survey of Anoka County Minnesota & Hydrology for Small Urban Watershed
(Soil maps are available through Anoka County Soil and Water Conservation District office)
* poorly drained
** easily erodible

FIGURE 2-2
SOIL DATA

2.3 SURFACE WATER RESOURCES

2.3.1 PUBLIC/PROTECTED WATERS AND WETLANDS

Minnesota's protected waters and wetlands have been inventoried by the Minnesota Department of Natural Resources (MnDNR). Public/protected waters and wetlands have been designated by M.S 103G. Shown in Figure 2-3 are waters and wetland Types 3, 4, and 5 which are greater than 2.5 acres in the incorporated areas and 10 acres in the non-incorporated areas.

FIGURE 2-3
PROTECTED WATERS AND PUBLIC DITCH SYSTEM

2.3.2 PUBLIC DITCHES

Approximately half of the watershed is drained by the former Ramsey County ditch system. In 1916, Ramsey County constructed Ditch 13 and Ditch 14 to drain surface waters from Sobota Slough, Rice Lake, Grass Lake, and Lambert Lake. The drainage system was not entirely successful. The immediately adjacent lands remained as meadows and pastures and were not suitable for cash crops. Therefore, in 1927, the County Board authorized the construction of a branch ditch system consisting of six laterals (No. 1, 2, 3, 4, 5, and 5A), connecting to the main Ditch 14 (Figure 2-3).

Authority for management of this ditch system was delegated to VLAWMO in 1986 by Ramsey County. The primary purpose of the ditch system has changed to serve as a conveyance system for urban storm water runoff. Land use surrounding the ditch system has changed to primarily urban residential development with scattered agricultural uses still practiced. It is VLAWMO's intent to manage the ditch system as a storm water drainage system as identified under M.S. 103B.227, subdivision 7.

Portions of the ditches were no longer well-defined due to subsidence of the ditch bottom or collapse of the side walls, especially in those areas with poorly drained soils. Outlet structures were constructed on Grass Lake and Rice Lake in the late 1990s, and Lambert Lake in 2005, as part of the Lambert Creek Clean Water Partnership Projects. The purpose of the structures was to restore the wetlands, to moderate wet and dry cycles affecting the wetlands, and reduce phosphorus export.

2.3.3 NATIONAL WETLANDS INVENTORY MAP

The U.S. Fish and Wildlife Service completed the National Wetland Inventory (NWI) of wetlands in Minnesota in the late 1970s. The inventory was conducted using aerial photography and the Cowardin system of wetland classification. Field verification of the identified wetlands was not conducted. The NWI is presented on the U.S. Geological Survey (USGS) quadrangle maps. The NWI mapping identifies 1,024 wetland polygons that cover approximately 5,500 acres within the watershed. NWI wetlands not included in the VLAWMO wetland inventory are shown separately from the VLAWMO inventoried wetlands in Figure 2-4.

Larger scale NWI maps are available for review at the VLAWMO office and may be purchased at the Minnesota Bookstore in St. Paul. Due to the age and methodology of the NWI mapping, field verification by a wetland professional is necessary to determine actual wetland locations, boundaries, and types. Inventoried wetlands will be discussed in greater detail in Section 2.3.5: VLAWMO Comprehensive Wetland Management Plan.

FIGURE 2-4
NWI WETLANDS AND VLAWMO INVENTORIED WETLANDS

2.3.4 METROPOLITAN MOSQUITO CONTROL DISTRICT WETLAND MAP

The Metropolitan Mosquito Control District (MMCD) has inventoried all wetlands in Ramsey County greater than 400 square feet (or approximately 0.01 acre). The wetland inventory is updated every 5 years by field inspection. The wetland inventory maps are available for review at the MMCD.

2.3.5 VLAWMO COMPREHENSIVE WETLAND MANAGEMENT PLAN

The VLAWMO is responsible for local wetland regulation under the 1991 Minnesota Wetlands Conservation Act (WCA). As part of their role as wetland managers, VLAWMO recognized the need to more accurately determine the location, size, classification, functions, and values of the wetlands within the watershed. As a result, VLAWMO completed a Comprehensive Wetland Management Plan in December 2001.

The Comprehensive Wetland Management Plan includes an updated inventory, functional assessment, and management classification for each wetland identified within the watershed. The wetland inventory was completed in 1997 using aerial photos with field verification of wetland type and boundaries. The 1997 inventory identified 329 wetlands that cover a total of 4,268 acres within the watershed. The majority of wetlands identified in the inventory are less than 5 acres in size and are primarily shallow marsh, open water, and/or wet meadow wetland types (Table 2-4 and Table 2-5).

TABLE 2-4
WETLAND SIZE DISTRIBUTION

Wetland Size Distribution				
Less than 1 Acre	1 to 5 Acres	5 to 10 Acres	10 to 15 Acres	Greater than 15 Acres
NUMBER OF WETLANDS (PERCENTAGE OF TOTAL)				
141 (43 percent)	108 (33 percent)	28 (8 percent)	15 (5 percent)	37 (11 percent)

TABLE 2-5
INVENTORIED WETLAND TYPES

Relative Predominance of Wetland Types				
Wetland Type	**Description**	**Number of Wetlands (Percent of Total)**	**Acres of Wetland (Percent of Total)**	**Average Size (Acres)**
2	Wet Meadow	39 (12 percent)	44 (1 percent)	3.4
2/3 or 3	Wet Meadow/ Shallow Marsh	9 (3 percent)	133 (3 percent)	14.8
2/6	Wet Meadow/ Scrub Swamp	2 (<1 percent)	13 (<1 percent)	6.5
3	Shallow Marsh	135 (41 percent)	690 (16 percent)	5.1
3/2/7 or 3/7/2	Shallow Marsh/ Wet Meadow/ Wooded Swamp	4 (1 percent)	276 (7 percent)	69.0
3/4 or 4/3	Shallow/Deep Marsh	6 (2 percent)	16 (<1 percent)	2.7
3/5	Shallow Marsh/ Open Water	4 (1 percent)	112 (3 percent)	28.0
3/6	Shallow Marsh/ Shrub Swamp	7 (2 percent)	239 (6 percent)	34.1
4	Deep Marsh	16 (5 percent)	54 (1 percent)	3.4
4/5 or 5/4	Deep Marsh/ Open Water	3 (<1 percent)	169 (4 percent)	56.3
5	Open Water	101 (31 percent)	1,437 (34 percent)	14.2
5/4/3	Open Water/ Marsh	1 (<1 percent)	43 (1 percent)	43.0
5/6	Open Water/ Shrub Swamp	1 (<1 percent)	0.3 (<1 percent)	0.3
6	Shrub Swamp	8 (2 percent)	132 (3 percent)	16.5
6/3	Shrub Swamp/ Shallow Marsh	5 (2 percent)	192 (4 percent)	38.4
6/3/4	Shrub Swamp/Marsh	1 (<1 percent)	646 (15 percent)	646.0

Data for the functional assessment was collected during the field inventory of each wetland. A version of the Wisconsin Rapid Assessment Methodology (WRAM), modified to include soils data, was used to evaluate functions and values. Wetland function is a measure of how well a wetland performs a task, such as storing floodwater and protecting water quality. Wetland value is defined as the personal preferences or values that people use to rate the importance of wetland functions. The value of a particular wetland is based on its location. Conflicts may arise between wetland values, such as wildlife versus floodwater retention and between wetlands versus competing land uses. The WRAM was used to evaluate four functions and values as identified in Table 2-6.

TABLE 2-6
WETLAND FUNCTIONS AND VALUES

Function/Value	Description
Floral Diversity	The diversity of vegetation within a wetland is often an indicator of its ecological integrity. Florally diverse wetlands provide potential habitat for sensitive species.
Wildlife Habitat	Many species of wildlife spend all or certain seasons of the year in wetland habitats for breeding, brood rearing, feeding, or cover purposes.
Water Quality	Wetland plants absorb nutrients during their growth and development. This removal means cleaner water leaving the wetland. Wetlands can slow the flow of water moving through them. This allows sediments and associated nutrients time to settle out before the water is released to other wetlands, lakes, or streams.
Aesthetics and Recreation	Wetlands are often beautiful areas to observe unique plant and animal species. They are an amenity to residential and commercial development in urban environments. Hunters and fishermen also frequent wetland areas.

The functional assessment results are categorized into Medium, High, and Exceptional categories. Table 2-7 provides a summary of the functional assessment.

TABLE 2-7
FUNCTIONAL ASSESSMENT OF VLAWMO INVENTORIED WETLANDS

Number, Acres, and Relative Predominance of Wetlands in Selected Wetland Function Categories						
Category:	**Medium**		**High**		**Exceptional**	
Function	**Number of Wetlands (Percent of Total)**	**Acres of Wetland (Percent of Total)**	**Number of Wetlands (Percent of Total)**	**Acres of Wetland (Percent of Total)**	**Number of Wetlands (Percent of Total)**	**Acres of Wetland (Percent of Total)**
Floral Diversity	117 (36 percent)	641 (15 percent)	48 (15 percent)	1,505 (35 percent)	18 (5 percent)	968 (23 percent)
Wildlife Habitat	131 (40 percent)	1,631 (38 percent)	30 (9 percent)	1,349 (32 percent)	9 (3 percent)	968 (23 percent)
Water Quality	75 (23 percent)	609 (14 percent)	21 (6 percent)	1,584 (37 percent)	4 (1 percent)	395 (9 percent)
Aesthetics and Recreation	125 (38 percent)	1,170 (27 percent)	33 (10 percent)	1,501 (35 percent)	4 (1 percent)	902 (21 percent)

The functional assessment was used as the basis for determining the management classification for each wetland basin. Decisions on wetland management are based n resource value and public perception of wetland values. VLAWMO conducted public surveys and workshops to develop the management classification system. During this process, it was noted that some basins within the watershed have not been included in the current inventory and some of the sensitive or developing wetlands would require a more detailed functional assessment, such as the Minnesota Routine Assessment Methodology (MNRAM). Detailed functional assessments, using the most current version of MNRAM, are required for all projects affecting wetlands. The management

classifications developed through the planning process include High Priority Protection, Moderate Management, Light Management, and Utilize (Table 2-8). These management classifications were derived based on Figure 2-5.

TABLE 2-8
WETLAND MANAGEMENT CLASSIFICATIONS FOR VLAWMO WETLANDS

Management Class	Description
High Priority Protection Wetlands (HP)	High quality natural basins, quality adjacent uplands, valued for floral diversity, unique habitat, and water quality functions.
Moderate Management Wetlands (MM)	Moderate quality basins, some receiving direct storm water, valued for at least one of the above functions.
Light Management Wetlands (LM)	Significantly impacted to moderate quality basins, most receiving direct storm water, low vegetative diversity to monotype.
Utilize Wetlands (U)	Wetlands created for storm water management or highly impacted natural basins.

The summary of the management classification process is provided in Table 2-9 and Figure 2-4.

TABLE 2-9
SUMMARY OF WETLAND MANAGEMENT CLASSIFICATIONS BY SUBWATERSHED

Wetland Management Classification								
Subwatershed	High Priority		Moderate Management		Light Management		Utilize	
	Number (Quantity)	Acres	Number	Acres	Number	Acres	Number	Acres
Pleasant/Charley/Deep	22	1146	14	54	23	17	23	25
Tamarack/Wilkinson	19	702	34	254	41	198	48	71
Vadnais/Sucker	6	739	5	3	6	18	17	30
Lambert Creek	8	462	10	82	23	220	26	40
Birch Lake	2	1	4	124	12	22	7	5
Gem Lake	1	52	0	0	1	1	1	0.1

FIGURE 2-5
WETLAND VALUE MANAGEMENT CLASSIFICATION DECISION MATRIX

2.3.6 PHYSICAL CHARACTERISTICS OF PUBLIC WATERS

2.3.6.1 Hydrological Characteristics of Public Waters

Information furnished by the MnDNR includes water body size, ordinary high water levels (OHWL), and normal water levels (NWL) for most protected waters and wetlands (Table 2-10).

Table 2-10
Physical Characteristics of VLAWMO Lakes

Lake	Surface Area (AC)	Max. Depth (ft)	Subwatershed
Amelia	217	3	Tamarack/Wilkinson
Birch	127	6	Birch Lake
Black	--	--	Tamarack/Wilkinson
Charley	31	21	Pleasant/Charley/Deep
Deep	53	11	Pleasant/Charley/Deep
Gem	25	10	Gem Lake
Gilfillan	110	9	Tamarack/Wilkinson
Goose	145	6	Lambert Creek
Pleasant	585	58	Vandais/Sucker
Sucker	61	26	Vadnais/Sucker
Tamarack	86	3	Tamarack/Wilkinson
Vadnais East	394	58	Vandais/Sucker
Vadnais West	216	9	Vandais/Sucker

2.3.6.2 Storm Water System

Local communities are required to develop Local Water Plans (LWP). LWPs will include information on the storm sewer drainage systems and resulting discharge rates and include a map of the storm water system. The map should include the direction of flow and identify existing storm water ponds, storage, and the location of storm water outfalls. The LWPs should also analyze peak flow rates and storage volume capacity for each subwatershed. Those plans will be available at city offices and at the VLAWMO office for reference. During the production of this plan, VLAWMO was considering the applicability of becoming a storm water utility and working with water quantity. VLAWMO's Current modeling direction is focused on water quality.

2.3.7 BOARD OF WATER COMMISSIONERS ST. PAUL REGIONAL WATER SYSTEM

The VLAWMO has designated water bodies which convey water directly to the BWCSP system as

BWCSP-protected waters. The BWCSP supply system consists of impoundment reservoirs that are supplied by diversions from the Mississippi River to Pleasant Lake and by runoff from within VLAWMO Watershed. Within VLAWMO, the system consists primarily of three reservoirs: Pleasant Lake, Sucker Lake, and the final impoundment, East Vadnais Lake, at which point the water is conveyed to the filtration plant. Additionally, BWCSP exercises water elevation and flow control over feeder lakes to the three reservoir lakes. These feeder lakes are Charley, Deep, and Wilkinson. Adjacent lands and alterations to these waterbodies will receive the greatest protection from VLAWMO. As we look at the Board of Water system, we will address Lambert Creek as an effort to manage source water protection.

2.3.8 FLOODPLAINS

2.3.8.1 Flood Insurance Study and Flood-Prone Areas

At this time, no serious flood prone areas have been identified within the VLAWMO. Table 2-11 lists the most current flood insurance study reports and the available flood insurance rate maps for VLAWMO. The flood insurance rate maps are available for review at the offices of the MnDNR and member communities, and are available on-line at the Federal Emergency Management Agency (FEMA) map store www.msc.fema.gov.

Ramsey County is in the process of conducting a countywide flood insurance restudy. The restudy is being conducted by FEMA and it will be made available digitally from FEMA and Ramsey County.

TABLE 2-11
AVAILABLE FLOOD INSURANCE STUDY

City	Year	Description	Number
Lino Lakes	1982	Flood Insurance Rate Map	270015
Vadnais Heights	2002	Flood Insurance Rate Map	270385
White Bear Lake	1987	Flood Insurance Rate Map	20386A
White Bear Township	1985	Flood Insurance Rate Map	270688

Federal Emergency Management Agency

2.3.8.2 Flood Levels and Peak Discharges

The flood levels and peak discharge information for Lambert Creek Subwatershed Basin are presented in Table 2-12. This information is not intended for use in setting flood levels or low flood elevations of structures.

TABLE 2-12
LAMBERT CREEK WATERSHED HYDROLOGIC MODELING RESULTS

Structure Number	Outlet Description	Outlet Location	Upstream Invert Elevation (MSL)	Downstream Invert Elevation (MSL)	Peak Discharge (cfs)	Peak Elevation (MSL)
03	2-5' x 7' CMP-A 64' Long	Across Whitaker Avenue Approximately 900' East of Margaret Avenue	911.33	911.07	560	917.8
07	11" Orifice	Goose Lake Outlet				
08	48" RCP 79' Long	Across Otter Lake Road Approximately 800' South of Whitaker Avenue	908.68	908.83	131	917.1
10	6' Weir	Rice Lake Outlet East of Oakmede Lane Approximately 680' South of Bibeau Road	911.00		50	913.3
12	4' x 6' RCP-A 41' Long	Road Crossing Southwest of Pond View Lane Cul-de-Sac	905.26	905.21	9	916.4
16	2-5' Wrs	Grass Lake Outlet East of I-35E Approximately 300' South of County Road F	905.00		49	906.2
90	54" RCP 145' Long	Lambert Lake Outlet Crossing Edgerton Street	889.94	889.81	83	896.3
91	54" RCP 145' Long	Crossing Koehler Road (East Crossing)	889.82	889.73	83	894.4
92	54" RCP 114' Long	Crossing Koehler Road (West Crossing)	887.46	887.29	86	892.3
97	48" CMP	Crossing McMenemy Street	881.91	882.17	139	881.2

2.3.9 HYDROLOGIC INFORMATION

2.3.10 WATER QUALITY DATA

There are four programs involved in the acquisition of water quality and water resources related data within the VLAWMO. These include:

- The MPCA Citizen Lake Monitoring Program (CLMP)
- The VLAWMO CLMP
- The VLAWMO Lake Level Monitoring Program
- The BWCSP Monitoring Program

There is lake level monitoring data from the MnDNR's Volunteer Lake Level Monitoring Program, and water quality data associated with MnDNR fishery survey reports available on the MnDNR Lake Finder website.

The following presents a summary of the data from the VLAWMO CLMP and the BWCSP Program. The basic MPCA CLMP program collects secchi disk transparency (SDT) data with the use of volunteers. This is similar to the VLAWMO CLMP program, with the exception that more data is collected: TP, chlorophyll-a, and SDT. The MPCA CLMP data is not discussed separately since this data is also part of the VLAWMO CLMP. The exception appears to be secchi transparency data for Pleasant Lake, which is from the MPCA CLMP Program, which is not part of the VLAWMO CLMP Program. Figure 2-6 shows the waterbodies monitored in the two programs.

2.3.10.1 VLAWMO Citizen Lake Monitoring Program

The VLAWMO CLMP was initiated in 1997. The purpose of the program is threefold:

- To begin measuring and documenting water quality for the purpose of having historical data with which to compare potential disturbances;
- To involve the community in the monitoring process, allowing them better awareness of the environment; and
- To reduce the cost of gaining data through conventional methods by using volunteers and the resources of the BWCSP.

Volunteers collect samples, which are transported to the laboratory by program assistant, Leanne Lemire. Lab analysis was done by the BWCSP lab from 1997 to 2005. Analysis has been done by the certified Ramsey County lab since 2006. Goose Lake's west basin is receiving separate monitoring as of 2006. Previous monitoring was of the east basin on Goose Lake. An Annual

Citizen's Lake Monitoring Report is completed by program assistant, Leanne Lemire. Copies of the report are available from the VLAWMO office.

The focus of the VLAWMO CLMP is on these lakes not monitored by the BWCSP:

- Amelia Lake
- Birch Lake
- Gem Lake
- Gilfillan Lake
- Gilfillan Storm Pond
- Goose Lake
- Tamarack Lake
- Wilkinson Lake

Parameters measured include Total Phosphorus (TP), secchi disk transparency (SDT), and Chlorophyll-a. Phosphorus (P) is often the limiting nutrient for plant growth in lake systems. Additions of P (e.g., external P inputs) will therefore enhance plant growth, including algae. Chlorophyll-a is a green pigment in algae. Measuring chlorophyll-a concentration gives an indication of how abundant algae are in a waterbody. Secchi depth is a measure of water transparency (how deep you can see through the water column). Murky and cloudy lakes have low secchi depth readings. A summary of the data and lake conditions is presented below. Analysis of the data is presented later in this section (2.3.11). Table 2-13, Table 2-14, and Table 2-15 present the annual average values for TP, SDT, and chlorophyll-a, respectively, as presented in the VLAWMO Citizen's Lake Monitoring Report for the monitored lakes.

FIGURE 2-6
CURRENT MONITORING SITES

TABLE 2-13
AVERAGE TOTAL PHOSPHORUS CONCENTRATIONS FOR VLAWMO CLMP LAKES (JUNE – SEPTEMBER)

Year	Amelia Lake TP, µg/L	Birch Lake TP, µg/L	Gem Lake TP, µg/L	Gilfillan Lake TP, µg/L	Gilfillan Pond TP, µg/L	Goose Lake TP, µg/L	Tamarack Lake TP, µg/L	Wilkinson Lake TP, µg/L
1997	28(2)	22(2)	54(1)	96(1)	---	21(2)	17(2)	---
1998	36(8)	41(7)	33(5)	47(9)	59(8)	17(8)	54(6)	48(8)
1999	38(6)	31(10)	26(5)	72(7)	97(6)	475(6)	90(6)	62(7)
2000	40(5)	27(9)	36(11)	35(9)	23(6)	49(3)	60(7)	38(5)
2001	33(3)	42(8)	56(6)	84(8)	142(8)	603(5)	132(11)	299(3)
2002	34(6)	31(8)	39(8)	81(10)	141(9)	613(6)	164(7)	107(6)
2003	29(5)	35(7)	52(7)	44(7)	234(6)	342(5)	168(6)	130(5)
2004	28(4)	31(7)	49(7)	58(9)	97(8)	526(7)	96(9)	72(4)
2005	24(4)	31(8)	43(7)	52(9)	101(8)	407(4)	143(8)	183(4)

(#) – represent number of samples

TABLE 2-14
AVERAGE SECCHI DISK TRANSPARENCY (SDT) VALUES FOR VLAWMO CLMP LAKES (JUNE – SEPTEMBER)

Year	Amelia Lake SDT, m	*Birch Lake SDT, m	Gem Lake SDT, m	Gilfillan Lake SDT, m	Gilfillan Pond SDT, m	Goose Lake SDT, m	Tamarack Lake SDT, m	Wilkinson Lake SDT, m
1997	1.5(1)	2.4(6)	1.2(5)	0.5(7)		0.4(8)	0.2(3)	---
1998	1.1(5)	2.4(7)	---	0.5(9)	0.3(9)	0.2(8)	0.5(6)	1.1(7)
1999	1.2(7)	2.4(10)	1.2(1)	---	---	0.3(5)	0.4(6)	---
2000	0.9(3)	2.4(9)	1.1(9)	---	---	0.3(3)	0.4(6)	---
2001	1.1(2)	2.4(8)	1.8(1)	---	0.4(4)	0.3(6)	0.4(7)	0.2(10)
2002	1.4(7)	2.4(9)	1.3(6)	0.4(10)	---	0.2(6)	0.4(8)	---
2003	1.5(5)	2.4(7)	1.4(8)	1.4(10)	---	0.3(1)	0.3(6)	---
2004	---	---	1.5(8)	---	---	---	0.8(2)	---
2005**	---	---	---	---	---	---	---	---

(#) – represent number of samples

*Data may be biased by clarity values being greater than lake depth.

**2005 SDT data not available at the time VLAWMO CLMP Report

TABLE 2-15
AVERAGE CHLOROPHYLL-A CONCENTRATIONS FOR VLAWMO CLMP LAKES (JUNE – SEPTEMBER)

Year	Amelia Lake Chl-a, µg/L	Birch Lake Chl-a, µg/L	Gem Lake Chl-a, µg/L	Gilfillan Lake Chl-a, µg/L	Gilfillan Pond Chl-a, µg/L	Goose Lake Chl-a µg/L	Tamarack Lake Chl-a, µg/L	Wilkinson Lake Chl-a, µg/L
1997	---	14(1)	23(1)	32(1)	---	134(1)	180(2)	---
1998	14(8)	4(4)	24(4)	44(9)	44(9)	93(5)	32(5)	26(5)
1999	9(4)	8(4)	16(2)	23(5)	12(1)	56(2)	26(4)	8(2)
2000	12(4)	14(8)	17(11)	47(8)	57(7)	154(3)	27(5)	34(3)
2001	8(3)	8(6)	12(6)	20(6)	13(6)	28(4)	37(5)	99(6)
2002	13(5)	10(7)	25(6)	43(8)	42(7)	170(4)	120(6)	40(8)
2003	7(2)	13(6)	20(6)	25(7)	41(3)	66(3)	95(4)	18(6)
2004	---	---	---	---	---	---	---	---
2005	7(4)	4(9)	26(7)	8(11)	130(7)	38(1)	65(8)	52(8)

(#) – represent number of samples

2.3.10.2 VLAWMO Lake Level Monitoring Program

The VLAWMO lake level monitoring program is a collaboration between VLAWMO and MnDNR. This program was initiated August 2006. Data is collected and submitted to MnDNR for review and inclusive in the state lakefinder website. VLAWMO lakes in this program are:

- Birch Lake
- Gem Lake
- Gilfillian Lake
- Goose Lake

2.3.10.3 VLAWMO Stream Monitoring Data

VLAWMO is collecting Lambert Creek Stream monitoring data as of 2006. A VLAWMO intern and Cub Scout troop, lead by Gary Cox, submitted the data to the MPCA Citizen Stream Monitoring Program.

2.3.10.4 BWCSP Monitoring Program

There were historically nine surface water monitoring sites sampled and maintained by the BWCSP. Continuous flow records and primarily levels of nutrients and solids are measured. Measurements were taken to detect the presence and concentrations of phosphorous, Kjeldahl nitrogen, ammonia,

chlorophyll-a, and total suspended solids. More recently, two sites are monitored on Lambert Creek (Lambert Mouth and Lambert Creek East), four sites are monitored on East Vadnais Lake (Vadnais Gatehouse, Vadnais Lake Central, Vadnais Lake North, and Vadnais Lake South), and the outlets of Sucker and Pleasant lakes are monitored. With the more recent monitoring, chlorophyll-a is not analyzed and SDT was only measured in 2000 and 2001. The locations of the monitoring sites are shown on Figure 2-4.

An analysis of the BWCSP water quality, made during the period of 1984 to 1999, is presented by Walker (Evaluation of Water Quality Controls in the St. Paul Water Utility Watersheds: Analysis of 1984-1999 Monitoring Data, 2000). The basic conclusions of this analysis are that:

- The Vadnais Lake chain water quality is generally improving.
- There are declining trends in phosphorus from water supply sources: Mississippi River, Sucker and Pleasant Lakes, and Vadnais Creek. Uncertain about Lambert Creek trends.
- Vadnais Lake phosphorus levels show no trends during the 1989 to 1999 period. However, the average TP concentration of about 30µg/L is near the 25µg/L and represents a decrease of about 50 percent compared to 1984 to 1986 conditions.
- Numerical goals for Vadnais Lake have been achieved for the Total Nitrogen (TN) to TP ratio, the silica (Si) to TP ratio, and the iron (Fe) to TP ratio.
- Approaching the numerical goals for TP concentrations, algae bloom frequency, and taste and odor.

A brief analysis of more recent data for TP is presented below. Figure 2-7 presents a graph of the TP data for the two Lambert Creek sites and shows that TP generally decreases from upstream to the downstream site, with the exception of some higher concentrations at Lambert Mouth in 2003 and 2004.

Table 2-16 presents the 2000 through 2005 growing season (May through September) average surficial TP concentration for the four East Vadnais Lake sites and the Pleasant Lake and Sucker Lake outlet sites. With the exception of the Vadnais Lake Gatehouse site, average East Vadnais Lake TP concentrations are around or slightly above the 25 µg/L goal for most years.

FIGURE 2-7
LAMBERT CREEK MONITORING RESULTS, 2000-2005 BWCSP DATA

TABLE 2-16
TP CONCENTRATIONS FOR BWCSP MONITORED LAKES (MAY – SEPTEMBER)

Year	Pleasant Lake Outlet TP µg/L	Sucker Lake Outlet TP, µg/L	Vadnais Lake Gatehouse TP, µg/L	Vadnais Lake Central TP, µg/L	Vadnais Lake North TP, µg/L	Vadnais Lake Gatehouse TP, µg/L
2000	36	28	21	32	---	---
2001	44	31	46	---	21	21
2002	54	35	31	---	27	27
2003	60	38	34	22	26	25
2004	38	39	40	---	32	28
2005	32	33	28	---	26	30

2.3.11 ASSESSMENT OF MONITORING DATA

Assessment of the CLMP and BWCSP lake monitoring data was completed using four assessment methods:

1. Comparisons with ecoregion mean values.
2. Comparison with State thresholds used for assessing primary-contact recreation (i.e., swimming) and aesthetics impairment in lakes.
3. Calculation of Trophic State Index (TSI) Values, and use of Metropolitan Council's "Lake Grade" system.
4. General screening for temporal trends.

Comparison with Ecoregion Mean Values. The Vadnais Lakes area falls in the North Central Hardwoods Forest (NCHF) Ecoregion. Analysis of data by the MPCA, for reference lakes in the ecoregion, found the following summer average water quality characteristics for the interquartile range (the central 50 percent of lakes):

- Total Phosphorus 23 to 50 µg/L
- Chlorophyll-a 5 to 22 µg/L
- Secchi Disk Transparency (SDT) 1.5 to 3.2 M

Comparison of the VLAWMO CLMP TP data with the ecoregion range for TP, shows that Amelia Lake and Birch Lake TP concentrations are within the interquartile range, while Gem Lake exceeds the seventy-fifth percentile (i.e., is higher than 75 percent of the reference lakes in the region) 2 out of 9 years. The other lakes and Gilfillan Pond are consistently above the seventy-fifth percentile.

Comparison of the VLAWMO CLMP SDT data in Table 2-14, with the ecoregion range, shows that with the exception of Birch Lakes, the averages are at or below the twenty-fifth percentile (i.e., 75 percent of reference lakes in the region have higher values) for most years. However, this may not be a valid comparison for some of these lakes. It appears, from the data secchi disk, readings can be seen all the way to the bottom of the lake, and the reading is recorded as greater than that depth. This right-censors the data and prevents higher values, which reflect the actual clarity from being recorded and can significantly bias results. Comparison of the CLMP chlorophyll-a data in Table 2-15, with the ecoregion range for chlorophyll-a, shows similar results to TP with Amelia and Birch lakes in the range, Gem Lake is occasionally over the seventy-fifth percentile and the other lakes are over the seventy-fifth percentile in most years.

Assuming the water quality measured at the outlets of Sucker and Pleasant lakes represent the quality of the surficial water within the lakes, comparison of the TP data in Table 2-16 shows that average Sucker Lake TP concentrations are within the interquartile range for ecoregion lakes, while Pleasant Lake exceeded the seventy-fifth percentile 2 out of 6 years. Also, review of Table 2-16 shows that Sucker Lake, in general, has lower TP concentrations than Pleasant Lake. This results from Sucker Lake receiving most of it hydrologic budget from Pleasant Lake and having TP losses from sedimentation. The TP concentrations for East Vadnais Lake at all BWCSP monitoring sites are within the interquartile range.

Comparison with State thresholds for assessing swimming impairment. The MPCA (2005: Guidance Manual For Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment 305(b) and 303(d) List) published TP, chlorophyll-a, and SDT thresholds for the NCHF Ecoregion for determination of primary-contact recreation and aesthetics use support shown in Table 2-17.

TABLE 2-17
TROPHIC STATUS THRESHOLDS FOR NCHF ECOREGION

	TP, µg/L	Chl-a, µg/L	SDT, m
Full Support: Not Listed as impaired	<40	<15	>1.2
Partial Support to Potential Non-Support: Review for Determination of Impairment	40-45	--	--
Partial Support to Potential Non-support: Listed as Impaired	>45	>18	<1.1

Source: MPCA, 2005. Guidance manual for assessing the quality of Minnesota surface waters for the determination of impairment 305(b) and 303(d) List

Comparison of the VLAWMO CLMP lakes with these thresholds shows that Amelia and Birch Lakes would be considered fully supporting, while the other five lakes and Gilfillan Pond would probably be listed as impaired.

Assuming the water quality measured at the outlets of Sucker and Pleasant lakes represent the quality of the surficial water within the lakes comparison of the TP data in Table 2-15 with the MPCA threshold for TP, shows that Sucker Lake would be fully supporting, while Pleasant Lake would probably get a closer review for determination of impairment because of the year-to-year variability.

Calculation of TSI and Lake Grades: Lake water quality is often described by its "trophic" or nourishment status. For low concentrations of nutrients (oligotrophic), there is little available nourishment, hence, little aquatic life including fish. If there is too much (hypereutrophic), the excessive nourishment often results in excessive algal growth. Moderate amounts (mesotrophic) are generally considered ideal for recreational purposes. The following schematic illustrates the relationships between trophic status and the Metropolitan Council Environmental Services (MCES) lake grade.

MCES Lake Grade	A	B	C	D	F
	◄	———	———	———	►
Trophic Status	*Oligotrophic*	*Mesotrophic*		*Eutrohpic*	*Hypereutrophic*
Nourishment	*few, small, scanty*	*moderately good*	*good, agreeable*	*above, overt excessive*	

MCES lake grades have been calculated for the VLAWMO CLMP lakes for the period of 1997 to 2005 (Table 2-18).

TABLE 2-18
VLAWMO CLMP LAKE GRADES, 1997-2005

Lake	MCES Grade
Amelia	B-
Birch	B
Gem	C
Gilfillan	C
Goose	F
Tamarack	D-
Wilkinson	D+

Source: VLAWMO Citizen's Lake Monitoring Report for 2005 by Leanne Lemire

Carlson's TSIs are calculated based on certain water quality indicators to determine where the lake fits on this continuum. These indicators are total phosphorus concentration, chlorophyll-a

concentration, and secchi depth. The TSIs are calculated based on relationships between these indicators and trophic status. High TSIs correspond to higher nutrient status. Calculated TSI values for VLAWMO CLMP monitored lakes and BWCSP-monitoring lake sites and outlets, are presented in Table 2-19 and Table 2-20. Table 2-21 describes lake conditions related to trophic state.

In general, TSI values are reasonably close for the three parameters with SDT and Chlorophyll-a behaving as expected given TP concentration for Amelia Lake and Gem Lake. This suggests that the availability of phosphorus controls production and there are no problems with non-algal turbidity. The data also indicates that clarity in Gem Lake is a little better than expected. SDT data for Birch Lake is higher than expected given the Chlorophyll-a and TP, which indicates the possibility of measurement or instrument problems. Gilfillan Pond, Tamarack Lake, and Wilkinson Lake data imply the presences of some non-algal turbidity. Chlorophyll-a is less than expected and clarity is worse than expected. However, only two years of SDT data was collected for Gilfillan Pond and Wilkinson Lake. Gilfillan Lake varies with Chlorophyll-a worse than expected, given TP concentration from 1998 to 2000 and better than expected from 2001 to 2005. This could be a sign of data quality issues. Goose Lake varies from year to year with very high TP and Chlorophyll-a slightly less than expected. This suggests Goose Lake either has non-algal turbidity and/ or light limitations for algal production.

