City of Burnsville

# Water Resources Management Plan

SEH

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# Water Resources Management Plan

## EXECUTIVE SUMMARY

### INTRODUCTION

This Executive Summary provides an introduction to the City of Burnsville's (City) updated Water Resources Management Plan (WRMP or Plan) and a look into some of the key issues related to water resources that are facing the City over the next ten to twenty years. The section begins with a brief history of water resource management in Burnsville dating back to the 1960's. Next, the summary provides an overview of the efforts and philosophy behind recent work to update the Plan. The Executive Summary closes with an outline of the major Plan sections and a review of two high-priority goals identified in the Plan.

#### History of Water Resource Management in Burnsville

Burnsville has experienced phenomenal growth in the last forty years, increasing in population from about 2,700 in 1960 to more than 60,000 today. This growth, along with topographic constraints in many areas of the City, contributed significantly to local flooding problems. Numerous small local ponds flooded on occasion because they had limited storage capacity and no natural overflows. The only solution at that time was to drain these ponds into other low spots. Ponds that were receiving water from other locations were subsequently threatened themselves by storm water that had never been directed to them before, causing legal dilemmas.

The City's first comprehensive drainage plan was completed in 1966. The 1966 drainage plan addressed extreme fluctuations in water levels on Crystal Lake. On several occasions in the late 1960's and in the early 1970's, it became necessary to pump the lake to lower its level. The City ultimately decided to install a gravity storm sewer system so that the discharge (i.e., lake level) would not be subject to the uncertainties of a mechanical pump. The next major hurdle was to construct a large lake/pond north of County Road 42 near the Savage/Burnsville border. The "new" Sunset Pond was created to accept the surface water from the new homes and businesses in west central Burnsville and the outflow of water from Crystal Lake. Shortly after completion of Sunset Pond, the downstream pipes were installed and the Crystal Lake outlet was finally in-place.

In 1994, the City completed its first generation local water resources plan (*Comprehensive Stormwater Management Plan*, OSM). Through the 1994 plan, the City formalized a policy of using natural ponds and wetlands as part of the storm

water drainage system. The City completed its second generation plan in 2002 and this 2008 plan represents an update to that 2002 plan.

The Lower Minnesota River Watershed District and the Black Dog and Vermillion River Watershed Management Organizations (WMOs) have in recent years taken steps towards, or completed, updating their watershed plans. Each of these organizations have jurisdiction over water resources related issues within portions of the City. In addition, the U.S. Environmental Protection Agency has instituted a storm water related permit program (i.e., the NPDES Phase II program) for communities for which the Minnesota Pollution Control Agency (MPCA) is in the process of developing the detailed requirements. Burnsville is one of the many cities in Minnesota that will be subject to these national storm water permit requirements.

### Updating the Plan

From about 1999 through 2002, the City worked with stakeholders to identify current water resource issues and develop a comprehensive strategy for addressing water resource related issues, with the goal of updating the City's 1994 plan. City staff developed a strategy that focuses on water quantity and water quality issues, incorporates new regulations required by local, state and federal agencies, and builds on recently completed plans for wetland protection and management, natural resource management and land use. Staff has expended considerable time and effort gathering data and resident feedback in preparation and development of this strategy. One of the key results of these efforts is this comprehensive WRMP.

In addition to City staff, an extensive list of individuals, groups, and committees were involved in the review and development of the 2002 Plan, including:

- The City Council;
- A Citizen Committee;
- Citizens at large via public forums;
- The Parks and Natural Resources Commission;
- The Economic Growth Committee; and
- The Planning Commission.

Preliminary work on the 2008 update started in late 2005 with much of the effort focused on updating water quality goals on City lakes and on revising the standards for new and redevelopment projects. As with the original plan, City commissions and Council were involved throughout the process.

This 2014 Plan update was completed to address three primary needs: to update the Development Standards to address changes in the precipitation frequency estimates published in Atlas 14; to aligning the Plan with the 2012 Black Dog Watershed Management Organization updated watershed plan; and to incorporate requirements of the revised NPDES MS4 Permit program into the Development Standards.

**Policy Considerations Regarding Storm Water Management**

Which water bodies should have the highest water quality goals?

What City standards are necessary to achieve water quality in lakes, streams and wetlands to be consistent with intended use and classification?

What steps should be taken to control excessive volumes and rates of runoff (i.e., flooding) and minimize related public capital and maintenance inputs?

Do extended high water levels warrant significant public expenditures to increase the capacity of the drainage system?

How can the City proactively continue development/redevelopment efforts and minimize impacts on water resources?

Do budgets for street sweeping, pond cleaning, lake treatments, etc., need to be increased?

Should the City aggressively pursue a campaign focused on improving water quality?

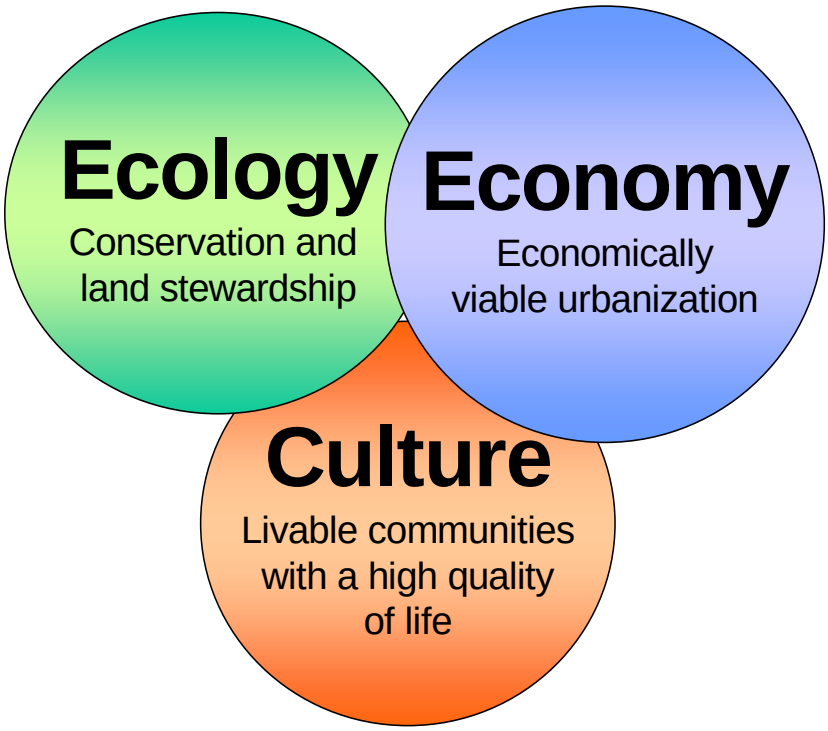
### Profile of the Plan

This Plan represents a unique combination of resource management, regulatory controls and public works management. State Statutes require that plans be prepared for each watershed in the seven county metropolitan area. Local (i.e., City) plans must also be prepared and approved by the applicable watersheds and the Metropolitan Council. Once approved, the WRMP becomes part of the City's overall Comprehensive Plan.

The Plan is intended to guide and help plan for water resources management activities through 2016. Though long term in focus, the Plan has numerous future decision points related to recommended capital improvements and ongoing inspection, maintenance and monitoring activities. The WRMP will leverage the resources of the City, watershed management organizations (WMOs) and adjacent communities to produce effective results.

This Plan will also play an important role in addressing excess volume and water quality treatment issues such as those raised by the citizen committee involved in updating the City's shoreland ordinance. This group identified significant water volume (i.e., flooding) concerns and water quality issues. In addition, further development of storm water standards will help address many of the important water resource issues. Establishment of impervious cover criteria and pretreatment requirements for stormwater will help protect and enhance the City's existing water resources. Incorporating the Comprehensive Wetland Protection and Management Plan and the Natural Resources Master Plan into this WRMP will provide the City with a true "Integrated Resources Management" approach to managing its natural resources.

**Figure 1 - The Planning Challenge.**




*Balancing ecology and economy to establish the desired culture.*

As illustrated in Figure 1, the challenge for the Plan is to strike an appropriate balance between economic and ecological issues to maintain and enhance the desired culture in Burnsville; a culture based on a livable community with a high quality of life. This Plan is a unique combination of ecology, culture and economy.

The planning approach goes well beyond reacting to problems after they occur and, for the purposes of this Plan, the following steps define the process:

1. Assessing the current condition of water resources;
2. Establishing realistic, attainable, and affordable goals that can be implemented;
3. Developing strategies and priorities for achieving those goals;
4. Implementing long-term monitoring and public information programs; and
5. Supporting the strategies with adequate funding.

Many water quality plans that are developed on the basis of a storm drainage philosophy offer only water quality treatment solutions. Burnsville's strategy will first focus on pollution prevention and runoff volume reduction followed by water

quality and quantity treatment. Through an integrated effort beginning at the community and local level, the City's water resources can best be protected.

The WRMP is a single comprehensive strategy that addresses the City's existing and future water resource needs in a proactive manner while promoting both citizen and business participation. The primary focus of the Plan is to identify strategies to achieve the City-established End Statement on the environment.

> ***"People find Burnsville is an environmentally sensitive community ensuring preservation and enhancement of its natural resources."***

## SECTIONS OF THE PLAN

The sections of this Plan are summarized in the following pages. Several topics are presented in greater detail in this overview of the Plan, in part to emphasize their importance. A few of the more significant water resources issues facing the City in the coming years are also highlighted.

### Land and Water Resource Inventory

This section of the Plan includes a collection of previous studies conducted in Burnsville as well as water resource information from a range of other sources. Information is presented on: climate and precipitation; soils, geology and topography; surface water, ground water and wetland resources; land use and utilities; natural communities and rare species; public and water-based recreation areas; the Minnesota Valley National Wildlife Refuge; and navigation and pollutant sources.

### Goals and Policies

The Plan establishes goals across 12 perspectives. These goals satisfy Minnesota State Statutes, §103B.235, and Minnesota Rules Chapter 8410, which establish requirements for the content of local water resource management plans. The 12 goals of this Plan are summarized in Table 1. Additional background information on two of the highest priority goals (Goal 1-Water Quantity and Goal 2-Water Quality) is presented following Table 1.

**Table 1 - Summary of Plan Goals.**

| Goal Number | Goal | Goal Statement |
|---|---|---|
| 1 | **Water Quantity (Flood Control)** | Control flooding and minimize related public capital and maintenance expenditure necessary to control excessive volumes and rates of runoff. |
| 2 | **Water Quality** | Achieve water quality standards in lakes, streams, and wetlands consistent with the intended use and classification and to maintain or improve water quality relative to current conditions. |
| 3 | **Erosion Control** | Minimize soil erosion through increased education and enforcement. |
| 4 | **Wetlands** | Maintain or increase wetland acreage and increase wetland values in accordance with the adopted Comprehensive Wetland Protection and Management Plan. |
| 5 | **Public Participation, Information and Education** | Increase public participation and knowledge in management of the water resources. |
| 6 | **Monitoring** | Implement a comprehensive water resources monitoring program. |
| 7 | **Maintenance and Inspection** | Preserve the function of water resource facilities through routine inspection and regular maintenance activities. |
| 8 | **Recreation, Fish and Wildlife** | Manage water recreation activities and improve fish and wildlife habitat. |
| 9 | **Ground water** | Prevent contamination of the aquifers and promote ground water recharge. |
| 10 | **Regulatory Responsibility** | Maintain regulatory authority at the local level while recognizing the role of other local, state and federal entities and complying with specified programs and requirements. |
| 11 | **Finance** | Establish funding sources to finance water resources management activities. |
| 12 | **Land Use** | Recognize the relationship between land use cover and water resources management. |

More on Goal 1: Water Quantity

At the August 15, 2000, Council work session, there was a clear consensus that water quantity issues should be the highest priority in the Plan. A summary of four of the significant needs identified in the 2002 WRMP is provided below.