General Screening for Temporal Trends

MPCA CLMP data for Pleasant Lake illustrates trends consistent with Walker's findings. Pleasant Lake quality has generally improved when comparing SDT data from the mid 1970's to data collected in recent years. VLAWMO monitored lakes trend graphs are attached as**Error! Reference source not found.**. It should be noted that these trend graphs are not vigorous trend analyses. However, review of the graphs shows:

- Possible negative trends in water quality for Goose, Gem, Tamarack, and Wilkinson lakes, and
- Slight water quality improvements over time in Birch and Amelia lakes

TABLE 2-19 TSI VALUES FOR VLAWMO CLMP LAKES (JUNE – SEPTEMBER)

Year	Amelia Lake	Birch Lake	Gem Lake	Gilfillan Lake	Gilfillan Pond	Goose Lake	Tamarack Lake	Wilkinson Lake
1997	TSI_{tp} - 52 TSI_{sdt} - 54 TSI_{chl-a} - M	TSI_{tp} - 49 TSI_{sdt} - 47 TSI_{chl-a} - 56	TSI_{tp} - 62 TSI_{sdt} - 57 TSI_{chl-a} - 61	TSI_{tp} - 70 TSI_{sdt} - 70 TSI_{chl-a} - 65	TSI_{tp} - M TSI_{sdt} - M TSI_{chl-a} - M	TSI_{tp} - 48 TSI_{sdt} - 73 TSI_{chl-a} - 79	TSI_{tp} - 45 TSI_{sdt} - 83 TSI_{chl-a} - 82	TSI_{tp} - M TSI_{sdt} - M TSI_{chl-a} - M
1998	TSI_{tp} - 56 TSI_{sdt} - 59 TSI_{chl-a} - 56	TSI_{tp} - 58 TSI_{sdt} - 47 TSI_{chl-a} - 44	TSI_{tp} - 55 TSI_{sdt} - M TSI_{chl-a}- 62	TSI_{tp} - 60 TSI_{sdt} - 70 TSI_{chl-a} - 68	TSI_{tp} - 63 TSI_{sdt} - 77 TSI_{chl-a} - 68	TSI_{tp} - 45 TSI_{sdt} - 83 TSI_{chl-a} - 75	TSI_{tp} - 62 TSI_{sdt} - 70 TSI_{chl-a} - 65	TSI_{tp} - 60 TSI_{sdt} - 59 TSI_{chl-a} - 63
1999	TSI_{tp} - 57 TSI_{sdt} - 57 TSI_{chl-a} - 52	TSI_{tp} - 54 TSI_{sdt} - 47 TSI_{chl-a} - 51	TSI_{tp} - 51 TSI_{sdt} - 57 TSI_{chl-a} - 58	TSI_{tp} - 66 TSI_{sdt} - M TSI_{chl-a} - 61	TSI_{tp} - 70 TSI_{sdt} - M TSI_{chl-a} - 55	TSI_{tp} - 93 TSI_{sdt} - 77 TSI_{chl-a} - 70	TSI_{tp} - 69 TSI_{sdt} - 73 TSI_{chl-a} - 63	TSI_{tp} - 64 TSI_{sdt} - M TSI_{chl-a} - 51
2000	TSI_{tp} - 57 TSI_{sdt} - 62 TSI_{chl-a} - 55	TSI_{tp} - 52 TSI_{sdt} - 47 TSI_{chl-a} - 56	TSI_{tp} - 56 TSI_{sdt} - 59 TSI_{chl-a} - 58	TSI_{tp} - 55 TSI_{sdt} - M TSI_{chl-a} - 68	TSI_{tp} - 49 TSI_{sdt} - M TSI_{chl-a} - 70	TSI_{tp} - 60 TSI_{sdt} - 77 TSI_{chl-a} - 80	TSI_{tp} - 63 TSI_{sdt} - 73 TSI_{chl-a} - 63	TSI_{tp} - 57 TSI_{sdt} - M TSI_{chl-a} - 65
2001	TSI_{tp} - 55 TSI_{sdt} - 59 TSI_{chl-a} - 51	TSI_{tp} - 58 TSI_{sdt} - 47 TSI_{chl-a} - 51	TSI_{tp} - 62 TSI_{sdt} - 52 TSI_{chl-a} - 55	TSI_{tp} - 68 TSI_{sdt} - M TSI_{chl-a} - 60	TSI_{tp} - 76 TSI_{sdt} - 73 TSI_{chl-a} - 56	TSI_{tp} - 96 TSI_{sdt} - 77 TSI_{chl-a} - 63	TSI_{tp} - 75 TSI_{sdt} - 73 TSI_{chl-a} - 66	TSI_{tp} - 86 TSI_{sdt} - 83 TSI_{chl-a} - 76
2002	TSI_{tp} - 55 TSI_{sdt} - 55 TSI_{chl-a} - 56	TSI_{tp} - 54 TSI_{sdt} - 47 TSI_{chl-a} - 53	TSI_{tp} - 57 TSI_{sdt} - 56 TSI_{chl-a} - 62	TSI_{tp} - 68 TSI_{sdt} - 73 TSI_{chl-a} - 67	TSI_{tp} - 76 TSI_{sdt} - M TSI_{chl-a} - 67	TSI_{tp} - 97 TSI_{sdt} - 83 TSI_{chl-a} - 81	TSI_{tp} - 78 TSI_{sdt} - 73 TSI_{chl-a} - 78	TSI_{tp} - 72 TSI_{sdt} - M TSI_{chl-a} - 67
2003	TSI_{tp} - 53 TSI_{sdt} - 54 TSI_{chl-a} - 50	TSI_{tp} - 55 TSI_{sdt} - 47 TSI_{chl-a} - 56	TSI_{tp} - 61 TSI_{sdt} - 55 TSI_{chl-a} - 60	TSI_{tp} - 59 TSI_{sdt} - 55 TSI_{chl-a} - 62	TSI_{tp} - 83 TSI_{sdt} - M TSI_{chl-a} - 67	TSI_{tp} - 88 TSI_{sdt} - 77 TSI_{chl-a} - 72	TSI_{tp} - 78 TSI_{sdt} - 77 TSI_{chl-a} - 75	TSI_{tp} - 74 TSI_{sdt} - M TSI_{chl-a} - 59
2004	TSI_{tp} - 52 TSI_{sdt} - M TSI_{chl-a} - M	TSI_{tp} - 54 TSI_{sdt} - M TSI_{chl-a} - M	TSI_{tp} - 60 TSI_{sdt} - 54 TSI_{chl-a} - M	TSI_{tp} - 63 TSI_{sdt} - M TSI_{chl-a} - M	TSI_{tp} - 70 TSI_{sdt} - M TSI_{chl-a} - M	TSI_{tp} - 94 TSI_{sdt} - M TSI_{chl-a} - M	TSI_{tp} - 70 TSI_{sdt} - 63 TSI_{chl-a} - M	TSI_{tp} - 66 TSI_{sdt} - M TSI_{chl-a} - M
2005	TSI_{tp} - 50 TSI_{sdt} - M TSI_{chl-a} - 50	TSI_{tp} - 54 TSI_{sdt} - M TSI_{chl-a} - 44	TSI_{tp} - 58 TSI_{sdt} - M TSI_{chl-a} - 63	TSI_{tp} - 61 TSI_{sdt} - M TSI_{chl-a} - 51	TSI_{tp} - 71 TSI_{sdt} - M TSI_{chl-a} - 78	TSI_{tp} - 91 TSI_{sdt} - M TSI_{chl-a} - 66	TSI_{tp} - 76 TSI_{sdt} - M TSI_{chl-a} - 70	TSI_{tp} - 79 TSI_{sdt} - M TSI_{chl-a} - 69

TABLE 2-20
TSI VALUES FOR BWCSP MONITORED LAKE SITES AND LAKE OUTLETS (MAY – SEPTEMBER)

Year	Pleasant Lake Outlet	Sucker Lake Outlet	Vadnais Lake Gatehouse	Vadnais Lake Central	Vadnais Lake North	Vadnais Lake South
2000	56	52	48	54		
2001	58	54	59		48	48
2002	62	56	54		52	52
2003	63	56	55	49	51	50
2004	57	57	57		54	52
2005	54	55	52		51	53

TABLE 2-21
LAKE CONDITIONS AND CARLSON'S TSI

TSI	Lake Condition
<30	Classical oligotrophy: Clear water, oxygen throughout the year in the hypoliminion, Salmonid fisheries in deep lakes.
30-40	Deeper lakes still exhibit classical oligotrophy, but some shallower lakes will become anoxic in the hypoliminion.
40-50	Water moderately clear, but increasing probability of anoxia in hypolimnion during summer.
50-60	Lower boundary of classical eutrophy: Decreased transparency, anoxic hypolimnia during the summer, macrophyte problems evident, and warm-water fisheries only.
60-70	Dominance of blue-green algae, algae scums probable, extensive macrophyte problems.
70-80	Heavy algal blooms possible throughout the summer, dense macrophyte beds, but extent limited by light penetration. Often would be classified as hypereutrophic.
>80	Algal scums, summer fish kills, few macrophytes, dominance of rough fish.

2.3.12 MPCA IMPAIRED WATERS

The Federal Clean Water Act (CWA) requires States to adopt water quality standards to protect the nation's waters. The CWA requires States to publish, every two years, an updated list of streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the 303 (d) list, is based on violations of water quality standards and is organized by river basin. These standards define how much of a pollutant can be in a surface and/or ground water while still allowing it to meet its designated uses, such as for drinking water, fishing, swimming, irrigation, or industrial purposes. Many of Minnesota's water resources cannot currently meet their designated uses because of pollution problems from a combination of point and nonpoint sources.

For each pollutant that causes a water body to fail to meet State water quality standards, the Federal CWA requires the MPCA to conduct a total maximum daily load (TMDL) study. The TMDL study identifies both point and nonpoint sources of each pollutant that fails to meet water quality standards.

The 2006 MPCA list of impaired waters includes Vadnais Lake East and Pleasant Lake, both for aquatic consumption and mercury. These impairments relate to risk from mercury through the consumption of fish.

2.3.13 EXOTIC SPECIES

Eurasian water milfoil (*Myriophyllum spicatum L.*), Curlyleaf Pondweed (*Potamogeton crispus*), and Common Carp (*Cyprinus carpio*) are all exotic species present in VLAWMO.

Eurasian water milfoil is an herbaceous perennial plant with a trailing growth habit. Eurasian water milfoil is a highly aggressive aquatic plant that can form dense mats which congest waterways and crowd out native aquatic plants. This growth can impair recreational uses of waterways including boating, swimming, and fishing. Dense growth of Eurasian water milfoil can alter and degrade the habitat of native fish and other wildlife.

Curlyleaf Pondweed is an exotic plant that forms surface mats that interfere with aquatic recreation. It usually grows early in the spring and dies back in the summer. The plant usually drops to the lake bottom by early July, which is usually the time of surveys. Curlyleaf Pondweed was the most severe nuisance aquatic plant in the Midwest until Eurasian water milfoil appeared.

Common Carp are domesticated ancestors of a wild form native to the Caspian Sea region and east Asia. Common Carp degrade shallow lakes by causing excessive turbidity, which can lead to declines in waterfowl and important native fish species. The Common Carp was introduced by unintentional release in 1879.

Information found on these exotic species was limited. Information sources included MnDNR Fisheries Surveys and an aquatic plant survey completed for Birch Lake in 2001. The aquatic plant information in the MnDNR surveys is generally from the years of 1995 to 1997. However, aquatic plant information for Gilfillan Lake is from a 1961 MnDNR report. Information from these reports is summarized below.

Review of the MnDNR website found that West Vadnais, East Vadnais, and Birch Lake are confirmed as having Eurasian water milfoil. Eurasian water milfoil in Birch Lake was confirmed in 2005. It was not found in the 2001 survey.

Curlyleaf Pondweed was not found in the 2001 Birch Lake survey. It was noted as present in the following MnDNR surveys:

- Deep Lake, 1995 survey, noted as common
- Gilfillan Lake, 1961 survey, noted as common
- Vadnais West, 1996 survey, noted as rare
- Vadnais East, 1997 survey, noted as rare
- Pleasant Lake, 1997 survey, noted as rare
- Sucker Lake, 1997 survey, noted as rare

MnDNR surveys are conducted during mid or late summer when Curlyleaf Pondweed levels are low to nonexistent.

Common Carp were generally noted as low (or in the lower quartiles) compared to lake classes in the MnDNR surveys reviewed. However, several lakes, Wilkinson, Gilfillan, and Pleasant, are known to have fish reclamation efforts in the past. Wilkinson Lake has been drawn down in 1994, 2001, 2002, and 2003 to promote winter fish kills. The most recent effort also included the construction of an outlet structure to control fish migration and reintroduction, and aquatic plant coverage has subsequently improved. Gilfillan Lake also had reclamation in 2003 by the MnDNR to help improve the MnDNR's use of the lake for Walleye rearing. Pleasant Lake has had rough fish harvesting efforts promoted by local citizens in the past (Gary Eagles, March 2006).

2.3.14 FISHERIES AND HABITATS

The MnDNR database of fisheries shows that seven lakes in VLAWMO have assigned ecological classes (Table 2-22). Limnological parameters were used to determine ecological classes such that the higher numbers reflect higher trophic (nutrient productivity) states. The classifications provide information used by the fisheries staff to manage these water resources.

TABLE 2-22
MNDNR CLASSIFICATION OF VLAWMO LAKES

Lake	Lake Class
Deep	40
Gilfillan	40
Sucker	38
Goose	43
Vadnais East	24
Vadnais West	43
Pleasant	24

Source: Various MnDNR Fishery Survey Reports MnDNR Report No. 417, An Ecological Classification of Minnesota Lakes with Associated Fish Communities

The MnDNR manages the fish population in Pleasant Lake. Ramsey County manages Tamarack Nature Center for wildlife. Privately funded biological surveys, reconnaissance studies, or management plans for wildlife in VLAWMO (e.g., Wilkinson Lake and Black Lake) have also been carried out. The Audubon Society is planning to complete wildlife, vegetation, and hydrology studies on the Rice Lake and Grass Lake wetland restoration projects.

Conversation with the MnDNR Area Fisheries Manager (Zappetillo, 2006) identifies the following fisheries activities:

- Pleasant Lake – No fish stocker, but use fish from Pleasant Lake to stock other lakes. Considering using as a musky brood stock lake. Registered fish reserve, no fishing permitted.
- Sucker – No physical management of fish.
- Deep – No physical management of fish. Registered fish reserve, no fishing permitted.
- Vadnais West – Has shorelines fishing, surveys have been completed, potentially reclaimable, but no plans at this time.

- Vadnais East – No physical management of fish.
- Gilfillan – MnDNR used this lake as a walleye nursery lake for several years, stocking it with walleye fingerlings in the spring. The fingerlings were harvested and moved to other lakes each fall. Excessive aquatic plant growth precluded this stocking program in 2006, as a result, vegetation control measures were taken.
- Goose – No physical management of fish: Considered a waterfowl lake.
- Birch – Locals have installed an aeration and stocked walleye and large-mouth bass.
- Amelia – No physical management of fish: Considered a waterfowl basin.
- Wilkinson – No physical management of fish: Too shallow.
- Black – Unknown.
- Charley – Registered fish reserve, no fishing permitted.

Due to lack of public access, the MnDNR has limited ability to actively manage fisheries on many of the VLAWMO lakes.

2.3.15 UNIQUE FEATURES

Eleven natural plant communities and several rare animal species are found within the watershed. The threatened species of Blanding's turtle (*Emydoidea blanding*) comprise the most abundant animal species. The other animal species found are red-shouldered hawk (*Buteo lineatus*) and osprey (*Buteo lineatus*). Maintaining water quality and adequate quantities of water to wetlands on the identified sites is important to the continued existence of these species. The unique features are shown on Figure 2-8 and Table 2-23.

FIGURE 2-8
UNIQUE FEATURES

TABLE 2-23
RARE, ENDANGERED, AND SENSITIVE SPECIES AND NATURAL COMMUNITIES

Common Name	Scientific Name	Status
PLANT AND ANIMAL SPECIES		
Blanding's Turtle	*Emydoidea blandingi*	*Threatened*
Osprey	*Pandion haliaetus*	---
Red Shouldered Hawk	*Buteo lineatus*	*Special concern*
Buttonbush	*Cephalanthus occidentalis*	---
Waterwillow	*Decondon verticullatus*	*Special concern*
Acadian Fly Catcher	*Empidonay virescens*	*Special concern*
Sanehill Crane	*Grus canaclensis*	---
Forster's Tern	*Stema forsteri*	*Special concern*
Marginated Rush	*Juncus marginatus*	*Special concern*
Turbokled Rein-Orchid	*Platarthera flauna var. herbliola*	*Endangered*

NATURAL COMMUNITIES
Cattail Marsh
Oak Forest
Willow Swamp
Dry Prairie, Sand Gravel
Alder Swamp
Rich Fen
Black Ash-Yellow Birch – Alder Swamp
Sedge Meadow
Tamarack Swamp
Wet Prairie
Prairie Rich Fen

MnDNR, Natural Heritage Program, March 1995

2.4 HUMAN ENVIRONMENT

This subsection summarizes watershed characteristics affected by human activities, particularly existing and future land use, water appropriations, and pollutant sources.

2.4.1 CURRENT LAND USE

Current land uses are presented in Figure 2-9 and Table 2-24. This information was compiled using year 2000 Land Use Geographic Information System (GIS) coverage from the MCES, updated using 2003 and 2004 aerial photography from Anoka and Ramsey county-portions of the VLAWMO, respectively.

FIGURE 2-9
CURRENT LAND USE

TABLE 2-24
CURRENT LAND USE BY SUBWATERSHED

Sub-watershed	Agriculture (acres)	Single Family (acres)	Single Family Attached (acres)	Multi Family (acres)	Retail/ Other (acres)	Office (acres)	Industrial and Utility (acres)	Industrial (acres)	Park, Recreation (acres)	Golf Course (acres)	Major Highway (acres)	Railway (acres)	Water (acres)	Total (acres)
Gem Lake	-	47	1	-	-	-	-	-	-	-	2	-	32	217
Lambert Creek	-	2521	207	132	251	4	190	177	236	66	145	-	237	5140
Birch Lake	-	164	38	35	59	22	37	10	12	-	36	-	123	614
Tamarack/ Wilkinson	371	1157	67	29	78	11	162	4	867	30	104	-	423	4391
Pleasant/ Charley/ Deep	-	1585	7	-	-	-	3	75	619	20	344	-	711	3366
Vadnais/Sucker	-	530	40	1	40	4	20	10	647	125	9	-	670	2192

2.4.2 FUTURE LAND USE

Future 2020 land use, per the MCES, is presented in Figure 2-10. Comparison of Figure 2-9 for current land use with Figure 2-10 for future 2020 land use shows the conversion of undeveloped land to single family residential throughout the watershed and to industrial and commercial along the I-35E corridor and areas in White Bear Township west of Goose Lake. However, visual comparison of the two figures probably overstates the development potential. Wetlands are not shown on the MCES's Planned Land Use Map and much of the current undeveloped land appears to be wetland. Wetland areas may not be developable. Therefore, an analysis was completed to approximate the amount of developable land by subwatershed. The analysis was completed using the GIS coverage and overlaying the wetland inventory information from VLAWMO (Figure 2-4) on the undeveloped land from the current land use (Figure 2-9). The amount of undeveloped land in excess of wetland acreage was considered developable land. Results of this analysis are presented in Table 2-25. These results show that developable land through 2020 represents 11 percent of the total watershed with Tamarack/Wilkinson and Gem Lake subwatersheds representing the areas where the largest changes could take place.

The MCES has also completed the 2030 future land use map (Figure 2-11). Comparison of Figure 2-10 for future 2020 land use and Figure 2-11 for the 2030 future land use shows that the Anoka County area of VLAWMO could develop at higher densities than shown on the 2020 plan. However, the specifics of this change are unknown at this time and will be developed as the City of Lino Lakes develops its next Comprehensive Land Use Plan.

TABLE 2-25
ESTIMATED DEVELOPABLE LAND BASED ON FUTURE 2020 LAND USE

Subwatershed	Developable Land Within MUSA (Ac)	Developable Land Outside MUSA (Ac)	Total Developable Land (Ac)	Percent of Subwatershed
Gem Lake	115	---	115	53
Lambert Creek	556	---	556	11
Birch Lake	63	---	63	10
Tamarack/ Wilkinson	508	261	769	18
Pleasant/ Charley/ Deep	282	---	282	8
Vadnais/ Sucker	42	-	42	2
TOTAL	**1,566**	**261**	**1,827**	**11**

FIGURE 2-10
FUTURE 2020 LAND USE

FIGURE 2-11
FUTURE 2030 LAND USE

2.4.3 SURFACE WATER APPROPRIATIONS

In the watershed, there are 18 water appropriations permits issued by the MnDNR. Water appropriations permits are issued by applicants pumping greater than 10,000 gallons-per-day or over one million gallons of water-per-year. The locations of pumping and permittees are shown on Table 2-26.

TABLE 2-26
WATER APPROPRIATIONS PERMITS

Number	Permit Number	Owner	Use	Maximum Gallons Per Minute	Water Source
1	026073	White Bear Lake Area Schools	Landscaping/Athletic Field Irrigation	200	G
2	033036	Veeco Instruments Inc	Industrial Process Cooling Once-Through	64	G
3	756227	St Paul, City Of	Municipal Waterworks	0	L
4	776229	St Paul, City Of	Municipal Waterworks	13780	G
5	776229	St Paul, City Of	Municipal Waterworks	13780	G
6	776229	St Paul, City Of	Municipal Waterworks	13780	G
7	806153	Vadnais Heights, City Of	Municipal Waterworks	5150	G
8	806153	Vadnais Heights, City Of	Municipal Waterworks	5150	G
9	846121	White Bear Township	Municipal Waterworks	5050	G
10	866043	Home Of The Good Shepherd	Commercial & Institutional	600	G
11	866085	North Oaks Golf Club	Golf Course Irrigation	1100	L
12	866211	Gem Lake Hills Inc	Golf Course Irrigation	375	G
13	866316	M-Foods Dairy Llc	Agricultural Processing	500	G
14	876149	Five Star Mobil Estates	Private Waterworks	600	G
15	896037	Whirlpool Corp & Reynolds Metals	Pollution Containment	50	G
16	906332	Total Petroleum Inc	Pollution Containment	3.5	G
17	926137	North Oaks Golf Course	Private Waterworks	80	G
18	946011	Shoreview, City Of	Basin (Lake) Level Maintenance	2500	L

Source: 2004 County Well Index
L for lakewater withdrawal
G for groundwater withdrawal

2.4.4 POLLUTANT SOURCES

Thirty-one pollutant sources within VLAWMO are identified by the Minnesota Pollution Control Agency (MPCA) (Figure 2-12 and Table 2-27). All sanitary landfills and dumps within VLAWMO have been closed and hazardous waste sites which have been identified are in various stages of soil and groundwater remediation. There are no permitted feedlots in the watershed.

Other potential pollutant sources such as abandoned wells and underground and aboveground storage tank sites are identified in the Ramsey County Groundwater Quality Protection Plan and Anoka County Groundwater Protection Assessment.

TABLE 2-27
POLLUTANT SOURCES: DUMPS AND LANDFILLS

Number	Name	Address	City
1	White Bear Township Dump	S of Robb Farm Rd & Blue Goose Rd 935 E. Hwy. 96	White Bear Township
2	White Bear Road & Gun Club Site	I-35E & Hwy 96	White Bear Lake
3	Vadnais Heights Demolition	On W 1/2 of land bounded by S Oak Rd, Clover Ave, County Road (Co Rd) F & O	Vadnais Heights
4	Gondek Demolition Landfill	1/8 mi SE of inter of County State Aid Highway (CSAH) 57 & CSAH 12	Vadnais Heights
5	Red St. Aero Barrel Disposal Site	1/2 mile SE of the intersection of McMenemy St and Co Rd F	Vadnais Heights
6	Water Gremlin	1610 Whitaker Avenue	White Bear Lake
7	Hemmigfield Demolition	NE quadrant of Co Rd F and RR crossing near Woodbridge Dr	Vadnais Heights
8	Jensen Demolition	SW quadrant of McMenemy Street and Co Rd F	Vadnais Heights
9	Promiscuous Dump - Vadnais Hts	SE quadrant of McMenemy Street and Co Rd F	Vadnais Heights
10	Vadnais Heights Municipal Dump	On E 1/2 of land bounded by S Oak Rd, Clover Ave, Co Rd F & O	Vadnais Heights
11	White Bear Lake Public Wks Lime Sldg Dmp	1884 Whitaker	White Bear Lake
12	Kohler Mix Specialties Surface Imp	4041 Highway 61	White Bear Lake
13	Robert Walker Demolition Dump	West Side of Centerville Road 1/3 mile South of Co Rd F	Vadnais Heights
14	Mclevish Demolition Dump	West of Centerville Road 1/2 Mile South of County Road F	Vadnais Heights
15	Minnesota Lumber & Wrecking Demo Site	Just NW of Intersection of CoRd E & Labore Rd	Vadnais Heights
16	Summit Farms Inc Abandoned Surface Imp	1/4 mile northwest of the intersection of Highway 61 and County R	Gem Lake
17	Wybierala Dump	Near Bibeau Rd & Fischer Lane	White Bear Township

Number	Name	Address	City
18	White Bear Lake City Dump	S of 4th Ave & Whitaker Ave	White Bear Lake
19	Northern Malleable Foundry Site	near Jay Way & Jay Circle	Vadnais Heights
20	Five Star Trailer Courts Demolition Fill	N side of Twin Lake, near Twin Lake Rd Twin Lake Blvd	Vadnais Heights
21	Ayde Property	1201 North Birch Lake Blvd	White Bear Township
22	Vadnais Heights Drum	3904/3910 McMenemy St.	Vadnais Heights
23	North Oaks Company - Parcel 27 & 306	W off of Centerville Rd, 1/2 mile N of Hwy 96	North Oaks
24	Centerville Road Site	Northeast corner of Centerville Rd & Birch Lake Blvd	White Bear Lake
25	North Oaks Company - Parcel 30	N off Hwy 96 approx. 1/2 mile W of Interstate 35E	White Bear Township
26	Parcel 5 - Private	444 Centerville Road	White Bear Lake
27	Parcel 4 - North Oaks Amoco Auto Service	4452 Centerville Road	White Bear Lake
28	Parcel 6c - Undeveloped Land	Centerville Road	White Bear Lake
29	Life Time Fitness (Proposed)	NW Quadrant of Labore Road & Co Rd E	Vadnais Heights
30	Weston Woods	935 Highway 96	White Bear Township
31	Valley Contracting	1101 South Birch Lake Blvd	White Bear Lake

Minnesota *Pollution Control Agency, March 1995*
**added January 1996*

FIGURE 2-12
POTENTIAL POLLUTANT SOURCES

2.4.4.1 Water-based Recreation Areas

There are two Ramsey County Parks within VLAWMO: Grass-Vadnais Regional Park and the Tamarack Nature Center. These county parks are part of the MCES Recreation Open Space System. The locations of park facilities are presented on Figure 2-9 and Table 2-28. In addition, there are numerous city parks near water bodies that are owned and maintained by member communities. Information regarding location, amenities, and hours of operation are available from the community office.

TABLE 2-28
WATER-BASED RECREATION FACILITIES

County	Name	Boat Launch	Canoeing	Operating Agency
Ramsey	Grass-Vadnais	No		Ramsey County
Ramsey	Bald Eagle-Otter Lake	Yes	Yes	Ramsey County
Ramsey	Tamarack Nature Center	No	No	Ramsey County
Ramsey Lake	Birch Lake	No	Yes	City of White Bear Shore Fishing and Hiking

2.5 GROUNDWATER RESOURCE DATA

Ramsey County adopted the Ramsey County Groundwater Quality Protection Plan in May 1996. Anoka County has published the Anoka County Groundwater Protection Assessment. In addition, surficial hydrology data is presented in the Geologic Atlas of Ramsey County, Minnesota and the Regional Hydrogeologic Assessment – Anoka Sand Plain. Groundwater resources data includes, but is not limited to; well head protection areas and sensitive geologic areas that can be found in these documents. Specific information on groundwater flow in the Lambert Creek Subwatershed, completed by the USGS as part of the Lambert Creek Clean Water Partnership study, is available in the VLAWMO office. Groundwater sensitivity is shown in Figure 2-13. Figure 2-14 illustrates the sensitivity of the water table aquifer in Anoka County (Anoka County CH&ESD – Plan Comments) and the sensitivity to the Prairie Du Chein-Jordan Aquifer in Ramsey County.

Ground water plans mentioned above are available for review at the VLAWMO office.

FIGURE 2-13
GROUNDWATER SENSITIVITY

3.0 ISSUES IDENTIFICATION/ASSESSMENT OF PROBLEMS

This section identifies, describes, and assesses issues facing the VLAWMO. These issues were identified through the resource inventories described in Section 2.0, past studies, workshops, and consultation held with local and State agencies and organizations. Issues listed are fairly comprehensive because of the multiple mechanisms used to solicit input. The assessment of issues and problems includes a brief description of the issue/problem prioritization.

The intent of this section is to describe and define issues so that the Board can make informed choices regarding future efforts of the VLAWMO. Numerous organizations are responsible for management of water within the watershed, not just the VLAWMO. Therefore, this section ends with an assessment of the adequacy of existing controls and the identification of management gaps relative to each issue. Responsibilities in terms of goals and objectives, priorities, and implementation strategies selected by the VLAWMO for addressing the issues are presented in Sections 4.0 and 6.0.

Significant issues are listed below. Undoubtedly, there are additional issues that have not yet surfaced. New issues can be considered at monthly watershed meetings.

3.1 ISSUES AND PROBLEM IDENTIFICATION

The following potential or known issues were identified through the planning process:

- Local communities obtain their potable water supply from groundwater
- Groundwater quality is threatened or impaired
- Surface water withdrawn from the watershed supplies a portion of the potable water for the 400,000 users of the St. Paul regional water system
- Much of the urban development occurred before the use of Best Management Practices (BMP) for mitigating water quality impacts of development were common place
- Additional development is expected
- Data for making informed decisions is needed
- Public awareness about water resources in the watershed and appropriate stewardship is limited
- Sensitive resources are present, including wetlands

- There are numerous shallow lakes in which water quality is either threatened or impaired
- Exotic species, such as Eurasian water milfoil, Curlyleaf Pondweed, and Common Carp, infest some lakes
- There are localized flooding problems

The priorities of each issue/problem were identified by subwatershed in Table 3-1.

TABLE 3-1
PRIORITIZATION OF ISSUES BY SUBWATERSHED

Groundwater Supply 1	Groundwater Threatened 2	Surface Water Supply 3	Urban Development Pre BMPs	Additional Development	Sensitive Resources & Wetlands	Threatened/Impaired Lakes	Exotic Species	Data Is Needed 4	Public Awareness/ Stewardship 5	Localized Flooding 6
M	H	L	M: Mostly parkland, but park development prior to BMPs.	L: Parkland, limited urban development potential.	H: W. Vadnais Lake classified by VLAWMO as a High Priority Wetland.	?: Limited data	L: Eurasian Water Milfoil confirmed, but boating is not a use.	M	H	L
M	H	H	H: Vadnais Heights about 80 to 90% developed, future focus on redevelopment.	M: Only 10 to 20% undeveloped.	H: E. Vadnais and Sucker Lakes rated as high priority wetlands by VLAWMO, and some rare natural features present.	H: E. Vadnais close to meeting Total Phosphorus goal, Sucker meeting MPCA swimming standard.	M: Eurasian Water Milfoil confirmed, but boating is not a use. Curleyleaf pondweed present, but rare. Carp low.	M	H	L
M	H	H	M: Much of the subwatershed is developed, but development has been more recent and includes some BMPs.	H: Approximately 300 acres for development remaining. Likely to be at higher densities than previous development in the area.	H: Pleasant and Charley Lakes rated as high priority wetlands by VLAWMO and some rare natural features present.	H: Monitoring shows Pleasant Lake average total phosphorus concentrations in some years exceeds MPCA threshold for impairment of swimming.	M: Some past efforts for carp harvesting by the residents of Pleasant Lake. Curleyleaf pondweed present but rare in Pleasant and Sucker Lakes.	M	H	L
M	H	H	M: Much of the subwatershed is developed, but development has been more recent and includes some BMPs.	H: Close to 800 acres potentially remaining for development. Likely to be at higher densities than previously, except rural residential areas in Lino Lakes.	H: Wilkinson and Amelia Lakes rated as high priority wetlands by VLAWMO and some rare natural features present.	H: Analysis of data show slight declining trends in water quality for Wilkinson and Tamarack Lakes.	H: Common carp have historically been a problem in Wilkinson and Gilfillan Lakes. Curleyleaf pondweed noted as common in 1961 DNR report for Gilfillan Lake.	M	H	L
M	H	H	M: Subwatershed and shoreline mostly developed.	M: Only 10 to 20% undeveloped.	M: Birch Lake and most wetlands rated as moderate to light management by VLAWMO.	H: Birch Lake meeting MPCA standards for swimming.	M: Eurasian Water Milfoil confirmed present in 2005 in Birch Lake, but localized problem.	M	H	L
M	H	H	H: Subwatershed is largely developed, future focus on redevelopment.	L: Only a few acres of developable land remaining.	M: Goose Lake rated as light management by VLAWMO. Limited number of wetland in the subwatershed.	H: Goose Lake is a highly productive lake, with high nutrient levels, poor water clarity, and no aquatic vegetation.	M: No exotic species confirmed, but Goose Lake is shallow and if infested with carp could have even greater water qulaity problems.	M	H	L
M	H	H	H: Subwatershed is largely developed, future focus on redevelopment.	L: Only a few acres of developable land remaining.	L: Very few wetlands present.	L: No lakes present.	L: Limited number of water bodies, and no confirmations of exotic species.	M	H	L

Groundwater Supply 1	Groundwater Threatened 2	Surface Water Supply 3	Urban Development Pre BMPs	Additional Development	Sensitive Resources & Wetlands	Threatened/Impaired Lakes	Exotic Species	Data Is Needed 4	Public Awareness/ Stewardship 5	Localized Flooding 6
M	H	H	M: Some existing development, but there is a lot of undevelopable wetland area.	H: Approximately several hundred acres of developable land remaining. Much of this is the City of Gem Lake portions of the subwatershed, should be developed at lower densities.	H: The Lambert Creek Wetlands are rated as high priority by VLAWMO, some rare natural features present.	M: No lakes present, but area drains to E. Vadnais Lake, and has been shown to be an historic source of phosphorus.	M: Presence of exotic species unknown, but the shallow wetland may be highly susceptable to impacts of carp and curleyleaf pondweed if infested.	M	H	H
M	H	H	M: Mostly developed, much of the remaining open area is undevelopable wetland. Potential for redevelopment/improvements to Lower Lambert Creek (streambank stabilization).	M: Only 10 to 20% undeveloped, outside wetland areas.	H: The Lambert Creek Wetlands are rated as high priority by VLAWMO, some rare natural features present.	M: No lakes present, but area drains to E. Vadnais Lake, and has been shown to be an historic source of phosphorus.	M: Presence of exotic species unknown, but the shallow wetland may be highly susceptable to impacts of carp and curleyleaf pondweed if infested.	M	H	H
M	H	L	L: Existing development generally at lower densities.	H: Roughly 50 percent of subwatershed developable at lower densities (i.e., 1 unit/3-acres).	H: Gem Lake rated as a high priority wetland by VLAWMO.	H: Monitoring shows a slight declining trend in the water quality of Gem Lake.	L: Exotic species unknown. Lack of outlet limits potential for infestations.	M	H	M: Landlocked basin, may be sensitive to lake level increases with increase runoff volumes from anticipated development.

H= High priority
M=Medium Priority
L= Low Priority

1. All rated high because private and/or community supply systems spread throughout entire watershed
2. All rated high because of potential for contamination
3. All rated high except Gem Lake subwatershed because connectedness.
4. All rated medium because data is needed to make informed decisions, but VLAWMO Managers place higher priority on resource outcomes
5. All rated high because VLAWMO Managers consider this an important implementation action
6. All rated low (except Gem Lake, and portions of Lambert Creek subwatershed) because it is generally not considered a big problem in the watershed, and is generally handled by the Local Units of Government

3.2 ASSESSMENT OF PROBLEMS

3.2.1 ISSUE: POTABLE WATER SUPPLY FROM GROUNDWATER

As shown in Table 2-26, White Bear Township, the City of St. Paul, and the City of Vadnais Heights, all have municipal supply wells located in the watershed. In addition, residents of Gem Lake and Lino Lakes, located in the watershed and portions of North Oaks, are supplied by private wells.

3.2.2 ISSUE: GROUNDWATER QUALITY: THREATENED AND IMPAIRED

There are also a number of additional potential pollutant sources that may or may not threaten supplies, as described in Table 2-27 and Figure 2-7 in Section 2.0. There is a superfund site that has contaminated groundwater in portions of North Oaks. Water supply in these areas is currently obtained from White Bear Township. Infiltration of contaminated urban runoff may also threaten groundwater. As shown in Section 2.0, much of the watershed has areas with high groundwater susceptibility.

3.2.3 ISSUE: POTABLE WATER SUPPLY FROM SURFACE WATER

The BWCSP withdraws water from East Vadnais Lake. Surface runoff and the VLAWMO provide a portion of the supply estimated at about 30 percent of the annual withdrawal. The balance of the supply is obtained through pumping from the Mississippi River to Charley Lake, which flows to Pleasant and Sucker lakes and then to East Vadnais Lake. Portions of the watershed that do not contribute include the Gem Lake Subwatershed, which does not discharge, and the subwatershed to West Vadnais Lake, which is not hydrologically connected to East Vadnais Lake.

3.2.4 ISSUE: URBAN DEVELOPMENT BMP OCCURRED BEFORE IMPLEMENTATIONS

The use of BMPs to mitigate the water quantity and quality impact of urban development did not become common until the late 1980s and early 1990s. Much of the development in the watershed occurred before this time. This means that much of the existing urban development does not have storm water quantity and quality practices in place, prior to the discharge of storm water to surface waterbodies. Retrofitting existing storm sewer systems, although costly, has the potential to improve water quality and reduce surface flooding. Retrofitting can be added with road maintenance, improvement projects, and when areas are redeveloped.

3.2.5 ISSUE: ADDITIONAL DEVELOPMENT IS EXPECTED

As shown in Table 2-25, approximate methods show that about 11 percent of the watershed is potentially still developable through 2020. Discussions with the VLAWMO commissioners and with various city staff found that many consider this estimate to be low. The exception is the City of White Bear Lake (Burch, 2006), which estimates that there are approximately 20 acres or less of developable land left in the VLAWMO portions of the city.

One reason that the estimate may be low is that there may be a number of individual platted undeveloped lots that are included in the MCES's coverage for developed areas. The analysis completed only looked at the acreage of areas noted as "undeveloped" in the MCES's GIS coverage. Storm water management opportunities may be limited on these existing platted lots as there may be some legal rights granted through previous approvals.

Another important conclusion about remaining development is that it varies by subwatershed. Inspection of Table 2-25 shows that the Gem Lake and Tamarack/Wilkinson subwatersheds has the greatest percentage of development remaining through 2020. In the Gem Lake subwatershed, and also in the Lambert Creek subwatershed, much of this development is within the municipal boundaries of the City of Gem Lake. In general, development with the City of Gem Lake is expected to be on larger lots of about 3 acres. However, a number of recent development proposals have been submitted at densities higher than allowed by the City, while other projects have petitioned for de-annexation, with subsequent annexation into Vadnais Heights, where higher densities would presumably be allowed.

In the Tamarack/Wilkinson subwatersheds, most of the remaining undeveloped area is in the cities of North Oaks and Lino Lakes. The area in Lino Lakes is outside the Metropolitan Urban Service Area (MUSA) and is shown as rural residential in future 2020 land use, however, for the 2030 Regional Development Framework of Lino Lakes it is shown as developable area. Also, much of the area around Amelia Lake was recently put into a conservation area. In North Oaks, development is managed by the North Oaks Corporation. This remaining development will be urban residential, at densities of around four lots per acre (North Oaks Corporation, 2006).

Additional development is an issue because it increases recreational needs and demand, increases potable water use, and changes local surface drainage patterns and pollutant loads.

Impervious surface covers soils that would otherwise infiltrate water, and natural drainage ways are replaced with storm sewers, paved channels, ditches, and other artificial drainage devices.

Impervious surfaces and artificial drainage, increase the volume and accelerates the rate of surface runoff reaching receiving waters. The effects of higher runoff volumes and rates on water resources are higher flows, flooding, erosion, and adverse impacts on aquatic habitats.

In addition to changing the hydrology in an area, development also increases the potential for pollution of water resources. Because the human population is concentrated, more materials are manufactured, consumed, and disposed of in developed areas. Not only is the number of possible pollutants increased, but also the opportunities for them to be released into the environment. Large quantities of wastewater and solid waste are generated in developed areas that must be treated and/or disposed. Construction sites disturb land and can result in substantial erosion. Erosion rates can be 20,000 to 40,000 times higher at construction sites than vegetated areas. After construction, impervious surfaces are likely places for the deposition of contaminants from vehicles, industry, lawn care, pets, sediment, organic litter (e.g., grass clippings), and trash. These contaminants are more likely to reach water resources because there is more surface runoff to transport pollutants and there are fewer natural filtration systems (like vegetation and wetlands) to remove pollutants.

3.2.6 ISSUE: DATA NEEDS/LIMITATION

The hydrology and issues facing the watershed are complicated and interrelated. Good information of recent origin is necessary for making informed decisions. Although, there is much information on the watershed (Section 2.0), and a number of recent studies, additional information is needed to reduce uncertainty and to track effective management efforts to support adaptive management. Specific data collection needs include:

Lake Levels: Lake level information is limited. The BWCSP monitors levels on Charley, Pleasant, Sucker, and East Vadnais lakes, while the Ramsey County Department of Public Works has a monitor who records levels for Birch Lake.

Many of the lakes are shallow and a diverse aquatic plant community is important for the water quality of these lakes. However, only Birch Lake has had a comprehensive survey.

3.2.7 ISSUE: PUBLIC AWARENESS

Public awareness of watershed and water quality issues has generally increased over the past 20 to 30 years. However, many residents and local officials, with responsibility for land use decisions, remain unaware that they live in the Vadnais Lakes area watershed, and that what they do on the landscape affects water quality and flows to area lakes and wetlands. This leads to practices that can contribute to water quality and aquatic resources problems. For example, a 2005 study by

VLAWMO and the Ramsey Soil and Water Conservation District called "Improving The Waters of Lower Lambert Creek" found numerous incidences where residents use questionable yard waste disposal practices.

3.2.8 ISSUE: SENSITIVE RESOURCES

As described in Section 2.0, there are numerous wetlands in the watershed, many of which have are classified as high priority by the VLAWMO. There are also a number of rare and natural features in the watershed (Figure 2-8). These wetlands and natural features provide important wildlife, aquatic life, education, and habitat functions. Wetlands can also provide water quality, flood storage, and recreation functions and values. Given the number of wetlands and the glacial topography of the Vadnais Lakes Area Watershed, the wetlands are particularly important for water quality and flood storage. In most of the watersheds, wetlands represent the edge where the aquatic environment has the most contact with the terrestrial environment.

3.2.9 ISSUE: LAKE WATER QUALITY: THREATENED OR IMPAIRED

There are numerous lakes in the watershed, some of which are threatened or impaired. The MPCA 2006 list of impaired waters only lists a few lakes for impairment of aquatic consumption due to mercury (i.e. fish consumption). There are also a number of lakes that have improved according to some of the studies completed by the BWCSP (i.e. Pleasant, Sucker, and East Vadnais lakes). However, East Vadnais Lake does not meet the BWCSP goal of 25 mg/L total phosphorus in all years and comparison of the VLAWMO CLMP and the BWCSP data for other lakes with the MPCA thresholds for swimming (nutrient) impairment suggests that some VLAWMO lakes would likely be considered impaired if the MPCA used the local data. These lakes include: Pleasant Lake, which in some years is above the threshold for phosphorus as measured at the outlet of the lake, and Goose, Gilfillan, Wilkinson, Tamarack, and Gem lakes. These lakes are for the most part shallow, and Wilkinson Lake and Tamarack Lake, in particular, are wetlands instead of lakes, making comparison with the MPCA thresholds uncertain. However, it is clear that a number of the lakes are nutrient rich and eutrophic to hypereutrophic. Also, trend-line analysis of data for these lakes (APPENDIX C), while not a rigorous trend analysis, does show possible negative trends in water quality for Goose, Gem, Tamarack, and Wilkinson lakes.

3.2.10 ISSUE: EXOTIC SPECIES INFESTATION

As discussed in Section 2.0, Eurasian water milfoil, Curlyleaf Pondweed, and Common Carp have been found in some watershed lakes. Eurasian water milfoil and Curlyleaf Pondweed can be recreational boating nuisance issues. However, with respect to Eurasian water milfoil infested lakes,

only Birch Lake has private boating as a use. Boating access and use are restricted in East and West Vadnais lakes.

Data on Curlyleaf Pondweed is limited, and where it exists at a nuisance level is unknown. MnDNR surveys show it as common or rare in Deep, Gilfillan, Vadnais East and West, Pleasant, and Sucker lakes. Most of these surveys were completed in the late 1990's, usually during the summer months. DNR data might not show the true extent of the Curlyleaf Pondweed problem, as they are in the end cycle of their life. Curlyleaf Pondweed can be a water quality concern at high densities because of its life cycle characteristics. It begins growing in the fall, starts growing again in early spring, and dies in early July. The fall and early spring growth can give it a competitive advantage over native plants. When it dies in early July it can also increase phosphorous loading through plant decomposition, and changes to sediment phosphorous release mechanisms (James, et. al., 2001). This mid-growing season release of phosphorous can trigger algae blooms, particularly if the Curlyleaf Pondweed growth was at densities that kept native plants from growing.

According to MnDNR surveys, Common Carp were at a low number for the lake class for East and West Vadnais, Sucker, and Pleasant lakes. Wilkinson Lake and Gilfillan Lake have had problems with Common Carp in the past and have had reclamation efforts. A new outlet with a fish barrier has recently been installed on Wilkinson Lake. As discussed in Section 2.0, local residents have also promoted Common Carp management efforts in the past for Pleasant Lake. Common Carp is an issue for the shallow lakes in the watershed because of their feeding behavior. They stir up bottom sediments and can uproot aquatic vegetation. This can contribute to water quality problems.

3.2.11 ISSUE: LOCALIZED FLOODING

There are localized flooding issues throughout the watershed due to storm water infrastructure issues. There are also identified flooding concerns along the lower and middle portions of Lambert Creek. Much of this area is considered floodplain, but there are flooding concerns by residents. High water levels have inundated private property in some of these areas.

3.3 ISSUE PRIORITIZATION

The Board considered the various issues identified, and an ordinal ranking exercise was used to evaluate the relative priority of each issue/problem. This was done by comparing the issue to each other and for each pair, asking the question which of the two is a higher priority, or if you had a limited amount of money, where would you spend it? Table 3-2 presents the results of the ranking. In general, the higher the total score at the bottom of the table, the higher the priority. However,

discussion of the ranking showed that there were some deviations to the manager's priorities from that shown in the table.

Discussion of these rankings by the participants showed:

- That the first issue was perceived as an issue of the quantity of groundwater and was probably ranked where it was because of the perception that this is a water rich area.
- Participants agreed that the groundwater threat and surface water supply (i.e., the issues dealing with the quality of potable water for human consumption) were the highest priority issues. However, it was also generally perceived that the groundwater quality contamination issue in North Oaks from the superfund site is being adequately addressed by the MPCA and Minnesota Department of Health (MDH). Thus, the balance of the concern of the issue is with respect to the potential for future groundwater contamination.
- Participants did not agree that public awareness and stewardship was a low priority. The group believed this was a high priority for the VLAWMO, but also recognized public awareness and stewardship through education programs is a tool for achieving and addressing some of the more outcome oriented issues/problems. The higher ranked issues/problems tended to be resource based outcomes.
- The participants agreed that localized flooding was a lower priority compared to the other issues. This is probably due to the past use of development design standards to minimize flooding and public works projects over time to address these types of issues.

Water priorities and partnership meetings were held in three communities with the community organization that most often dealt with natural resources. The communities visited included North Oaks, White Bear Lake, and Vadnais Heights. Individual community members in the other communities, White Bear Township, Gem Lake, and Lino Lakes, were also contacted to solicit input.

A prioritization exercise was used at the meetings to determine where the citizens felt VLAWMO should focus its energy. The results are summarized in Table 3-2 and Table 3-3.

TABLE 3-2
ORDINAL RANKING

	Groundwater Supply	Groundwater Threatened	Surface Water Supply	Urban Development Pre BMPs	Additional Development	Sensitive Resources & Wetlands	Threatened/Impaired Lakes	Exotic Species	Data Limited/Needed	Public Awareness/ Stewardship	localized flooding
Groundwater Supply		6	2	6	6	0	6	2	0	2	0
Groundwater Threatened	0		3	0	0	0	0	0	0	0	0
Surface Water Supply	4	3		0	0	0	0	0	0	0	0
Urban Development Pre-BMPs	0	6	6		1	6	6	0	0	0	0
Additional Development	0	6	6	5		0	0	0	0	0	0
Senstive Resources & Wetlands	6	6	6	0	6		3	0	0	0	0
Threatened/Impaired Lakes	0	6	6	0	6	3		0	0	0	0
Exotic Species	4	6	6	6	6	6	6		1	3	0
Data Limited/Needed	6	6	6	6	6	6	6	5		6	2
Public Aswareness/Stewardship	4	6	6	6	6	6	6	3	0		0
Localized flooding	6	6	6	6	6	6	6	6	4	6	
Total	30	57	53	35	43	33	39	16	5	17	2

TABLE 3-3
CITIZEN PRIORITIES

Goal	Weighting (Total Votes)
Protection of Wetlands and Habitat	38
Protect or Improve Water Quality	31
Erosion Control – Regulation	11
Groundwater Protection	8
Wise Use of Public Funding	8
Public Participation and Public Relations	7
Control Flooding	5
Management of Public Ditch System	2

The input from the citizens overwhelmingly indicates they felt the VLAWMO's role is the protection of wetlands and water quality in general. This planning process is hoped to be the start of a continuing dialogue with the residents of the watershed.

3.4 ADEQUACY OF EXISTING CONTROLS

Table 3-4 provides a summary of existing controls, potential management gaps, and ideas for each issue, as discussed by the Board and the technical advising group. Management gaps identified were considered in the development of goals, policies, and management strategies for the VLAWMO in Section 4.0 of this Plan. The applicability of shoreland and flood plain ordinances is summarized in Table 3-5. Table 3-5 identifies communities within the watershed that have adopted shoreland and floodplain ordinances in accordance with the MnDNR's regulations. A few communities determined that additional ordinances are not required. Details on specific existing controls and programs for wellhead protection and local storm water programs are presented in Table 3-6 and Table 3-7. Table 3-6 provides a comparison of local ordinances affecting storm water quality with the MPCA's National Pollutant Discharge Elimination System (NPDES) general permit for construction.

There are also some emerging controls that will affect water management efforts by municipalities in the VLAWMO. These include:

- Municipal Separate Storm Sewer System Permitting (MS4) under the NPDES.
- MCES requirement for LWPs and for such plans to be a part of the next round of Comprehensive Land Use Plans in 2008. Requirements for LWPs by the MCES are included as APPENDIX D. Most of these requirements are consistent with, or part of, NPDES, MS4, and NPDES Construction Site General Permit requirements for storm water. Additional notable requirements include:
    - Storm water infiltration on hydrologic soil types A and B.
    - Soil amendment and soil ripping after mass grading to mitigate compaction.
    - Peak runoff rate control for the 24-hour, 1-or-2, 10- and 100-year precipitation events.
    - Policies and planning relative to impaired waters, and TMDL studies.

All of the municipalities (cities and townships) in VLAWMO are mandatory MS4s. The City of North Oaks does not own any storm water or road infrastructure. Everything within North Oaks is owned and operated by the North Oaks Association. Conversations with the MPCA indicate that they consider the North Oaks Association to be the permittee in this case.

Under the Storm Water Program, MS4s are required to develop and implement a Storm Water Pollution Prevention Program (SWPPP). The SWPPP must cover six minimum control measures:

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
6. Pollutant prevention/good housekeeping

The MS4 must identify the BMPs and measurable goals associated with each control measure. An annual report on the implementation of the SWPPP must be submitted each year.

In Minnesota, the MPCA has issued an NPDES General Permit for MS4s with an effective date of June 1, 2006, and an expiration date of May 31, 2011.

3.5 SUMMARY

This section describes how the VLAWMO identified and prioritized 11 issues/problems facing water resources in the watershed. Existing and emerging controls, as well as management gaps and ideas relative to each issue/problem were identified.

Goals, policies, and management strategies presented in Section 4.0 considered the identified issues/problems, their priority, and management gaps.

TABLE 3-4
EXISTING CONTROLS AND POTENTIAL MANAGEMENT GAPS BY ISSUE

Issue	Existing Controls	Potential Gaps and Additional Management Ideas
Local communities obtain their potable water supply from groundwater	MnDNR – Water applications permitting addresses supply, interference, conservation planning, and emergency planning. MDH – Permits well construction New Metropolitan Council requirements for half inch of infiltration for storm water permits recharge	While MDNR does permit appropriations, and anticipates interference issues with other wells, sometimes problems do occur, and corrective actions are needed to resolve the issue. Also, in general, while the Twin Cities area is considered water-rich, groundwater levels are declining. This could become more of an issue in the future. Potential gaps that VLAWMO could fill include: 1. Serving as a place to resolve well interference issues since Board is comprised of representatives of member

Issue	Existing Controls	Potential Gaps and Additional Management Ideas
		communities. 2. Promoting and protecting recharge 3. Promoting reuse of storm water for irrigation instead of potable water supply.
Groundwater quality is threatened or impaired	CERCLA – Superfund cleanup/management efforts by MPCA and MDH. RCRA – MPCA permitting of industrial facilities to reduce hazardous waste NPDES – MPCA storm water permitting of: • Industrial facilities • Construction • Municipalities New Metropolitan Council – requirements for storm water Safe Drinking Water Act (SDWA) – Requirement for wellhead protection Programs to seal abandoned wells with property transfers Local ordinances and platting procedures that influence construction erosion control and storm water quality NEPA and SEPA – Requirements for environmental review	Discussions with the Technical Advisory Group found that many of the management efforts that protect the quality of surface water should also be protective of groundwater provided that a pretreatment of storm water is provided prior to infiltration. There are also many State and Federal programs to protect groundwater, clean up spills and contamination, and protect community supplies. The Technical Advisory Group felt the most obvious gap was with respect to private wells. There was some disagreement with respect to the need for additional efforts to seal abandoned wells. One participant felt these were addressed adequately with current requirements to seal during property transfers. Another participant felt there are many abandoned wells in existence, and a cost-share program should be considered to address those not being found during property transfers. Other potential gaps discussed included: • Education – regarding private wells and groundwater protection • Assistance with wellhead protection particularly if capture zones cross municipal boundaries • Standardizing BMP practicies
Surface water supplies the Board of Water Commissioners, St. Paul Regional Water System	CERCLA, RCRA, NPDES, NEPA, SEPA, New Metropolitan Council requirements, and SDWA requirements listed above. Source Water Protection Planning by the BWCSP	There is an Emergency Response Plan for BWCSP faciltiies, but not one for the watershed. For new development, water quality, and erosion control, there is a gap in the State regulations for sites that disturb

Issue	Existing Controls	Potential Gaps and Additional Management Ideas
	MnDNR Emergency and Conservation Plan, MnDNR Demand Reduction Measures, and MnDNR Appropriation Permit Program Use/access limitations to Pleasant, Sucker, and East Vadnais lakes. System improvements for water quality – ferric chloride addition systems, aration in Pleasant and E. Vadnais Lakes, Lambert Creek improvements	less than 1 acre. There is also a gap for water quality in The State regulations for redevelopment that creates less than 1 acre of new, impervious surface, but is replacing significant amounts of existing impervious surface. There may be a gap for water quality in the State requirements in implementation of the NPDES General Permit for construction. The State does not have sufficient personnel to inspect, while local units of government, except for the city of Gem Lake, do not have ordinances equivilent to the NPDES General Construction Permit for storm water.
Much of the development occurred before the use of BMPs for mitigating. Water quality impacts of development were commonplace.	NPDES Construction General Permit Voluntary retrofit of water quality practices by local communities.	The NPDES permit requires temporary construction erosion control if disturbed area for proposed projects exceed 1 acre; permanent post-construction water quality practices required if new impervious surface exceeds 1 acre. There could be a gap for post-construction-water quality with projects that are less than 1 acre of new, impervious surface, but is replacing significant amounts of existing impervious surface.
Additional development is expected	CERCLA, RCRA, NPDES, NEPA, SEPA, New Metropolitan Council requirements listed above	As discussed above under the surface water supply issue, there: • Is a gap in State regulations for construction erosion control on small sites (less than 1 acre disturbed) • May be gap in implementation (and enforcement) of State requirements in the NPDES General Permit Except as covered by the New Metropolitan Council requirements, there are also gaps in the standards for:" • Mitigating soil compaction • Runoff volume control There may also be a gap with respect to maintenance of BMPs once they are built. However, new NDPES General Permit requirements for MS4s does

Issue	Existing Controls	Potential Gaps and Additional Management Ideas
		have inspections and maintenance requirements.
Data for making informed decisions is needed	BWCSP – Monitoring of lakes, lake outlets, lake levels and Lambert Creek sites. Past monitoring for Lambert Creek and clean water partnership projects. VLAWMO – CLMP monitoring of trophic state parameters for Amelia, Birch, Wilkinson, Giffillan, Gilfillian Storm Pond, Tamarack, Goose, Deep and Gem Lakes MPCA – CLMP monitoring secchi transparency Ramsey Conservation District – Volunteer precipitation monitoring network Ramsay County/MDNR – Volunteer lake level monitoring VLAWMO – wetland inventory MnDNR – Fisheries survey reports for selected lakes on 5-year cycle	Much data is collected, but vigorous assessments for trends, lake diagnostics periodic, and program effectiveness is periodic. Birch Lake is the only lake with Comprehensive Aquatic Plant Survey of recent origin. Some parameters of potential concern such as bacteria (fecal coliforms) and turbidity not monitored. VLAWMO CLMP – Samples not useable for MPCA-impaired waters 305(b) and 303(d) listings since laboratory utilized was not certified. Not all wetlands on NWI have been inventoried by VLAWMO.
Public awareness about water resources in the watershed and appropriate stewardship is limited	Information campaigns and miscellaneous efforts completed by VLAWMO and local communities as time and resources allow. NPDES General Permit Requirements for MS4s for Public Education and Outreach; and Public Participation and Involvement. Annual reports and distribution from VLAWMO and MS4. VLAWMO CLMP Annual Report on Water Quality	The MS4 programs for Public Education and Outreach and Public Participation are evolving but typically target the distribution of information. Gaps include: • Resource specific information • Targetted efforts to change behaviors and promote stewardship by residents and businesses • Information on the benefits of aquatic plants in VLAWMO lakes • Education efforts and information specific to the management of public lands
Sensitive resources are present including wetlands	NEPA, SEPA, Minnesota Endangered Species Statute, Minnesota Wetland Conservation Act (WCA), VLAWMO Wetland Management Plan NDPES and local permitting storm water level New Metropolitan Council requirements	The VLAWMO Wetland Management Plan has been completed for WCA; however, Wetland Management Plan requirements have not been adopted as standards. Some Technical Advisory Group members suggest additional local requirements than those in WCA

Issue	Existing Controls	Potential Gaps and Additional Management Ideas
	for water quality listed above. Protection of parks and existing conservation easements DNR Geologic Atlas for Ramsey County	regarding: • The De Minimus size for permitting • Replacement of wetlands in VLAWMO Encouraging or completing habitat improvements such as the use of native plants, wetland restorations, or Lambert Creek habitat improvements as part of other public improvements, or separate capital improvements.
There are numerous shallow lakes in which water quality is either threatened or impaired	MPCA/ CWA impaired waters program NPDES storm water, local and New Metropolitan Council requirements for water quality listed above State of Minnesota Mercury Reduction Plan Use/access limitations to Pleasant, Sucker, and East Vadnais Lakes Conservation easements/areas Amelia/Wilkinson Lakes System improvements for water quality – ferric chloride addition systems, aration in Pleasant Lake, Lambert Creek improvements Past rough fish control efforts Voluntary storm water redevelopment retrofits wide	Only a couple of the VLAWMO lakes (i.e. East Vadnais) are on the MPCA. Impaired waters list for fish consumption. However, screening level data analysis in Section 2 suggest that other lakes (Goose, Gem, Gilfillan, Tamarack, Pleasant and Wilkinson) could potentially be considered impaired due to excessive nutrients. More lakes within the watershed could be identified or listed as either threatened or impaired, once data is submitted to MPCA. Past analysis for the VLAWMO CLMP program was not completed at a certified laboratory and not submitted to MPCA for assessment of impairment. Cause and effect with respect to phosphorous cycling is uncertain in some of the lakes, and Lambert Creek wetlands. Strategically designed monitoring and modeling is needed to guide management.
Exotic species such as Eurasian water milfoil, Curlyleaf Pondweed and Common Carp infest some lakes.	MnDNR – Aquatic plant management programs Past reclamation (rough fish) control efforts on Wilkinson, Gilfillan and Pleasant Lakes Aquatic plant management efforts by the Birch Lake Association	Information on aquatic plant communities and current level of infestation by Curlyleaf Pondweed is limited. Public education on exotic species and the potential for infestation.
There are localized flooding problems	Local Floodplain and Shoreland ordinances MnDNR permitting for protected waters and protected waters wetlands	Not all member communities have adopted VLAWMO detention requirements for new development. Gem Lake is landlocked, and there is currently no policy regarding management of landlocked basins, and the promotion of

Issue	Existing Controls	Potential Gaps and Additional Management Ideas
	Flood insurance program and floodplain mapping VLAWMO second generation plan standards for detention	storm water volume control. The exception is the New Metropolitan Council requirements that include volume control.

**This table is not intended to be an extensive list of potential management actions. It reflects discussions by the commissioners and members of the Technical Advisory Group to identify where there are significant managements efforts already in place and some of the most obvious gaps. The gaps identified do not reflect a decision by the VLAWMO. These gaps, along with priorities, and available resources where considered in developing the goals, policies, and management strategies in Section 4.0.*

TABLE 3-5
THE APPLICABILITY OF SHORELAND AND FLOOD PLAIN ORDINANCES

City	Shoreland Ordinances	Floodplain Ordinances
Gem Lake	Not required	Not required
North Oaks	Yes	Not required
Lino Lakes	Yes	Yes
Vadnais Heights	Yes	Yes
White Bear Lake	Yes	Yes
White Bear Township	Yes	Yes

TABLE 3-6
COMPARISON OF LOCAL ORDINANCES AFFECTING STORM WATER QUALITY

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
Permitting	Requires development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). Plan Covers construction activity with ≥ 5 acres of land disturbing activity, and small construction activity ≥ 1 acre of land disturbance. Application must be submitted, however, SWPPP need not be submitted except for projects disturbing 50 acres or more, or if projects propose alternative methods for storm water management other	Erosion control plans shall be required for all land disturbing activities (Goals 6.5 Vadnais Heights 1990 Surface Water Management Plan). Surface Water Management Plan incorporated into Zoning Code (Chapter 19 Water Management District of the Vadnais Municipal Code) by reference.	Erosion control for sites that disturb more than 1 acre. Storm water program for new or redevelopment that disturbs more than 1 acre, or smaller projects that are part of a common plan. (City of White Bear Lake Storm Water Pollution Prevention Program, 2003).	A developer must submit a Preliminary Site Plan …which shall include a narrative description and plans for erosion and sediment control.	No person shall develop any land for residential, commercial, industrial, or institutional uses without first having provided storm water management measures that control or manage runoff from such developments (Zoning Ordinance Section 22).	If the appointed reviewer determines that the erosion and sediment control plan meets the requirements of this ordinance, the Town shall issue a permit that authorizes the land disturbance activity contingent upon the implementation and completion of the erosion and sediment control plan (APPENDIX F: Draft Local Water Management Plan, 2000). In order to obtain a	Either Rice Creek Watershed or VLAWMO shall approve all subdivision grading, drainage and wetland mitigation plans (Subdivision ordinance). The city will coordinate the NPDES Phase II responsibility with the RCWD and VLAWMO permitting programs while understanding that ultimate responsibility of such a program remains with the City (Surface Water Management Plan, 2005).

Note: The matrix presents a summary of selected portions of rules and ordinances. For complete descriptions of the requirements see the respective rules and ordinances.

[1] Source: Minnesota Pollution Control Agency, General Permit Authorization to Discharge Storm water Associated with Construction Activity Under the National Pollutant Discharge Elimination System/State Disposal System Permit Program.

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
	than those specified in the General Permit.					subdivision approval and/or a zoning certificate, or a building permit, a developer or redeveloper of land must submit to the Township and the RCWD or VLAWMO a surface water drainage and erosion control plan which is in conformance with the Township's plan (Section 4: Draft Local Water Management Plan, 2000).	

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
Runoff rate control requirements	None specified except for discharges to certain special waters.	Plan evaluates 100 year storm and ten day event (snow melt) at multiple water bodies, flows given at those points.	MS4 BMP 5.A.1 The City of White Bear Lake will continue to require detention ponds to provide rate and water quality controls for new developmen. (City of White Bear Lake Storm Water Pollution Prevention Program, 2003). Proposers of all developments greater than 2.5 acres in size shall submit rate and runoff control measures with the permit applications… The runoff control plans must provide…calculations showing that the post-development rate of discharge will not exceed predevelopment rate (City of White Bear Lake Water Management Plan, 1997).	Appropriate provisions should be made to accommodate increased Storm water runoff and consequent soil loss occasioned by changed soil and surface conditions during and after development…such provisions may include, but are not limited to: The installation of improvements…such as streets, storm sewers curb and gutter, detention basins and other features (Ordinance 75) The subdivider shall demonstrate that any changes in topography shall not be adverse to water flowage or water control and shall be responsible for any change in topography that causes such adverse consequences...The	The general policy on Storm water runoff rates is to reduce the impacts of development by maintaining pre-development hydrological conditions. Calculations for the 2, 10 and 100-year 24-hours storms required. (Zoning Ordinance Section 22)	In general, peak flow rates shall be restricted to the 1-year, and 100-year undeveloped condition flow rates and shall not exceed the capacity of the downstream channel (Section 3: Draft Local Water Management Plan, 2000). Sedimentation and Storm water detention basins shall be designed .with a maximum flow rate equal to existing 2-, 10-, and 100-year flow rates (Section 3: Draft Local Water Management Plan, 2000).	Peak storm water discharge rates and storage volumes from any watershed, subwatershed, detention basin, wetland or conveyor shall be consistent with the values shown in the plan (Local Water Management Plan, 1994). The 100-year discharge rates and storage volume given in 1994 plan, appendix on VLAWMO, but referenced to VLAWMO Plan (presumably First generation plan). Modeling of Amelia subwatershed listed as future CIP item. The 2005 Surface Water Management Plan calls for controlling the volume and rate of runoff to

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
				subdivider shall install storm sewer facilities subject to the specifications and inspection of the City Engineer if adequate provision is not made or does not naturally exist for disposal of storm waters. (Subdivision Ordinance 93)			conform with NPDES Phase II requirements.

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
Erosion and Sediment Control	Requires SWPPP with temporary and permanent erosion prevention and sediment control practices. Has specific standards for: Temporary and permanent erosion prevention and sediment control. Temporary sediment basins for drainage basins with more than 10 acres disturbed area. Energy dissipaters at pipe outlets. Temporary erosion protection or permanent cover for exposed soils. Stabilizing of ditches connected to surface waters. Sequencing of sediment controls before land disturbance.	Erosion control plan consistent with Ramsey Soil and Water Conservation District Erosion & Sediment Control Manual 1989 required. Plan also calls for: Preserving natural vegetation to greatest extent practical Protection of graded areas from runoff Protection of stockpiles Installation prior to obtaining grading permit (being grading) Protecting adjacent and streets property: site entrances and dust control Drain inlet and conveyance system	Erosion and sediment control plan shall be subject to review and approval of the applicable Watershed District and City Engineer (Subdivision regulations 104.070 Subd. 8.). Subdivision regulations also state: Measures must conform to natural limitations Installed prior to development Smallest practical area exposed at any one time. When exposed, expose for shortest period of time. Top soil saved, restored Natural vegetation protected when practical Runoff to sediment basin before discharge City of White Bear Lake Water Management Plan, 1997 also has language	The developer shall plan for necessary erosion and sediment control practices to insure effective control of soil losses within the standard prescribed … (Erosion and Sediment Control Ordinance 75). Specifics include: Tailoring to site topography and soils, and maximum use of vegetation Retain natural vegetation wherever possible Maximum exposed condition of 30 days without vegetation if structural controls Temporary seeding and mulching for rough grading (90 to 360 days of exposure) Permanent seeding >1yr rough grading During final landscaping and turf establishment soil shall not be exposed	Approval of an SWPPP required before land disturbance for projects larger than 1 acre. General criteria: Minimize areas and duration of exposure Minimize disturbance of natural vegetation Protect receiving water bodies, wetlands, and storm sewer inlets Protect adjacent properties Minimize off-site sediment from trucks and equipment Minimize work in and adjacent to waterbodies and wetlands Maintain stable slopes Minimize disturbance to root systems and trees Minimize compaction	A person engaged in a land disturbing activity must submit an erosion and sediment control plan that will prevent soil erosion or sediment from damaging adjacent land, bodies of water, watercourses or wetlands to the Town for its approval (APPENDIX F: Draft Local Water Management Plan, 2000). The (Ramsey County Erosion and Sediment Control Handbook) shall be the reference for Erosion and Sediment Control Practice specifications used in the Town of White Bear. (APPENDIX F: Draft Local Water	Policy 1 (erosion and Sediment Control): Establish erosion control practices for new and redevelopment: Objective 1: Construction Site Storm water Runoff Control to Reduce Pollutants from Construction Activities Using the Land Disturbance Criteria of the RCWD and VLAWMO and the General NPDES Phase II Permit (2005 Plan).

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
	Protecting of storm drain inlets with BMPs. Using vehicle tracking BMPs.	protection Temporary sediment basins Establishment of temporary and permanent vegetation to minimize time of exposed condition Energy dissipaters Temporary vegetation	about silt fences, diversions, dikes, vehicle tracking, mulching, seed mixes, sod, and soil conservation practices that limit after development soil loss to not more than 0.5tons/acre/year.	for more than 15 days. Implement practices as soon as possible VLAWMO, review, comment and inspection allowed/provided. VLAWMO shall be responsible for monitoring whether the erosion and sediment control elements of the site plan are in conformance…and whether development is proceeding according to the approved plan.	Protection of stockpiles Soil tilling (6 inches) Methods to prevent sediment damage to adjacent properties and sensitive resources Stabilize steep slopes Protection of storm sewer infrastructure from sediment Disposal of collected sediment and debris Stabilization within timeframes Sedimentation basins (10 acres / 5 acres). Includes much of the NPDES General Construction Permit Language(Section 17 Zoning Ordinance).	Management Plan, 2000).	
Permanent Water Quality Storm Water Controls	Permanent storm water management system: Treatment of ½ inch of runoff from new impervious surface if ≥ 1 acre of pervious	NURP pond, sedimentation basin prior to discharge, and skimmers on outlets.	All subdivision design shall incorporate adequate provision for storm water runoff subject to review and approval of the applicable Watershed	Appropriate provisions should be made to accommodate increased Storm water runoff and consequent soil loss occasioned by changed soil and surface	For all land disturbing activities covering 1 acre or more the applicant shall comply with all requirements of the NPDES Phase II Regulation.	All proposed drainage plans for developments in the White Bear Township will be required to incorporate the	Policy 2 (Water Quality) in cooperation with RCWD and VLAWMO establish Maximum Acceptable Nutrient Concentrations (MANC) in streams

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
	surface is replaced with impervious surface by one of the following methods: Wet sedimentation basin with max discharge 5.66 cfs/pond acre. Infiltration/filtration BMPs. Regional ponds with max discharge 5.66 cfs/pond acre. A combination of the above. An alternative method with 80 percent TSS removal on an annual basis. Pollution prevention methods during construction for solid waste disposal, hazardous materials handling, and vehicle washing.		District and City Engineer. (Subdivision Regulation 1404.070) Post construction storm water management for new and re-development of one acre or larger will include: Detention ponds Infiltration rain gardens Infiltration grass swales Vegetative Cover seeding Outlet structure stabilization Catch basin sumps Swirl separators (City of White Bear Lake Storm Water Pollution Prevention Program, 2003). Storm water shall not discharge from lateral conveyors directly into any waters or wetland a other than designated detention basins without either primary	conditions during and after development… such provisions may include, but are not limited to: The installation of improvements…such as Streets, storm sewers curb and gutter, detention basins and other features (Ordinance 75) Developer shall maintain sediment basin, debris basins and silt traps to substantially reduce sediment from runoff water.	Minimum requirements of the Storm Water Management Plan (for proposed development) shall be consistent with the most recent version of the Minnesota Pollution Control Agency NPDES Construction Permit Requirements. Treat half inch of runoff, 1 inch if discharged to a special water	principles of best management practices for each site (Section 3.0: Draft Local Water Management Plan, 2000). The design of all sedimentation and Storm water detention basins as well as the use of wetlands, lakes and ponds as detention basins, must meet the criteria set forth in the Management Plan of the Vadnais Lakes Area Watershed Management Organization or the Rice Creek Watershed District as appropriate. Sedimentation and Storm water detention basins	contributing to recreational lakes. Objective 1B (Water Quality) in cooperation with RCWD, Support the Development of Management Plans with Specific Action Items for Each Recreational Lake to Meet the Desired Future Condition of Maintaining or Establishing a Minimum Lake Grade of C, and Swimming as a Lake use.

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
			sedimentation in a natural or man-made structure, such as catch basins or grit chambers, and/or established programs of street, maintenance or house-keeping practices implemented to reduce the inflow of pollutants (City of White Bear Local Water Management Plan, 1997). Proposer must provide dead storage volume of no less than the calculated runoff from a 2.5-inch rainfall over the tributary area. The dead storage shall be below the outlet of the newly constructed detention basins to allow for reasonable accumulation of sediment (City of White Bear Lake Local Water Management Plan, 1997).			shall be designed…with design removal rates of 80 percent suspended solids and 50 percent of phosphorus. Areas within the Saint Paul Water Utility (SPWU) protected waters, removal rate of 90 percent suspended solids and 65 percent phosphorus. Storm water run-off from a development or construction site may be directed to a water or wetland only after pretreatment within a wet detention pond facility designed and constructed in accordance with the Town's Local Water Management Plan (Ordinance 35,	

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
						Wetland Overlay District Permit Procedure).	
Runoff Volume Control Requirements	None except as one of the options for minimizing temperature increases to trout streams.	None	Infiltration BMPs mentioned in SWPPP.	The subdivider shall demonstrate that any changes in topography shall not be adverse to water flowage or water control and shall be responsible for any change in topography that causes such adverse consequences. ..The subdivider shall install storm sewer facilities subject to the specifications and inspection of the City Engineer if adequate provision is not made or does not naturally exist for disposal of storm waters. (Subdivision Ordinance 93)	At a minimum first half-inch from a 24-hours storm unless the site is within 2,000 feet of special water where the first 1-inch of runoff from a 24-hour storm event shall be infiltrated (Section 22 Zoning Ordinance).	None	The 2005 Surface Water Management Plan calls for controlling the volume and rate of runoff to conform with NPDES Phase II requirements. The 2004 Parks, Natural Open Space/Greenways, and Trail System Plan by the City states that using natural infiltration methods will be an underlying principle for managing storm water on all public, and where feasible, private lands.
Security requirements	None	None but could be required in a developers agreement.	City may require a soil erosion control cash deposit to guarantee erosion control measures are taken (Subdivision regulations 104.070	City Council may require performance bond, cash escrow, or letter of credit…	The applicant shall provide security, to the City of Gem Lake, for the performance of work described and delineated on the City	Upon approval of an erosion and sediment control plan, the Town may require the developer to post a	The developer shall provide financial security to the Lino Lakes Public Improvement Financing Policy, as amended. A

Topic	MPCA General Permit to Discharge Storm Water Associated with Construction Activities[1]	Vadnais Heights	White Bear Lake	North Oaks	Gem Lake	White Bear Township	Lino Lakes
			Subd. 8.)		approved Storm Water Pollution Prevention Plan…(Section 22 Zoning Ordinance).	performance bond, cash or certified check to insure completion of the erosion and sediment control plan(Ordinance 35).	development agreement shall include a description of the required securities (Subdivision ordinance).