Earley Lake. Following a flood event in July 2000, interest in developing an immediate solution to the Earley Lake problem was renewed as one of the top

priorities for storm water management in the City. A feasibility study was completed in the spring of 2001 that explored several alternatives to reduce or eliminate these problems. Two alternatives from the report were selected by the City Council as capital improvement projects. Hydrologic/hydraulic modeling for Earley Lake assuming both improvements showed a significant reduction in the flood levels for a 100-year storm event. Construction began in the fall of 2001 and was completed in the spring of 2002.

Northeast Burnsville - River Hills. Heavy rains in July 2000 focused attention on area-wide drainage problems in northeast Burnsville. A detailed model of pipe capacities was completed as part of the planning process. The model is based on field-verification of the in-place drainage system and a specific analysis of the inlet capacities of existing catch basins. Improvements at Galtier/Highway 13 and Chandler Court Pond were implemented during late 2000 and early 2001. Improvements in water quality also resulted from this project.

Additional storm sewer improvements that will address flooding problems in northeast Burnsville continue to be completed as part of the City's annual street reconstruction program.

South Twin Lake. Local flooding relative to existing flood easements continues to be a problem. Modifications to the existing outlet structure were made to reduce the chances of the outlet plugging during large rainfall or runoff events.

Crystal Lake. Crystal Lake's high water levels have created concerns relative to lost recreational opportunities and shoreline erosion. Modifications to the outlet system were identified that will significantly reduce the duration of high water levels on the lake. During the July 2000 public meeting, Crystal Lake residents indicated that their preference was to first address water quality issues on Crystal Lake. Therefore, structural modifications of the Lake's outlet system have been a lower priority in the Plan.

**Atlas 14 – Rainfall Frequency Update (2013-2014)**

The National Oceanic and Atmospheric Administration (NOAA) published new precipitation frequency estimates for the Midwestern States in Atlas 14 Volume 8. This information supersedes Technical Paper (TP)-40 published in1961 and NOAA Technical Memorandum NWS Hydro 35 published in 1977 that are the sources of precipitation frequency data and Intensity-Duration-Frequency (IDF) curves recommended in the MnDOT Drainage Manual and that have been the basis of design throughout much of Minnesota for highway and municipal drainage design.

MnDOT Technical Memorandum No. 13-08-B-04 establishes the State of Minnesota's policy and guidelines for use of the new precipitation estimates for design of drainage systems The MnDOT memorandum states the following:

*Continued on next page.*

**Implementation**
The guidelines contained in this Memorandum are effective immediately for trunk highway projects where feasible. Use the Atlas 14 precipitation data for hydraulic design on all trunk highway projects let after June 30, 2014. Local road authorities are encouraged to adopt these or similar guidelines.

**Guidelines**
Use Atlas 14 Precipitation Frequency Estimates when using rainfall-runoff models to compute hydrology for the design of hydraulic infrastructure. The data is obtained from NOAA's Precipitation Frequency Data Server (PFDS) at http://hdsc.nws.noaa.gov/hdsc/pfds/ based on the project location.

For rainfall-runoff models that use the Natural Resources Conservation Service (NRCS) rainfall distributions, if feasible, use a rainfall distribution based on the Atlas 14 data. Use the NRCS Type II rainfall distribution for NRCS peak flow methodology or for other projects where developing a rainfall distribution is not feasible.

Atlas 14 precipitation data should be used immediately for trunk highway projects using rainfall-runoff models provided its application does not jeopardize letting dates of projects already in the design phase. Use the Atlas 14 precipitation data for the hydraulic design of all trunk highway projects let after June 30, 2014. Where use of Atlas 14 is not feasible, evaluate the impacts of using Atlas 14 and document the justification for using the criteria from the Drainage Manual (2000). Notify the State Hydraulics Engineer about projects designed with rainfall-runoff models let after June 30, 2014, that are not designed with Atlas 14 precipitation data.

As a result of the updated rainfall frequency estimates, the City of Burnsville has updated its current design standards and ordinances to be consistent with this new information. An example of the significance of the new data relates to the total rainfall depth for a 100-year 24-hour storm event changing from 6.0 inches to a depth of 7.5 inches. More detail is provided in the standards section of the Plan.

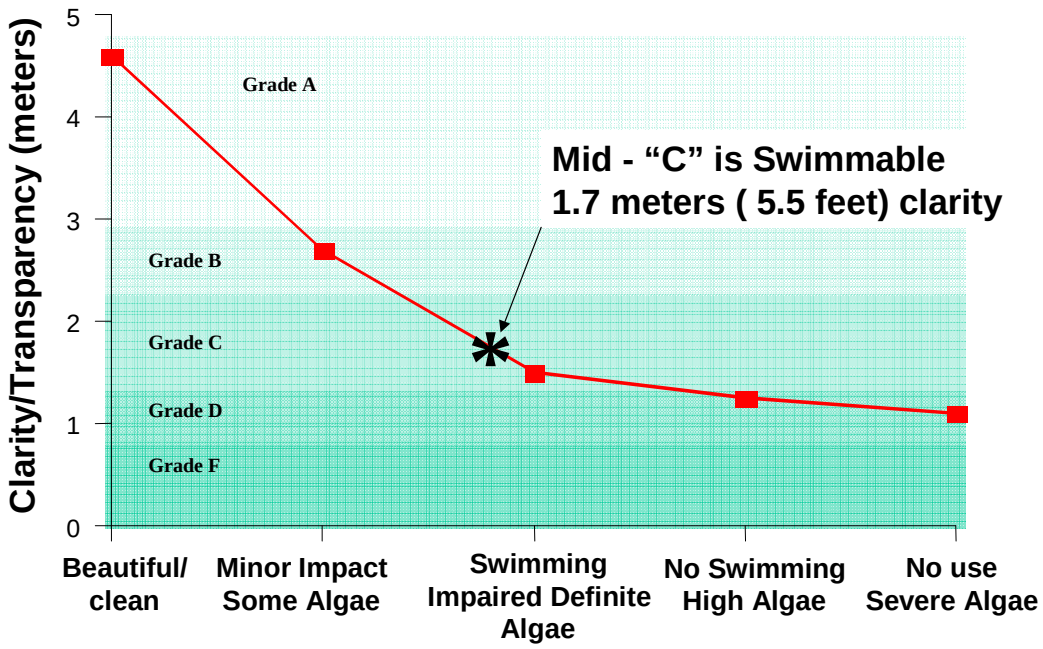
## Effect on Flood Maps

In addition to the policy changes relating to project specific analysis, the updated Atlas 14 precipitation data may ultimately be used to develop updated Flood Insurance Rate Maps (FIRM). However, the FIRM map panels for Dakota County and the City of Burnsville were recently updated and the Minnesota Department of Natural Resources currently has no immediate plans to update these maps to reflect the Atlas 14 data. Therefore, existing FIRM maps will remain in effect and will continue to serve as the basis for the City implementing its floodplain ordinance.

More on Goal 2: Water Quality

The goal setting process for Burnsville lakes revolves around their recreational suitability. In 1990, the MPCA completed a questionnaire survey related to negative lake user perceptions (Heiskary, S. and C. B. Wilson, 1990). The survey involved 200 participants within MPCA's Citizen Lake Monitoring Program. The survey focused on individual perception of both the physical appearance of their lake, along with the perceived impacts on whole-body contact recreation (i.e., swimming). Results were analyzed as a function of Secchi disc transparency. Figure 2 illustrates how citizen perception drops with water transparency and how it relates to the Metropolitan Council's grading system.

**Figure 2 - Citizen Perception of Lake Quality versus Lake Clarity**




The water quality objectives of the Plan are centered on Burnsville lakes that support a full range of recreation uses including full-body contact recreation (i.e., they are swimmable). The priority lakes include Lac Lavon, Crystal Lake, Lake Alimagnet and the future (Kraemer) Quarry Lake. In addition, other significant water bodies have specific water quality goals established based on community input.

During the annual planning session in January 2000, the City Council discussed the issue of having "Grade B" lakes in Burnsville. The idea stems from a system used by the Metropolitan Council to establish lake quality report cards. The Metropolitan Council grading system ranges from A (best) to F (worst). The grading curve represents three water quality indicators as shown in Table 2.

**Table 2 - Lake Grades and Lake Water Quality.**

| Grade | Total Phosphorus (µg/l) | Chlorophyll a (µg/l) | Secchi disc (meters) |
|---|---|---|---|
| **A** | <10 | 23 | >3.0 |
| **B** | 10-30 | 23-32 | 2.2-3.0 |
| **C** | 30-70 | 32-68 | 1.2-2.2 |
| **D** | 70-90 | 68-152 | 0.7-1.2 |
| **F** | >90 | >152 | <0.7 |

The three variables used in the grading system strongly relate to open-water nuisance aspects of a lake such as algal blooms. These conditions can also indicate accelerated cultural eutrophication (i.e., aging). In-lake phosphorus levels are related to the abundance of algae, chlorophyll a is a measurement of algae abundance and Secchi disc transparency relates to the appearance of the lake. This data supports the conclusion that the less algae in the lake, the better the clarity. Nuisances such as aquatic macrophytes (i.e., weeds) are not indicated with this grading system. Recent grades of selected lakes within the City are summarized in Table 3.

**Table 3 - Grade of Selected Lakes in Burnsville.**

| Lake | Approximate 'Grade' (1994 to Present) |
|---|---|
| **Crystal Lake** | Consistently considered "C" |
| **Keller Lake** | Often considered "D" |
| **Lac Lavon** | Consistently "A" |
| **Wood Pond** | Sometimes "B", often "C" |
| **Twin Lakes** | Upper end of "C" |
| **Earley Lake** | "C" |
| **Sunset Pond** | Upper end of "C" |
| **Lake Alimagnet** | Often considered "D" |

Based on the 2002 status (i.e., grade) of selected Burnsville lakes as shown in Table 3, the question was asked: "Is it possible to achieve Grade B lakes in Burnsville?" Certainly in the case of Lac Lavon, the goal should remain Grade A, as should the goal for future Kraemer/Quarry Lake in northwest Burnsville. But for the other significant water bodies, the question is one of dollars and practicality. If we throw enough dollars at any water body it is possible to achieve Grade B quality. However, the means and methods necessary to achieve the goal, if even financially feasible, still may not be acceptable to the public.

Based on citizen input, the City Council established the lake clarity goals shown in Table 4. For the purpose of future management, the goals will shift from an overall lake grade (i.e., A to F) to the Secchi disc transparency listed in Table 4.