TABLE 3-7
VLAWMO PUBLIC GROUNDWATER SUPPLIES AND WELLHEAD PROTECTION STATUS

Community	Public Community Well(s) in VLAWMO	Wellhead Protection Planning Status
White Bear Township	Y	Part 1
Vadnais Heights	Y	Part 1
White Bear Lake	N	This community has not entered the wellhead protection program
North Oaks	Does not have their own public water supply. Portions of city supplied by White Bear Township	---
Gem Lake	Does not have their own public water supply	---
Lino Lakes	N	Completed
Board of Water Commissioners of the St. Paul	Y	Part 1 – Approved, working on Part 2

4.0 GOALS, POLICIES AND MANAGEMENT STRATEGIES

This portion of the Plan includes the goals and policies for water resources management in VLAWMO through the year 2016. Each goal is briefly described, including the issues addressed and their priority, and the policies and management strategies to be enacted to achieve the goal. These goals and associated policies form the framework for water resources management decisions made by VLAWMO. The process for implementing is provided in more detail in Section 6.0.

The development of these goals, policies, and strategies considered the issues/problems identified in Section 3.0 and their priority and the adequacy of existing controls and management efforts. Fundamental principles in developing this management approach include:

- That VLAWMO is not the only organization with responsibility for water management in the watershed. This is a shared responsibility between State and local government and the public.
- That available VLAWMO resources should focus on priorities. Several efforts done well are better than numerous efforts done poorly or incompletely.
- That VLAWMO efforts should build on, improve, or enable existing control/management efforts before starting duplicate efforts.
- That management efforts should possibly vary by subwatershed. As demonstrated in Section 2.0 and Section 3.0, watershed characteristics and issues vary by subwatershed.

VLAWMO has divided the watershed into six separate subwatershed areas (Figure 2-1). The Vadnais/Sucker Subwatershed and the Lambert Creek Subwatershed were divided into small catchments to reflect the differences in land use characteristics in different portions of these subwatersheds. The six main subwatersheds will form the basis for taxing and financing capital improvement projects within subwatersheds.

The following goals have been established by VLAWMO:

1. Prevent flooding
2. Protect and improve surface water quality
3. Protect groundwater quality and quantity
4. Protect wetland resources

5. Protect and improve waters for wildlife habitat and recreation
6. Enhance public participation and stewardship
7. Optimize public resources
8. Analyze and use alternative funding sources
9. Make and enable informed decisions
10. Improve communications

Each of these goals and associated objectives, policies, and management strategies are described below.

4.1 GOAL 1: PREVENT FLOODING

This goal addresses the issue of localized flooding. This is ranked a low priority in all watersheds except for portions of the Lambert Creek Subwatershed and the Gem Lake Subwatershed. There are existing concerns in the Lambert Creek Subwatershed and there are future concerns in the Gem Lake Subwatershed because the subwatershed is landlocked and it is expected there will be increased runoff volumes with additional development.

The basic management philosophy is that in areas where flooding is a low priority, existing public works efforts, and floodplain and shoreline ordinances provide a sufficient level of control if combined with two additional activities:

1. Controlling peak runoff increases from new development.
2. Improvements to certification procedures for low floors of structures in flood-prone areas.

To address the future concerns regarding Gem Lake, policies are included regarding the preference for volume control and low impact development technologies and for management of landlocked basins. For the Lambert Creek flooding issues, policies are included regarding public ditch maintenance, and the need for studying and improving existing conditions. There are also general policies to insure proper placement of structures and control peak runoff rate increases with new development.

4.1.2 POLICY 1.1: ENSURE NEW/RE-DEVELOPMENT CONSTRUCTION, MINIMIZING FLOODING RISK AND LOSS OF FLOODPLAIN CAPACITY

Management Strategies and Standards

Strategy 1.A: Floodplain and Shoreland Ordinances. Some LWP Authorities (i.e., cities and townships with water planning authority, LWPA) are required to have MnDNR-approved floodplain and shoreland ordinances, depending on water resources issues. Where MnDNR does not require such ordinances, VLAWMO requires there be no encroachment upon floodways that will reduce capacities to expedite flood flows. No permanent structures, with the exception of drainage conveyance structures, may be constructed in the floodways. VLAWMO will only allow structures in the flood fringe with vertical separation of 2 feet above the 100-year regional overflow elevation and have been protected through flood proofing or by other construction techniques.

Strategy 1.B: Low Floor Certification. LWPAs are required to have a process for certifying that as-built low floor elevations of structures in or near flood-prone areas are completed as approved.

4.1.3 POLICY 1.2: MANAGE NEW DEVELOPMENT AND DRAINAGE ALTERATIONS

Management Strategies and Standards

Strategy 1.C: Rate Control Standards. New development on either a regional basis, or site-by-site basis must be designed to hold the post-construction peak runoff rates at pre-development levels for the 1-or-2, 10- and 100-year precipitation events. A hydrograph method based on sound hydrologic theory shall be used to analyze runoff for design or analysis of flows and water levels.

Strategy 1.D: Landlocked Basin Standards. Runoff volume management to control post-development volumes at pre-development volumes is preferred for the Gem Lake Subwatershed. An outlet with a fish migration barrier may be completed, provided the following criteria/standards are met:

- The low floors of new structures have been established with a 2-foot vertical safety factor based on the 100-year elevation or the runoff elevation of the landlocked basin.
- Potential downstream impacts have been addressed, and if necessary, appropriate mitigation identified.
- An established outlet elevation that retains as much storage within the subwatershed as possible.

This strategy/standard is intended to be applied to landlocked basins in addition to Gem Lake, if identified.

Strategy 1.E: Major Drainage Alteration Review. Drainage alterations on major waterways of 1 square mile drainage area or more, needs to be submitted to VLAWMO for review and comment prior to LWPA approval.

4.1.4 POLICY 1.3: MAINTENANCE OF PUBLIC DITCHES

Management Strategies and Standards

Strategy 1.F: Regular Inspection and Maintenance. VLAWMO encourages the individual municipalities to inspect ditches annually and clean the structures and pipes of the public ditch systems on a regularly scheduled basis. Municipalities shall include a description of planned inspections and cleaning effects in the LWPs and shall report the results of their annual inspections to the VLAWMO.

Strategy 1.G: Repairs. If repairs beyond regular maintenance are required, the communities shall inform the Board of the necessary repairs. Then, contemplating major repairs, the VLAWMO Board of Directors will notify the communities and agencies and will follow the procedures in Minnesota Statute 103E.

4.1.5 POLICY 1.4: STUDY AND IMPROVE AREAS ALONG LAMBERT CREEK

Management Strategies and Standards

Strategy 1.H: Lower Lambert Creek Flood Reduction Study. VLAWMO will work with the City of Vadnais Heights to identify and study flooding issues on lower Lambert Creek. If feasible and economical remedial actions are identified, VLAWMO will work with the City and residents to identify possible funding mechanisms, partnerships, and grants (such as the MnDNR Flood Drainage Reduction Program) to implement improvements. A minor plan amendment to enable implementation would be completed if feasible solutions and acceptable funding mechanisms are found.

Strategy 1.J: County Road E and Highway 61 Area Storm Water Study. VLAWMO will work with Gem Lake, MnDOT and Ramsey County to look at areas along County Road E and Highway 61 that drain north through a 21-inch pipe to the Gem Lake Watershed. This outfall is believed to be the only major storm water outlet in the subwatershed. The purpose of the study is to investigate opportunities to control runoff volumes to landlocked Gem Lake. Funding options will also be addressed by the study. The study is scheduled for plan year 3 (i.e., 2009). If feasible options are found, a minor plan amendment will be completed.

4.2 GOAL 2: PROTECT AND IMPROVE SURFACE WATER QUALITY

This goal is intended to address the following surface water quality issues identified in Section 3.0:

- Surface water withdrawn from the watershed supplies a portion of the potable water for the 400,000+ users of the St. Paul Regional Water System.
- There are numerous shallow lakes in which water quality is either threatened or impaired.

The first issue is a high priority for the VLAWMO for all subwatersheds, except the Gem Lake Subwatershed and the West Vadnais Lake Catchment. The issue is a lower priority in these areas because the lack of surface water connection.

The second issue is rated high for most subwatersheds. Several subwatersheds do not have lakes and the issue was rated as low-to-medium priority. However, these catchments are hydrologically connected through storm sewer systems to downstream lakes, contribute pollutants, and thus, the following policies and strategies still apply.

The two issues regarding development and re-development:

- Much of the urban development occurred before the use of BMPs for mitigating water quality impacts of development were common place, and
- Additional development is expected and is also addressed in the following policies and strategies as they relate to surface water quality management.

4.2.1 POLICY 2.1: PREVENT FURTHER DEGRADATION OF SURFACE WATER

Management Strategies and Standards

Measurement of this policy will be tracked using data from the VLAWMO CLMP. In addition to the strategies listed below for this policy, other strategies, most notably Strategy 4.B: Implement Wetland Protection Standards, with the buffer standard, have water quality components that are designed to help achieve this policy.

Strategy 2.A: Storm Water Standards. Management strategies include requirements for temporary erosion control, post-construction water quality, and municipal storm water management practices consistent with the MPCA's NPDES General Permits for Construction and MS4s. LWPs and official controls need to include programs to comply with MS4 requirements and local controls for ordinances need to be consistent with the NPDES General Construction Permit Requirements.

LWPs and official controls also need to address new MCES requirements for soil ripping and amendment, and at least half-inch volume control and include the wetland buffer standards listed under the goal in Section 4.4.

The Board also expects the BWCSP to continue treating water diverted to the VLAWMO from the Mississippi River. Discontinuation of treatment may cause degradation of VLAWMO lakes. Treatment includes the ferric chloride addition and aeration of Pleasant and East Vadnais lakes.

Storm water management standards are presented separately below for construction erosion control, greater than 1 acre, redevelopment projects less than 1 acre, post construction storm water quality, peak runoff rate control, and runoff volume control.

Construction Erosion Control Standards

Proposal projects creating more than 1 acre of impervious surface, or 1 acre of disturbed area, should already be complying with the NPDES General Construction Permit. However, consistency with the State requirements will standardize local application and inspection, with State assistance for enforcement, if needed. Construction activities must minimize erosion and retain eroded sediment onsite.

- Erosion and sediment control measures shall be consistent with BMPs in the 2006 Minnesota Storm Water Manual, and shall be sufficient to control erosion and to retain sediment on site.
- All temporary erosion and sediment controls shall be installed on all down gradient perimeters before commencing the land disturbing activity, and left in place and maintained as needed until removed per municipality approval after the site had been stabilized. All permanent erosion control measures shall be installed and operational per the design and as required by the municipality.
- Erosion and sediment controls shall meet the standards for the General Permit Authorization to Discharge Storm Water Associated With Construction Activity Under the National Pollutant Discharge Elimination System/State Disposal System Permit Program Permit MN R100001 (NPDES General Construction Permit) issued by the MPCA, August 1, 2003, as amended for projects disturbing more than 1 acre.
- Final stabilization of the site must be completed in accordance with the NPDES General Construction Permit requirements.
- If the activity creates more than 1 acre of disturbed area and the activity is taking place on a site where soils are currently disturbed, areas that will not be graded as part of the development and areas that will not be stabilized according to the timeframes specified in the NPDES General Construction permit Part IV.B.S, shall be seeded with a temporary or permanent cover before commencing the proposed land disturbing activity.

- The VLAWMO or municipality may at their discretion use turbidity measurements as an indicator of potential non-compliance with these standards. If nephelometric turbidity units (NTU) measurements taken at a point of site storm water discharge exceed 50 NTUs, a construction erosion control inspection of the site shall be completed. Enforcement procedures and timeframes to correct non-compliant conditions shall be as specified by the NPDES General Construction Permit. Exceedence of the turbidity indicator alone shall not constitute non-compliance.

Redevelopment Project Standard

Projects that create less than 1 acre of new impervious surface, but remove and replace or modify more than 1 acre of existing impervious surface, must incorporate water quality BMPs targeting 50 percent phosphorus and 80 percent sediment removal based on predevelopment conditions to the extent practical. BMPs should include low impact development (LID).

Post Construction Water Quality Standard

Post construction storm water runoff quality measures shall meet the standard for the General Permit Authorization to Discharge Storm Water Associated with Construction Activity Under the National Pollutant Discharge Elimination System/State Disposal System Permit Program Permit MN R100001 (NPDES General Construction Permit) issued by the MPCA, August 1, 2003, as amended.

- The water quality control volumes necessary to meet the NPDES General Construction Permit that are satisfied using infiltration or filtration technologies (filtration only on Type C and D soils) can count toward the Volume Control requirements of these Standards.
- Ponds with overflows or outlets located below the seasonally high water table are allowed only where it can be demonstrated that there is a reasonable need for such an outlet to control seepage damage to existing structures.
- Redevelopment projects are required to incorporate water quality BMPs to the extent practical.

Peak Runoff Rate Control Standard

Development on either a regional basis or site-by-site basis must be designed to hold the post-construction peak runoff rates at pre-development levels for the 1-or-2, 10- and 100-year precipitation events. A hydrograph method based on sound hydrologic theory shall be used to analyze runoff for design or analysis of flows and water levels.

Runoff Volume Control Criteria Standard

- Development that creates one acre or more of new impervious surface must incorporate volume control practices into the design sufficient to infiltrate at least a half inch of runoff from new impervious area on A and B soil. For C and D soil, low-impact development and other volume control BMPs are required to minimize impacts.

Credits for site design are the preferred methods for meeting the volume control requirements and shall be considered prior to the design of infiltration facilities. VLAWMO also encourages preservation of open space, site design practices such as directing roof drains to pervious surfaces, and other credits described in the Minnesota Storm Water Manual (MPCA, 2005) and reuse of storm water, for irrigation, as preferred methods for meeting the volume control requirements.

The following practices should allow a half-inch credit per unit area of the practice. To receive credit, applicants must request the credits, and provide calculations and documentation showing that the following criteria are met.

Rooftop Disconnection Credit. This credit will be given per unit area of rooftop that is disconnected and directed to a pervious area where it can either infiltrate or transpire. To receive the credit:

- Projects involving the subdivision of land must include the maintenance and preservation of the disconnection as part of a recorded restrictive covenant;
- The disconnection must be designed to adequately address the issue of basement seepage;
- The contributing length of rooftop to a discharge location shall be 75 feet or less;
- The rooftop contributing area to any discharge location cannot exceed 1,000 square feet;
- Disconnection will only be credited for residential lot sizes greater than 6,000 square feet;
- The receiving pervious area slope must not exceed 5 percent and must not channelize flow;
- Where provided, downspouts must be at least 10 feet away from the nearest impervious surface to discourage reconnection;
- No soil evaluation is required for disconnections that drain to hydrologic soil groups A and B;
- Disconnections draining to hydrologic soil groups C and D shall have a soil evaluation to demonstrate that additional flows will not create nuisance conditions; and
- For those rooftops draining to a stream buffer, the applicant may only use either the rooftop disconnection credit or the buffer credit, not both.

Non-Rooftop Disconnection Credit. This credit will be given for practices that disconnect impervious surfaces by directing runoff as sheet flow to a pervious area where it can either infiltrate or transpire. Credit is given per unit area of impervious surface disconnected. To receive the credit:

- The site must be graded to promote the flow of runoff to the pervious area;
- The maximum impervious flow path length shall be 75 feet;
- The length of the disconnected pervious area must be equal to or greater than the contributing length;
- The vegetated pervious area must be on a slope less than or equal to 5 percent and must not channelize flow;
- No soil evaluation is required for disconnections that drain to hydrologic soil groups A and B;
- Disconnections draining to hydrologic soil groups C and D shall have a soil evaluation to demonstrate that additional flows will not create nuisance conditions; and
- For those rooftops draining to a stream buffer, the applicant may only use either the rooftop disconnection credit or the buffer credit, not both.

Buffer Credit. This credit is given when a buffer is effectively used to disconnect and control runoff volumes, by directing runoff from impervious areas to sheet flow across pervious areas within the buffer, where it is either infiltrated or transpired. Credit is given per unit area of impervious surface disconnected. To receive the credit:

- The site must be graded to promote the flow of runoff to pervious areas in the buffer;
- Minimum buffer widths must be consistent with buffer requirements of Rule E;
- The maximum impervious flow path length shall be 75 feet for impervious surface;
- The length of disconnected pervious area must be equal to or greater than the contributing length of impervious surface;
- The vegetated pervious area must be on a slope less than or equal to 5.0 percent and must not channelize flow;
- Runoff shall enter the buffer as sheet flow. A level spreading device shall be utilized where local site conditions prevent sheet flow from being maintained;
- The credit is not applicable if rooftop or non-rooftop credits are already allowed for the same disconnection; and
- Buffers must be protected by conservation easement or dedicated outlots, and maintained in a natural condition in accordance with Rule E.

Grass Channel Credit. This credit is given where a grass channel is used instead of subsurface pipe to convey runoff. Credit is given per unit area of the channel bottom. To receive the credit:

- The channel must serve a low to moderate density development, with a density no greater than 4 units per acre;
- No soil evaluation is required for disconnections that drain to hydrologic soil groups A and B and where soil has been ripped and tilled to a depth of 6 inches prior to final seeding or sodding;
- Hydrologic soil groups C and D shall have a soil evaluation to demonstrate infiltration capacity;
- Channel bottom widths shall be between 2 and 8 feet;
- Channel side slopes shall be greater than 3:1, and channel slope shall be less than or equal to 3 percent;
- The length of the grass channel shall be equal to or greater than the roadway length; and
- The dimensions of the swale shall ensure that runoff velocity is nonerosive for the two- and ten-year design storms.

Soil Amendment Credit. This credit is given per unit area of soil amended prior to final seeding and/or sodding. To receive the credit:

- Amendment shall consist of ripping and tilling to a depth of at least 6 inches, and the addition of 20 percent compost (i.e., compost depth of 1.2 inches with 6 inch tillage depth); and
- The minimum area amended, where soil amendment is used to improve pervious soils in conjunction with the roof-top, non-roof top, and buffer disconnection, credits is 5,000 square feet.

Forest/Prairie Restoration Credit. This credit is given per unit area of forest or prairie restored. To receive credit:

- The minimum restoration area must be 20,000 square feet;
- There must be a 5-year maintenance agreement;
- Native plants must be used;
- Seeding and/or planting densities must be sufficient to achieve 75 percent forest canopy or prairie cover in 10 years;
- Prairies shall be planted with a native seed mix approved by MnDOT, BWSR, NRCS, or the Ramsey or Anoka SWCD, with the exception of a one-time planting with an annual nurse or cover crop. Plantings of native forbs and grasses may be substituted for seeding; and
- The area restored must be protected and maintained under a perpetual conservation easement or dedicated outlot.

The following practices are allowed a credit, but the amount of credit must be calculated on a case by case basis. To receive credit, applicants must request the credits, and provide calculations and documentation showing that the following criteria are met.

Natural Area Conservation Credit. A volume control credit will be given when natural areas are conserved at development or redevelopment sites, thereby retaining or improving their pre-development or hydrologic and water quality characteristics. To the extent practicable, these natural areas should be delineated to maximize contiguous land and avoid fragmentation. Credit will be given for a runoff volume based on what the conserved area could have been developed as under the current Comprehensive Land Use Plan for the Local Government Unit (LGU) without conservation. Areas that are already protected by existing Federal, State, or local law do not qualify. To receive the credit:

- The area cannot be disturbed during project construction (i.e., cleared or graded, except for temporary disturbances for utility construction, or to improve or restore vegetation);
- The area must be maintained in a natural vegetative state in an outlot and protected with a conservation easement;
- Mowed grass will not be considered a natural vegetative state; and
- A long-term vegetation management plan is required.

Green Rooftop Credit. A credit will be given when Green Rooftops are used to manage runoff. The amount of credit will be calculated based on manufacturer's specifications and guidance. To receive credit:

- The rooftop must be installed according to manufacturer's specifications;
- A long-term maintenance agreement clearly specifying parties responsible for maintenance is required; and
- A long-term vegetation management plan is required.

Permeable Paver/Pavement Credit. A credit will be given when permeable pavers or pavement are used to manage runoff. The amount of credit will be calculated based on manufacturer's specification and guidance. To receive credit:

- The pavers and/or pavement must be installed according to manufacturer's specifications;
- A long-term maintenance agreement clearly specifying parties responsible for maintenance is required;
- The area must have low traffic volumes (less than 1,000 trips per day for parking lots);
- The seasonally high water table must be at least 3 feet from the surface;
- The slope must be less than 2 percent;
- There must be low oil and/or grease usage on the site;
- The minimum base layer void space is 40 percent; and
- The minimum base layer depth is 9 inches.

- The water quality control volumes necessary to meet the NPDES General Construction Permit that are satisfied using infiltration or filtration technologies (filtration only on Type C and D soils) can count toward the Volume Control requirements of these Standards

- When using infiltration for volume control, infiltration volumes and facility sizes shall be calculated:

    - Using the appropriate hydrological soil group classification and saturated infiltration rate from the table below, or
    - Using documented site specific infiltration or hydraulic conductivity measurements completed by a licensed soil scientist or engineer, or
    - Using the method provided in the Minnesota Storm Water Manual Volume 2 (MPCA 2005) pages 18 through 21 of Chapter 12-INF, and
    - The design shall consider the infiltration rates of the least permeable horizon within the first 5 feet below the bottom of the infiltration practice, and
    - The system shall be capable of infiltrating the required volume in 72 hours.

TABLE 4-1
HYDROLOGIC SOIL TYPE, INFILTRATION RATE, AND SOIL TEXTURE

Hydrologic Soil Type	Infiltration Rate	Soil Texture
A	.30 inches/hour	Sand, loamy sand, or sand loam
B	0.15 inches/hour	Silt loam or loam
C	0.07 inches/hour	Clay loam, silty clay loam, silty clay, or clay

Source: Urban Hydrology or Small Watersheds (SCS, 1986), as amended.

Constructed infiltration facilities, such as infiltration basins and trenches:

- Can only be used if there is pretreatment of storm water runoff designed to protect the infiltration system from clogging with sediment and to protect groundwater quality;
- Cannot be used within 400 feet of a municipal or other community supply well or within,
- 100 feet of a private well unless specifically allowed by an approved wellhead protection plan,
- Cannot be used for runoff from fueling and vehicle maintenance areas and industrial areas with exposed significant materials,
- Cannot be used on areas with less than 3 feet vertical separation from the bottom of the infiltration system and the seasonal high water table,
- Cannot be used in Type D soils.

- Infiltration areas must be fenced or otherwise protected from disturbance before the land disturbing activity starts.

- Volume control amounts may be waived by the LGU for sites with predominately Type C and D soils, or where a shallow water table prevents construction of infiltration systems, provided the following are met in order of decreasing preference:
    - Credits and site design practices to minimize the creation of connected impervious surfaces are used to the extent practical.
    - Underdrains are used to promote filtration instead of infiltration.
- Vegetation used in conjunction with infiltration systems must be tolerant of urban pollutants, and the range of soil moisture conditions anticipated.

4.2.1.1 Storm Water Management Maintenance Standards

All storm water management structures and facilities shall be maintained in perpetuity to assure that the structures and facilities function as originally designed. The responsibility for maintenance shall be assumed either by the city, township, or county with jurisdiction over the structures and facilities, or by the applicant entering into a compliance agreement with the LGU. As part of the LWP, all communities shall complete a maintenance plan for inspections and periodic maintenance of stormwater outfalls, sumps, ponds, ditches and other infrastructures. VLAWMO will conduct periodic spot checks to ensure compliance.

4.2.2 POLICY 2.2: IMPROVE THE QUALITY OF SURFACE WATERS

The water quality improvement strategy incorporates the following strengths in addition to the development and redevelopment of storm water management strategies described above for Management Strategy 2.A.

Management Strategies and Standards

Strategy 2.B: Numerical Standards for Lakes. Some of the lakes in the watershed would likely be considered impaired, due to excessive nutrients, if VLAWMO CLMP were used by MPCA for determination of impairment. East Vadnais Lake is very close, but still slightly above the BWCSP goal of 25 μg/L total phosphorous. The VLAWMO is adopting the following water quality standards for the lakes.

- East Vadnais, less than 25 μg/L total phosphorus, as a growing season average.
- Pleasant, Charley and Sucker lakes, meeting full support for primary contact recreation, which using MPCA thresholds for impairment are less than 40μg/L total phosphorus, less than 15 μg/L chlorophyll-a, and greater than or equal to 1.2 meters SDT.
- With other shallow lakes (Goose, Gem, Vadnais West, Tamarack, Gilfillan, Deep, Black, Birch and Amelia) the initial standard is no degradation from existing 2005/2006 conditions,

as described under policy 4.2.1 above, with the intent of revising these as Sustainable Lake Management Planning (SLMP) (Strategy C below) and modeling (described in Strategy 2.C below) are completed.

For Pleasant Lake and Charley Lake, currently on the 303d list for mercury, VLAWMO will work with MPCA to educate residents on the implications and assist where possible as the MPCA completes the statewide mercury TMDL.

Strategy 2.C: Development of SLMPs. The development of SLMPs for lakes in VLAWMO will be promoted. SLMPs will be collaborative efforts with local residents and municipalities. The completion of one to two plans will be targeted each year. VLAWMO contributions to the plans will include: modeling and financial cost share assistance. VLAWMO cost share assistance will be a 50 percent match up to $7,500 of the cost of SLMP with member communities, lake associations and other groups coming up with the balance required. Plan contents are expected to include:

- Aquatic plant coverage and management
- Exotic species issues and management
- Shoreline condition and management
- Nutrient dynamics and management
- Storm water runoff and phosphorus contributions and management
- Roles and responsibilities for management
- Implementation schedule and plan
- Shortage of potential recreational opportunities (pier, public access, etc…)

The VLAWMO feels that joint development of SLMPs is an excellent means of motivating, involving, and educating the local residents, coordinating management, leveraging resources, and filling some of the data gaps. This is also the place where the issue concerning exotic species can be collaboratively addressed. The MnDNR will be contacted regarding special issues and/or for information gathering and to incorporate comprehensive wildlife conservation strategies (CWCS) or a DNR approved method.

The order of SLMPs are as follows:

TABLE 4-2
SLMP IMPLEMENTATION PLAN

Lake	Year
Birch	2007
Tamarack	2008
Wilkinson	2009
Goose	2009
Gem	2010
Gilfillan	2010
Pleasant	2011
East Vadnais	2011
Sucker	2012
Amelia	2012
West Vadnais	2013
Black	2013
Charley	2014
Deep	2014

Based on the following score:

Lake Name	Lake Grade	Score	Management VLAWMO Priority	Score	305B or 303D List	Score	Local Partner/Funding	Score	Total Score
Birch	B-	2	Moderate	3	NO	0	P/HF/CF	5	10
Tamarack	D-	4.5	High	4	NO	0	P	1	9.5
Wilkinson	D+	3.5	High	4	NO	0	P/HF	2	9.5
Goose	F	5	Light	2	NO	0	P	1	8
Gem	C	3	High	4	NO	0	P	1	8
Gilfillan	C	3	Light	2	NO	0	P/HF	2	7
Pleasant			High	4	YES	1	P/HF	2	7
East Vadnais			High	4	NO	0	P/HF	2	6
Sucker			High	4	NO	0	P/HF	2	6
Amelia	B-	1.5	High	4	NO	0	NP	0	5.5
West Vadnais			High	4	YES	1	NP	0	5
Black			High	4	NO	0	NP	0	4
Charley			High	4	NO	0	NP	0	4
Deep			High	4	NO	0	NP	0	4

For local scoring: P = Partner Group Available (1 point)
NP = No Partnering Group (0 points)
HF = Historical Funding for Water Quality Project (1 point)
CF = Current Funding Available from local groups (3 points)

Strategy 2.D: Promotion of Water Quality Improvement And Wetland Restoration/Enhancement Projects. The VLAWMO will provide financial incentives for improvement projects by maintaining a fund to provide cost share for water quality improvement and wetland restoration/enhancement projects. Project sponsors can be residents, cities and townships, counties, MnDOT, and conservation districts within the watershed. A project can include anything that improves water quality from shoreland stabilization, to the projects identified as part of the 2005 study *Improving the Waters of Lower Lambert Creek – A Feasibility Study*, to projects identified as part of a SLMP. Cost sharing details will be developed during the first year of implementation, however, it is expected that the improvements will need to have a demonstrated aquatic habitat benefit, a water quality (sediment and phosphorus) benefit, or runoff volume benefit, and there will need to be a means of assuring future protection and maintenance. Maintenance efforts and efforts necessary to meet the requirements of the NPDES General Construction permit would not be eligible.

Strategy 2.E: Management of Lambert Creek. Management of Lambert Creek shall include annual monitoring and assessment, operation and maintenance of improvements, coordination of potential TMDL studies and subwatershed BMPs, and implementation of restoration efforts. Lambert Creek currently has 5 monitoring stations (Figure 2-6). VLAWMO will continue to provide operation and maintenance of the Lambert Creek improvements (i.e., Grass Lake, Rice Lake, and Lambert Creek weirs). The Clean Water Partnership grant work plan has identified several projects or programs aimed at enhancing assessment, stream bank stabilization, or other water quality improvements.

Strategy 2.F: Source Water Protection and Emergency Response Planning. The BWCSP is working on a Source Water Protection Plan and has an Emergency Response Plan for their facilities, but there is no Emergency Response plan for the watershed. Most of VLAWMO effort toward potable water supply protection is reflected in the strategies above. However, since the Board is comprised of representatives of member communities it is in a position to assist with Source Water Protection and Emergency Response Planning. VLAWMO will also compile information on existing Emergency Management Plans and contacts, and distribute to commissioners so they can become familiar with general procedures. The idea is for VLAWMO and the commissioners to be aware of procedures and contacts and to be able to answer questions from the public or to direct them to the appropriate contacts.

Strategy 2.G: Control Soil Loss on Small Construction Sites in Shoreland Areas. The NPDES General Permit for construction includes requirements for construction erosion control for projects

that disturb more than 1 acre. Erosion from small sites in higher risk areas close to waterbodies can also cause problems. This strategy includes the development of programs to include simple construction erosion control requirements for small sites in shoreland areas to be distributed and enforced as part of building permits. LWPAs are expected to develop and detail such a program in their LWPs.

Strategy 2.H: Support and Coordinate TMDL Studies. VLAWMO will complete data analysis by a certified lab and provide lake and stream water quality data collected to MPCA for storage in Storet. When a water resource is deemed impaired and placed on the 303d list or 305b list, VLAWMO will provide local partnership services and coordinate a partnership between member communities, VLAWMO, BWCSP, and State agencies to discuss, fund, and implement TMDL studies. For Pleasant Lake and Charley Lake, currently on the 303d list for mercury, VLAWMO will work with MPCA to educate residents on the implications and assess, where possible, as the MPCA completes the statewide mercury TMDL.

4.3 GOAL 3: PROTECT AND IMPROVE GROUNDWATER QUALITY AND QUANTITY

This goal is intended to address the following issues:

- Local communities obtain their potable water supply from groundwater
- Groundwater is threatened or impaired

The first issue reflects availability of supply and is a medium priority for the VLAWMO in all subwatersheds. The second issue reflects groundwater quality and is a high priority across the watershed.

In general, VLAWMO feels that there are sufficient regulatory efforts in these areas with appropriations permitting by MnDNR, the superfund cleanup efforts by MPCA and MDH, wellhead protection efforts, and the sealing of abandoned wells at the time of property transfer. The exception is with respect to conservation and recharge and to protecting groundwater from contamination due to infiltration of storm water.

4.3.1 POLICY 3.1: PROMOTE MANAGEMENT PRACTICES THAT PROTECT RECHARGE

Management Strategies and Standards

The strategy for protecting recharge is included in Strategy 2.A: Storm Water Standards, above. The storm water strategy includes standards to protect infiltration and recharge during development such as soil ripping and amendment to mitigate compaction, infiltration on Soil Types A and B, the use of

credits to promote site design, and conservation of groundwater by reusing storm water for irrigation.

4.3.2 POLICY 3.2: PROMOTE MANAGEMENT PRACTICES THAT PROTECT GROUNDWATER QUALITY

Management Strategies and Standards

The strategy for protecting groundwater quality is reflected in Strategy 2.A: Storm Water Standards, above, and in an additional strategy below to assist with wellhead protection planning and implementation. The storm water strategy includes the NPDES General Permit requirements as the primary standards. This permit requires pre-treatment of storm water prior to infiltration, consideration of water table depth, and restricts infiltration for some hot spot types of land uses such as vehicle fueling areas. The new MCES requirements included in the strategy also requires consideration of wellhead protection when determining where storm water infiltration is appropriate. These requirements for controlling the quality of storm water infiltrated will help protect the quality of groundwater for both public and private wells. An education component is also planned as part of Goal 6, below, with respect to dumping of hazardous materials, the sealing of abandoned wells, and the protection of private wells.

Strategy 3.A. Wellhead Protection Assistance. Various member communities, with wells in the VLAWMO, are working on Wellhead Protection Plans. However, since the VLAWMO Board is comprised of representatives of member communities, it is in a position to assist with planning and resolution of issues between communities where capture zones cross municipal boundaries.

Strategy 3.B. General Permit for Small Appropriations. VLAWMO has developed a General Permit to allow for appropriations of water below the MnDNR threshold of 10,000 gallons per day, or 1 million gallons per user, per year, from any public water basin within the jurisdiction of VLAWMO and located within the boundaries of the Municipality. VLAWMO will continue using this General Permit. A description of the permit and its general form are included as **Error! Reference source not found.**.

4.4 GOAL 4: PROTECT AND ENHANCE WETLAND RESOURCES

Wetland conditions shall be protected from chemical, physical, biological, or radiological changes to prevent significant adverse impacts to the following designated wetland uses: maintaining biological diversity, preserving wildlife habitat, and providing recreational opportunities, erosion control, groundwater recharge, low flow augmentation, storm water retention, stream sedimentation, and aesthetic enjoyment as specified in MN Rule 7050.0210 Subp. 13a.. Avoidance of direct or indirect

wetland disturbance will be required for all development and land disturbing activities, in accordance with the state and federal requirements and approved local wetland management plans. Wetland mitigation sequence incorporating the following principles in descending order of priority:

- Avoid the impact
- Minimize the impact, and
- Mitigate the unavoidable impact to the designated uses of a wetland by compensation. Compensatory mitigation shall be accomplished in the following descending order of priority of replacement:
    - Restoration of a previously diminished wetland, and
    - Creation of a wetland for all development and land disturbing activities, in accordance with State and Federal requirements and approved local wetland management plan.

This goal is intended to address the issue:

- Sensitive resources, natural areas, and wetlands are present.

This is a high priority issue in all subwatersheds, except those where there are few or no wetlands present. Policies and implementation strategies that address Goal 2: Protect and Improve Surface Water Quality, also helps achieve this wetland protection goal, while some of the education strategies under Goal 6 are designed to complement the wetland strategies. Additional policies are described below.

4.4.1 POLICY 4.1: CONTINUE WETLAND CONSERVATION ACT PERMITTING

Management Strategies and Standards

Strategy 4.A: WCA Permitting. In accordance with the Minnesota WCA Rule 8420, VLAWMO is the LGU for administration of wetland issues in the watershed with the exception being MnDOT related activities, where MnDOT is the LGU. VLAWMO will continue to operate under WCA Rules (MN Ch. 8420) as amended.

4.4.2 POLICY 4.2: IMPLEMENT THE VLAWMO WETLANDS MANAGEMENT PLAN

Management Strategies and Standards

Strategy 4.B Implement Wetland Protection Standards. The VLAWMO Wetland Management Plan included buffer and hydroperiod (i.e., inundation and bounce) standards for wetlands based on

an inventory and classification of wetlands within the watershed. These standards are presented below. The classification scheme is presented in Figure 2-4.

As discussed below, these standards do not apply to public waters even though they were included in the inventory. Public waters include Charley, Deep, Pleasant, Vadnais East, Vadnais West, Sucker, Gem, Goose, Gilfillan, Wilkinson, Black, Birch, and Tamarack lakes.

This strategy requires implementation of these standards through LWPs and official controls for Public/Protected Waters Wetlands and Wetlands (wetlands), when land is subdivided. Detailed assessments of wetlands must be completed when a project is proposed using MNRAM 3.0 or the most current version. More detailed evaluations of classified wetlands in Figure 2-4 may be completed for proposed projects by the applicants. However, such assessments need to follow a Wetland Functional Assessment method acceptable to the VLAWMO and wetland sensitivity analysis, as described in the Wetland Management Plan (VLAWMO, 2001).

The following standards apply to lands containing or adjacent to a wetland when the land is subdivided:

General Standards

A. Structures intended to provide access to or across a wetland shall be prohibited unless approval is obtained in conformance with applicable Federal, State, and local regulations.
B. Strategy 2.A: Storm Water Standards shall be followed to control erosion and sedimentation during construction and to minimize post-construction storm water quality impacts.
C. The following hydroperiod standards are required and should be followed when designing the manner in which storm water is routed through natural wetlands from high priority protected wetlands to Utilize basins/storm water ponds. Utilized basins/storm water ponds being defined as a water management structure for which there is documentation that the basin was created for upland water quality purposes.

TABLE 4-3
HYDROPERIOD GUIDELINES FOR WATER LEVEL FLUCTUATIONS IN WETLANDS

Category	Wetland Management Classification*			
	High Priority Protection	Moderate Management	Light Management	Utilize Basins
Storm Bounce	Existing	Existing plus 0.5 feet	Existing plus 1.0 feet	Existing plus 2.0 feet
Discharge Rate	Existing	Existing	Existing or Less	Existing or less

Category	Wetland Management Classification*			
	High Priority Protection	Moderate Management	Light Management	Utilize Basins
Inundation Period for 1 or 2-year Precipitation Event	Existing	Existing plus 1 day	Existing plus 2 days	Existing plus 7 days
Inundation Period for 10-year Precipitation Event	Existing	Existing plus 7 days	Existing plus 14 days	Existing plus 21 days
Run-out control elevation	No change	No change	0 to 1.0 feet above existing run out	0 to 4.0 feet above existing run out
Run-out control elevation (landlocked)	Above delineated wetland, and in conformance with Strategy 1.D; Landlocked Basin Standards	Above delineated wetland, and in conformance with Strategy 1.D; Landlocked Basin Standards	Above delineated wetland, and in conformance with Strategy 1.D; Landlocked Basin Standards	Above delineated wetland, and in conformance with Strategy 1.D; Landlocked Basin Standards

*As shown on Figure 2-4 (Adapted from the State of Minnesota's Storm Water Advisory Group's "Storm Water and Wetlands: Planning and Evaluation Guidelines for Addressing Potential Impact of Urban Storm Water and Snow-Melt Runoff on Wetland, June 1997)

D. Where a wetland buffer is required, the Applicant shall:
    1. Submit to the LWPA and receive approval of a conservation easement or outlot for the protection of the approved wetland buffer and wetlands. The easement or outlet must describe the boundaries of the wetland and wetland buffer, monuments and monument locations, and prohibit structures, paving, mowing, introduction of non-native vegetation, cutting, filling, dumping, yard waste disposal, fertilizer application, or removal of the wetland buffer monuments within the wetland buffer or the wetland.
    2. Demonstrate execution of the conservation easement or record in an outlot by:
        a. Submitting evidence to the VLAWMO or the LWPA that the plat showing the outlot, or approved easement document, has been recorded in the County Recorder's/Registrar Titles' office.
        b. Submitting a duplicate original of the easement document or plat executed and acknowledged acceptable for filing with the County Recorder/Registrar of Titles' office, and
        c. Installing the wetland monumentation required by this standard.

E. All open areas within the wetland buffer shall be seeded and/or planted in accordance with the vegetation standards below.

Buffer Standards

A. For a Lot of Record or a Development Application approved by the VLAWMO Board of Commissioners or LWPA before the date when LWPs are required (i.e. two years after approval of this plan), the Applicant shall maintain a wetland buffer around the perimeter of all wetlands that are constructed as part on an approved wetland mitigation plan. The wetland buffer provisions of this standard shall not apply to a Lot of Record approved prior to the date when LWPs are required (i.e. two years after approval of this plan) or for Development applications approved by the VLAWMO Board of Commissioners or LWPA prior to this date until such land is subdivided. Land subdivided after the date shall establish buffers adjacent to Public/Protected waters and the wetlands according to these standards. Buffer standards shall also not apply to the subdivision of current lots of record that are 1 acre or less.

TABLE 4-4
BUFFER WIDTHS

Criteria	Wetland Management			
	High Priority	Moderate Management	Light Management	Utilize Basin
Average Width, feet	50	40	20	15
Minimum width, feet	35	25	16.5	10

*As shown on Figure 2-4

B. Wetland buffers shall apply regardless of whether or not the wetland is on the same parcel as a proposed development application. For subject parcels, in which the wetland is on an adjacent parcel, the wetland buffer requirements for the parcel shall be reduced by the distance between the property line of the parcel and the wetland on the adjacent parcel.

C. Buffer vegetation shall be established and maintained in accordance with the requirements found in this standard. During the first two growing seasons, buffer vegetation that does not survive, must be replanted. After the first two growing seasons, if the condition of the buffer area changes through natural processes not caused by the property owner, the owner shall not be required to reestablish the buffer. Buffers shall be identified within each lot by permanent monumentation approved by the VLAWMO.

D. Alterations, including but not limited to building, paving, mowing, cutting, filling, dumping, yard waste disposal or fertilizer application, are prohibited within wetland buffers. However, non-native invasive vegetation, such as common buckthorn, purple loosestrife, and reed canary grass, may be removed as long as the wetland buffer is maintained to the standards required by VLAWMO. Alterations do not include plantings that enhance the native

vegetation or selective clearing or pruning of trees or vegetation that are dead, diseased, or pose similar hazards.

E. Roadways and trails that must be aligned either adjacent to or across wetlands and shall be exempt to strict application of wetland buffer requirements if the Applicant submits documentation to the LWPA sufficient to lead to a determination by the LWPA that no reasonable alterative to construction in the wetland buffer exists. All other roadways and trails shall meet the buffer standards in Table 4-3.

F. Use of a meandering wetland buffer to maintain a natural appearance is encouraged. Water quality treatment ponds and storm water infiltration areas shall be allowed within wetland buffers provided that they meet the performance standards for wetland vegetation below.

Alternative Wetland Buffers With Extraordinary Management

A. Instances exist where, because of the unique physical characteristics of a specific parcel of land, an alternative wetland buffer may be necessary to allow for the reasonable use of the land. The alternative wetland buffer standard set forth below may be applied based on an assessment of the following:
    1. Undue hardship would arise from not allowing the alternative or denial of the alternative would otherwise not be in the public interest
    2. Size of the parcel
    3. Configuration of existing roads and utilities
    4. Percentage of the parcel covered by wetlands, and
    5. Configuration of wetlands on the parcel.

B. The LWPA shall determine whether use of alternative standards is appropriate in conjunction with VLAWMO as part of its review of a Wetland Replacement Plan. An applicant must receive VLAWMO Board approval prior to submitting a preliminary plan or plat application that applies the alternative buffer standard.

C. In instances where the Board and the LWPA approve alternative buffer standards, an applicant will be required to apply extraordinary construction and storm water management practices (extraordinary management practices) to control erosion, sedimentation, and nutrient loading during and for two years after construction, using dual-slit fence techniques. Dual silt fencing will be considered properly installed if the up-slope fence is located on the undisturbed edge of the wetland buffer and the down-slope fence is installed 5 to 6 feet into the unscarified wetland buffer. Silt fence must be placed outside the wetland. An Applicant must demonstrate that alternatives to the recommended measures to control erosion, sedimentation, and nutrient loading will limit dissolved phosphorus concentrations to one milligram per liter (mg/L) or less. Extraordinary management practices that may be

permitted in conjunction with and up-slope from, the above wetland buffer requirement include, but are not limited to, measures that add redundant protections to normally required BMPs.

D. Where alternative wetland buffer standards are approved, wetland buffers shall meet the standards established in Table 4-4.

TABLE 4-5
ALTERNATIVE WETLAND BUFFER WIDTH STANDARDS

Criteria	Wetland Management Classification*			
	High Priority	Moderate Management	Light Management	Utilize
Average Width, feet	40	30	15	10
Minimum Width, feet	30	20	10	5

As shown on Figure 2-4

E. The Applicant shall submit all of the necessary information to document that the proposed extraordinary management practices will at least duplicate the performance of the required buffers. The Applicant shall also have the burden of proving that the purpose and objectives of these standards will be met through the use of these extraordinary management practices.

Monumentation Standards

When using a conservation easement, a monument is required where each lot line crosses a wetland buffer edge. Wetland buffer monuments shall have a maximum spacing of 200 feet, where the lots are wider than 200 feet. If the wetland and buffer is held as open space in a residential development, one standing monument with additional metal hubs may be used to designate the buffer at 200-foot increments. If no buffer is required, monuments shall be placed at the wetland boundary. The monument shall consist of a post and a wetland buffer sign. The post shall be of a material approved by the LWPA such as a fiberglass reinforced composite or wood with a maximum size of 4 inches by 4 inches. The sign shall be mounted on flush with the top of the post and state, "Wetland Buffer: No Mowing Allowed" or "Wetland Buffer: Vegetation Clearing Limit." The post shall be installed to a height of 4 feet above grade, set at least 36 inches in the ground, if wooden, and 18 inches, if a composite post with an expanding metal anchoring system. Monuments may be waived in unusual circumstances where the LWPA determines that these signs would not serve a practical purpose.

Buffer Vegetation Standards

A. When natural vegetation exists in the wetland buffer areas (with the exception of species in the Minnesota Noxious Plant List), the retention of such vegetation in an undisturbed state is preferred. A wetland buffer has acceptable natural vegetation if it:
    1. Has a continuous, dense layer of perennial grasses or forbs that have been uncultivated or unbroken for at least 5 consecutive years, or
    2. Has an overstory of trees and/or shrubs with at least 60 percent canopy closure that have been uncultivated or unbroken for at least 5 consecutive years, or
    3. Contains a mixture of the plant communities described in (1) and (2) above that have been uncultivated or unbroken for at least 5 consecutive years.

B. Notwithstanding the performance standards set forth above (A), VLAWMO and the LWPA may determine existing wetland buffer vegetation to be acceptable if:
    1. It is composed of undesirable plant species (including, but not limited to common buckthorn, purple loosestrife, leafy spurge and/or noxious weeds as defined by M.S., Sections 18-75-18.88 and Minnesota Rules 1505.0730 o 1505.0760)
    2. It has topography that tends to channelize the flow of surface runoff
    3. For some other reason it is unlikely to retain nutrients and sediment.

C. Where wetland buffers, or a portion thereof, are not vegetated or have been cultivated or otherwise disturbed within 5 years of the permit application, such areas shall be planted. Wetland buffer plantings must be identified on the Wetland Replacement Plan, and/or grading plan. The wetland buffer landscaping shall be according to each of the following standards:
        1. Wetland buffers shall be planted with a seed mix containing 100 percent perennial plant species, except for a one-time planting of an annual nurse or cover crop such as oats or rye.
        2. The seed mix used shall be broadcast at a minimum rate of 30 pounds per acre unless an alternative plan is approved by the LWPA staff. The annual nurse or cover crop used shall be applied at a minimum rate of 20 pounds per acre. The seed mix shall consist of at least 12 pounds of pure live seed (PLS) per acre of native prairie grasses and 3 pounds per acre of native forbs. Native prairie grass and native forb mixes shall contain no fewer than five native prairie grasses and 15 native forb species. Seed mixes and rates shall be according to MnDOT and Minnesota Board of Soil and Water Resources (BWSR) guidance and specifications.
        3. Native shrubs may be substituted for native forbs, however, substitutions must be pre-approved by the LWPA staff. Such shrubs may be bare root seedlings

and shall be planted at a minimum rate of 60 plants-per-acre. Shrubs shall be distributed so as to provide a natural appearance and not be planted in rows.

4. Ground cover or shrub plantings installed within the wetland buffer are independent of landscaping required elsewhere by other applicable rules.
5. Native prairie grasses and forbs shall be seeded or planted by a qualified contractor. Native grass and wildflower seed materials shall be acquired and installed in accordance with the Restoring and Managing Native Wetland and Upland Vegetation (MnDOT, BWSR, 2006) or the most current wetland BWSR guidance manual.
6. No fertilizer shall be used in establishing new wetland buffer vegetation, except on highly disturbed sites when deemed necessary to establish native vegetation, as indicated by an accredited soil testing laboratory.
7. All seeded areas shall be mulched immediately with MnDOT Type Mulch straw at a rate of 2 tons per acre and the mulch shall be anchored with disk or tackifier.
8. Wetland buffer (both natural and created), shall be protected by erosion control during construction in accordance with NPDES general permit requirements for construction and erosion control shall remain in place until the plantings are established.

D. During the first two full growing seasons, the Applicant must replant wetland buffer vegetation that fails to survive. If the condition of the wetland buffer changes through natural processes not caused by the landowner after two full growing seasons, the owner shall not be required to reestablish the wetland buffer to meet the standards contained in this section.

Encroachments in Required Buffer Areas

A. Wetland buffers must be kept free of all structures (including fences and play equipment). Wetland buffers must not be mowed except as pre-approved in writing by LWPA staff for maintenance purposes.
B. Variances:
    1. All variance requests must be submitted in writing to the VLAWMO Staff and Board.
    2. Variances that would circumvent the intent and purposes of the standard shall not be granted.

Performance Bond Requirements

If a Development Application requires landscaping of a wetland buffer, no work shall begin and no permits shall be issued until the Applicant files with LWPA staff a performance bond, cash escrow,

or letter of credit with a corporation approved by LWPA staff as surety thereon, or other guarantee acceptable to LWPA staff and in an amount determined as set forth below:

A. Amount – The amount shall be for no less than 1.5 times the amount estimated by the LWPA staff, as the cost of completing the wetland buffer landscaping. The performance bond must cover two complete growing seasons following completion of the development and must be conditioned upon complete and satisfactory implementation of the approved wetland buffer landscape plan and fall inspection of the wetland buffer by the LWPA.
B. Submittal – The Applicant shall provide one copy of a signed contract with an environmental consultant to monitor and certify final completion of the wetland buffer requirements after the end of the second full growing season.
C. Form of Application – The performance and cash escrow, letter of credit, or other guarantee acceptable to LWPA staff shall be posted within 20 days of approval of the development application and prior to the commencement of the development or the preparations thereof.

4.4.3 POLICY 4.2: ENHANCE OR RESTORE WETLANDS

Management Strategies and Standards

The strategy for this policy consists of having funds available for wetland restoration and enhancement when opportunities arise as detailed in Strategy 2.D: Promotion of Water Quality Improvement and Wetland Restoration/Enhancement Projects.

4.5 GOAL 5: PROTECT AND IMPROVE WATERS FOR WILDLIFE HABITAT AND RECREATION

This goal is to protect and improve waters for wildlife habitat and recreation and is intended to address the issue:

- Sensitive resources, natural areas, and where wetlands are present.

This is a high priority issue in all subwatersheds except those where there are few or no wetlands present.

4.5.1 POLICY 5.1: PROTECT AND IMPROVE AQUATIC HABITAT

Management Strategies and Standards

The strategy for this policy relies mostly on policies and management strategies for protecting and improving water quality and for protecting and enhancing wetlands. Under the above strategies

habitat and wetland efforts can be completed as projects or can be added as wildlife plantings and/or native plants to enhance other capital improvement projects. Strategy 2.D: Promotion of Water Quality Improvement and Wetland Restoration/Enhancement Projects specifically includes habitat improvements as eligible for cost sharing and some of the efforts identified for improving lower Lambert Creek involve techniques such as bioengineering, which have added habitat benefits. Strategy 2.C: Development of SLMPs also includes an emphasis on aquatic plant management and education regarding aquatic plants is called out as important in Goal 6.

4.5.2 POLICY 5.2: PROTECT AND IMPROVE WATERS FOR RECREATION

Management Strategies and Standards

The strategy for this policy relies on protecting and improving water quality using the management strategies for Goal 2. Protect and Improve Surface Water Quality.

4.6 GOAL 6: ENHANCE PUBLIC PARTICIPATION AND STEWARDSHIP

This goal addresses the issue that public awareness about water resources in the watershed and appropriate stewardship are limited. Policies for achieving this goal focus on assisting and enabling the municipalities and townships covered by MS4 requirement to effectively meet the minimum controls for public information and education, providing information about VLAWMO, and additional targeted education efforts to change behavior and foster stewardship.

4.6.1 POLICY 6.1: ASSIST AND ENABLE MS4S

Management Strategies and Standards

Strategy 6.A: Assist and Enable MS4 Public Information and Education Efforts. Strategy 2:A Storm Water Standards requires the incorporation of the six minimum controls for SWPPPs under the MS4 program as part of LWPs. Strategy 6.A includes assistance from the VLAWMO for these efforts. The municipalities have better mechanisms for distributing information and education materials to residents than the VLAWMO. These include inserts with water bills, city news letters, and public access channels. The VLAWMO will take advantage of these delivery vehicles by routing information to municipalities for distribution. The VLAWMO will also be available to MS4 permittees to leverage the purchase and development of joint education/information materials.

4.6.2 POLICY 6.2: ENCOURAGE PUBLIC PARTICIPATION

Management Strategies and Standards

The VLAWMO will encourage public participation through the following bullets listed so that citizens have a stake in improvement projects and through an additional policy to maintain and develop a Citizens Advisory Committee (CAC) and vehicles for public input:

- Efforts to involve volunteers in monitoring as described below under Goal 9.
- Involving citizens in Sustainable Lake Planning efforts under Strategy 2.C: Development of SLMPs.
- Through expectations for cost sharing of improvement projects (Strategy 2.D: Promotion of Water Quality Improvement And Wetland Restoration/Enhancement Projects)

Strategy 6.B: Develop and Maintain a CAC or Vehicles for Public Input. The VLAWMO will seek advice from the CAC for specific questions and issues. The CAC will meet at least once per year to provide advice on budgets and work plans. Additional meetings will be called as specific questions and issues arise. CAC membership is open to members of the public interested in water management issues and should represent a cross section of interests and geographic areas. The VLAWMO will also promote other vehicles for soliciting public input and advice. These may include public information meetings and hearings and direct contact and communication with community groups such as lake associations.

4.6.3 POLICY 6.3: INFORM THE PUBLIC

Management Strategies and Standards

Strategy 6.C: Keep the Public Apprised of VLAWMO Activities. This strategy involves keeping the public informed regarding programs and activities of the VLAWMO. It includes mandatory notices in local newspapers, and public hearings, the completion and distribution of an annual report, and articles and information distributed to local news papers and lake associations. It also includes an annual meeting to introduce VLAWMO Commissioners, summarize major activities of the past year and the upcoming years, and to hold a forum on water resources topics of interest.

4.6.4 POLICY 6.4: PROMOTE EDUCATION AND MARKETING TO FOSTER STEWARDSHIP

Management Strategies and Standards

Strategy 6.D: Develop and Implement an Education and Marketing Program to Foster Sustainable Behaviors. The MS4 public information and education efforts as well as additional information based strategies above, focus on the distribution of information. However, social science studies have shown that information based campaigns are not very successful at changing behaviors. This strategy includes the development and implementation of more focused efforts designed to foster sustainable behaviors by residents, businesses, parks departments, and public works departments. Some of the topical areas to be emphasized under this strategy include:

- Proper storage and disposal of household hazardous waste and yard waste
- The importance of sealing abandoned wells
- Benefits of wetlands
- Residential and business storm water BMPs
- The importance of aquatic plants in shallow lakes
- Shoreline management
- The importance of disconnected storm water management

Tools and outlets to be used or considered include presentations, participation in community events, school programs, fact sheets, prompts, signage, and focused workshops.

4.7 GOAL 7: OPTIMIZE PUBLIC RESOURCES

4.7.1 POLICY 7.1: MINIMIZE PUBLIC EXPENDITURES

Management Strategies and Standards

Strategies throughout Section 4.0 of this Plan are designed to manage development, redevelopment, and drainage alterations to minimize water quality and quantity, and aquatic habitat impacts to public waters, public waters wetlands, wetlands, drinking water supplies, and drainage infrastructure, thereby minimizing public expenditures caused by improper planning and uncontrolled growth.

4.7.2 POLICY 7.2: AVOID DUPLICATIONS OF MANAGEMENT EFFORTS

Management Strategies and Standards

Strategy 7.A: Build on Existing Regulatory Program Efforts. Emphasis has been placed on identifying existing programs and efforts throughout this Plan in an effort to avoid duplicating efforts and to focus resources where they are most needed. This has led to the use of the existing NPDES general permit requirements for construction and MS4s, the WCA requirements and Well Protection requirements as the basic standards for meeting goals and implementing policies. Selected additional requirements address important gaps perceived by the VLAWMO.

Strategy 7.B: Implement Standards through LWPs. The VLAWMO intends to implement the storm water, erosion control, and wetland standards (Strategies 2.A, 2.G and 4.B) through the LWP process. The LWPA are expected to incorporate these standards into their LWP. The LWPA are required to complete LWPs within 2 years of the VLAWMO Plan approval. LWP content and the VLAWMO review process is identified in Sections 5.0 and 6.0. Following approval of LWPs, LWPAs will have an additional 120 days to revise official control (i.e., ordinances) and another 60 days to begin implementation. When LWPs are approved, the VLAWMO will complete an

Memorandum of Understanding (MOU) with each LWPA detailing LWPA and VLAWMO roles and responsibilities for reporting, tracking, coordinating, and implementation of plan requirements. The VLAWMO will have oversight responsibility to ensure implementation of LWPs. If the LWPAs are found to be non-implementing, the VLAWMO will work with the LWPA to correct, and may, if problems persist, decide to develop rules and develop permitting programs to take on the Land Use Authorities granted by M.S. 103B to enforce standards in this Plan. However, the VLAWMO preferred position is to avoid unnecessary duplication of permitting programs.

4.7.3 POLICY 7.3: UTILIZE VOLUNTEERS

Management Strategies and Standards

To control costs, VLAWMO will use volunteers to help implement the monitoring and public information/education strategies under Goals 6 and 9. VLAWMO will provide the leadership, oversight and education needed to effectively maximize volunteer resources.

4.7.4 POLICY 7.4: PROMOTE COST SHARING

Management Strategies and Standards

Many of the lakes and water resources in the VLAWMO do not have public access. However, the public benefits if waters discharged to and from these waterbodies are managed for water quantity and quality, and thus, there is justification for the expenditure of public funds even when there is not public access. However, the VLAWMO expects benefited parties to share in the cost and effort of projects to optimize public expenditures, more appropriately apply costs to the most benefited parties, and create local investment in outcomes.

4.7.5 POLICY 7.5: COORDINATE DATA COLLECTION AND MANAGEMENT EFFORTS

Management Strategies and Standards

There are numerous data collection efforts by various organizations and agencies operating in the watershed. These organizations also have an array of management activities, education efforts, and capital improvements going on at any one time. Coordination will be completed on an on-going basis to avoid duplication of efforts, and to identify complementary efforts. The instrument for this coordination will be the annual Technical Advisory Committee (TAC) meeting described in Strategy 10.A.

4.8 GOAL 8: ANALYZE AND USE ALTERNATIVE FUNDING SOURCES

4.8.1 STRATEGY 8.1: CONTINUE TO ANALYZE AND USE ALTERNATIVE FUNDING SOURCES

VLAWMO has successfully used grants and will continue to pursue grants, as well as continue to analyze and use alternative funding sources. VLAWMO has also researched special taxing district status under M.S. 275.066 by levy, storm water utilities, and the use of special assessments. Efforts to enable these alternative funding sources will continue as part of this strategy.

4.9 GOAL 9: MAKE AND ENABLE INFORMED DECISIONS

The objective of this goal is to collect and analyze data necessary for informed decisions.

4.9.1 POLICY 9.1: DEVELOP ENVIRONMENTAL DATA COLLECTION PROGRAMS

Management Strategies and Standards

Strategy 9.A: Modify and Continue the VLAWMO CLMP. This strategy continues the operation of the VLAWMO CLMP with selected modifications. These modifications initially include:

- Using a certified laboratory for sample analysis so that the data can be used by the MPCA for determination of impairment.
- Adding a Quality Assurance/Quality Control (QA/QC) component to the monitoring.

The QA/QC component will consist of the collection of duplicate samples for the assessment of field precision. One duplicate sample will be collected per-lake, per-year, which, given the monthly sampling schedule amounts to about 10 percent of samples. The guideline/target for assessing field precision will be the relative difference of less than 30 percent for total phosphorus.

Additional changes to the VLAWMO CLMP and other VLAWMO monitoring efforts will be completed once data assessment efforts detailed under Strategy 9.C are completed, since data assessment may identify additional improvements. The inspection of the flow measurement flumes located at various locations in the VLAWMO will also be completed in first year of plan implementation to identify needed repairs.

Strategy 9.B: Promote Efforts to Collect Additional Environmental Data. This strategy targets the collection of additional environmental data identified in Section 3.0 as gaps. Specific efforts include:

- Soliciting additional volunteers for the Ramsey County and MnDNR Volunteer Lake Level Monitoring Program for Goose, Gem, Tamarack, Amelia, Gilfillan, and Wilkinson lakes.
- Promoting aquatic plant surveys as part of SLMPs (Strategy 2.C).
- Finishing the Wetland Inventory.
- Taking over the Lambert Creek monitoring efforts from the BWCSP.

4.9.2 POLICY 9.2: WATER QUALITY MODELING

Strategy 9.C: Complete Detailed Assessments of Data. Much water quality data has been collected in the VLAWMO. The Plan (Section 2.0) includes a preliminary assessment of lake water quality data. However, the last time a comprehensive evaluation of the data was completed was in 2000. Periodic evaluations of data collected are necessary to convert data into information that decision makers can use. This strategy includes periodic detailed evaluations of collected data, on about a 5-year cycle. This is particularly important for Lambert Creek. Detailed assessment of the Lambert Creek data is needed to better understand phosphorus dynamics and assess the effectiveness of the recent improvements. Results of the assessment will also form the basis for water quality modeling in Strategy 9.D. Detailed assessments will include evaluation of trophic state parameters for the lakes and comparison with standards, trend analysis for lake data, and flow weighted-mean-concentration and mass-balance-analysis for the Lambert Creek sites.

Strategy 9.D: Water Quality Modeling

VLAWMO will employ a two-phased approach to modeling the watershed: Developing Bathtub Model for the watershed and updating the model as more information becomes available.

The first phase will consist of re-creating a Bathtub Model of the watershed using the spreadsheet model developed in the mid-1980s by Dr. William Walker for the BWCSP. The methodology will be based on the documented approach outline in Urban Nonpoint Sources Impact on a Surface Water Supply (Walker, 1985). This phase would be completed in 2007.

The second phase of the modeling will be to update the modeling as more information, such as aquatic survey, becomes available as the SLMP area is completed. The second phase will be completed on a rolling basis as SLMPs are completed.

4.10 GOAL 10: IMPROVE COMMUNICATIONS

The intent of this goal is to improve communications between member communities of the JPA and other agencies.

4.10.1 POLICY 10.1: INVOLVE THE PUBLIC IN DECISIONS

Management Strategies and Standards

Strategy 10.A: Annual Planning Meetings. The VLAWMO will hold annual meetings with a Policy Committee and a TAC. The Policy Committee will be comprised of public officials from the JPA member communities, while the TAC will be comprised of staff from member communities and other State and local agencies. The purpose of the meetings will be to coordinate efforts and review annual work plans and budgets.

4.11 SUMMARY

This section identifies ten goals and associated policies and management strategies. Section 5.0 describes the administration necessary to achieve these goals and implement the policies and strategies. Section 6.0 describes the implementation program.

5.0 ADMINISTRATION

5.1 AUTHORITY

The VLAWMO's surface water management authority derives from M.S. 103B.211 Subdivision 1.

5.2 REGULATORY CONTROLS

Minnesota Department of Natural Resources (MnDNR):

The MnDNR administers the Public Waters Work Permit Program, which includes the Riprap Shore Protection Permit Program, the Water Appropriation Permit Program, and the Dam Safety Permit Program. The MnDNR is involved in enforcement of the WCA and is responsible for identifying, protecting, and managing calcareous fens. The MnDNR also administers the Shoreland and Floodplain Program which provides assistance and over site for the administrators of the Shoreland and Floodplain Management Program.

The MnDNR Public Waters Work Permit (M.S., 103G.245) requires a MnDNR protected waters permit for any work below the Ordinary High Water elevation (OHW) or any work that will alter or diminish the course, current, or cross-section of any protected water, including lakes, wetlands, and streams. For lakes and wetlands, the MnDNR's jurisdiction extends to designated U.S. Fish and Wildlife Service Circular 39, Types 3, 4, and 5 wetlands, which are 10 acres or more in size in unincorporated areas, or 2.5 acres or more in size in incorporated areas. The program prohibits most filling of protected waters and wetlands for the purpose of creating upland areas. The Public Waters Work Permit program was amended in 2000 to minimize overlapping jurisdiction with the WCA.

Questions concerning the MnDNR's role in water resources management should be directed to:

MnDNR Division of Waters, Metro Region
1200 Warner Road
St. Paul, MN 55106
(651) 772-7900

Minnesota Board of Water and Soil Resources (BWSR)

The BWSR oversees the State's watershed management organizations (joint powers and watershed district organizations), oversees the State's oil and water conservation districts, and administers the rules for the WCA and Metropolitan Area Watershed Management. Questions concerning the BWSR's role in water resources management should be directed to:

Minnesota Board of Water and Soil Resources
520 Lafayette Road
St. Paul, MN 55155

Minnesota Pollution Control Agency (MPCA)

The MPCA administers the State Discharge System/NPDES Permit program (point source discharges of wastewater), the NPDES General Storm Water Permit for Industrial Activities program, the NPDES MS4 Storm Water Permit program, Section 401 of the CWA Water Quality Certification program, Water Quality (rules 7050) and the individual sewage treatment system regulations (7080 Rules). The MPCA also reports the State's "impaired waters" (303d list) to the U.S. Environmental Protection Agency. Spills should be reported directly to the MPCA. Questions concerning the MPCA's role in water resources management should be directed to:

Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Minnesota Department of Health (MDH)

The MDH administers the Well Management Program, the Wellhead Protection Program, and the Safe Drinking Water Act rules. See the Background part of the Groundwater section for more information about these programs. Questions concerning the MDH's role in water resources management should be directed to:

Minnesota Department of Health
P.O. Box 64975
St. Paul, MN 55155

Minnesota Environmental Quality Board (EQB)

The EQB administers the State's environmental review program, including Environmental Assessment Worksheets and Environmental Impact Statements. Questions concerning the EQB's role in water resources management should be directed to:

Minnesota Environmental Quality Board
658 Cedar St.
St. Paul, MN 55155

U.S. Army Corps of Engineers (COE)

The COE administers Section 10 of the Rivers and Harbors Act permit program, and the Section 404 permit program. See Section 8.3 for more information about these programs. Questions concerning the COE's role in water resources management should be directed to:

U.S. Army Corps of Engineers, St. Paul District
Army Corps of Engineers Centre
190 East 5th St.
St. Paul, MN 55101

The Metropolitan Council

The Metropolitan Council provides regional planning and wastewater services (collection and treatment) for the seven-county Metropolitan Area. The Metropolitan Council will be requiring LWPs as part of the next generation of comprehensive Land Use Plans in 2008. A draft of their requirements for LWPs is included as APPENDIX D. Questions concerning the Metropolitan Council's role in water resources management should be directed to:

Metropolitan Council
390 Robert Street North
St. Paul, MN 55101-1805

The VLAWMO

Currently VLAWMO provides regulatory permitting programs with respect to the WCA and small water appropriations. With implementation of this new plan, additional standards will be required to control runoff rates (Strategy 1.C), to manage landlocked basins (Strategy 1.D), to manage storm water quality (Strategy 2.A), to control soil loss on small construction sites (Strategy 2.G), and to implement the VLAWMO Wetland Management Plan (Strategy 4.B).

VLAWMO will work with the local communities to implement these strategies through the Local Water Planning Process as described in Section 5.6.

5.3 FINANCIAL MECHANISMS

There are several authorities the VLAWMO can utilize to finance water plans, projects, and activities. These include a variety of taxes, assessments, charges, grants, and loans. Current functions of the VLAWMO are funded by contributions from the member organizations, according to formulas in the JPA and by grants. As stated in Section 4.0, Strategy 8.1, it is the VLAWMO's intent to analyze and implement additional funding mechanisms. In particular, the VLAWMO will seek designation as a Special Taxing District and levy authority under M.S. 275.066 through legislative action and may consider a storm water utility. Capital improvements with localized

benefit may be funded by establishing special tax districts and special assessments as allowed by M.S. 103B.

5.4 JOINT POWERS AGREEMENT

The 2007 JPA is included as **Error! Reference source not found.**. The VLAWMO membership has revised the JPA concurrently with the plan review process.

5.5 PLAN REVISIONS/AMENDMENTS

This section establishes the process by which interim amendments to the Plan may be made and who may initiate the amendments. This VLAWMO Water Management Plan is effective through the year 2016.

The Board of Commissioners of the VLAWMO recognizes that the Water Management Plan must periodically be amended to remain a useful long-term planning tool. Some comprehensive studies or capital improvements programs undertaken, will likely warrant annual review or amendment, and the information in the technical appendices may require updating from time to time. Occasionally, the VLAWMO's goals, policies, criteria, and management strategies may need revisions.

The Board of Commissioners of VLAWMO recognizes that the Plan must periodically be amended to remain useful as a long term planning tool. The administrative section and capital improvement programs, goals, policies, regulations, and implementation requirements may also require occasional revision. The VLAWMO will keep a record of supplemental data until reproduction of a new appendix is warranted. In the interim, the supplemental data will be available upon request at the VLAWMO office.

Recommendations for program changes or Plan amendments may be initiated by individuals, special-interest groups, local and county governments, Federal, State, and regional agencies, and VLAWMO itself. All recommendations must be submitted to the Board in writing along with a statement of problem and need, a rationale for VLAWMO involvement, and an estimate of the cost. The Board will keep a record of all recommendations and will meet at least annually to review the recommendations and to hear testimony from sponsors.

Any proposed amendments to the Water Management Plan involving the goals, policies, criteria, management strategies, or technical appendix, shall be considered and/or adopted according to the General Amendment Procedures.

5.5.1 GENERAL AMENDMENT PROCEDURES

According to MN Rules 8410.1040, Subp.2, the following amendment procedures are to be followed:

- All amendments to a plan must adhere to the review process provided in M.S. 103B.231, Subp.11, except when the proposed amendments constitute minor amendments.
- The water management organization has held a public meeting to explain the amendments and publishes a legal notice of the meeting twice, at least seven days as well as fourteen days, before the date of the meeting.
- The organization has sent copies of the amendments to the affected local units of government, the MCES, and the State review agencies for review and comment.
- BWSR has either agreed that the amendments are minor or failed to act within 45 days of receipt of the amendments.

Significant changes or changes that affect other jurisdictions within the VLAWMO shall be submitted to these jurisdictions for review and comment as required by M.S. 103B.231 subp. 11. Changes requiring LWPA and agency review will indicate the impact on LWPs and will identify those local plans that will require revision upon approval of the change. The review period shall be limited to 60 days. The proposed changes shall be submitted to the Metropolitan Council, MnDNR, MPCA, and BWSR for a 60-day review.

Following the prescribed review period or upon receipt of all comments, the VLAWMO shall publish a notice of public hearing on the proposed plan amendments in at least one legal newspaper. Notice shall be mailed at least 30 days before the hearing to the Anoka SWCD, Ramsey SWCD, Anoka County, Ramsey County, the MCES, MnDNR, MPCA, MnDOT, and BWSR. Any person may submit a request to BWSR not later than 10 days following the hearing, asking that the proposed amendments be fully reviewed in accordance with M.S. If BWSR determines that no full review is necessary, the VLAWMO shall adopt the proposed changes within 60 days. If BWSR determines a full review is necessary under M.S., the VLAWMO shall delay any action on approval of the amendments until final receipt of the BWSR board review. Within 120 days of approval by the BWSR, the VLAWMO shall adopt the proposed changes. These changes shall be provided to all known holders of the water plan by addendum within 60 days of adoption.