The 2008 Plan includes updates to the water quality goals for Lake Alimagnet, Crystal Lake, Keller Lake based on studies completed after the publication of the 2002 Plan. Twin Lake has also been separated into two water bodies, North and South Twin, for the purposes of future management and each has its own water clarity goal. The completed studies detail new water quality goals and proposed capital improvement projects intended to facilitate improvements to meet the revised goals**.**

**Table 4 - Lake Clarity Goals.**

| Lake | 2008 Clarity Goal (meters) [2] | 2002 Clarity Goal (meters) [2] | 3-Year Average Clarity (meters)[1] |
|---|---|---|---|
| **Lac Lavon** | 3.6 | 3.6 | 3.8 |
| **Quarry Lake** | 3.6 | 3.6 | N/A – Future Lake |
| **Crystal Lake** | 2.1 | 2.6 | 1.7 |
| **Wood Pond** | TBD | 1.7 | 1.5 |
| **Lake Alimagnet** | 1.3 | 1.7 | 0.6 |
| **Earley Lake** | 1.7 | 1.7 | 1.7 |
| **Keller Lake** | 1.8 | 1.7 | 1.3 |
| **Sunset Pond** | 1.7 | 1.7 | 2.4 |
| **North Twin Lake** | 1.7 | 1.7 | 1.7 |
| **South Twin Lake** | 1.4 | 1.7 | 1.7 |
| **Black Dog Lake** | | To be developed | No data available |

1. Average of most recent three years monitored.
2. Revised 2008 Plan Update

The basics premise behind revising these goals is to establish realistic clarity goals, such that when the goal is met, it will allow the water body (if impaired) to be removed from the impaired waters list. The revised clarity goals are based on the most recent lake monitoring data and lake management plans prepared for each water body. The Water Resources Management Plan allocates funding to implement the strategies identified in the lake management plans to achieve these revised goals. The City will re-evaluate all water quality goals when this Plan is updated in 2016 to consider whether clarity goals should be adjusted or added for any of the community's water bodies. For waters that are impaired, the City plans to work cooperatively with the local watershed organizations and MPCA to convert the lake management plans in to Total Maximum Daily Load (TMDL) studies.

### Watershed Assessment

The Watershed Assessment section is intended to facilitate decision making and future goal setting. Through a comparative analysis of the subwatersheds, a method for developing an implementation schedule for future improvements and management activities is established.

The City's existing hydrologic model was updated as part of the planning process. The updated model includes recent modeling efforts at Keller, Crystal and Earley Lake, incorporation of Lakeville data in the Crystal Lake subwatershed and review and revision of existing subwatershed boundaries, land use and outlet structure inconsistencies.

Burnsville lies within the larger Minnesota River Basin in east central Minnesota. Within Burnsville, the Minnesota River Basin includes several smaller watershed units including the following three:

- Vermillion River Watershed
- Black Dog Watershed
- Lower Minnesota River Watershed

Each of these watersheds is discussed in detail in a separate section of the Plan. A total of twelve action and implementation plans are presented for individual lakes and subwatersheds located within these three watershed units.

### Implementation

The Implementation section is the final section of the Plan. It is intended to provide guidance in carrying out the Plan objectives. The implementation section summarizes capital improvement projects, studies and ongoing maintenance, inspection, monitoring and other management activities recommended for the years 2002 through 2016. Estimated costs of recommended actions and an implementation schedule are provided for each of the next fifteen years. Procedures for amending the Plan are also discussed.

The implementation plan is based on goal-driven action plans. The process of developing the action and implementation plans is based on four steps:

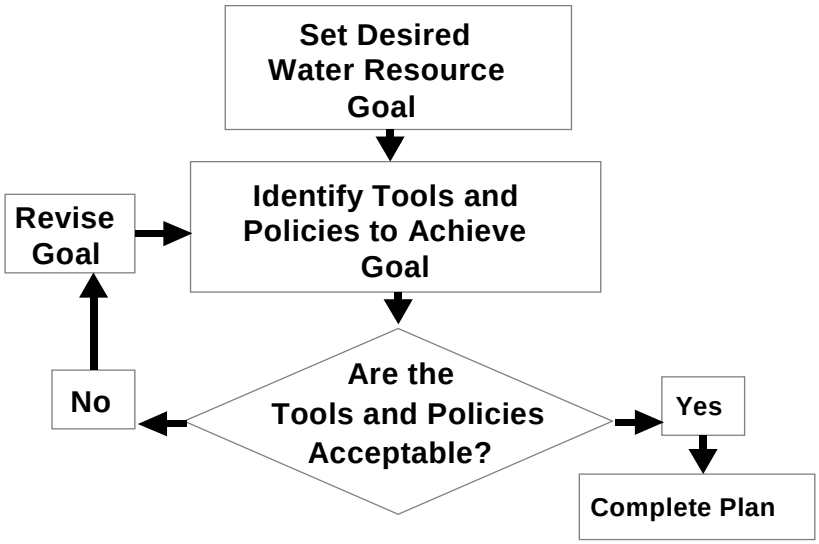
1. Development of goal statements consistent with Minnesota Rules Chapter 8410, the WMOs and Metropolitan Council;
2. Identification of issues or problems related to achieving the goals;
3. Identification of solutions corresponding to each of the issues; and
4. Development of specific action steps, including identification of resources, measurement, schedule and cost.

Based on the action plans from each Plan section, a process for accomplishing the goals of this WRMP is established.

#### Implementation Tools

Throughout the planning process, staff has worked to develop a collection of tools to help achieve the goals and objectives of this Plan. The process for applying these tools is illustrated in Figure 3.

**Figure 3 - Water Resource Planning Flowchart.**




To answer the question in Figure 3, "Are the tools and policies acceptable?' requires careful consideration of Ecology (conservation and land stewardship), Economy (economically viable urbanization) and Culture (livable communities with a high quality of life). This Plan sets out to help answer the question by prioritizing key actions over the next fifteen years to balance Ecology, Economy and Culture in a way that achieves the water resource goals of the City.

The implementation "tool box" for retrofitting existing systems or for new development/re-development projects contains a wide range of practices. The following list summarizes many of the available tools that were considered during the planning process, and will be used as applicable:

- Runoff Pre-treatment
- On-site Runoff Storage and Treatment
- Maintenance and Housekeeping
- Landscape Techniques
- Low-Impact Development (LID) Practices
- Reduced Impervious Cover
- Infiltration
- Phosphorus Ban
- Retention Basins
- Weed Harvesting
- Dredging
- Increased Monitoring of Water Quality
- Public Education and Involvement
- Partnering with Lake Homeowners, Watersheds and Other Communities
- Distributing Costs in an Equitable Manner

- Regulatory Tools
- Rural Street-Sections
- Improvements or Changes to Sand/salt Applications
- Reduced Parking Area or Pervious Pavements
- Utilizing Grants to the Fullest Extent

Of the multitude of tools available, regulatory tools focused on maintaining local control are extremely important. Examples of regulatory tools include erosion control, wetland protection and groundwater protection ordinances and/or standards. Shoreland and storm water ordinances also fall into this category. A full review of existing zoning and land use regulations will be undertaken to ensure that existing City regulations do not prohibit the use of innovative storm water management initiatives or pilot projects.

Compliance related activities also fall under the cover of regulatory tools. Future issues such as Total Maximum Daily Loads (TMDLs) and Federal Storm Water permitting are two such examples.

By establishing priorities, cost estimates and schedules the City has the tools to reach goals that are realistic, attainable, and affordable and that can be implemented. Inspection and maintenance activities are expected to increase along with additional monitoring, public involvement and capital improvement projects. To finance these new activities, the City must also investigate and implement new funding alternatives.

Implementation Costs

The financial goal for this WRMP is to establish equitable funding sources to pay for water resources management activities. Following a detailed analysis and prioritization process for the recommended capital improvement projects and ongoing activities of this Plan (in 2001-2002) a 10-year project and activity implementation schedule was presented to City committees. The 10-year Plan had an estimated total cost over the 10-years of $24.6 million. While there was generally broad support for a 10-year implementation plan from 3 of 4 committees, there were also concerns for the financial impact of the Plan on industrial and commercial property owners. The Economic Growth Committee recommended a 20-year schedule.

Council subsequently approved the plan with a 15-year implementation schedule and an estimated cost over the next fifteen years of $27.3 million (in 2002 dollars). The additional costs of the 15-year schedule, as compared to the 10-year schedule, result from the additional 5-years of annual operating costs and anticipated ongoing project costs (e.g., storm sewer replacement program and pond clean out program). Table 5 includes the actual expenditures for the years 2002 through 2007 designated by an (A) following the value and revised annual expenditures based on the 2008 WRMP Update designated by an (R) following the value.

**Table 5 - Implementation Plan Summary.**

| Year | 2002 WRMP Estimated Expenditures ($ Million) (1) | Actual (A) or Revised (R) Expenditures ($ Million) (2) |
|---|---|---|
| 2002 | 1.76 | 1.38 (A) |
| 2003 | 1.57 | 1.69 (A) |
| 2004 | 1.59 | 1.65 (A) |
| 2005 | 1.71 | 1.54 (A) |
| 2006 | 1.89 | 2.15 (A) |
| 2007 | 1.76 | 1.34 (A) |
| 2008 | 1.93 | 5.22 (R) |
| 2009 | 1.89 | 2.93 (R) |
| 2010 | 1.89 | 2.09 (R) |
| 2011 | 1.89 | 1.47 (R) |
| 2012 | 1.89 | 1.61 (R) |
| 2013 | 1.89 | 1.08 (R) |
| 2014 | 1.89 | 1.08 (R) |
| 2015 | 1.89 | 1.08 (R) |
| 2016 | 1.89 | 1.08 (R) |
| **Total** | **27.3** | **27.4 (R)** |

1. All values are in 2002 dollars.
2. Values are actual dollars through 2007 and estimated amounts for 2008-2016 in 2008 dollars.

Relative to historical levels, the storm water utility fund was increased in 2001 and 2002 to help address the increased commitment to water resources management. Future increases will be needed to meet the needs of the Implementation Plan. Any increases in the storm utility fees resulting from the implementation plan would only apply to the 15-year plan schedule.