5.5.2 MINOR AMENDMENTS

Amendments to an approved Plan's capital improvement program may be considered to be minor Plan amendments if the following conditions are met:

- The original Plan set forth the capital improvement program but not to the degree needed to meet the definition of "capital improvement program" as provided in M.S., Section 103B.205, subdivision 3; and
- The affected county or counties have approved the capital improvement program in its revised, more detailed form.

5.5.3 FORM AND DISTRIBUTION OF PLAN AMENDMENTS

Unless the entire document is reprinted, all amendments adopted by the organization will be printed in the form of replacement pages for the Plan, each page of which will be:

- On draft amendments being considered, show deleted text as stricken, and new text as underlined,
- Renumbered as appropriate, and
- Include the effective date of the amendment.

VLAWMO will maintain a distribution list of agencies and individuals who have received a copy of the Plan and shall distribute copies of amendments within 30 days of adoption.

5.6 LOCAL WATER MANAGEMENT PLANS

LWPAs, City of Gem Lake, City of Lino Lakes, City of North Oaks, City of Vadnais Heights, City of White Bear Lake, and White Bear Township are required to develop a LWP providing a coordinated system of managing the watershed on a regional or subwatershed basis consistent with this Plan. In accordance with M.S. 103B.235 and MN Rules 8410.0160, cities will adopt LWPs within two years of BWSR's approval of this Plan. All LWPs must be submitted to VLAWMO within 21 months after the plan has been approved. Following approval of LWPs, LWPAs will have an additional 120 days to revise official control (i.e., ordinances) and another 60 days to begin implementation. VLAWMO staff is available to serve as advisors to the LWPA in the preparation of their LWPs.

5.6.1 LWP REVIEW

5.6.1.1 VLAWMO Review

After consideration, but before adoption by the governing body, each LWPA shall submit its LWP to the VLAWMO for review for consistency with this Plan. The VLAWMO shall approve or disapprove the local plan or parts of the plan. The VLAWMO shall have 60 days to complete its review and shall, as part of its review, take into account the comments submitted to it by the MCES. If the VLAWMO fails to complete its review within the prescribed period, the LWP shall be deemed approved unless the LWPA agrees to an extension.

5.6.1.2 MCES Review

Concurrently with its submission of its local water management plan to VLAWMO as provided in M.S. 103 Subdivision 3a, each LGU shall submit its water management plan to the Metropolitan Council (council) for review and comment by the council. The council shall have 45 days to review and comment upon the local plan or parts of the plan with respect to consistency with the council's comprehensive development guide for the metropolitan area. The council's 45-day review period shall run concurrently with the 60-day review period by VLAWMO. The Metropolitan Council shall submit its comments to VLAWMO and shall send a copy of its comments to the LGU. If the Metropolitan Council fails to do this within the 45-day period, VLAWMO shall complete its review as provided in M.S. 103 Subdivision 3a.

5.6.2 ADMINISTRATION AND ENFORCEMENT OF LWPS

LWPAs are responsible for implementing and enforcing LWPs covering their jurisdictions. When LWPs are approved, the VLAWMO will complete a Memorandum of Understanding (MOU) with each LWPA detailing LWPA and VLAWMO roles and responsibilities for reporting, tracking, coordinating, and implementing LWP requirements. The VLAWMO will have oversight responsibility to ensure implementation of LWPs. Oversight will include spot check of municipal projects and program audits. If the LWPAs are found to be non-implementing, the VLAWMO will work with the LWPA to correct, and will if problems persist, decide to develop Rules and develop permitting programs to take on the Land Use Authorities granted by M.S. 103B and 103D to enforce standards in this Plan. However, the VLAWMO preferred position is to avoid unnecessary duplication of permitting programs.

6.0 IMPLEMENTATION PROGRAM

This section presents the implementation for the Plan. The implementation program described consists of administrative efforts, LWP development and implementation, studies and projects, and capital improvements. Each element is described below. An implementation schedule and budget is presented in Table 6-1. It is expected that the first year of plan implementation (i.e., 2007) will continue existing WCA and monitoring programs, focus on starting the new programs, piloting education efforts, and completing the data assessment and modeling work. The second year will continue the new programs, start the Sustainable Lakes planning program, and focus on coordinating and reviewing LWPs. Starting in the third year efforts will shift to special studies, financial incentives and projects. The estimated impacts of the implementation program on residents and local government are presented at the end of the section.

6.1 ADMINISTRATIVE EFFORTS

The VLAWMO retains two full-time employees: an administrator and a water resources technician. The VLAWMO also hires a summer intern. These employees take care of the day-to-day operation of the VLAWMO as well as implementation of the other program elements. Administrative efforts shown in Table 6-1 also include legal, audit, and booking keeping services as well as office space, office equipment, office rent, information systems, training, and general engineering.

6.2 LWP DEVELOPMENT AND IMPLEMENTATION

As described in Section 5.6, LWPAs are required to complete and implement a LWP. The VLAWMO intends that this program be the primary mechanism for implementing local standards. LWP content must meet the requirements of M.S. 103B.235 and Minnesota Rules 8410. However, the VLAWMO is not that concerned about the watershed inventory portions of the State statutes and rules. The VLAWMO would rather see the LWPAs incorporate the local standards, update official controls, and focus on watershed based solutions. This Plan is the third generation plan for VLAWMO and the LWPAs have each initiated, or have received approval of, at least one LWP such that local water resources inventories are reasonably complete. The LWPAs also have local ordinances covering storm water and erosion control to some degree, and where applicable, LWPAs have MnDNR approved shoreland and floodplain ordinances. Wellhead Protection Plans for community supply wells in the watershed are also either complete or underway.

Table 6-1
Implementation Program - Vadnais Lake Area Water Management Organization

Item Description	Policy/ Strategies Addressed	Potenial Funding Sources	Year									
EXPENSES			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
6.1 Administrative/Managerial*												
Day-to-day operation of VLAWMO*	All	M, L, SU	$52,100	$55,540	$56,929	$58,352	$59,811	$61,306	$62,838	$64,409	$66,020	$67,670
Staff*	All	M, L, SU	$128,500	$137,160	$140,589	$144,104	$147,706	$151,399	$155,184	$159,064	$163,040	$167,116
Training*	All	M, L, SU	$1,400	$1,500	$1,538	$1,576	$1,615	$1,656	$1,697	$1,740	$1,783	$1,828
Contingency*	All	M, L, SU	$10,000	$8,500	$8,713	$8,930	$9,154	$9,382	$9,617	$9,857	$10,104	$10,356
6.2 Local Plan Development and Implementation**												
Technical Assistance	P1.1/S1.A and 1.B; P1.2/S1.C and 1.D; P 2.1/S2.A; P2.2/S2.G; P4.2/S4.B;	M, L, SU	$5,000	$15,000								
6.3 Studies and Programs												
6.3.1 Lower Lambert Creek Flood Reduction Study	P1.4/S1.H	M, L, SU,SA, G					$15,000					
6.3.2 County Rd E and Hwy 61 Stormwater Study	P1.2/S1.D	M, L, SU,SA, G			$15,000							
6.3.3 Development of Sustainable Lake Plans	P2.2/S2.C	M, L, SU, G	$7,500	$7,500	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000		
6.3.4 Financial Incentives and Cost Sharing**	P2.2/S2.D; P4.2; P5.1; P7.4	M, L, SU	$5,000	$5,000	$7,500	$25,000	$10,000	$40,000	$40,000	$50,000	$50,000	$35,000
6.3.5 Public Education and Information	P6.1; P6.2/S6.B; P6.3/S6.C; P6.4/S6.D	M, L, SU	$4,000	$12,000	$12,300	$12,608	$12,923	$13,246	$13,577	$18,916	$19,389	$19,874
6.3.6 Facilties Operations	P2.2/S2.E	M, L, SU	$10,000	$10,300	$10,609	$10,927	$11,255	$11,593	$11,941	$12,299	$12,668	$13,048
6.3.8 Data Analysis and Monitoring*, ***	P7.3; P9.1/S9.A and S9.B; P9.2/S9.C and S9.D	M, L, SU	$40,500	$12,500	$7,813	$8,008	$23,208	$8,413	$8,624	$8,839	$9,060	$29,287
6.3.9 WCA and	P4.1/S4.A	M, L, SU, R	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
OPERATIONS BUDGET TOTAL			$264,000	$265,000	$275,989	$284,504	$305,672	$311,995	$318,477	$340,124	$332,064	$344,179
6.4 Capital Improvements												
Lambert Lake Restoration *****		G	$40,305									
Lambert Creek Stream Restoration and Stabilization		G	$50,000		$15,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
Whitaker Pond dredging *****		G	$0	$50,000								
Lambert Creek Monitoring improvemtns & Flume		G	$76,000		$5,000							
Aluminum/ Ferric Chemical Feed - Grass Lake outlet to Lambert Pond		G	$0			$0	$18,000					
Goose Lake Restoration - Sediment Evaluation / Rough Fish Management *****		CIP-L, G	$0	$50,000	$50,000	$25,000						
Branch 4 - N.E. Quadrant of Vadnais Heights City Center Storm water quality pond / PW site Stormpond		CIP-L, G, M	$0			$30,000						
Tamarack Lake Restoration		CIP-L, G	$0				$15,000					
Watershed Renewal fund: SLMP/Pilot Implementation		CIP-L, G	$0	$15,000	$50,000	$50,000	$51,250	$52,531	$53,845	$55,191	$56,570	$57,985
Other - det. by Plan amendment					$0	$0	$0	$0	$0	$0	$0	$0
Total CAPITAL IMPROVEMENTS Expenses			$166,305	$115,000	$120,000	$115,000	$94,250	$62,531	$63,845	$65,191	$66,570	$67,985
Operations and CIP Budgets TOTAL			**$430,305**	**$380,000**	**$395,989**	**$399,504**	**$399,922**	**$374,526**	**$382,322**	**$405,315**	**$398,634**	**$412,163**
INCOME			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Review fees and BWSR implementation grant (WCA)*			$5,500	$5,500	$5,638	$5,778	$5,923	$6,071	$6,223	$6,378	$6,538	$6,701
Interest*			$500	$1,000	$1,025	$1,051	$1,077	$1,104	$1,131	$1,160	$1,189	$1,218
Miscellaneous *****			$196,305									
CIP- income				$0	$0	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Member Contributions			$228,000	$373,500	$389,327	$377,675	$377,922	$352,351	$359,968	$382,777	$375,908	$389,244
Total Income			$430,305	$380,000	$395,989	$399,504	$399,922	$374,526	$382,322	$405,315	$398,634	$412,163
Member contribution increase from previous year, $			$42,000	$145,500	$15,827	-$11,651	$247	-$25,571	$7,617	$22,809	-$6,869	$13,336
Member contribution Increase from previous year, %			23%	64%	4%	-3%	0%	-7%	2%	6%	-2%	4%

M = member contributions, L = levy, SU = stormwater utility, CIP-L, SA = special assessment, G = Grants, R = Review Fees; CIP-L MN Statute 103B.251

* Assumed annual increase of 2.5% per year

** Reflects VLAWMO share, cost share to match from others would be additional

*** Includes $30,000 carryover for data assessment and modeling

**** WCA Admininstration costs included in staff time under Administrative/Managerial

***** Carryover from Clean Water Partnership Grant $166,305 for Lambert Lake restoration and other Lambert creek enhancements, and carryover of $30,000 for modeling.

****** SLMP to start in 2007; one time reductions: Data analysis $2000, Public Educ $2000, Staff $3500

Budgets presented are planning level and subject to annual approval in accordance with protocols specified in the Joint Powers Agreement.

Table 6-2
Approximate Financial Impacts on VLAWMO Residents
For Various Budget Amounts

			Budget Amounts						
Tax Capacity	$ 34,910,908.00		$ 200,000.00	$ 225,000.00	$ 250,000.00	$ 275,000.00	$ 300,000.00	$ 325,000.00	$ 350,000.00
Rate			0.0057	0.0064	0.0072	0.0079	0.0086	0.0093	0.0100
Various Property Values		Residential Tax Capacity 1%							
	$ 150,000.00	$ 1,500.00	$ 8.59	$ 9.67	$ 10.74	$ 11.82	$ 12.89	$ 13.96	$ 15.04
	$ 200,000.00	$ 2,000.00	$ 11.46	$ 12.89	$ 14.32	$ 15.75	$ 17.19	$ 18.62	$ 20.05
	$ 250,000.00	$ 2,500.00	$ 14.32	$ 16.11	$ 17.90	$ 19.69	$ 21.48	$ 23.27	$ 25.06
	$ 300,000.00	$ 3,000.00	$ 17.19	$ 19.33	$ 21.48	$ 23.63	$ 25.78	$ 27.93	$ 30.08
	$ 350,000.00	$ 3,500.00	$ 20.05	$ 22.56	$ 25.06	$ 27.57	$ 30.08	$ 32.58	$ 35.09
	$ 400,000.00	$ 4,000.00	$ 22.92	$ 25.78	$ 28.64	$ 31.51	$ 34.37	$ 37.24	$ 40.10
	$ 450,000.00	$ 4,500.00	$ 25.78	$ 29.00	$ 32.22	$ 35.45	$ 38.67	$ 41.89	$ 45.11
	$ 500,000.00	$ 5,000.00	$ 28.64	$ 32.22	$ 35.81	$ 39.39	$ 42.97	$ 46.55	$ 50.13

Actual tax values will differ due to tax increment financing, non collectables, fiscal disparities and changes in market.

Tax capacity for 2006 from Ramsey County portions of VLAWMO, after TIF and fiscal disparities

Storm Water Utility Fee

Proposed

Unit Rate = $3.19

SF Rate = $2.20 per mo.

	Exempted	# Parcels	Surface area ac.	Res. Equiv Fac	Pot. Rev./mo	credit estimate	Rate/ acre	Curve Number CN	Retention inches (S)	Runoff Depth inches (Q)	Runoff Vol (ac-ft) QA
Res - Single Family		7361	5338.7	1	$16,194	$0	$3	72	3.89	0.29	130
Res - Multi family		1414	365.2	2.72	$3,168	$0	$9	85	1.76	0.8	24
Commercial		273	481.3	4.23	$6,495	$0	$13	92	0.87	1.24	50
Industrial		67	329.9	3.3	$3,474	$0	$11	88	1.36	0.97	27
Institutional: school, hosp. govern. Church		62	255.8	3.3	$2,694	$0	$11	88	1.36	0.97	21
Golf course		9	221.4	0.74	$524	$0	$2	69	4.49	0.22	4
Agricultural		42	491.5	0.25	$392	$0	$1	61	6.39	0.07	3
Vacant, parks, cemetaries	x	437	1266.8	0.74	$2,997	$2,997	$2	69	4.49	0.22	23
Road ROW, RR	x	28	120.1	3.52	$1,347	$1,347	$11	89	1.24	1.03	10
Wetlands and public waters	x	31	3647.9	2.72	$31,642	$31,642	$9	85	1.76	0.8	242
Total		9724	12518.6		$68,927	$35,986					259
Exempted parcel fees					$35,986						
Billable parcel fees					$32,941						

Revenue estimate:

	Exempted f	Billable gross	Est. credits	Net Revenue
Full year	$431,836	$395,284	0	$395,284

Storm Water Utility Fee

Proposed

Unit Rate = $3.19

SF Rate = $2.20 per mo.

	Exempted	# Parcels	Surface area ac.	Res. Equiv Fac	Pot. Rev./mo	credit estimate	Rate/ acre	Curve Number CN	Retention inches (S)	Runoff Depth inches (Q)	Runoff Vol (ac-ft) QA
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Institutional: school, hosp. govern. Church		62	255.8	3.3	$2,694	$0	$11	88	1.36	0.97	21
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Road ROW, RR	x	28	120.1	3.52	$1,347	$1,347	$11	89	1.24	1.03	10
Wetlands and public waters	x	31	3647.9	2.72	$31,642	$31,642	$9	85	1.76	0.8	242
Total		9724	12518.6		$68,927	$35,986					259
Exempted parcel fees					$35,986						
Billable parcel fees					$32,941						

Revenue estimate:

	Exempted f	Billable gross	Est. credits	Net Revenue
Full year	$431,836	$395,284	0	$395,284

Table 6-3
Annual Outcomes/Activities
Vadnais Lakes Water Management Organization

Item Description	Year									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
6.1 Administrative/Managerial										
	*On-going day-to-day operations *Audit *TAC and PC meetings *Seek legislative authorization as special taxing district and/or utilitze a stormwater utility. Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report	*On-going day-to-day operations *Audit *TAC and PC meetings *Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report	*On-going day-to-day operations *Audit *TAC and PC meetings *Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report	*On-going day-to-day operations *Audit *TAC and PC meetings *Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report	*On-going day-to-day operations *Audit *TAC and PC meetings *Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report	*On-going day-to-day operations *Audit *TAC and PC meetings *Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report	*On-going day-to-day operations *Audit *TAC and PC meetings *Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report	*On-going day-to-day operations *Audit *TAC and PC meetings *Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report	*On-going day-to-day operations *Audit *TAC and PC meetings *Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report	*On-going day-to-day operations *Audit *TAC and PC meetings *Pursue grants, consider other funding mechanisms depending on legislatuive action. *Complete annual workplan and assess previous year implementation as part of Annual Report
6.2 Local Plan Development and Implementation										
	* Assist cities and township with LWPs	*Assist with and review LWPs. *Complete MOUs	*On-going oversight and communication	*On-going oversight and communication *Program review of two LWPAs	*On-going oversight and communication *Program review of two LWPAs	*On-going oversight and communication *Program review of two LWPAs	*On-going oversight and communication *Program review of two LWPAs	*On-going oversight and communication *Program review of two LWPAs	*On-going oversight and communication *Program review of two LWPAs	*On-going oversight and communication *Program review of two LWPAs
6.3 Studies and Programs										
6.3.1 Lower Lambert Creek Flood Reduction Study					*Complete Engineers Report. Consider plan amendment.					
6.3.2 County Rd E and Hwy 61 Stormwater Study			*Complete Engineers Report. Consider plan amendment.							
6.3.3 Development of Sustainable Lake Plans	Target completion of 1 plan	Target completion of 1 plan	*Target completion of 2 plans *Assist with implementation of plans through element 6.3.4	*Target completion of 2 plans *Assist with implementation of plans through element 6.3.4	*Target completion of 2 plans *Assist with implementation of plans through element 6.3.4	*Target completion of 2 plans *Assist with implementation of plans through element 6.3.4	*Target completion of 2 plans *Assist with implementation of plans through element 6.3.4	*Target completion of 2 plans *Assist with implementation of plans through element 6.3.4	*Assist with implementation of plans through element 6.3.4	*Assist with implementation of plans through element 6.3.4
6.3.4 Financial Incentives and Cost Sharing	*Participate Kohler Rd Pilot Project *Complete program criteria	*Solicit projects *Begin advertising	*Solicit projects *Select and implement projects	*Solicit projects *Select and implement projects	*Solicit projects *Select and implement projects	*Solicit projects *Select and implement projects	*Solicit projects *Select and implement projects	*Solicit projects *Select and implement projects	*Solicit projects *Select and implement projects	*Solicit projects *Select and implement projects
6.3.5 Public Education and Information	*Education program development and pilot efforts *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.	*Implement education and marketing program *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.	*Implement education and marketing program *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.	*Implement education and marketing program *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.	*Implement education and marketing program *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.	*Implement education and marketing program *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.	*Implement education and marketing program *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.	*Implement education and marketing program *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.	*Implement education and marketing program *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.	*Implement education and marketing program *Route articles and information to MS4s for distribution *CAC meeting(s) *Annual report and meeting. Notices and hearings as needed.
6.3.6 Facilities Operations	*Maintenance of Lambert Creek and Whitaker Pond facilities *Inspection of parshall flumes and repairs if needed	*Maintenance of Lambert Creek and Whitaker Pond facilities *On-going inspection with monitoring efforts	*Maintenance of Lambert Creek and Whitaker Pond facilities *On-going inspection with monitoring efforts	*Maintenance of Lambert Creek and Whitaker Pond facilities *On-going inspection with monitoring efforts	*Maintenance of Lambert Creek and Whitaker Pond facilities *On-going inspection with monitoring efforts	*Maintenance of Lambert Creek and Whitaker Pond facilities *On-going inspection with monitoring efforts	*Maintenance of Lambert Creek and Whitaker Pond facilities *On-going inspection with monitoring efforts	*Maintenance of Lambert Creek and Whitaker Pond facilities *On-going inspection with monitoring efforts	*Maintenance of Lambert Creek and Whitaker Pond facilities *On-going inspection with monitoring efforts	*Maintenance of Lambert Creek and Whitaker Pond facilities *On-going inspection with monitoring efforts
6.3.7 Data Collection and Monitoring	*VLAWMO CLMP monitoring *Complete aquatic plant survey of 1 lake as part of 6.3.3	*Implement revised monitoring program *VLAWMO CLMP monitoring *Solicit additional for lake level volunteer monitors *Complete aquatic plant survey of 1 lake as part of 6.3.4 *Complete inventory or remaining NWI wetlands and update wetland classification	*Implement revised monitoring program *VLAWMO CLMP monitoring *Complete aquatic plant survey of 2 lakes as part of 6.3.3	*Implement revised monitoring program *VLAWMO CLMP monitoring *Complete aquatic plant survey of 2 lakes as part of 6.3.3	*Revise monitoring plan *VLAWMO CLMP monitoring *Complete aquatic plant survey of 2 lakes as part of 6.3.3	*Implement revised monitoring program *VLAWMO CLMP monitoring *Complete aquatic plant survey of 2 lakes as part of 6.3.3	*Implement revised monitoring program *VLAWMO CLMP monitoring *Complete aquatic plant survey of 2 lakes as part of 6.3.3	*Implement revised monitoring program *VLAWMO CLMP monitoring *Complete aquatic plant survey of 2 lakes as part of 6.3.4	*Implement revised monitoring program *VLAWMO CLMP monitoring	*Revise monitoring plan *VLAWMO CLMP monitoring
6.3.8 Data Analysis and Modeling	*Data assessment and modeling study *Revise monitoring plan				*Data assessment and model update *Revise monitoring plan					*Data assessment and model update *Revise monitoring plan
6.3.9 WCA and Appropriations Permitting	*On-going permit program operations	*On-going permit program operations	*On-going permit program operations	*On-going permit program operations	*On-going permit program operations	*On-going permit program operations	*On-going permit program operations	*On-going permit program operations	*On-going permit program operations	*On-going permit program operations
6.4 Capital Improvements										
Lambert Lake Outlet	*Complete construction									
Lambert Lake Restoration		Target Completion								
Lambert Creek Stream Restoration and Stabilization	Target Completion	Target segment completion	Target segment completion	Target segment completion	Target segment completion	Target segment completion	Target segment completion	Target segment completion	Target segment completion	Target segment completion
Whitaker Pond Dredging		Target Completion								
Lambert Creek Monitoring Improvements & Flume	Target start	Target Completion								
Aluminum/ Ferric Chemical Feed - Grass Lake outlet to Lambert Pond					Target Completion					
Goose Lake Restoration - Sediment Evaluation / Rough Fish Management *****		Target Start			Target Completion					
Branch 4 - N.E. Quadrant of Vadnais Heights City Center Storm water quality pond / PW Site Stormpond				Target Completion						
Tamarack Lake Restoration					Target Completion					
Watershed renewal: SLMP/Pilot Implementation		Target Implementation of Renewal /SLMP Activities	Target Implementation of Renewal /SLMP Activities	Target Implementation of Renewal /SLMP Activities	Target Implementation of Renewal /SLMP Activities	Target Implementation of Renewal /SLMP Activities	Target Implementation of Renewal /SLMP Activities	Target Implementation of Renewal /SLMP Activities	Target Implementation of Renewal /SLMP Activities	Target Implementation of Renewal /SLMP Activities
Other			*Consider plan amendment to update CIP		*Consider plan amendment to update CIP		*Consider plan amendment to update CIP		*Consider plan amendment to update CIP	

Specific standards that LWPs should include are listed below and in APPENDIX D. For each strategy, the LWPs need to incorporate the standard(s) or describe the required process. The LWP also needs to describe how and when the official controls (i.e., ordinances and Public Works Design Manual) will be updated.

- Strategy 1.A: Floodplain and Shoreland Ordinances. (LWPs need to include a reference to these ordinances)
- Strategy 1.B: Low Floor Certification
- Strategy 1.C: Rate Control Standards
- Strategy 1.D: Landlocked Basin Standards
- Strategy 1.F: Regular Inspection and Maintenance
- Strategy 2.A: Storm Water Standards
- Strategy 2.G: Control Soil Loss on Small Construction Sites in Shoreland Areas
- Strategy 4.B: Implement Wetland Protection Standards

In addition to incorporation of these standards, it is expected that LWPs will incorporate SWPPPs completed for the MS4 NPDES General Permit, and if applicable, Wellhead Protection Plans. Of particular interest from the SWPPPs will be inspection and maintenance procedures for post construction BMPs. There is a perception that many storm water ponds have been built in the VLAWMO, but the number and their current status and condition are unknown. VLAWMO views this element of the SWPPPs as a means of addressing this perception and insuring maintenance. VLAWMO also expects a description of the inspection frequencies and procedures for construction erosion control. Additional specific content for individual LWPAs includes the following:

- For the cities of Vadnais Heights and White Bear Lake, and White Bear Township; a description of the process to be used to incorporate storm water quality practices into redevelopment projects to the extent practical.
- For the cities of Gem Lake, White Bear Lake and White Bear Township: a description of how runoff volume controls and disconnected storm water management will be used to prevent damage around Gem Lake, a landlocked lake. VLAWMO will be available to provide assistance for this effort.
- For the cities of Gem Lake, Lino Lakes and North Oaks: specifics regarding the management and maintenance of Individual Sewage Treatment Systems (ISTS systems).

For other cities, an estimate of the number of remaining ISTS Systems, their condition and approach to long-term management needs to be provided.

LWPs and official controls need to be completed according the schedule given in Section 5.6. After approval LWPAs are expected to implement their plans. The VLAWMO will have oversight responsibility to ensure implementation of LWPs. Oversight will include spot check of municipal projects and program audits. If the LWPAs are found to be non-implementing, the VLAWMO will work with the LWPA to correct, and will if problems persist, decide to develop rules and develop permitting programs to take on the Land Use Authorities granted by M.S. 103B to enforce standards in this Plan. However, the VLAWMO preferred position is to avoid unnecessary duplication of permitting programs.

6.3 STUDIES AND PROGRAMS

Studies and programs include:

- Lambert Creek Studies and Management:

Strategy 1.H; Policy 2.2, Strategies 2.D, 2.E, 2.F, and 2.H; Policy 7.3; Policy 7.5; Policy 9.1, Strategies 9.A, 9.B; Policy 9.2, Strategy 9.C.

- County Road E and Highway 61 Area Storm Water Study:

Strategy 1.J

- Development of SLMPs:

Strategy 2.C

- Financial Incentives and Cost Sharing Program:

Strategy 2.D, Policies 4.3 and 5.1

- Public Education and Information:

Policies: 6.1, 6.2, 6.3, 6.4, and Strategies 6.B, 6.C, and 6.D.

- Data Collection and Monitoring:

Policies 7.3, 9.1, and 9.2; Strategies 9.A, 9.B, and 9.C.

- Data Assessment and Modeling:

Policy 9.2; Strategy 9.D.

- WCA and Small Waters Appropriation Permitting:

Policy 4.1; Strategy 4.A.

Each program is briefly described below. Budgets, with expenses beyond staff time, are shown in Table 6-1. Budgets shown are preliminary and are reviewed and approved each year, according to procedures in the JPA (**Error! Reference source not found.**).

6.3.1 LAMBERT CREEK STUDIES AND MANAGEMENT

These studies are designed to investigate issues along Lower Lambert Creek to better understand them and to assess whether or not feasible options exist to address problems. Funding options will also be addressed by the studies. Studies will be scheduled throughout the existence of the plan. If feasible options are found, a minor plan amendment will be completed.

6.3.2 COUNTY ROAD E AND HIGHWAY 61 AREA STORM WATER STUDY

This study is designed to look at areas along County Road E and Highway 61 that drain north through a 21-inch pipe to the Gem Lake Subwatershed. This outfall is believed to be the only major storm water outlet in the subwatershed. The purpose of the study is to investigate opportunities to control runoff volumes to landlocked Gem Lake. Funding options will also be addressed by the study. MnDOT is a potential partner for this study. The study is scheduled for plan year 3 (i.e., 2009). If feasible options are found, a minor plan amendment will be completed.

6.3.3 DEVELOPMENT OF SLMPS

This program area is designed to promote SLMPs (Strategy 2.C). The program requires cost share from locals, municipalities, or other organizations in the form of cash or labor. VLAWMO contributions to plan development include water quality modeling and data assessment and a 50 percent match up to $7,500. Data assessment and modeling are scheduled as program element 6.3.8. Promotion of SLMPs will target one lake beginning in 2007 and 2008, after the data assessment is complete. In 2009, two lakes per year will be targeted for each of the next six years. This approach provides incentives for all 13 lake plans.

6.3.4 FINANCIAL INCENTIVES AND COST SHARING

This program consists of maintaining a fund to cost share and promote projects that have a water quality, water quantity, wetland restoration, or aquatic habitat benefit. Project sponsors can be residents, cities and townships, counties, and conservation districts within the watershed. Projects can include anything that improves water quality from shoreland stabilization, to the projects identified as part of the 2005 study *Improving the Waters of Lower Lambert Creek – A Feasibility Study*, to

projects identified as part of a SLMP. Cost sharing details will be developed during the first year of implementation, however, it is expected that the improvements will need to have a demonstrated aquatic habitat benefit, a water quality (sediment and phosphorus) benefit, or runoff volume benefit, and there will need to be a means of assuring future protection and maintenance. Projects with a greater local cost share will likely have a higher chance of receiving cost share. Maintenance efforts and efforts necessary to meet the requirements of the NPDES General Construction permit would not be eligible.

The first plan year includes $5,000 in this fund from the USEPA 319/Clean Water Partnership Grant to be used to complete the Kohler Road Pilot project identified in the 2005 study for Lower Lambert Creek in partnership with Ramsey County, Ramsey SWCD, Vadnais Heights, and BWCSP. The total cost of the Kohler Road pilot is estimated at $20,000. The 2005 study also identified approximately $69,000 of additional improvements for Lower Lambert Creek.

The budget for this fund increases slightly in year 2 of the plan, but it is expected that staff will be occupied with LWP reviews. Thus, it is not until year 3 that significant funds are appropriated for this program. However, the fund amount was selected such that it could provide incentive for the additional Lower Lambert Creek improvements with additional monies available to promote implementation of the SLMPs as well as other beneficial projects as they arise.

6.3.5 PUBLIC EDUCATION AND INFORMATION

This program starts with modest efforts in year 1 for program development and pilot efforts. This includes staff time and an additional $6,000 to hire additional help to pilot some programs in local schools. Subsequent years have slightly higher budgets so that successful pilot efforts can be expanded. Other efforts in this program include the public information and education efforts described in Strategies 6.A, 6.B, 6.C, and 6.D.

6.3.6 FACILITIES OPERATION

This program provides funding for the operation and maintenance of the Lambert Creek facilities (i.e., weirs and flumes), the Whitaker weir and pond, and VLAWMO ditches, which is being funded by VLAWMO and Ramsey County.

6.3.7 DATA COLLECTION AND MONITORING

This program implements strategies 9.A and 9.B. The first year reflects modest changes to the CLMP monitoring program to change laboratories and add a QA/QC effort. Budgets increase slightly in subsequent years to reflect additional data collection efforts from revised monitoring

protocol being developed as part of the assessment of existing data that will be completed in 2007. An inventory of wetlands not assessed with the original Wetland Management Plan is included in the year 2008.

6.3.8 DATA ANALYSIS AND MONITORING

This program implements strategies 9.C and 9.D. The first year of plan implementation (2007) includes $40,000 for data assessment and modeling. This is money already acquired by the VLAWMO. Detailed data assessments would also be completed in years 5 (2011) and 10 (2016) of the plan. Budgets for these years are lower since the bulk of model development occurs with the work in year 1. The 5-year assessment is intended to provide a midcourse review, while the review in year 10 is intended to provide information for development of the next generation plan.

6.3.9 WCA AND SMALL WATERS APPROPRIATION PERMITTING

VLAWMO will continue its role as LGU for the WCA, including permitting (Strategy 4.A). VLAWMO will also continue permitting efforts for small waters appropriations using a General Permit (Strategy 3.B).

6.4 CAPITAL IMPROVEMENTS PROGRAM

The completion of the Lambert Lake Project, which is part of the Clean Water Partnership Projects, is ongoing. The roughly $200,000 dollars included for this project come from 2006 carry over funds or from the grant.

The VLAWMO will create a Matching Grant Fund in the amount of $15,000 that will be used to match grants for resource management projects or capital improvements, construct capital improvements that are of high watershed priority, are demonstration projects, or have otherwise been designated by VLAWMO for construction by VLAWMO and as match or "seed money" to encourage local improvements. Additional capital improvement may be identified as part of studies described above.

- Lambert Creek Stream Restoration and Stabilization
- Lambert Creek Flume Replacement
- Goose Lake Sediment Treatment and Rough Fish Removal
- Aluminum/Ferric Chemical Feed to Grass Weir
- Lambert Creek TMDL Project

- Tamarack Lake Restoration
- Branch 4 – North Storm Water Quality Pond
- Branch 4 – Northeast Quadrant Storm Water Quality Pond

The VLAWMO will review its capital improvement budget every two years with changes completed as minor plan amendments. VLAWMO has several options for capital projects financing. Under the authority provided by M.S. 103B 251, VLAWMO has the authority to certify for payment by the county all or part of the cost of an approved capital improvement. The JPA provides that if cities are unable to come to a cost sharing agreement, then VLAWMO may order the project by funding 97 percent of the project cost from Ramsey County and 3 percent Anoka County ad valorem tax levy.

6.5 IMPACT OF IMPLEMENTATION PROGRAM

This Plan will be funded through member contributions, grants, special assessments, and, if legislative action is successful, a Special Taxing District under M.S. 275.066 by levy. Funds obtained through member contributions would apply toward local government levy limits. Funds obtained from special assessments and levy by the VLAWMO would not apply to municipal levy limits. However, there would be a financial impact to the residents of the cities and townships that reside in the VLAWMO Watershed. One of VLAWMO's goals is to optimize public resources, while still accomplishing VLAWMO's goals and implementing the Plan.

Table 6-1 shows the additional cost to the member cities for implementing the Plan if legislative action to become a Special Taxing District is unsuccessful. Table 6-2 shows the approximate financial burden on the VLAWMO residents for the various VLAWMO budget amounts and home values, shown as a tax per residence.

In addition to member contributions and taxes to operate the VLAWMO, member communities may have additional costs associated with implementation of their LWPs. The LWPAs already have ordinances in place that address many of the VLAWMO requirements, however, there are additional requirements for standards affecting storm water management and wetland protection, which will require additional staff time and resources. Most of these requirements are part of MS4 requirements already affecting the LWPAs (with the exception of the City of Gem Lake), anticipated MCES requirements for LWPs, and NPDES General Permit requirements for construction that already apply for land disturbing activities and projects that create impervious surfaces. Also, the Plan considers existing land use and future land use for year 2020, as compiled by the MCES from

local Comprehensive Land Use Management Plans. This plan does not conflict with these local plans.

6.6 MEASURABLE OUTCOMES

Table 6-3 provides a list of the products or measurable outcomes of this Plan on an annual basis. These listed items will be used to develop annual workplans and will be reported in annual reports as a means of tracking implementation of the Plan.

The other primary outcome measurements for judging effectiveness of the Plan are the numerical standards established for the lakes in Strategy 2.B, and the non-degradation from 2005/2006 standards established by Strategy 2.A. Comparisons with these standards will be established and completed with detailed data analyses scheduled for 2007, 2011, and 2016.

6.7 FUTURE PLAN AMENDMENTS

1. Update Management Matrix
2. Seeking levy and storm water utility fee
3. Priority Schedule

Project: Wetland Management Plan.

- Modified WRAM was used as close to comparable methodology for when the wetland assessment was done in the 1990's. The only modification was to add soils information from the County Soil Surveys.
- As new development, redevelopment or other projects are proposed, MNRAM 3.0 or the current methodology will be used to assess any wetlands involved. Redevelopment that triggers a municipal permit will also trigger wetland management buffer and hydro period requirements.
- NWI basins not already inventoried will be assessed with current assessment methodology.
- The TEP and the USACOE will be asked to comment (and approve) on how scores from the current methodology are used in the management matrix.

Project: Capital Improvements.

- Detailed capital improvements as they are planned and subsequently ordered by the Board.

Project: Plan Amendment.

- Amendments based for example on new legislative requirements or policy initiatives, or technological advances.

Project: TMDL Studies.

- Amendments based on waterbodies within the watershed being listed on the 305b or 303d impaired waters list.

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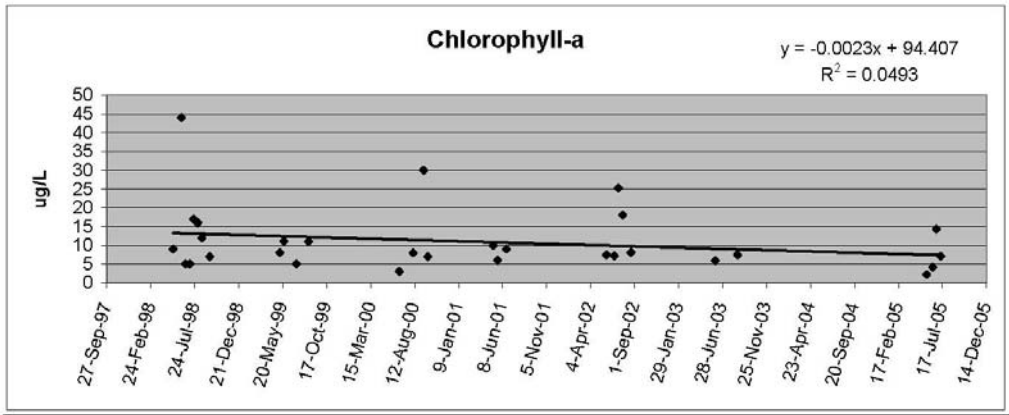
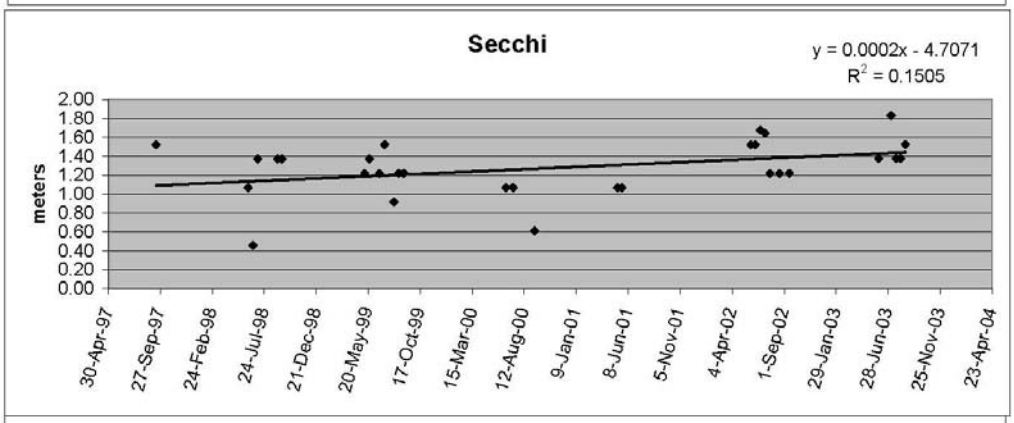
APPENDIX A
ANNUAL REPORT CARD

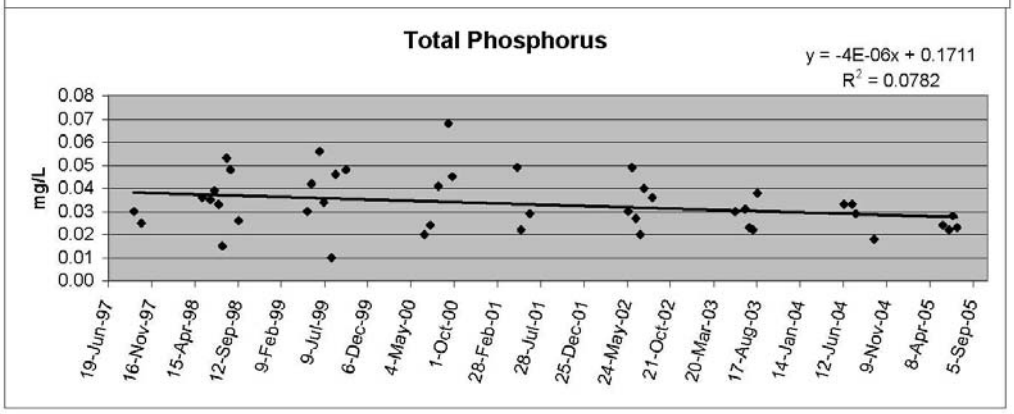
APPENDIX B
WETLAND INVENTORY MAP

APPENDIX C
VLAWMO CLMP LAKE DATA SUMMARIES

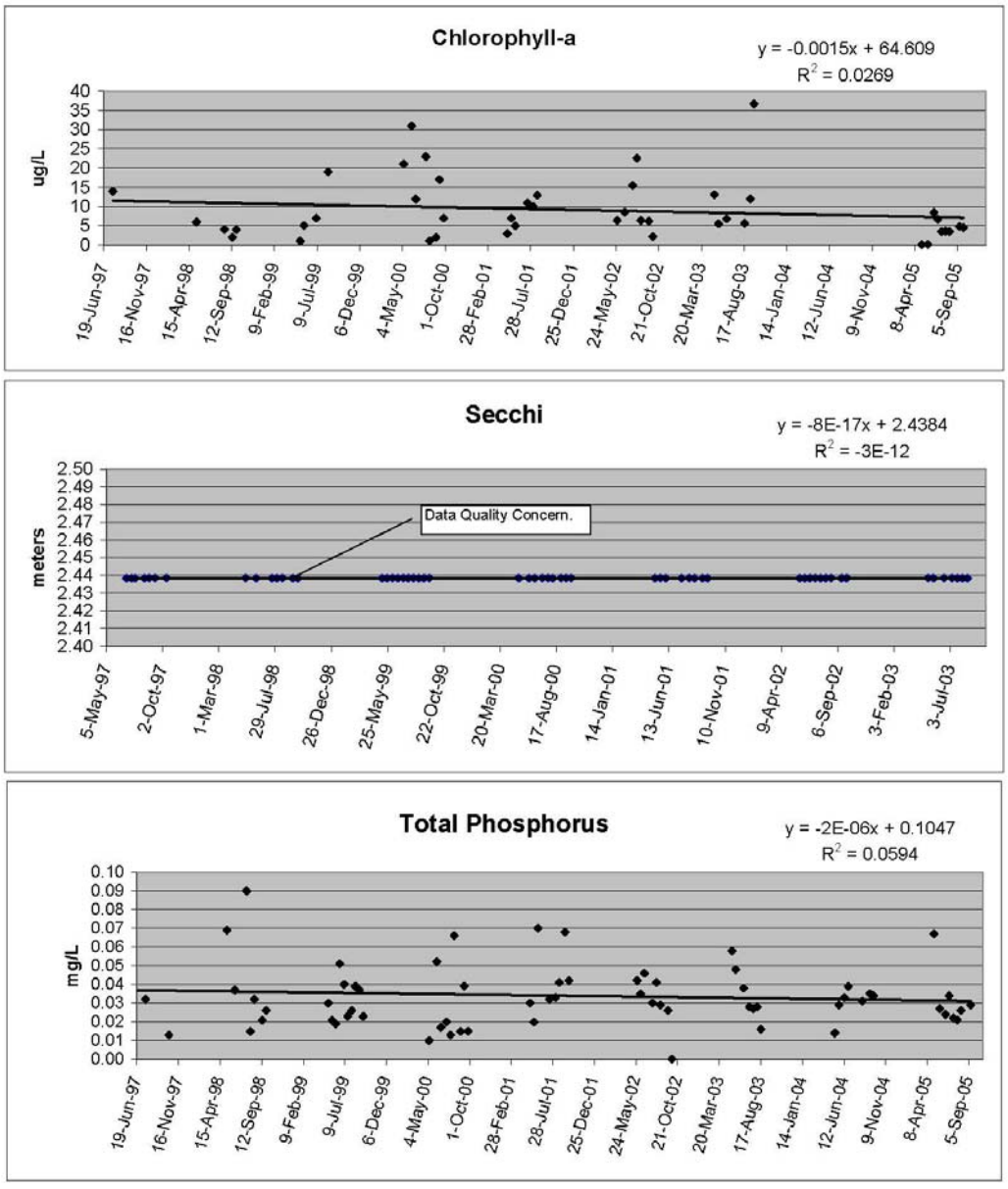
AMELIA LAKE- ALL YEARS



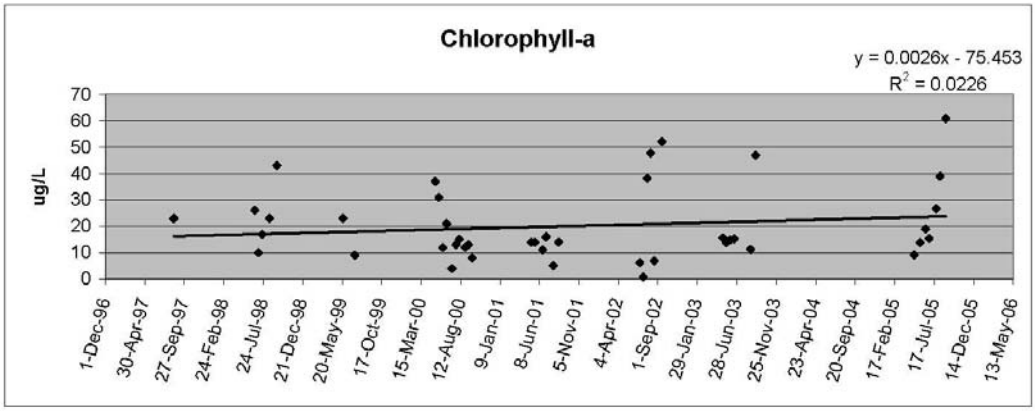


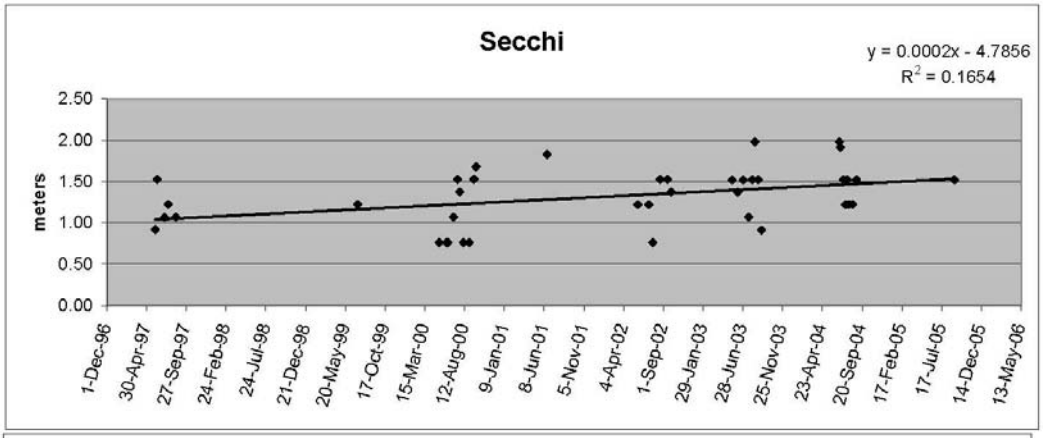


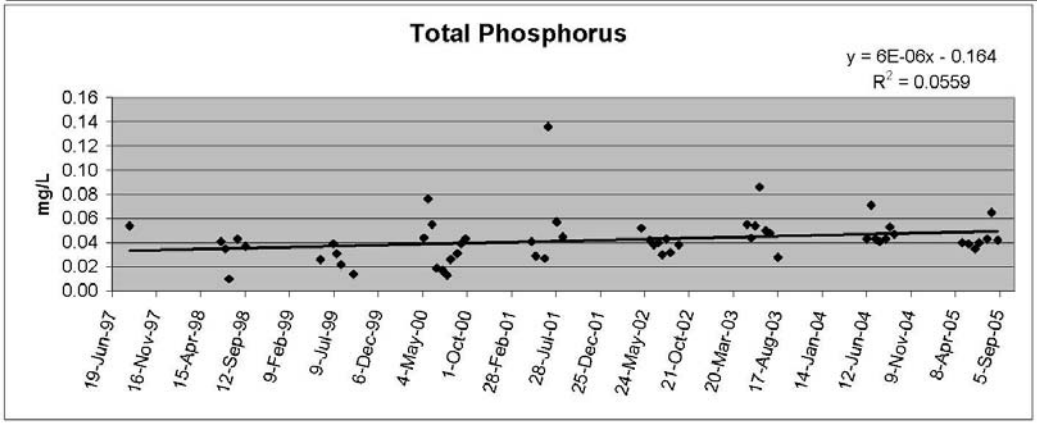
BIRCH LAKE - ALL YEARS



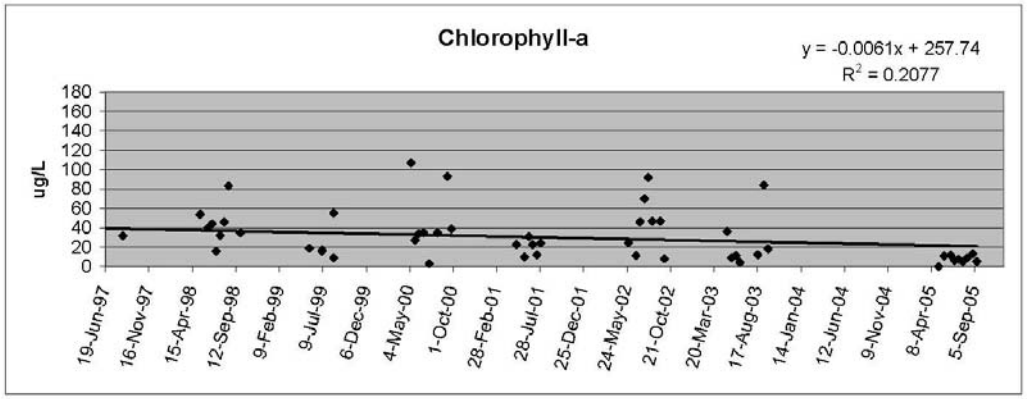
GEM LAKE - ALL YEARS

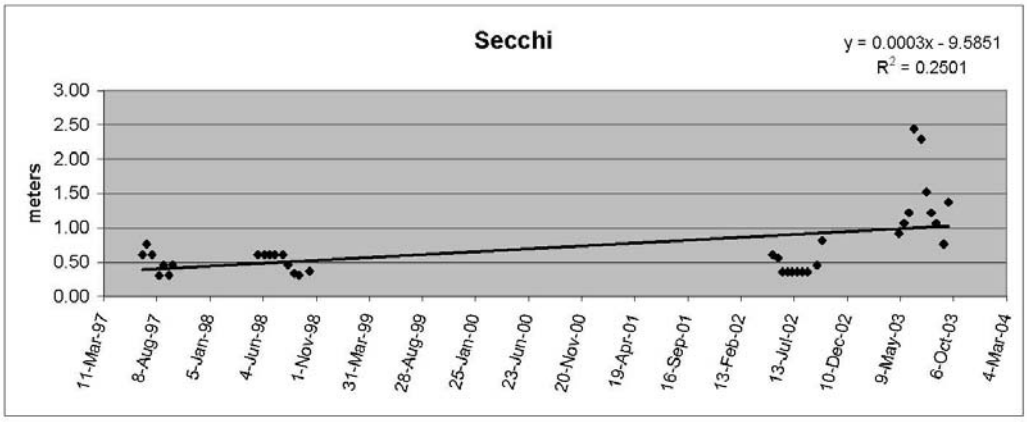


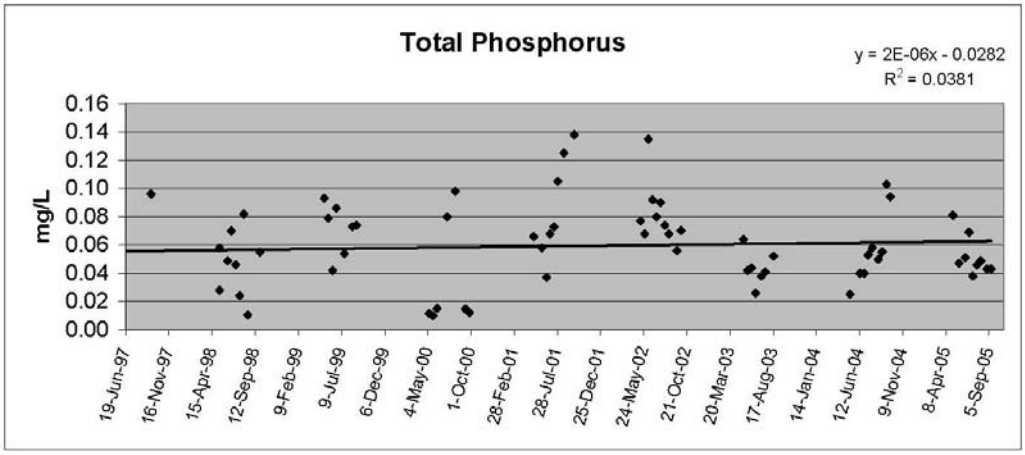




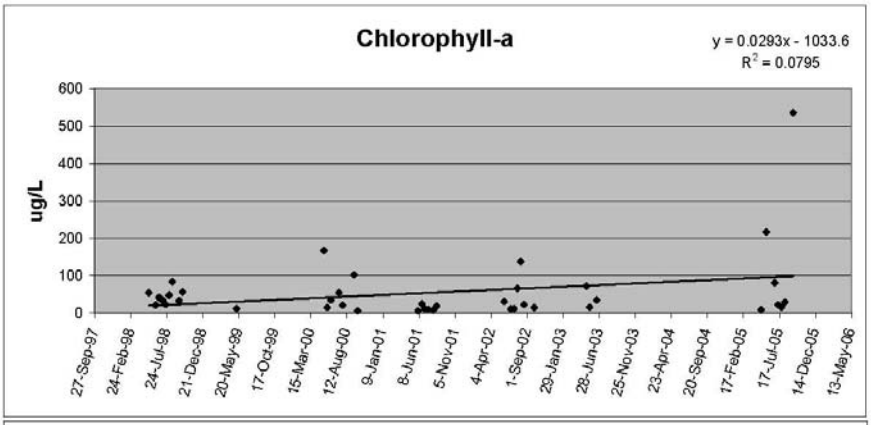
GILFILLAN LAKE - ALL YEARS

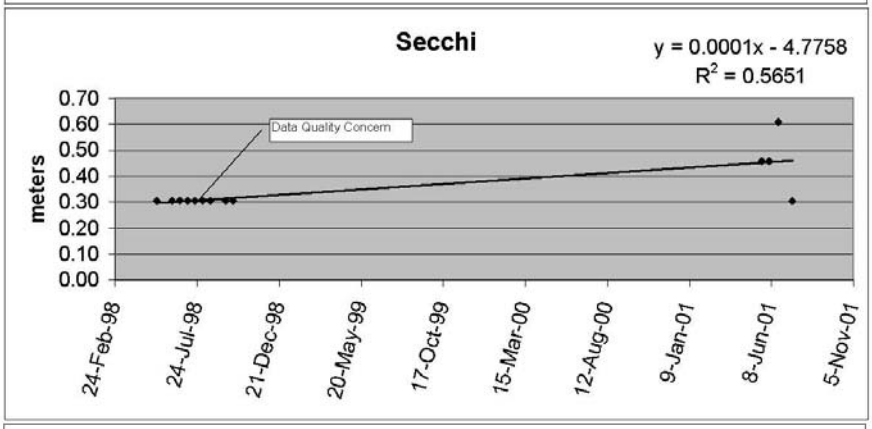


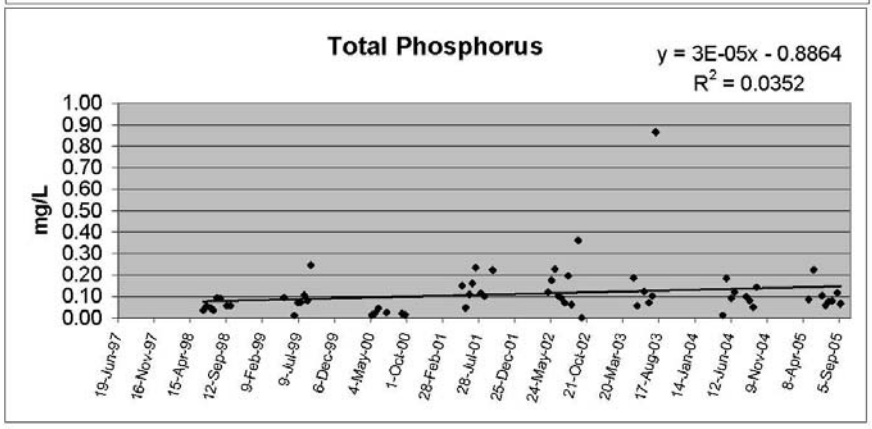




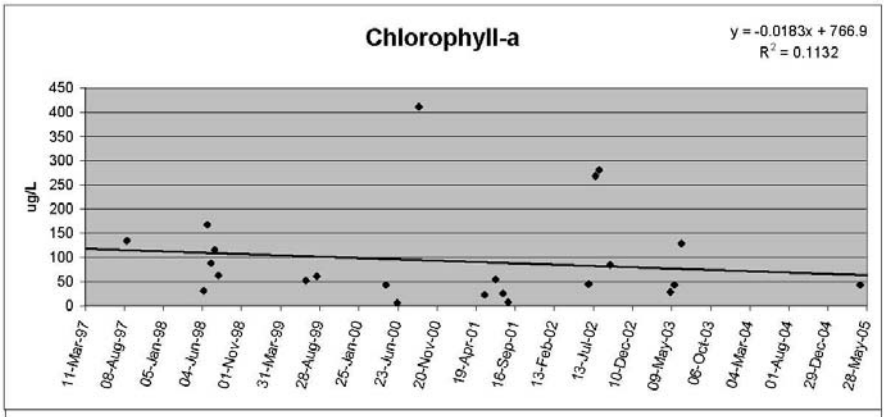
GILFILLAN POND - ALL YEARS

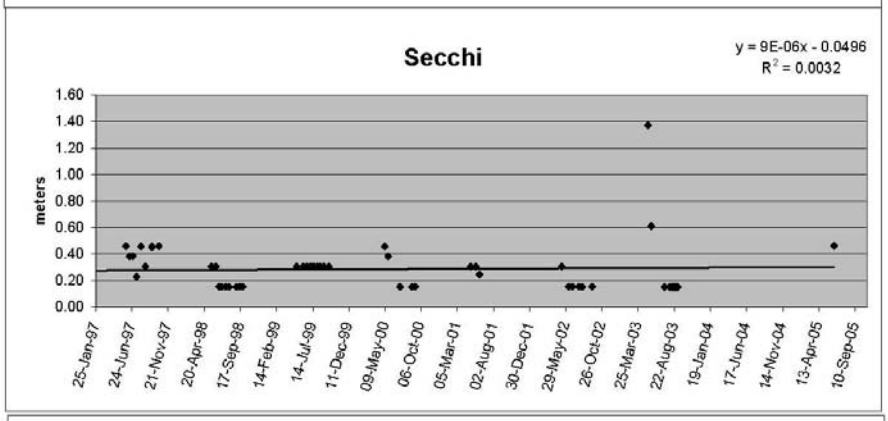


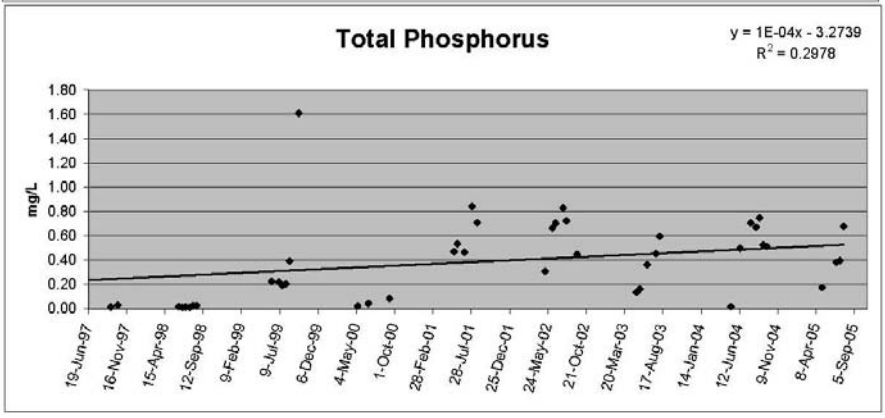




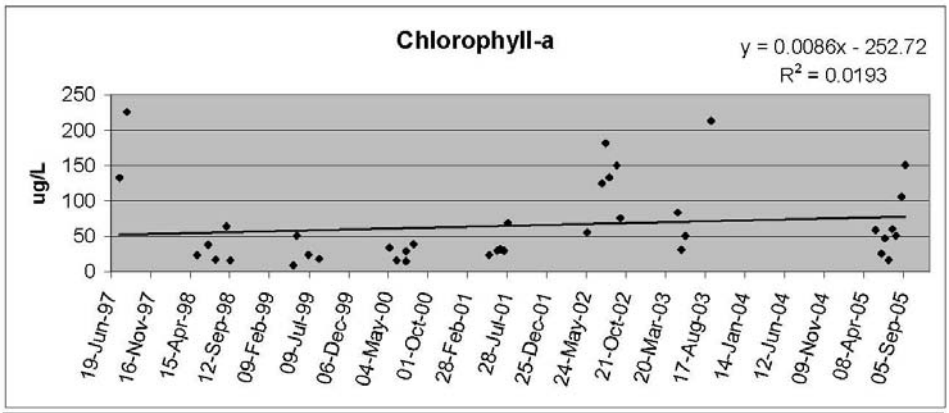
GOOSE LAKE - ALL YEARS

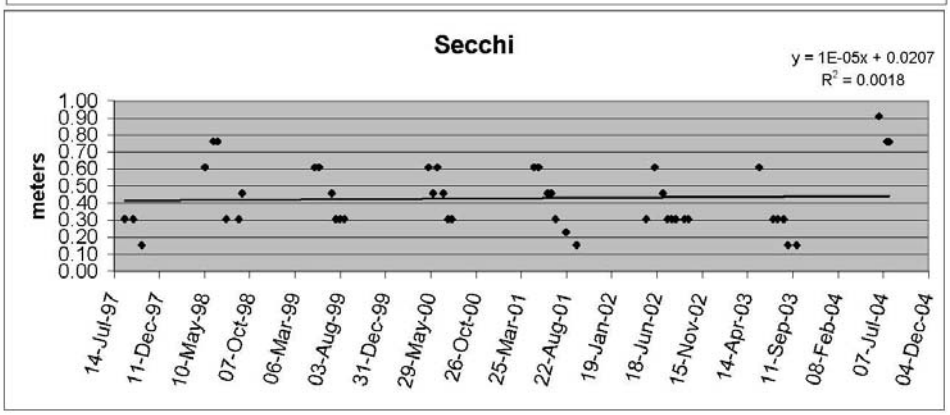


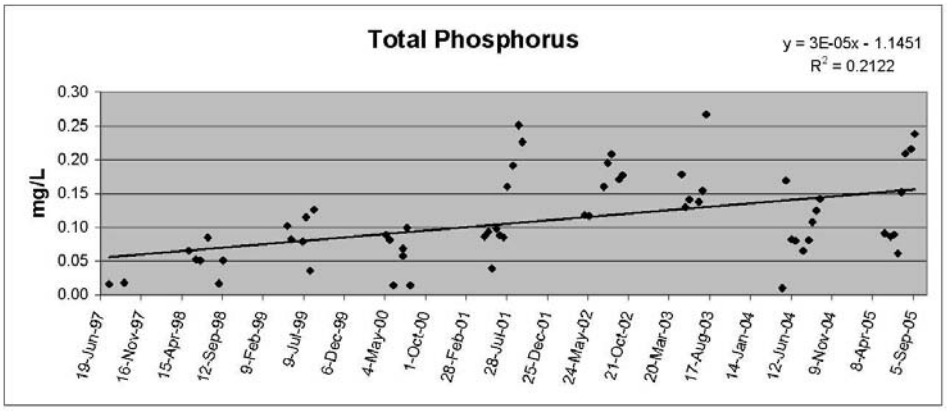




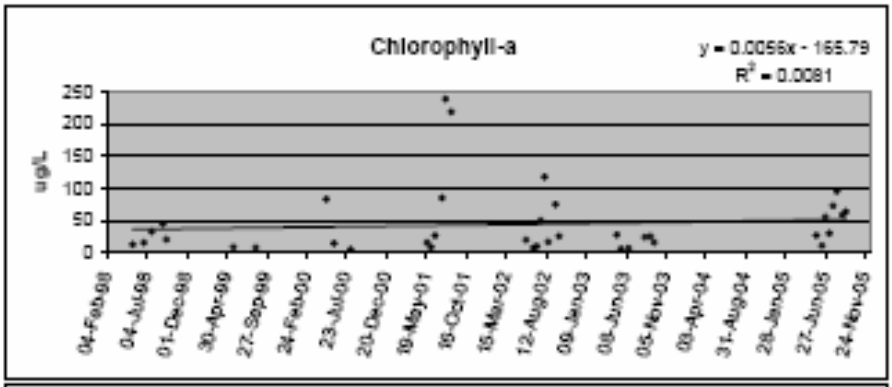
TAMARACK LAKE - ALL YEARS

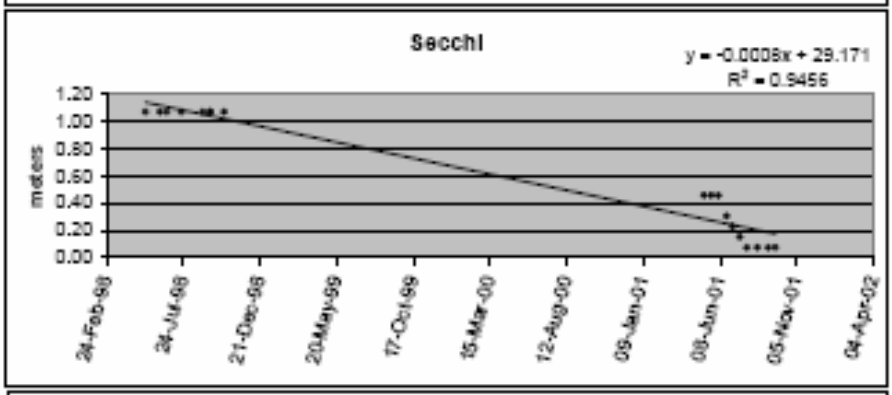


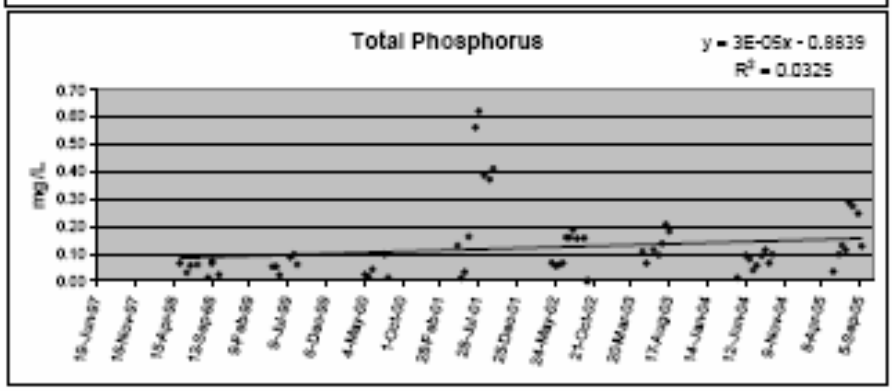




WILKINSON LAKE - ALL YEARS







APPENDIX D
METROPOLITAN COUNCIL LWP REQUIREMENTS

Local Water Management Plans

Background

In the Twin Cities Metropolitan Area, all cities and townships are covered by one or more watershed management organization (WMO). WMOs are required to prepare plans to address watershed management issues (see Minn. Stat. Sec. 103B.201). Cities and townships are required to prepare local water management plans that are consistent with all applicable WMO plans (see Minn. Stat. 103B.235). In addition, Phase I and II NPDES MS4 permit communities are required to prepare storm water pollution prevention plans (SWPPPs). Some MS4 communities are listed as nondegradation communities and required to provide information in their SWPPP related to nondegradation. With the multitude of planning requirements, there is a need to coordinate and consolidate all of these different planning documents. Comprehensive local water management plans (plans that address all of the water management planning requirements out there) are crucial in helping the region meet its goal of no adverse impact on area waterbodies.

In 1995, the Metropolitan Land Planning Act was amended to require that each city and township's comprehensive plan include a local water management plan. Local water management plans need to be consistent with the requirements in Minnesota Statutes 103B and in the Metropolitan Land Planning Act. Local water management plans are reviewed by the Metropolitan Council (Council) as part of the local comprehensive planning process prior to their approval by the WMO and adoption by the city or township. Local water management plans are crucial in helping the region meet the challenge of cost-effective management of water quality and quantity.

Local Water Plan Requirements

Minnesota Rules Chapter 8410 (Metropolitan Area Local Water Management), requires the local water management plans to address the specific elements. In the Council's 2030 Regional Development Framework, the Council adopted a water management goal for the region, "the quality of water leaving the metropolitan area is as good as the water quality entering the metropolitan area, and in compliance with federal and state regulations." To meet this goal, the Council has linked the control of pollution from point and nonpoint sources. The 2030 Water Resources Management Policy Plan states that if a community does not have a local water management plan as part of its 2008 comprehensive plan update, the comprehensive plan will be found incomplete for review. If the community has a plan that does not meet Council requirements for local water management plans, the Council will likely find the plan to have an impact on our system, thus requiring a plan modification. The following list is an expansion of the requirements under Chapter 8410. The list is intended to clarify, through additional detail, what communities should do to ensure that their local

water management plan is consistent with the Council's 2030 Water Resources Management Policy Plan.

1. Purpose of plan
2. Water resource management related agreements
3. Executive summary
4. Land and water resources inventory (For this requirement and others that follow, communities are encouraged to use as much of the WMO plan as they can. The community should be aware that not all WMO plans will contain the level of detail needed for the community and in those instances, the community will need to provide additional information).
5. Establishment of policies and goals
    A. All communities need a strong policy statement to show that they are committed to a goal of no adverse impact (nondegradation) for area water resources.
    B. All communities need goals for their lakes consistent with Watershed Management Organization plan goals.
    C. The Council's *2030 Regional Development Framework* classified communities as urban planning areas (developing and developed areas) and rural planning areas (rural centers, agricultural, diversified rural and rural residential areas). Communities classified as developed or developing and MS4 communities in the rural planning area need to include actions that show the community is committed to the goal of no adverse impact or nondegradation goal for area water resources. Actions should include:
        i. Adopting erosion and sediment control ordinances that are consistent with NPDES Construction Storm water permit and MS4 permit requirements
        ii. Preparing wetland management plans (refer to 8G for more details of what should be in a wetland management plan)
        iii. Adopting ordinances that control peak runoff (Suggested guidance - Minnesota Storm water Manual)
        iv. Adopting best management practices for development that will result in TSS and TP reductions of 80% and 50% respectively
        v. Adopting best management practices for redevelopment that will result in TSS and TP reductions (Suggested guidance - Minnesota Storm water Manual)
        vi. Including funding mechanisms that support implementation and enforcement
    D. Developing and developed communities that are a Phase I or Phase II NPDES MS4 permit community need to integrate their Storm water Pollution Prevention Plan policies and goals into their local water management plan, in accordance with MPCA requirements and schedules.
    E. Developed and developing communities listed as nondegradation communities as part of their NPDES MS4 permit need to revise their Storm water Pollution Prevention Plan to include the required information for nondegradation. Nondegradation policies and goals should be summarized or integrated into their local water management plans.

F. Rural planning area (rural centers, agricultural, diversified rural and rural residential) communities need to include actions that show the community is committed to the goal of no adverse impact (nondegradation goal) for area water resources. Actions should include:
   i. Adopting erosion and sediment control ordinances that are consistent with NPDES Construction Storm water permit and MS4 permit requirements where applicable
   ii. Preparing wetland management plans (refer to 8G for more details of what should be in a wetland management plan)
   iii. Adopting ordinances that control peak runoff
   iv. Including funding mechanisms that support implementation and enforcement

6. Assessment of problems and corrective actions for problems identified
   A. All communities need to assess the water quality and quantity related problems in their community, prioritize the problems and include actions to adequately solve the problems that were identified.
   B. All communities must acknowledge and list any impaired waters within their jurisdiction as shown on the current MPCA 303d Impaired Waters list. A TMDL is a calculation that determines the allowable pollutant load that can be discharged into the impaired water such that the water is not impaired. A community that discharges water to an impaired waterbody within or adjacent to the community, needs to explain how and if it intends to be involved with the development of the Total Maximum Daily Load (TMDL) study.
      i. If a TMDL study is not completed, the city should identify the priority it places on addressing impaired waters and how the city intends to participate in the development or implementation of TMDL studies.
      ii. If the city is not directly involved in the TMDL study, the city should show how it intends to implement the study findings once the study is completed by the responsible party.
      iii. If a TMDL study is completed for the impaired water, the community needs to include an implementation strategy including funding mechanisms that will allow them to carry out the TMDL requirements.