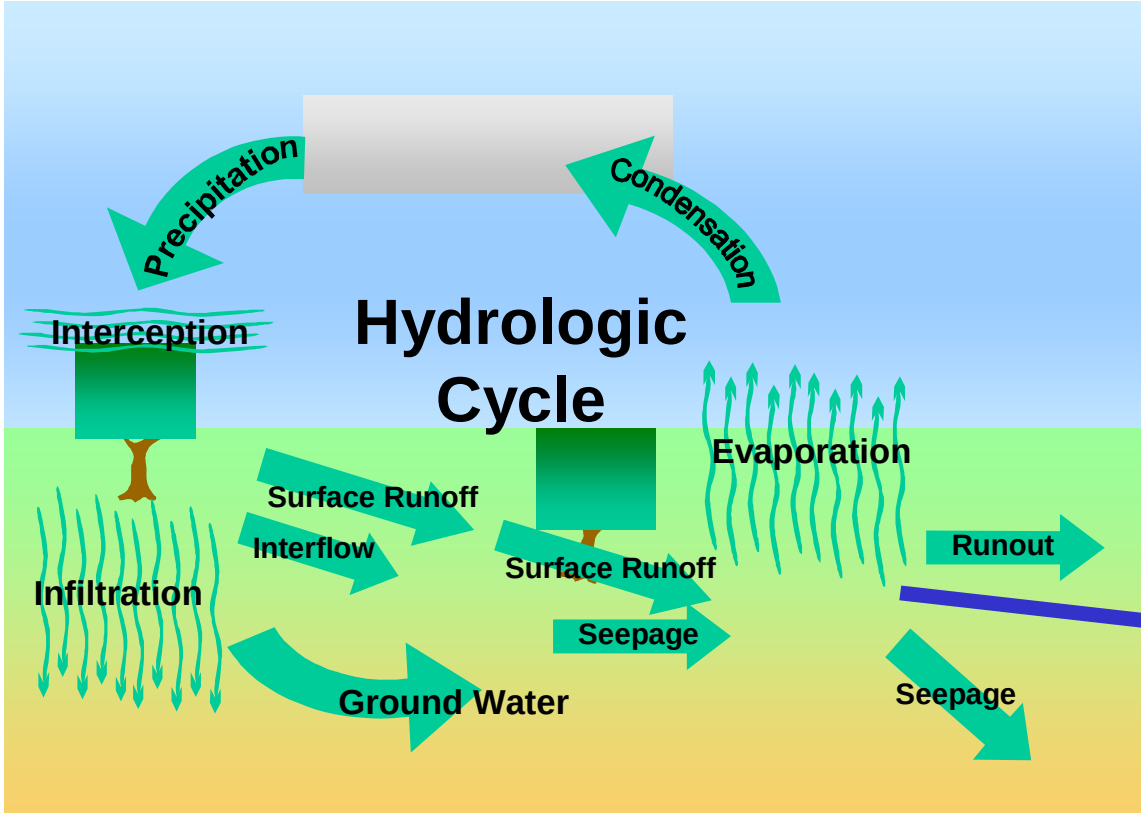
There is strong consensus that the new costs should be apportioned based on overall property contributions to runoff and pollutant loading. This is the current philosophy behind the City's storm water utility. In addition, a renewed focus will be placed on securing grants, enlisting regional watershed funding, seeking local partnerships with adjacent communities and investigating other financing mechanisms like Lake Improvement Districts.

Staff's intent is to revisit the goals, policies, tools and progress of the Plan on a three-year basis. The three-year average water quality results will be reviewed, the effectiveness of regulatory programs will be evaluated, and the success of public improvement projects will be assessed. Based on the three-year reviews, the WRMP will be updated to produce a truly dynamic plan.

## LAND AND WATER RESOURCE INVENTORY

A comprehensive approach to storm water management requires management of water resources, drainage systems and land use in a unique combination of balance and prioritization. The approach must consider the entire hydrologic cycle, as illustrated by Figure 4. This section describes the land and water resource inventory in Burnsville.

**Figure 4 - Hydrologic Cycle**



## CLIMATE AND PRECIPITATION DATA (BARR, 2000)

The Twin Cities metropolitan area climate is a humid continental climate, with moderate precipitation, wide daily temperature variations, warm humid summers and cold winters. The growing season varies from 142 days to 202 days, averaging 166 days. Freezing temperatures may occur until the middle of May and after the middle of September.

The nearest "first order" weather recording station is the Minneapolis-St. Paul Metropolitan Airport Station of the U.S. National Oceanic and Atmospheric Administration. The data from this installation is of highest value and accuracy. The National Weather Service forecast office for the metropolitan area, located in Chanhassen, also records weather data. Several Minnesota State Climatological network stations also exist and provide more detailed local weather data, kept by the Minnesota State Climatologist.

The highest temperature on record at the airport station to date was 108°F, set in 1936, and the lowest temperature was –34°F, set in 1936. The extreme conditions tell little except that temperatures range from uncomfortably hot to bitterly cold. The average annual temperature at the airport station is 44.9°F. Average total annual precipitation at the airport is 28.3 inches (1961-1990 average). The State Climatology Office of the DNR has information about temperature, precipitation and other climate data. Table 6 gives the precipitation summary for the airport station. Generally, the summer precipitation far exceeds that of the winter, the summer rainfall usually being sufficient for proper plant growth. From May to September, the growing months, the average rainfall is 17.3 inches, or about 61 percent of the normal annual precipitation. The normal percent of possible sunshine received in the area is 57 percent.

The annual snowfall averages about 50 inches, equivalent to about 5 inches of water. The heaviest monthly snowfall recorded to date at the Minneapolis-St. Paul International Airport was 46.4 inches of snow for the month of January 1982. The area averages 40 to 45 days per year when the snow depth is 6 inches or greater and about 20 days per year when the snow depth is more than 12 inches. Runoff from snowmelt can occur anytime during the winter, but the more severe snowmelt runoff conditions usually occur in March and early April.

Average weather imposes little strain on the typical drainage system. Extremes of precipitation and snowmelt are important for drainage design. The National Weather Service has data on extreme precipitation events that can be used to aid in the design of drainage systems. Extremes of snowmelt most often affect major rivers, the design of stormwater storage areas, and landlocked basins, while extremes of precipitation most often affect the design of conveyance facilities. Appendix D provides information on 100-year flood elevations, peak discharge rates, storage requirements, and other pertinent hydrologic information for the storm water retention areas and the trunk conveyance system within the City.

**Table 6 - Precipitation Summary – Minneapolis/St. Paul Airport Station**

| Total Precipitation, Inches | | | | | | | | Snow, Inches | | | # Days with Precip | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Month | Mean | High-Yr | | Low-Yr | | 1-Day Max | | Mean | High-Yr | | =.10 | =.50 | =1.0 |
| Jan | 0.95 | 3.63 | 1967 | 0.05 | 1892 | 1.21 | 24/1967 | 12.6 | 46.4 | 1982 | 2.8 | 0.2 | 0.0 |
| Feb | 0.88 | 3.25 | 1922 | 0.03 | 1894 | 1.90 | 24/1930 | 9.6 | 26.5 | 1962 | 2.5 | 0.3 | 0.0 |
| Mar | 1.94 | 4.75 | 1965 | 0.09 | 1910 | 1.62 | 1/1965 | 12.2 | 46.1 | 1965 | 4.3 | 0.8 | 0.2 |
| Apr | 2.42 | 5.88 | 1986 | 0.16 | 1987 | 2.22 | 27/1975 | 3.6 | 21.8 | 1983 | 5.4 | 1.3 | 0.2 |
| May | 3.39 | 10.92 | 1942 | 0.21 | 1934 | 3.59 | 29/1942 | 0.1 | 2.4 | 1954 | 6.8 | 2.3 | 0.7 |
| Jun | 4.05 | 9.82 | 1990 | 0.22 | 1988 | 2.91 | 7/1984 | 0.0 | 0.0 | 1949 | 7.3 | 3.0 | 1.1 |
| Jul | 3.53 | 17.90 | 1987 | 0.11 | 1936 | 9.15 | 23/1987 | 0.0 | 0.0 | 1948 | 5.6 | 2.2 | 0.9 |
| Aug | 3.62 | 9.31 | 1977 | 0.20 | 1925 | 7.28 | 30/1977 | 0.0 | 0.0 | 1948 | 5.8 | 2.2 | 0.9 |
| Sep | 2.72 | 7.77 | 1903 | 0.41 | 1940 | 4.96 | 12/1903 | 0.0 | 0.4 | 1985 | 5.8 | 1.9 | 0.6 |
| Oct | 2.19 | 6.42 | 1911 | 0.01 | 1952 | 2.75 | 19/1934 | 0.4 | 8.2 | 1991 | 4.3 | 1.2 | 0.4 |
| Nov | 1.55 | 5.29 | 1991 | 0.02 | 1939 | 2.52 | 11/1940 | 7.3 | 46.9 | 1991 | 3.6 | 0.8 | 0.2 |
| Dec | 1.08 | 4.27 | 1982 | 0.00 | 1943 | 1.50 | 14/1891 | 11.6 | 33.5 | 1969 | 2.8 | 0.3 | 0.1 |
| Annual | 28.32 | 40.15 | 1911 | 11.54 | 1910 | 9.15 | 7/23/87 | 57.3 | 101.5 | 1983 | 57.1 | 16.5 | 5.3 |
| Winter | 2.91 | 6.24 | 1967 | 0.69 | 1958 | 1.90 | 2/24/30 | 33.5 | 71.7 | 1967 | 8.1 | 0.8 | 0.1 |
| Spring | 7.75 | 16.13 | 1965 | 2.12 | 1910 | 3.59 | 5/29/42 | 15.8 | 48.1 | 1965 | 16.6 | 4.3 | 1.1 |
| Summer | 11.20 | 23.52 | 1987 | 1.73 | 1994 | 9.15 | 7/23/87 | 0.0 | 0.0 | 1949 | 18.7 | 7.4 | 2.9 |
| Fall | 6.46 | 13.50 | 1911 | 1.71 | 1952 | 4.96 | 9/12/03 | 7.7 | 55.1 | 1991 | 13.7 | 4.0 | 1.2 |

**Averages based on data from the years: 1961-1990** **Extremes from the years: 1891 -1996**

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As a result of the updated rainfall frequency estimates, the City of Burnsville has updated its current design standards and ordinances to be consistent with this new information. An example of the significance of the new data relates to the total rainfall depth for a 100-year 24-hour storm event changing from 6.0 inches to a depth of 7.5 inches. More detail is provided in the standards section of the Plan.

## TOPOGRAPHIC DATA (BARR, 2000)

In general, the land within Burnsville slopes from south to north toward the Minnesota River. At the southern end of the watershed, an upland ridge slopes down to Crystal Lake. Continuing north, the upland transitions into an undulating glacial outwash plain. This area is pitted with shallow depressions surrounded by mounds of glacial till. Further north, the pitted outwash plain gives way to an outwash terrace, just above the Minnesota River floodplain. This transition corresponds roughly to the political boundary between the Black Dog WMO and the Lower Minnesota River Watershed District.

Some areas in east central Burnsville in the vicinity of Alimagnet Lake drain to the east to Alimagnet Lake and ultimately to the Vermillion River. Areas in the southwest corners of the City within the Credit River Subwatershed direct stormwater runoff to the south and west to the Credit River. The highest point within the City of Burnsville is Buck Hill, with an elevation of 1,215 feet above seal level. The lowest point in the City is just above the banks of the Minnesota River at approximately elevation 700.

Two-foot topographic information has been developed by the City of Burnsville and has also been incorporated into the Dakota County Geographic Information system database. Specific topographic information for areas within the City is available at the Burnsville City Hall.

Dakota County has 2-foot contour interval topographic mapping available for the entire county. There are also 10-foot contour interval 7-1/2 minute series topographic maps available from the U.S. Geological Survey.

## SOILS DATA (BARR, 2000)

Soil Composition, slope and land management determine the effect of soils on stream and lake water quality. Soil composition and slope are important factors affecting the rate and amount of stormwater runoff. The shape and stability of aggregates of soil particles–expressed as soil structure–influence the permeability, infiltration rate, and erodibility of soils. Slope is important in determining stormwater runoff rates and hence susceptibility to erosion.

Infiltration capacities of soils affect the amount of direct runoff resulting from rainfall. The higher the infiltration rate for a given soil, the lower the runoff potential. Conversely, soils with low infiltration rates produce high runoff volumes and high peak discharge rates.

Four general soil hydrologic groups have been established by the Natural Resources Conservation Service. These groups are:

**Group A** Low runoff potential – high infiltration rate (0.30 – 0.50 in/hr)

**Group B** Moderate infiltration rate (0.15 – 0.30 in/hr)

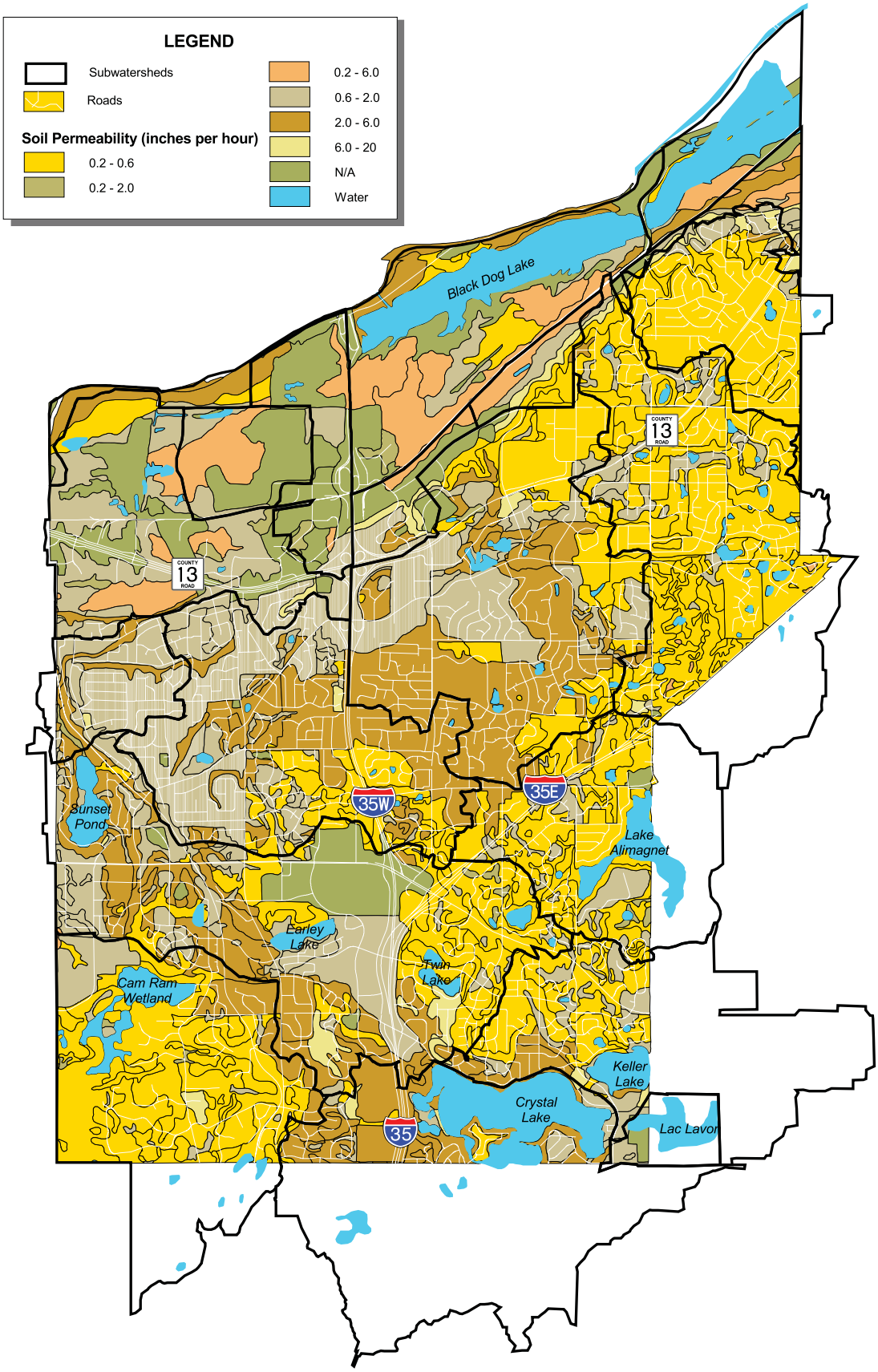
**Group C** Slow infiltration rate (0.05 – 0.15 in/hr)

**Group D** High runoff potential – very slow infiltration rate (0.0 – 0.05 in/hr)

The hydrologic grouping symbols (A-D) are combined with land use and used to estimate the amount of runoff that will occur over a given area for a particular rainfall amount. The Dakota County soil survey lists the hydrologic soil groups in tables, but does not map the soils according to these groupings. Figure 5 illustrates the general soil permeabilities throughout Burnsville.

### Soil Information Used in this Plan

The hydrologic group of soils was used in the development of the City-wide hydrologic model, a summary for which is included in Appendix D. Soils hydrologic information is also used, in part, to help evaluate the potential performance of Low Impact development infiltration practices. More detailed information of how this soils information is used in evaluating required infiltration and filtration practices is provided in Appendix B.




Source: Dakota County Soil Survey

| | | | | |
|---|---|---|---|---|
| SEH | 09/20/02<br>watershed.apr<br>naf | SOIL PERMEABILITY RATES | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>5 | |

As land is developed for urban use, much of the soil is covered with impervious surfaces, and soils in the remaining areas are significantly disturbed and altered. Development often results in consolidation of the soil and tends to reduce infiltration capacity of otherwise permeable soil, resulting in significantly greater amounts of runoff.

Most of the soils in Burnsville are well to excessively drained. Silty and loamy sediments over glacial till can be found throughout the watershed. According to the Dakota County soil survey, there are four general soil types in the Burnsville area: 1) nearly level, silty and loamy soils (on floodplains); 2) level to very steep, silt, loamy, and sandy soils (on outwash plains and terraces); 3) nearly level to steep, loamy and silty soils (on uplands); and 4) gently sloping to very steep, loamy and sandy soils (on uplands and pitted outwash plains).

The Minnesota River Valley includes, on its lowest level, floodplain soils such as alluvium, peat, and muck identified as the Chaska-Minneiska-Colo soil complex. Alluvial soils are usually flood deposits. The particulate sizes range from gravelly sand to silt and clay, with silt and very fine sands being predominant. The alluvial soils are questionable with respect to supporting structures, although some building is economically possible, with wise application of loading techniques. Peat and muck are terms for soils of high organic content. In peat, one can identify some partially decayed vegetative (organic) matter such as reeds, grasses, mosses, and leaves. In muck, the decomposition has advanced to such a stage that the materials are not definable. Peat and muck are poor soils in an engineering sense. These soft materials require expensive methods to support structures.

At the edge of the Minnesota River Valley floodplain, just below the bluffs which border the valley, lie well-drained silt loams and more poorly drained silty clay loams. These soils are a result of erosion of soils on the higher levels of the bluffs.

More detailed soil information may be found in the Soil Survey of Dakota County, Minnesota prepared by the U.S. Department of Agriculture, Natural Resources Conservation Service.

## GEOLOGY AND GROUNDWATER RESOURCES

### Geology (Barr, 2000)

Bedrock underlies Burnsville at a depth of between 0 to 500 feet, but averages between 100 and 200 feet. Bedrock at a depth of 0 corresponds to locations where the rock is exposed at the ground surface. This occurs in the watershed primarily at the bluffs along the Minnesota River. The bedrock is deepest (400 feet or more) beneath steep peaks of glacial till, such as Buck Hill. The rock underlying the watershed is a sedimentary formation with the oldest layer dating back to the Paleozoic era, approximately 600 million years ago. Over time with deposition of more sediment, the bedrock has reached a thickness of over 1,000 feet. The top of this formation is

rock, formed during the Ordovician period about 400 million years ago. Beneath the uplands of the watershed are the youngest sedimentary bedrock deposits. These shale and limestone beds transition to St. Peter sandstone beneath the outwash plain, finally to Prairie du Chien group dolomite and sandstone under the outwash terrace. One hundred (100) to 200 feet of glacial till covers most of the bedrock in the watershed. Much of the glacial till was deposited during the Pleistocene epoch beginning approximately 2 million years ago. The most recent glacial deposits were laid down about 10,000 years ago by the Wisconsin glaciation. Figure 6 shows the generalized regional stratigraphic column, the vertical relationship of the units and their approximate thickness.

There are minor buried bedrock valleys in Burnsville. Buried bedrock valleys are carved into the bedrock underlying the watershed. They are called buried since they are filled in as a result of glacial deposition. There may be little or no relationship between the location of surface valleys and buried bedrock valleys.

More information about the geology of Burnsville can be found in the Dakota County geologic atlas.

### Groundwater Resources (Barr, 2000)

Two types of aquifers are present in Burnsville: surficial and bedrock aquifers. The following paragraphs provide general information about the aquifers in the Burnsville area; for more information, the reader is referred to the Dakota County Geologic Atlas and the Dakota County Groundwater Protection Plan.

#### Surficial Aquifers

Surficial aquifers are water-bearing layers of sediment, usually sand and gravel, which lie close to the ground surface. Many domestic and some irrigation wells in the watershed draw water from these aquifers. Since the surficial aquifers are more susceptible to pollution, they are not used for municipal or public supply wells. In some locations in Burnsville, the aquifer could provide sufficient water yield for some nonpotable industrial users. The typical depth of the water table beneath the watershed is approximately 200 feet.

Recharge to the surficial aquifers is primarily through the downward percolation of local precipitation. Some surficial aquifers may also be recharged during periods of high stream stage. Surficial aquifers may discharge to local lakes, streams or to the underlying bedrock.

The ponds and lakes scattered throughout the watershed recharge the groundwater. Some of these water bodies are landlocked and their only outlet is to the groundwater. Some of the landlocked lakes are probably perched above the regional level of the shallow groundwater in the watershed.