   More information on the MPCA's TMDL program can be found on the MPCA's web site at http://www.pca.state.mn.us/water/tmdl/index.html.

7. Financial considerations
   A. All communities need to include a 5-year CIP that includes funds to solve the problems identified in number 6 above.
   B. All communities need to include funding in their CIP or operating budget for ongoing maintenance of their storm water infrastructure.

8. Implementation priorities and program
   A. Developed, developing and any MS4 communities in the rural planning area need to provide information on how they intend to manage storm water:
      i. Include an erosion and sediment control ordinance consistent with NPDES Construction Storm water permit and MS4 permit requirements

ii. Identify ways to control runoff rates (suggested guidance - Minnesota Storm water Manual) so that land-altering activities do not increase peak storm water flow from the site for a 24-hour precipitation event with a return frequency of 1or 2, 10, and 100 years.
iii. Require criteria for wet detention basin minimum pollutant removal efficiency to protect and improve storm water runoff quality. Best management practices for development and redevelopment should result in TSS and TP reductions (suggested guidance - Minnesota Storm water Manual).
iv. Require infiltration of the first ½ inch of runoff from the impervious areas created by new projects where there are A and B soils. Use of infiltration techniques is prohibited in some potential storm water hotspot areas, e.g. vehicle fueling areas (suggested guidance - Minnesota Storm water Manual).
v. Recommend adding a soil amendment and requiring soil ripping 1 ½- 2 feet after mass grading is complete for all soil types.
vi. Require infiltration in wellhead protections areas to be based on the community's wellhead protection plan and at the discretion of the local government.
vii. Require pretreatment of storm water prior to discharge into all lakes and streams.

B. Rural planning area communities, excluding MS4 communities, need to provide information on how they intend to manage storm water:
i. Include an erosion and sediment control ordinance consistent with NPDES Construction Storm water permit requirements
ii. Identify ways to control runoff rates so that land-altering activities do not increase peak storm water flow from the site for a 24-hour precipitation event with a return frequency of 1or 2 years
iii. Require criteria for wet detention basin minimum pollutant removal efficiency to protect and improve storm water runoff quality for areas where development is occurring. Best management practices for redevelopment (suggested guidance - Minnesota Storm water Manual) should result in TSS and TP reductions.

C. All communities with designated trout streams must identify actions in their plan to address the thermal pollution effects from development.
D. All communities with special waters, such as outstanding resource value waters, need to meet state requirements for development near these waters (see Appendix A part B.1-8 of the Minnesota Construction General Permit for a list of these waters and Appendix A part C.1-5 for specific requirements).
E. All communities need to consider the use of storm water practices that promote infiltration/filtration and decrease impervious areas (better site design and integrated storm water management), where practical.
F. All communities need to include information on the types of best management practices to be used to improve storm water quality and quantity and the maintenance schedule for the best management practices.
G. All communities need to include a wetland management plan or a process and timeline to prepare a plan. At a minimum, the wetland management plan should incorporate a function and value assessment for wetlands. Other items to address in the plan include the pretreatment of storm water prior to discharge into all wetland types, and the use of

native vegetation as buffers for high quality wetlands. Buffers should be consistent with the functions and values identified in the plan.

H. Developed and developing communities that are a Phase II NPDES MS4 permit community need to include information on how the community is meeting the permit conditions for required Storm water Pollution Prevention Plans:
   i. Public education and outreach
   ii. Public participation/involvement
   iii. Illicit discharge detection and elimination
   iv. Construction site runoff control
   v. Post-construction runoff control
   vi. Pollution prevention/good housekeeping.
   vii. Activities planned to be undertaken along with numerical goals, strategies, and timelines
   viii. Funding source for the various required activities.

I. Developed and developing communities which are required to revise their Storm water Pollution Prevention Plan to include the required nondegradation information as part of their NPDES MS4 permit need to summarize or integrate the nondegradation information into the local water management plan.

9. Amendment procedures

A. Each local plan must include year the plan extends to and establishes the process by which amendments may be made.

APPENDIX E

VLAWMO GENERAL WATER APPROPRIATIONS PERMIT INFORMATION

General Permit for the Appropriation of Water Below the Permitting Threshold Established by the Department of Natural Resources.

General Permit

At the request of the City Council (Town Board) per resolution _____, a general permit for the purpose of appropriations as defined in Minnesota State Statute Chapter 103B.211 Subd. 4 will be issued to the City (township) of _____. This permit will be in effect unless reviewed or amended by the municipality and /or the Vadnais Lake Area Water Management Organization (VLAWMO).

Conditions of the Permit

The permit will allow for appropriation of water below the Department of Natural Resources threshold of 10,000 gallons per day of 1 million gallons per user per year from any public waterbasin within the jurisdiction of VLAWMO and located within the boundaries of the Municipality. Each individual appropriation is required to provide the following information to the Municipality:

Name

Address

Waterbasin per VLAWMO management plan

Estimated Pump rate

Purpose of the Appropriation

Contingency plan for restriction of use

The applicant shall not exceed the estimated pumping rate or use the appropriation for any other purpose except stated. Approval of this appropriation will be renewed automatically at the beginning of each calendar year unless the approval is appealed. Any violation will cause the applicant's appropriation approval to be revoked until January 1 of the following year. The City or Town will do monitoring and enforcement of the appropriation.

All appropriations are considered on a water basin basis. Appropriations from waterbasins less than 500 acres are discouraged. (Ref. Minnesota State Statutes 103G. 285, Subd. 4) A protective elevation may be set for the waterbasin, below which an appropriation is not allowed. The Municipality shall have the right to establish a protective elevation for a specific waterbasin. In establishing that elevation the Municipal council or board shall consider the existing aquatic vegetation, fish and wildlife habitat, existing uses, and total volume within the water basin and the slope of the littoral zone. (Ref. Minnesota State Statutes

103G.285, Subd. 3.) An application is not complete without a contingency plan describing alternatives the applicant will use if further appropriation is restricted due to flow of the stream or level of the waterbasin. (Ref. Minnesota State Statutes 103G.285, Subd. 6.)

Appeal and Review Procedure

Appropriation approval will be in effect until a process of review begins with a formal request being made to the Municipality to place a moratorium on appropriation for a given waterbasin, wetland or watercourse by the following parties:

1. *Resident with legal ownership of shoreline of the water*
2. *Adjacent Community*
3. *VLAWMO*

Once the formal request is made, a public meeting will be held. Notice will be posted in the local paper prior to the next council or board meeting of the Municipality. The party will make a presentation to the Council/Town Board on their concerns and the need for limiting appropriations on a given waterbasin. VLAWMO will attend the meeting and provide information on the extent of the water basin, wetland or watercourse that is impacted and any technical information required the Council/Town Board. After the party and VLAWMO have presented information the Council/Town Board, a public meeting will be held to solicit comments from other residents or communities.

Upon completion of all information and testimony, the Council Town Board will act by resolution on the request of the resident. VLAWMO will support any Municipal resolution that is determined to impact only residents within the Municipality. For residential rulings, the following actions are allowed under this permit:

1. *Table to the next Council/Town Board Meeting (allows pumping to continue on a monitoring basis)*
2. *Order appropriation be stopped on the waterbasin for all adjacent owners for a period of time (short term if it is a preventive action until more information is collected or long term if it is seen as a long term problem)*
3. *Order appropriation stopped until a new water elevation determined by the Council /Town Board is reached.*
4. *Deny the appropriation moratorium request (Council/Town Board believes there is not a negative impact of the appropriation to their residents)*

If VLAWMO or an adjacent Municipality initiates the action, VLAWMO will call a special meeting of the VLAWMO Board of Commissioners to act on the need for appropriations after the public hearing is held. Information gathered as part of the public meeting will be used to make a ruling. The Board may take the following actions:

1. *Take no action (based on data collected, moratorium is not required).*
2. *Order appropriation be stopped on the waterbasin for all adjacent owners for a period of time (short term if it is a preventative action until more information is collected or long term if it is seen as a long term problem).*
3. *Order appropriations stopped until a new water elevation determined by the VLAWMO is reached.*

If an appropriation is revoked, VLAWMO will inform all affected property owners of the action and the appropriation will end immediately with a written or verbal notification. Enforcement of the ban is by the Municipality and is considered a misdemeanor and will consist of a fine of $25.00 for each violation. All moratoriums on appropriations will remain effect until removed by resolution of the Council or VLAWMO or on January 1 of the next year.

Approved by the VLAWMO Board at its July 8, 2004 meeting.

_____ _____

Chair Secretary - Treasurer

_____ Attest: _____

Vice Chair Administration

APPENDIX F
CURRENT VLAWMO JPA

JOINT POWERS AGREEMENT
TO PROTECT AND MANAGE THE VADNAIS LAKE AREA WATERSHED

THIS AGREEMENT, made and entered into as of the last date of execution, by and between the participating units of local government of the Cities of Gem Lake, Lino Lakes, North Oaks, Vadnais Heights, and White Bear Lake and the Township of White Bear, hereafter referred to as "Members" and individually as "Member", agree to continue the Vadnais Lake Area Water Management Organization, as a public agency.

SECTION I
GENERAL PURPOSE

The Vadnais Lake Area Water Management Organization (VLAWMO), created, pursuant to Minn. Stat. Section 471.59, is dependent upon the sincere desire of each Member to work cooperatively to meet the requirements of the Metropolitan Surface Water Management statute, Minn. Stat. Section 103B.201 et seq. (Metro Surface Water Management Act) and Chapter 103D (Watershed Law), hereafter collectively referred to as the "Act".

It is the general purpose of the parties to this Agreement to establish an organization to:

1) Continue the Vadnais Lake Area Water Management Organization;
2) Develop a water management plan, and
3) Operate appropriate programs including those to:
   a) protect, preserve and use natural surface and groundwater storage and retention systems;
   b) minimize capital expenditures necessary to correct flooding and water quality problems;
   c) identify and plan for means to effectively protect and improve surface and groundwater quality;
   d) establish more uniform local policies and official controls for surface and groundwater management;
   e) prevent erosion of soil into surface water systems;
   f) promote groundwater recharge; and
   g) protect and enhance fish and wildlife habitat and water recreational facilities and secure other benefits associated with the proper management of surface and groundwater, and be in accordance with the Act.

SECTION II
VADNAIS LAKE AREA WATERSHED

VLAWMO shall manage a watershed area in northern Ramsey County and southeastern Anoka County shown on the map set forth on APPENDIX A.

SECTION III
DEFINITIONS

For purposes of this Agreement, the following terms shall have the meanings as defined in this Section.

"Agreement" – This Agreement pursuant to Minnesota Statutes Section 471.59 reconstituting the Vadnais Lake Area Water Management Organization (VLAWMO).

"Area" – The boundaries of the Vadnais Lake Area Watershed as set forth on the map set forth on Appendix A and hereafter referred to as the "Area".

"Board of Directors" – The governing board of VLAWMO consisting of one elected official from each of the Members which are parties to this Agreement.

"Capital Improvement Program" or "capital improvement program" or "Works of Improvement" – A multi-year itemized program, described in the approved VLAWMO Water management Plan and any amendments to it, setting forth the schedule, timing, and details of specific contemplated capital improvements by year.

"City Council or Town Board" – The governing body of a governmental unit which is a Member to this Agreement.

"City Staff" – Persons hired by units of local government whether as an employee or an independent contractor.

"Commissioner" – A person appointed by each Member to the Technical Commission.

"Comprehensive Plan" or "comprehensive plan" – The meaning given it in Minn. Stat. Section 473.852, Subdivision 5.

"Director" – An elected official appointed by each Member as a representative to the Board of Directors.

"Governmental Unit" – Any city, town, township, county, school district, or other political subdivision or an "instrumentality of a governmental unit "as described in Minn. Stat. Section 471.59, Subdivision 1.

"Local Government Unit" – Cities, counties and towns, not including school districts, as described in Minn. Stat. Section 473.852, Subd. 7.

"Local Water Management Plan" - A plan adopted by the each of the members pursuant to Minn. Stat. Section 103B.235.

"Member" – Each local governmental unit that is a party to this Agreement.

"Technical Commission" – A commission composed of a technically skilled person appointed by each Member.

"Vadnais Lake Area Watershed" – The area contained within a line drawn around the extremities of all terrain whose surface drainage is tributary to Vadnais Lake.

"VLAWMO" – The abbreviated name of the organization created by the Agreement, the full name of which is the "Vadnais Lake Area Water Management Organization".

"Watershed Management Plan" - A plan adopted by VLAWMO pursuant to Minn. Stat. Section 103B.231.

SECTION IV
ORGANIZATION OF VLAWMO; RESPONSIBILITIES OF MEMBERS

Subdivision 1. Board of Directors. The governing body of the Vadnais Lake Area Water Management Organization (VLAWMO) shall be its Board of Directors.

Subdivision 2. Appointment of Directors. Each Member shall appoint one representative, who must be an elected official, to the Board, and said representative shall be called a "Director". The appointment process shall follow Minn. Stat. Section 103B.227, Subdivisions 1 and 2.

Subdivision 3. Term of Office. Each Director shall serve at the will and consent of the Member making the appointment and for a three year term of office as follows:

1) The Directors appointed by the Cities of Lino Lakes and White Bear Lake and the Township of White Bear shall be appointed for three year terms, the beginning date of which was January 1, 2004 and every three years there after.
2) The Directors appointed by the Cities of North Oaks, Gem Lake and Vadnais Heights shall be appointed for a term of three years, the beginning date of which is January 1, 2005 and every three years there after.

The term of office of each Director shall commence from the date of their appointment and will continue until their successors are selected. Successor Directors shall serve out the remainder of the term of the Directors they succeed.

Subdivision 4. Eligibility to Serve. Each Member shall determine the eligibility or qualification standards for its Director appointment. Eligible appointees should be compliant with Minn. Stat. Section 103B.227, which, among other things provides that local units of government staff may not serve as a Director.

Subdivision 5. Record of Appointment. Each governmental unit shall, within thirty (30) days following the appointment of a Director or Successor Director, file a written notice of such appointment with the Secretary of the Board.

Subdivision 6. Appointment of Alternate Director. One Alternate Director may be appointed by each of the Members to this Agreement. The Alternate may attend the meetings of the Board of Directors, but only the appointed Director or the Alternate Director in the absence of the Director shall be allowed to vote on any matters before the Board.

Subdivision 7. Appointment of Technical Commission Representative. Each Member to this Agreement shall appoint one commissioner and may appoint one alternate to serve on the Technical Commission.

Subdivision 8. Compensation. Directors shall serve without compensation and without expense allowance from VLAWMO. A Director may be reimbursed for out-of-pocket expenses incurred on VLAWMO business with the approval of the Board. A Member may compensate its Director or Alternate for his/her service, in the discretion of the Member.

SECTION V
ORGANIZATION OF THE BOARD OF DIRECTORS

Subdivision 1. Annual Meeting; Election of Officers. At the first meeting of the Board and at the first meeting of each calendar year thereafter, also known as the Annual Meeting, the Board shall elect from among the Directors a Chair, Vice Chair, Secretary and Treasurer, or a combination Secretary-Treasurer, and such other officers as it deems necessary to conduct its meetings and affairs. An Alternate Director may not serve as an officer of VLAWMO.

Subdivision 2. Duties of officers

1) **The Chair** shall preside over meetings of the Board, and in the absence of the Chair, the Vice Chair shall perform this duty. In the absence of the Chair or Vice Chair, the Treasurer shall preside. The Chair shall retain all rights of a Director to speak, make motions and vote.
2) **The Vice Chair** shall preside at meetings when the Chair is absent and shall automatically be promoted to complete the annual term of the Chair if the then current Chair resigns or is removed from the Board.
3) **The Secretary** shall maintain a record of the proceedings of the Board, be responsible for the custody of the records of the Board, see that notices are duly given and complete such other duties as the Board may assign. If the duties of the Secretary are delegated to a VLAWMO employee, the Secretary shall supervise the performance of those duties.
4) **The Treasurer** shall be responsible for all monies of VLAWMO and shall periodically report the fiscal condition of VLAWMO to the Board. The Chair, Vice Chair, Treasurer and Administrator are authorized to be signers for financial disbursements provided that all checks, other forms of disbursement, or any obligations will require at least two signatures from among the authorized signers.

Subdivision 3. Quorum. A majority of the Members present shall constitute a quorum at all Board meetings. In the absence of a quorum, a scheduled meeting shall not be started and the meeting shall be re-scheduled.

Subdivision 4. Meetings. Regular meetings of the Board shall be held at least once each quarter on a day and time selected by the Board. All meetings of the Board are subject to the Minnesota Open Meeting Law. Notice of the time and place of each meeting shall be sent to all Members, provided to the public requesting this information, posted one week before the meeting outside the meeting area, and published in a newspaper of general circulation distributed in the VLAWMO area. Meetings shall be conducted in accordance with the latest version of Roberts Rules of Order.

Subdivision 5. Voting. Each Director shall have one (1) vote in all matters, as follows:

1) approval of the proposed annual VLAWMO operating budget shall require approval of a simple majority of all Directors;
2) approval of Works of Improvement (capital improvement projects) will require approval of two-thirds (2/3) of all Directors; and
3) approval of all others matters will be determined by a simple majority of Directors present and voting.

Subdivision 6. Committees. The Board may appoint such committees and subcommittees as it deems appropriate. At least one Board member shall be the appointed as the Chairman of each committee and all committees shall regularly report their activities to the Board.

Subdivision 7. Public Participation. The Board may appoint such committees and subcommittees composed of citizens as needed to provide for public participation and input in watershed activities and the responsibilities of VLAWMO. Such citizen committees shall be advisory.

SECTION VI
RESPONSIBILITIES AND DUTIES OF THE BOARD OF DIRECTORS

Subdivision 1. Policies and Procedures. The Board shall adopt rules and regulations as it deems necessary to carry out its duties and the purpose of this Agreement. Such rules and regulations may be amended from time to time in either a regular or special meeting of the Board provided that notice of such proposed amendment has been given to each Director at least ten (10) day prior to the meeting at which the proposed amendment will be considered. The initial rules and regulations shall be submitted to the Members for their review. Members shall submit their comments to the Board within 45 days. These rules and regulations, after adoption, shall be recorded in the VLAWMO policy book.

Subdivision 2. Watershed Management Plan (Plan). The Board shall adopt a water management plan, as required by the Act. The Plan shall be subject to the appropriate governmental unit review as required by the Act.

Subdivision 3. Data. The Board, in order to give effect to the purposes of the Act may:

1) Acquire and record appropriate data within the Area; and
2) Establish and maintain devices for acquiring and recording hydrological or other data within the Vadnais Lake Area Watershed.

Subdivision 4. Local Studies. Each Member reserves the right to conduct separate or concurrent studies on any matter under study by VLAWMO.

Subdivision 5. Transfer of Drainage System. VLAWMO shall have the authority of a watershed district under section Minn. Stat. Chapter 103B to accept the transfer of drainage systems in the watershed, to repair, improve, and maintain the transferred drainage systems, and to construct all new drainage systems and improvements of existing drainage systems in the watershed, provided that projects may be carried out under the powers granted in Minn. Stat. Chapter 103B and that

proceedings of the Board with respect to the systems must be in conformance with the Watershed Management Plan adopted pursuant to Minn. Stat. Chapters 103A through103H.

Subdivision 6. Works of Improvement. Each Member agrees to contribute its proportionate share of all approved capital improvement expenditures, which includes engineering, planning, legal and administrative costs, based on the benefit to be received by each Member or other entity from the improvement or management project. The Board shall submit, in writing, a statement to each Member or other entity, setting forth in detail the expenses incurred by VLAWMO for each project.

Capital improvement projects may be initiated either by (1) recommendation of the VLAWMO Board to the governmental unit(s) affected or, (2) petition to the Board by the affected governmental unit. In either case and after study, and approval by two-thirds (2/3) of the Directors, the Board shall provide the affected governmental units with estimated costs and a description of the benefits to be realized by those affected and the costs to be borne based on benefit.

Subdivision 7. Water Conveyances. The Board may order any governmental unit to construct, clean, repair, alter, abandon, consolidate, reclaim or change the course of terminus of any ditch, drain, storm sewer, water course, natural or artificial, that affects the Vadnais Lakes Area Watershed in accordance with adopted plans.

Subdivision 8. Watershed Operations. The Board may order any government unit to acquire, operate, construct or maintain dams, dikes, reservoirs and appurtenant works in accordance with adopted plans.

Subdivision 9. Storm and Surface Waters. The Board shall regulate, conserve and control the use of storm and surface water within the Vadnais Lakes Area Watershed pursuant to its Watershed Management Plan.

Subdivision 10. Entrance upon land. To the extent permitted by Minnesota Statutes, the Board or its designated representatives may enter upon lands within or outside the Vadnais Lakes Area Watershed to make surveys and investigations to accomplish the purposes of VLAWMO and the Act.

Subdivision 11. Legal and Technical Assistance. The Board may obtain and provide legal and technical assistance in connection with litigation or other proceedings between one or more of its Members and any other political subdivision, commission, board or agency relating to the planning or construction of facilities to drain or pond storm waters within the Area.

Subdivision 12. Permits. VLAWMO shall cooperate with appropriate local, state, and federal agencies in obtaining required permits and shall review permits issued by local units of government to accomplish the purposes identified in Section I of this Agreement.

Subdivision 13. Office. VLAWMO shall maintain an office within the Area. All notices to VLAWMO shall be mailed or delivered to such office.

Subdivision 14. Insurance. VLAWMO may contract for or purchase such insurance as the Board deems necessary for its protection.

Subdivision 15. Financial Records. The Board shall maintain the books and accounts of VLAWMO consistent with generally accepted accounting principles and provide the separate accounting of operations and capital improvement projects.

Subdivision 16. Audit. The Board shall annually cause an independent certified audit of the books and accounts of VLAWMO.

Subdivision 17. Claims. To the extent required by Minnesota Statutes, VLAWMO shall be responsible for damages caused by it. All Minnesota Statutes governing notices of claims and limits on municipal liability shall be applicable to VLAWMO. To the extent permitted by Minnesota Statutes, VLAWMO shall be treated as a single municipal entity for municipal liability purposes.

Subdivision 18. Employees. The Board may employ or subcontract to persons or entities to fulfill defined responsibilities of VLAWMO with the approval of a majority of the Board.

Subdivision 19. Contracts. The Board may make such contracts and enter into such agreements as necessary to fulfill its obligations under this Agreement. Any such contract or agreement shall be in accordance with the Uniform Municipal Contracting Law, Minn. Stat. Section 471.345, and the Joint Powers Act, Minn. Stat. Section 471.59.

Subdivision 20. Annual Report to Members. The Board shall make and file a report to all of the Members at least once each year including the following information:

a. the financial condition of VLAWMO;
b. the status of all VLAWMO projects and work; and
c. the business transacted by VLAWMO and other matters which affect the interests of VLAWMO.

Copies of said report shall be transmitted to the administrator of each Member.

Subdivision 21. Records. VLAWMO's books, reports and records shall be available for and open to inspection at reasonable times.

Subdivision 22. Other Powers. The Board may exercise such other powers necessary and incidental to the implementation of the purposes set forth herein as authorized by the Members.

Subdivision 23. Amendments to this Agreement. The Board may recommend changes in this Agreement to the Members. This Agreement may be amended only by the Agreement of each of its members.

SECTION VII
RESPONSIBILITIES AND DUTIES OF TECHNICAL COMMISSION

Subdivision 1. Duties and Responsibilities. The Board shall establish a Technical Commission (Commission) that will provide technical expertise for the planning and operation of VLAWMO programs and projects. This Commission through the VLAWMO Administrator and other VLAWMO employees shall administer the day-to-day operations of VLAWMO. The VLAWMO Administrator shall serve as a non-voting member of the Commission. Each Member shall appoint a representative, who will be known as Commissioner, and an alternate to the Commission.

Subdivision 2. Eligibility to Serve. Each Member shall determine the eligibility or qualification standards for its Commission appointment, following guidelines promulgated by the Board.

Subdivision 3. Technical Commission Officers. The Board shall annually appoint a Chair from among the Commissioners. At the first meeting of the Commission each calendar year, the Commission shall elect from among the Commissioners a Vice Chair and Secretary, and such other officers as it deems necessary to conduct its meetings and affairs. An Alternate Commissioner may not serve as an officer of the Commission.

Subdivision 4. Meetings. Regular monthly meetings of the Commission shall be held on a day and time selected by the Commissioners. All meetings of the Commission are subject to the Minnesota Open Meeting Law. Notice of the time and place of each meeting shall be sent to all **Commissioners**, provided to the public requesting this information, posted one week before the meeting outside the meeting area, and published in a newspaper of general circulation distributed in the watershed. Meetings shall be conducted in accordance with the latest version of Roberts Rules of Order. Each Commissioner shall have one vote.

A majority of the Commissioners present shall constitute a quorum at all Commission meetings. In the absence of a quorum, a scheduled meeting shall be opened, re-scheduled and adjourned.

Subdivision 5. Watershed Management Plan (Plan). The Commission shall prepare and/or update a water management plan, as required by the Act. The Plan, either a new one or an updated one, shall be recommended to the Board of Directors for approval. The Plan shall:

1) Describe the existing physical environment, land use, an development in the area and the environment, land use, and development proposed in existing local and metropolitan comprehensive plans;
2) Present information on the hydrologic systems and components, including any drainage systems previously constructed under Minn. Stat. Sections 106A.005 – 106A.811 and existing and potential problems relating thereto;
3) State objectives and policies, including management principles, alternatives and modifications, water quality, and protection of natural characteristics;
4) Set forth a management plan, including the hydrologic and water quality conditions that will be sought and significant opportunities for improvement;
5) Describe the effect of the plan on existing drainage systems;

6) Describe conflicts, if any, between the watershed plan and existing plans of governmental units;
7) Establish a procedure providing for citizen and technical advisory committees or other means of public participation;
8) Set forth an implementation program consistent with the management plan, which includes a capital improvement program and standards and schedules for amending the comprehensive plans and officials controls of governmental units in the watershed to bring about conformance with the watershed plans; and
9) Set out a procedure for amending the water plan.

The Plan shall be subject to the appropriate governmental unit review as required by the Act.

Subdivision 6. Local Water Management Plan. After the adoption of a new or revised watershed management plan, each Member and any other local government unit within the Area shall review its local water management plan for changes needed for it to be consistent with the new or revised Watershed Management Plan. Each local water management plan shall include:

1) a description of the existing and proposed land uses;
2) a definition of drainage areas, including the volumes, rates and paths of storm water runoff;
3) identification of areas and elevations for storm water storage;
4) a description of water quality efforts which may be needed to implement the plan; and
5) an implementation program including official land use and developmental controls and a capital improvement program if needed.

After consideration, but before adoption of a new or revised local water management plan by the governmental unit, each Member or any other governmental units in the Area shall submit its water management plan to the Board. The Board shall within sixty (60) days approve or disapprove the plan or parts thereof. If the Board fails to complete its review within the prescribed period, and unless an extension is agreed to by the Member or other local governmental unit, the local plan shall be deemed approved consistent with applicable state laws.

Subdivision 7. Dispute Resolution for Water Plan Improvements Initiated. Appeals of Wetland Conservation Act decisions shall follow the procedure outline in MN Rules Chapter 8420.0250.

Subdivision 8. Appeals of Decisions and Recommendations of the Commission. Members shall comply with Commission's determinations as to the force and effect of the Watershed Management Plan, the Local Water Management Plans and any cost allocations for improvements initiated pursuant to these plans.

Any governmental unit which disputes a determination of the Commission as to force and effect of the Watershed Management Plan, any Local Water Management Plan, or the cost allocations for improvements, initiated pursuant to these plans, may appeal the recommendation or decision to the Board within thirty (30) days of receipt of such written notice of such determination.

Should the appeal not be completed to the satisfaction of all parties, a party may submit the dispute to arbitration. Arbitration shall be conducted in the following manner:

1) A governmental unit shall have thirty (30) days from receipt of the written decision on the appeal by the Board to submit a dispute to arbitration by giving written notice to an officer of the Board;
2) The Board of Arbitration shall consist of three Members, one appointed by the governmental unit initiating the arbitration, one appointed by the Board and one appointed by the Chief Administrative Law Judge of the State of Minnesota, if willing to do so and if not, by the Chief Judge of the Ramsey County District Court. The third member so appointed shall preside at the arbitration hearing;
3) The arbitration cost of the neutral arbitrator shall be divided equally between VLAWMO and the government unit initiating the arbitration; and
4) Arbitration shall be conducted in accordance with the Uniform Arbitration Act (Minn. Stat. Chapter 572), except as modified above.

Subdivision 9. Other Duties. The Commission shall exercise such other duties necessary and incidental to the implementation of the purposes set forth herein as authorized by the Board.

SECTION VIII
FINANCING VLAWMO

Subdivision 1. Annual Operating Budget. On or before July 1st of each year, the Board shall prepare a proposed annual operating budget for the following calendar year. The budget shall provide funds to operate VLAWMO for the next calendar year. The proposed operating budget and the sources for these funds shall be recommended for approval to the Members.

The annual operating budget may be funded by one or more of the following:

1) An authorized special tax levy authorized by the State of Minnesota for an amount approved by the Members;
2) VLAWMO operated Storm Water Utility authorized by the State of Minnesota and approved by the Members;
3) Annual payment from each governmental unit party to this agreement and other entities based on an annual assessment as determined in Subdivision 2 in this Section; and
4) Service fees, grants, interest or other funding sources as available.

Each Member shall pay its annual assessment in the following manner:

1) The entire amount shall be due by January 31st of the year due; or
2) One-half (1/2) of each Members entire amount shall be due by January 31 of the year due and the second
one-half (1/2) of the entire amount shall be due by August 31 of the year due.

Failure to pay the required amounts by the due dates will cause a one (1) percent per month service fee to be added to the unpaid amount due.

Subdivision 2. Budget Meeting and Approval. The proposed annual Operating and Capital Improvement budget for the next calendar year shall be prepared by July 1 of each calendar year. Each Member shall review the proposed operating budget and shall either approve, reject or propose an amended operating budget on or before October 15th of each year. No response from a Member, within this time period, will be considered approval of the proposed operating budget. After final approval of the proposed operating budget by each Member, the Secretary shall certify and prepare a statement showing the approved operating budget and the assessed amount to be paid by each Member on or before October 31 of each year.

Subdivision 3. Annual Assessment for Services

The annual contribution of each Member or other entity shall be calculated upon the following formula:

1) Forty percent (40 percent) based upon the assessed valuation of all real property of each governmental unit within the Area;
2) Forty percent (40 percent) based upon the total area of the property within each governmental unit within the Area; and
3) Twenty percent (20 percent) based upon the population of each governmental unit within the Area.

Subdivision 4. Capital Improvement Projects Program and Funding. On or before June 1 of each year the Board shall prepare a capital improvements program and budget for projects to be started or completed in the following year as described in the Water Plan and submit for approval by the Members. Each proposed project shall be described and its estimated cost and time for completion shall be provided. Only projects described in the Watershed Management Plan or its amendments may be included in the capital improvement budget. Funding in the capital improvement budget shall be calculated as follows:

1) If money raised by the Special tax levy or by the Storm Water Utility is to be used for Capital Projects, the Members shall be provided the opportunity to review and approve the amount of the tax levy that will be used for Capital Projects within sixty (60) days of receipt of the Board's Capital Improvement Budget;
2) If a capital project is to be funded wholly or in part by one or more governmental unit(s), they will be provided the opportunity to review and approve or disapprove the capital improvement budget within sixty (60) days of receipt of the Board's Capital Improvement Budget; and
3) If service fees, grants, interest or other funding sources are available the source and amounts of such funds shall be shown.

If the capital improvement budget is approved, as provided above, each governmental unit shall contribute its budgeted share of the cost of constructing said capital improvement projects.

Subdivision 5. Governmental Unit Financing. Members may establish a watershed management tax district in the Area for the purpose of paying costs of the engineering and planning required to develop a watershed management plan for the Area. After the plan is adopted and approved, a tax district may be established for the purpose of paying capital costs of projects described in the plan (including normal and routine maintenance of projects). If required, the tax district shall be established by ordinance adopted after a hearing by a local government unit, following provisions of Minn. Stat. Chapter 103B.

Subdivision 6. Reserve Funds. The Board may accumulate reserve funds for the purposes herein mentioned and may invest funds of the Board not currently needed for its operations in the manner and subject to the laws of Minnesota applicable to statutory cities. Any and all reserve funds must be clearly indicated on the annual financial audit provided to the Members.

Subdivision 7. Gifts; Grants; Loans. VLAWMO may, within the scope of this Agreement, accept gifts, apply for and use grants or loans of money or other property from the United States, the State of Minnesota, a unit of government or other governmental unit or organization or any person or entity for the purposes described herein; may enter into any reasonable agreement required in connection therewith, shall comply with any laws or regulations applicable thereto, and may hold, use and dispose of such money or property in accordance with the terms of the gift, grant, loan or agreement related thereto.

SECTION IX
DURATION OF THIS JOINT POWERS AGREEMENT

Subdivision 1. Duration of Agreement. Each Member agrees to be bound by the terms of this Agreement until December 31, 2011, and that it may be continued thereafter at the option of the Members. This Agreement shall be in full force and effect upon the filing of certified copy of the resolution approving said Agreement by each governmental unit.

Subdivision 2. Termination of Agreement. This Agreement shall continue in full force and effect until the majority of the Members shall agree to terminate this Agreement or it expires. This Agreement may be replaced by a new joint powers agreement pursuant to Minn. Stat. Section 471.59 to provide for continuing the work of VLAWMO consistent with Minn. Stat. Chapter 103B.

SECTION X
DISSOLUTION

Subdivision 1. Dissolution of VLAWMO. VLAWMO shall continue until the majority of the Members shall mutually agree to dissolve VLAWMO which proceeding must be in accord with Minnesota Rules 8410.0180.

Subdivision 2. Petition to Dissolve VLAWMO. Consistent with Minnesota Rules 8410.0180, all Members may petition the Board of Water and Soil Resources to terminate VLAWMO. This petition shall be in the form of a resolution from the Board of VLAWMO. Upon 90 days notice, in writing, to the clerk/administrator or each Member, Ramsey and Anoka Counties, the Board shall hold a hearing and upon favorable vote of a majority of the Board of Commissioners submit the petition to the Board of Water and Soil Resources recommending that VLAWMO be dissolved.

The resolution adopted shall recognize that the Members, jointly or severally, are willing and able to assume ownership of VLAWMO's assets and the responsibility for managing and maintaining VLAWMO's previously approved projects and implement the watershed plan of VLAWMO developed pursuant to Minn. Stat. Chapter 103B. Such resolution by the Board of Commissioners shall be submitted as a petition to the State Board of Water and Soil Resources requesting that a hearing be held pursuant to procedures in Minn. Stat. Chapter 103B.

Upon a set of findings and order for dissolution of VLAWMO by the State Board of Water and Soil Resources, all property of VLAWMO shall be transferred, either jointly or severally, to the governmental units of VLAWMO. Such transfer of VLAWMO assets may be made in proportion the total contribution of each Member as required by the last annual operating budget.

The transfer of real estate property of VLAWMO pursuant to this section shall not affect the benefits or damages for any improvement previously constructed by VLAWMO before dissolution. The real estate property affected shall remain liable for its proper share of any outstanding indebtedness of VLAWMO applying to the property before the dissolution, and levies assessment for the indebtedness continue in force until the debt is paid off.

SECTION XI
COUNTERPARTS

This Agreement may be executed in several counterparts and all so executed shall constitute one Agreement that is binding on all of the parties hereto notwithstanding that all of the parties are not signatory to the original of the same counterpart.

IN WITNESS WHEREOF, the following parties have executed this agreement on the day of complete execution thereof by all parties,

CITY OF GEM LAKE By _____
Mayor

Dated ___/___/___ Attest _____
City Clerk

CITY OF LINO LAKES By _____
Mayor

Dated ___/___/___ Attest _____
City Clerk

CITY OF NORTH OAKS By _____
Mayor

Dated ___/___/___ Attest _____
City Clerk

CITY OF VADNAIS HEIGHTS By _____
Mayor

Dated ___/___/___ Attest _____
City Clerk

CITY OF WHITE BEAR LAKE By _____
Mayor

Dated ___/___/___ Attest _____
City Clerk

WHITE BEAR TOWNSHIP By _____

Chair

Dated ___/___/___ Attest _____

City Clerk

(VLAWMOJPA2007**)**