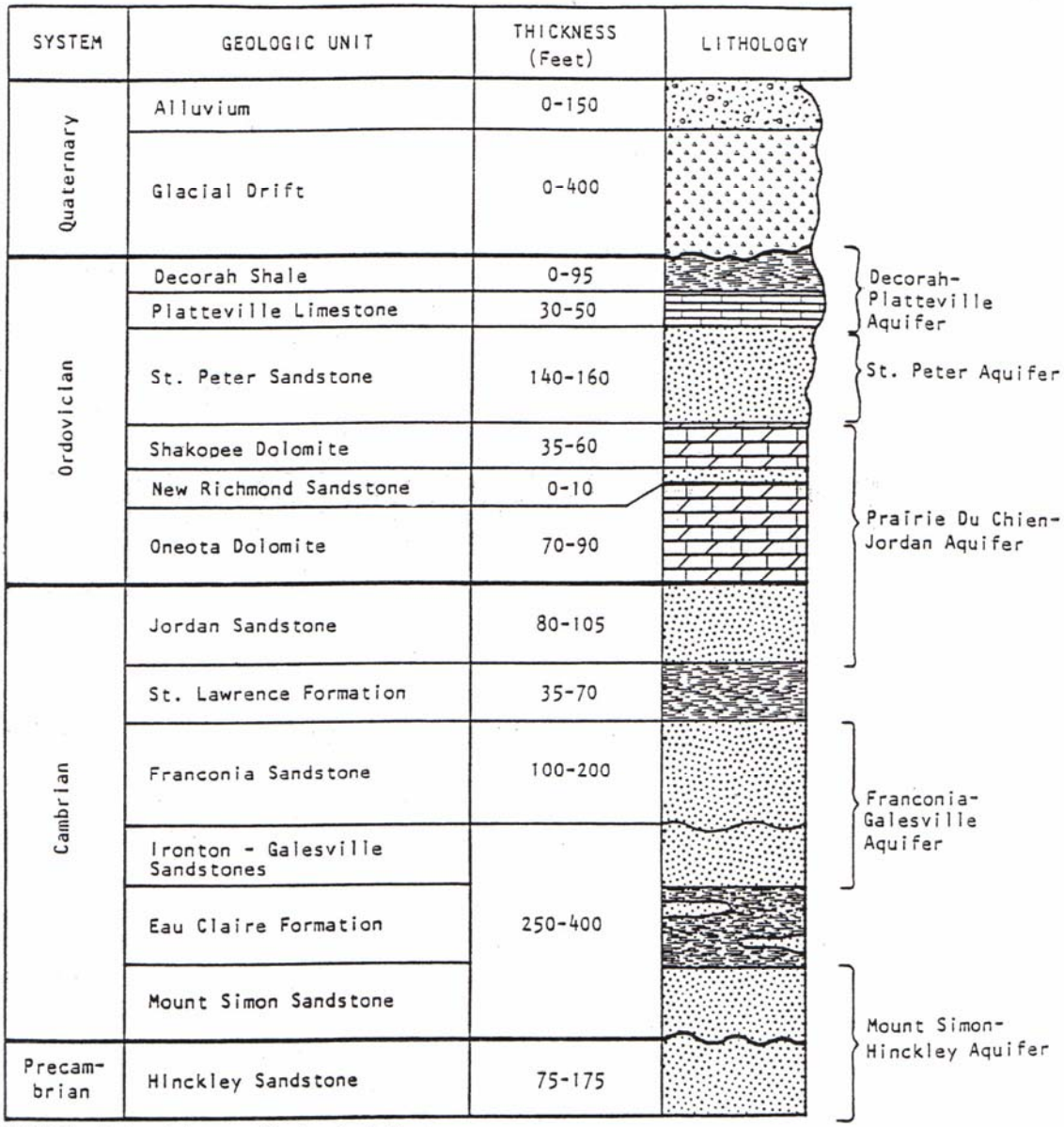
Bedrock Aquifers

Five major bedrock aquifers are available for water supply in Burnsville. The major bedrock aquifers are, in order of use and development: 1) Prairie du Chien-Jordan, 2) Mount Simon-Hinckley, 3) Ironton-Galesville, 4) St. Peter, and 5) Platteville. The aquifer used most often for water supply in the area is the Prairie du Chien-Jordan aquifer. The Prairie du Chien-Jordan aquifer is high yielding, more easily tapped than deeper aquifers, has very good water quality, and is continuous throughout most of the area.

The groundwater level in the Prairie du Chien-Jordan aquifer varies from 700 feet to more than 900 feet above mean sea level as shown in the Dakota County geologic atlas. The aquifer is recharged in areas where thin permeable drift overlies the limestone layers. Some recharge of this aquifer occurs locally from percolation through the overlying glacial deposits of St. Peter Sandstone. However, hydrogeologic considerations suggest this recharge would be a minimal contribution to the aquifer flow. Regional recharge of the Prairie du Chien-Jordan aquifer occurs to the south, in Freeborn and Mower Counties. Groundwater movement in the aquifer is generally from south to north, toward the Minnesota and Mississippi Rivers.

The aquifer with the highest water quality and highest possible yields is the Mt. Simon-Hinckley aquifer, but it is more expensive to use than the Prairie du Chien-Jordan because of its greater depth and there are limitations to its use. Minnesota statutes limit appropriations from the Mt. Simon-Hinckley aquifer to potable water uses, where there are no feasible or practical alternatives, and where a water conservation plan is incorporated with the appropriations permit. The water level of the Mt. Simon-Hinckley is approximately 700 feet above mean sea level. Recharge of the Mt. Simon-Hinckley takes place far north of the watershed, where the bedrock is closer to the surface, and occurs by percolation through the overlying drift and bedrock. Regional groundwater movement in the aquifer is to the southeast. The local direction of groundwater flow in the Twin Cities is tends to be toward Minneapolis, due to pumping of the aquifer.

## Figure 6 - Geologic Cross Section




SOURCE: United States Geological Survey

## LAND USE AND PUBLIC UTILITIES

Figure 7 shows existing land use in Burnsville. Intense commercial development is clustered along I-35W, County Road 42 and Highway 13. Figure 8, the City's zoning map, shows the anticipated future land use in Burnsville.

Burnsville is completely within the Metropolitan Urban Service Area (MUSA), the area delineated by the Metropolitan Council for sanitary sewer service.

There were less than about 1,200 acres of vacant land in the City of Burnsville as of 2002. As of 2008, the number changed to 404 acres. Many of these properties contain or are adjacent to wetland habitat identified during the field inventory. Development of the properties, or purchase by the City, may produce opportunities for improvement or protection of existing wetlands or creation or restoration of wetland habitat.

In 2007, the City evaluated the past, current and potential impacts of land use on loading of various pollutants to City waters. This analysis was completed as part of the new provisions required in the reissued 2006 NPDES permit. The permit required 30 Minnesota municipalities to complete a nondegradation assessment and report.

Based on the findings of the assessment, Selected MS4s were required to submit additional information to the Minnesota Pollution Control Agency (MPCA) Commissioner and to determine whether additional control measures, beyond those already identified in their SWPPP, could reasonably be taken to minimize the impacts of new or expanded discharges. The nondegradation assessment consists of determining the change in loading of annual runoff volume, total suspended sediment (TSS), and total phosphorus (TP) between 1988 and current conditions (2005) and between current conditions and projected future conditions (2020).

While the 1988 to 2005 loading assessment shows an increase in the runoff volume due to more impervious surfaces from 1988 to 2005, TSS loadings have decreased, and the TP loadings increased only slightly relative to 1988 levels. This result relates chiefly to the fact that numerous storm water treatment ponds accompanied the new development and re-development that occurred between 1988 and 2005. The results show that these ponds are working to remove significant amounts of total suspended sediment and phosphorus from storm water runoff.

Looking into the future, the projected level of development between 2005 and 2020 will continue to add impervious surface and result in additional annual runoff volume. Runoff infiltration is expected to play an increasingly important role in storm water management. The proposed standards within this WRMP will establish runoff volume control for both new development and redevelopment. These volume control and infiltration practices have the potential to offset the increase in runoff volume caused by the expansion of impervious surfaces.

### Southwest Burnsville

The southwest area of the City contains rolling topography with areas of very steep slopes, as well as many of the largest remaining stands of trees in the community. The area is zoned rural residential requiring one-acre lots when City sewer services are available and two-acre lots when City sewer is not available.

As an update to the 1990 Comprehensive Plan, the City prepared a report entitled Southwest Public Services Study. The study reviewed natural conditions and explored the means and methods for extending public utilities to the area.

The key policy decision that resulted from the study was that the City adopted an official master plan for the future of this area and requires all future subdivisions to be consistent with this plan. The resulting plan incorporates a design for the extension of public sanitary sewer, public water service and provision for storm water drainage improvements.

It is the intent to allow the area to remain unsewered for the foreseeable future. The City has addressed the southwest Burnsville area in more detail in Appendix A of the Master Plan for the area completed as part of the 1990 Comprehensive Plan.

## SURFACE WATER RESOURCES

### Public Waters (Lakes, Wetlands, Streams, Ditches)

Figure 9 shows all the DNR-protected waters located within the Black Dog watershed in Burnsville, based on the DNR Protected Waters maps, the City Comprehensive Wetland Protection and Management Plan and the City Natural Resources Master Plan. There are no protected or public ditches in Burnsville. There are three remnant trout streams and a remnant calcareous fen in Burnsville according to the DNR and Lower Minnesota River Watershed District as illustrated in Figure 10. However, there is currently not a trout population in these streams.

Policy 5 in Section 5.6 of the Black Dog Watershed Management Organization Plan requires the City's Plan to address disturbed shoreland areas. There are no known disturbed shoreland areas within the City.

### Stormwater System, Hydrologic Data, and Flooding Information

Figure 11 shows the major subwatersheds, including an overview of the water resource inventory and storm sewer system. This information was from the City's Stormwater Management Plan, the WMO Plans, topographic data, and storm sewer as-built drawings. A more detailed map showing drainage areas and corresponding subcatchment identifications is provided in Figure D-1 in Appendix D of this Plan.

A Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) was completed for areas within the City of Burnsville along the Minnesota River.

Included in the FIS is a floodplain study of the Minnesota River completed by the United States Department of Interior. The results were outlined in a report entitled "Flood Plain Areas of the Lower Minnesota River" dated 1973. This report identified the boundaries of the floodway and floodplain.

A flood insurance study (FIS) for the City of Burnsville was originally completed in September 1977, and provides flood information for properties adjacent to Alimagnet Lake and the Crystal Lake-Keller Lake system. Recent updates to the City's FIS have been completed in the form of two Letters of Map Revision (LOMR). Updated base flood elevations were established for Twin Lakes and Earley Lake (SEH, 2004) in central Burnsville and for the Cam Ram Wetland Area (SEH, 2005) in southwest Burnsville. These LOMRs were reviewed and approved by the Minnesota Department of Natural Resources and FEMA. Dakota County has also been working on updates to the County-wide FIRM maps and is expected to have draft maps available for review in 2008.

Appendix D provides information on 1% (100 year) flood elevations, peak discharge rates, storage requirements and other pertinent hydrologic information for ponds and wetlands, and for the trunk conveyance system. The information in Appendix D has been updated since the 2002 Plan by including the results of Flood Insurance Rate Map updates completed throughout the City and information from several other site specific hydrologic/hydraulic studies. The information should be used as a starting point in the development planning process, recognizing that new information may be available for these water bodies relative to the potential risks of flooding.

As a result of the updated Atlas 14 rainfall frequency estimates, the City of Burnsville has updated its current design standards and ordinances to be consistent with this new information. An example of the significance of the new data relates to the total rainfall depth for a 100-year 24-hour storm event changing from 6.0 inches to a depth of 7.5 inches. More detail is provided in the standards section of the Plan.

### Water Quality Data

Water quality data including Secchi disc depth (clarity), total phosphorus and chlorophyll –a concentrations were collected at the following lakes, in the following years:

- Crystal Lake – 1973, 1980, 1983, 1989, 1994-2007,
- Keller Lake – 1996-2007
- Lac Lavon – Secchi disc only 1989–1991, 1997–2007
- Earley Lake – 1994-2007
- Wood Lake – 1996-2007
- Sunset Pond – 1994-1998, 2000-2007
- Twin Lakes – 1999, 2001-2007

More detailed discussion of the current quality and future management activities for these lakes is provided in the Watershed Assessment Section and specific Watershed Sections in this Plan.

## WETLAND MANAGEMENT

The City's first Wetland Protection and Management Plan (WPMP) was completed in 1988 (SEH). An updated Wetland Protection and Management Plan (SEH, 2008) was developed to provide the City with an updated wetland inventory and functions and values analysis, to provide enhanced management strategies to preserve and protect the wetland resources, and to comply with local watershed organizations plans. The regulatory framework developed in the WPMP has been incorporated into the City's existing planning and zoning regulations and implemented by ordinance.

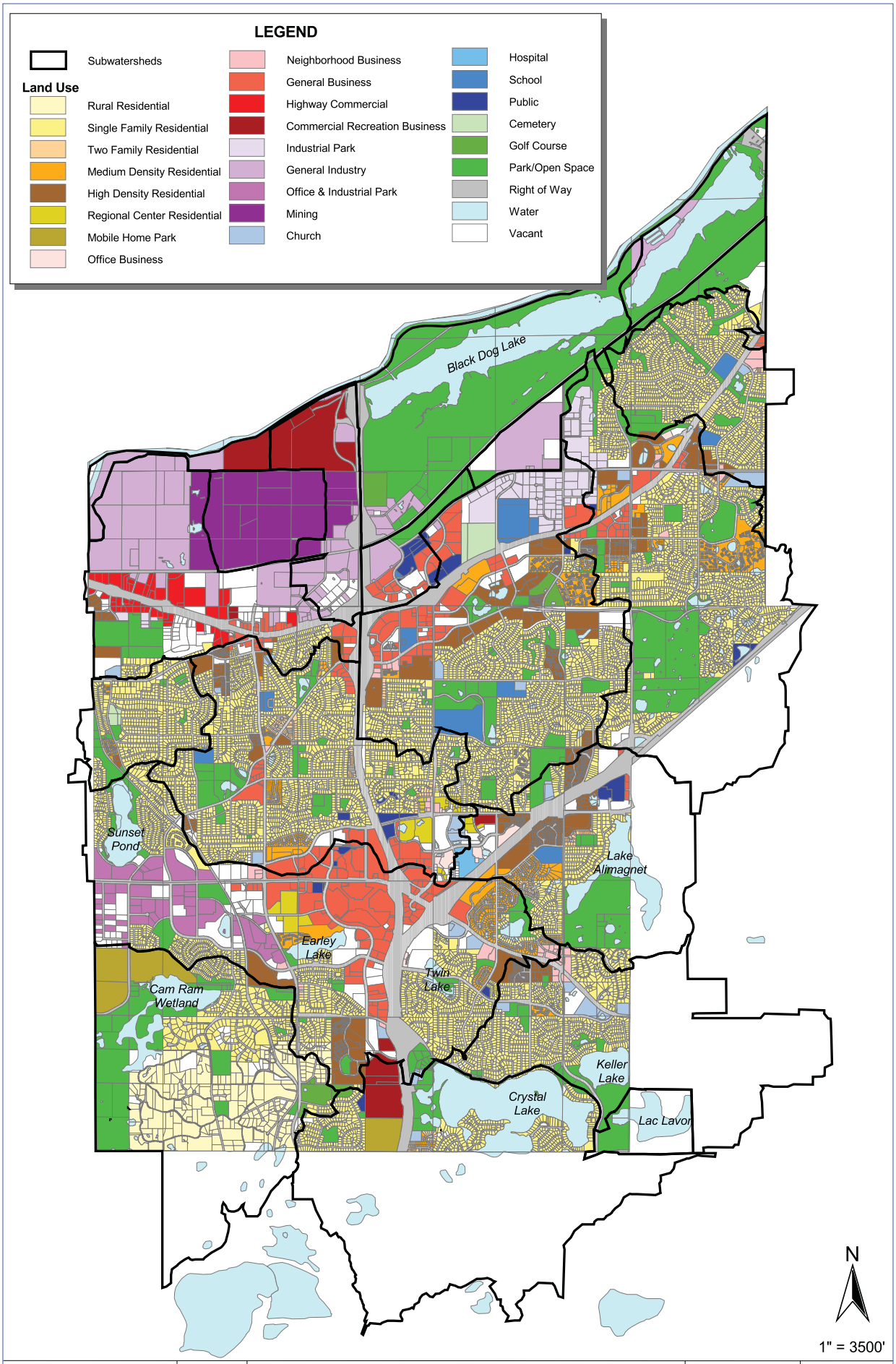
As a brief background relating to the City's wetland management program, is it important to recall the extent of water resources with the City. The City covers approximately 17,282 acres, of which approximately 2,785 acres, or 16 percent, is wetland or other surface water features. These water resources include eight lakes, 264 wetlands, 59 storm water or other created ponds, and portions of three designated trout streams. Wetlands alone constitute 1,794 acres, or about 10 percent of the city area. One of the most prominent features is the Minnesota River and the extensive backwater and wetlands associated with it. The Minnesota River wetlands and Black Dog fen, within the Minnesota Valley National Wildlife Refuge, account for 913 acres. This represents just over half of the wetland habitat within the City.

The purpose of the WPMP is to establish a comprehensive wetland protection and management program to protect, conserve, and manage the wetlands within the City. The Plan also recognizes that development and redevelopment will continue well into the future, and will serve as a guide for City staff and developers to follow as they evaluate the potential impacts of a given project. The WPMP will serve as the toolbox for the City, and includes the best available mapping of the wetlands and water resources, differentiation of wetlands from other water features, and development of regulatory policies and goals. The WPMP is also intended to meet or exceed the requirements of the watershed management organizations within the City.

The WPMP was prepared following the requirements of Mn. Rule 8420.0650, Local Comprehensive Wetland Protection and Management Plans. The WPMP includes:

- Updated inventory of the wetlands in the City; including accurate mapping, functions and values analysis, and classification;
- Differentiation of jurisdictional and regulated wetlands from other water features;
- Development of regulatory and non-regulatory options for wetland preservation and protection;

- Identification of potential wetland mitigation sites within the city;
- Refinement of a GIS-based wetland management system.

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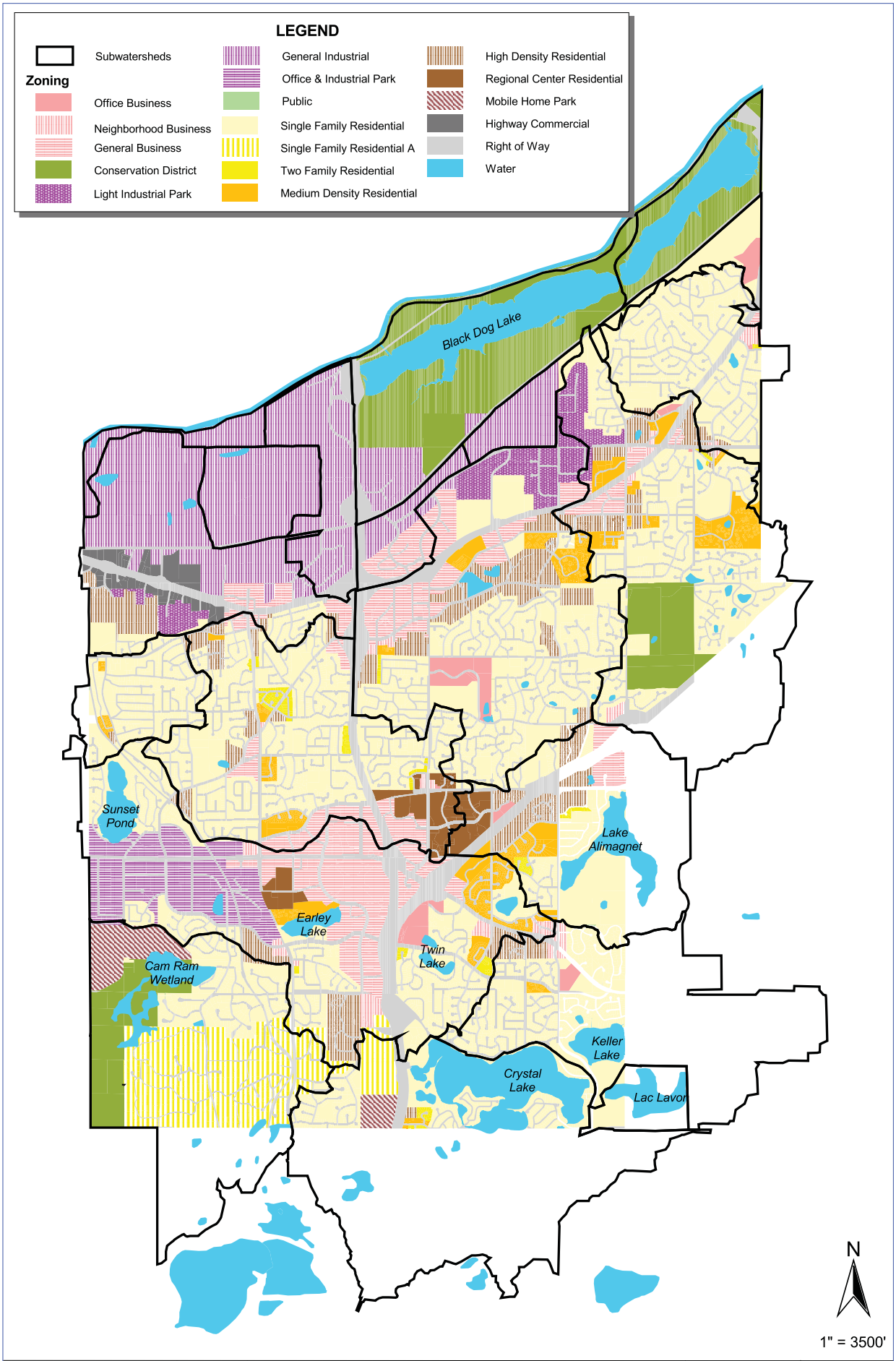


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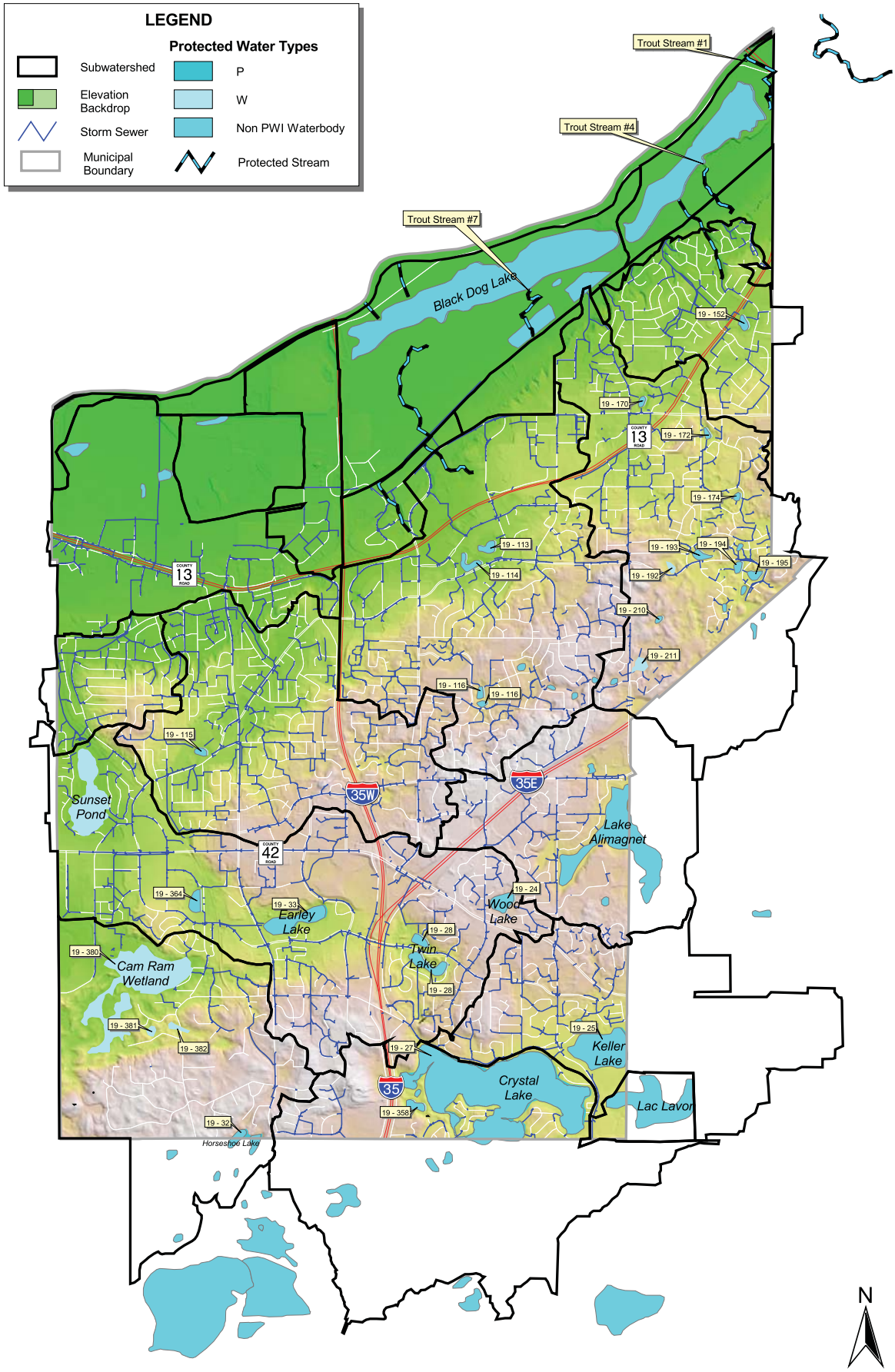
| SEH | 9/20/02<br>burns.apr<br>naf | CITY OF BURNSVILLE<br>ZONING MAP | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>8 | |

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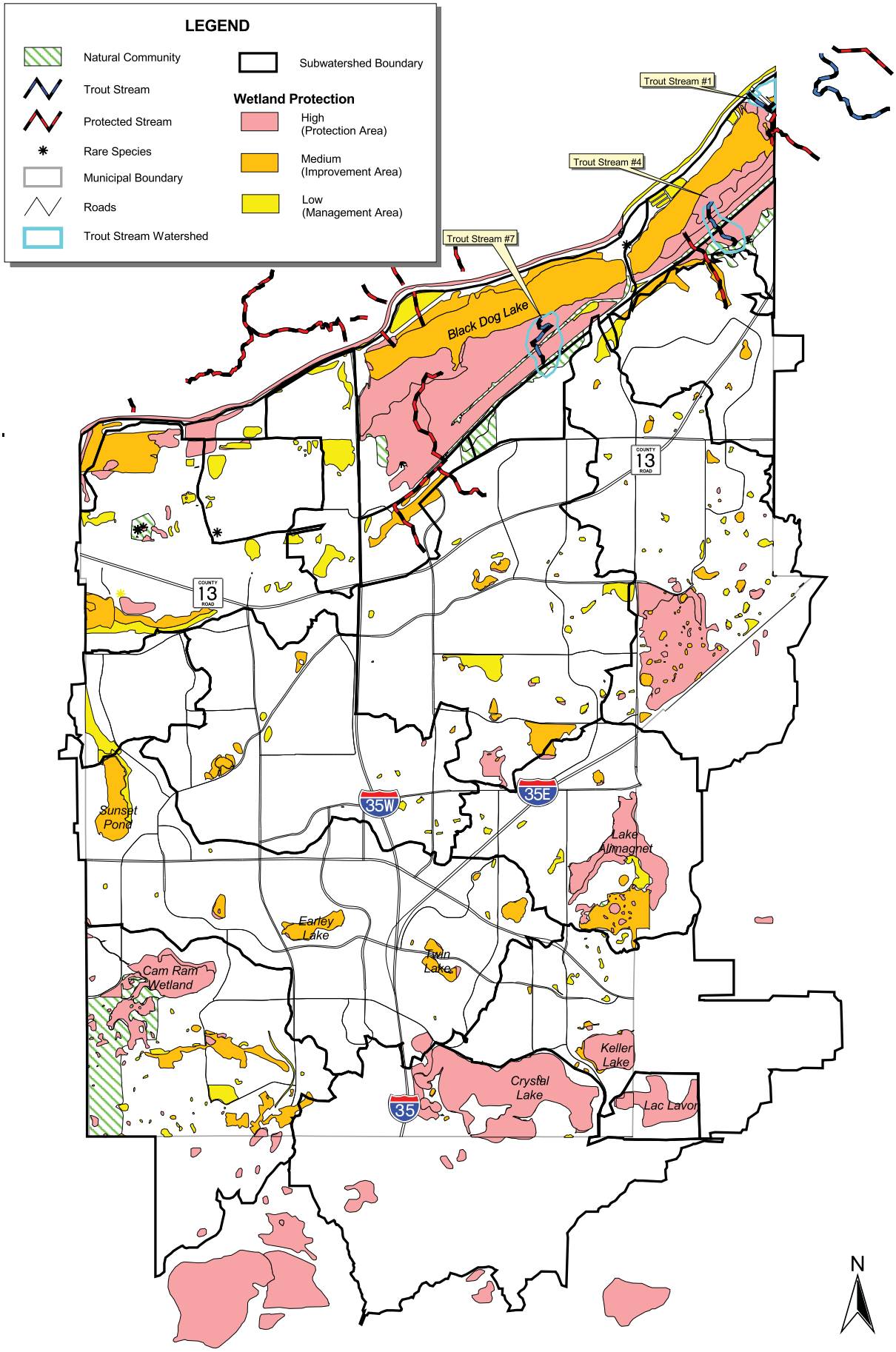
|---|---|---|---|---|
| SEH | 9/20/02<br>watershed.apr<br>naf | STORM SEWER AND PROTECTED WATERS | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>9 | |

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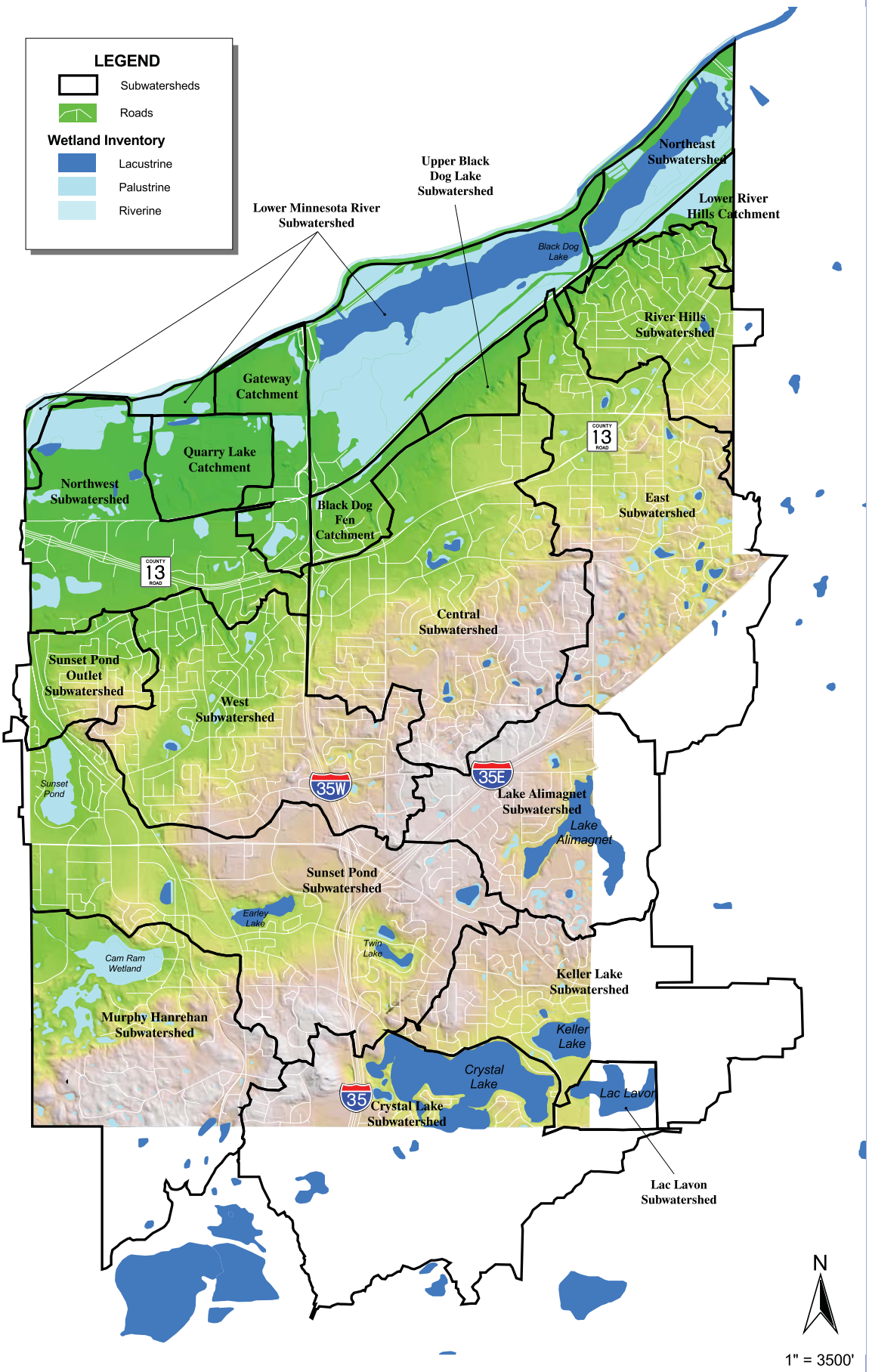


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| SEH | 9/10/02<br>watershed.apr<br>naf | BURNSVILLE MAJOR SUBWATERSHEDS WITH ELEVATION MODEL BACKDROP | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>11 | |

This Plan has also been prepared with the requirement that it comply with the standards of the local watershed management organization plans. The City is located within four major watershed units. These watersheds are regulated by three organizations including: Black Dog Watershed Management Organization (BDWMO), Lower Minnesota River Watershed District (LMRWD), and Vermillion River Joint Powers Organization. The fourth watershed, Credit River, is administered by the BDWMO for the portion of the watershed within Dakota County.

### Wetland Inventory and Classification

An inventory of wetlands was performed in 1997, to assess the extent and distribution of wetlands and to collect data reflective of wetland quality in the City. Data for the function and value assessment was collected during a brief visit to each wetland basin or complex. Collected data include a physical description of the basin and characterization of the plant community, hydrologic characteristics and wildlife and fishery habitat. Characterization of adjacent upland areas was also performed including a description of adjacent land use, disturbances or other influences on each wetland. The field assessment resulted in collection of data on 314 wetlands including 2,681 acres of wetland habitat. These data are summarized in Table 7.

In contrast, there were 532 wetland basins identified on the National Wetland Inventory (NWI) totaling 2,790 acres of wetland habitat. Most of the NWI was mapped between 1982 and 1993 from aerial photography taken between 1974 and 1984. Comparison between the NWI and the 1997 inventory indicates a loss of 218 basins and 109 acres of wetland habitat. This represents a 22 percent loss in the number of wetland basins and a loss of four percent of the wetland habitat in the City since the National Wetland Inventory was assembled in the 1980s. That loss is in addition to the approximately 85.7 percent loss of wetland in Dakota County between the 1860s and the 1980s. Assuming the total wetland loss in the City is similar to that estimated for Dakota County (85.7 percent), there may have been as much as 19,510 acres of wetland habitat in the City of Burnsville in the 1860s. The 1997 inventory reveals a total loss of 86.3 percent of the historic wetland area.

The 1998 wetland inventory was reviewed and updated using recent high-resolution aerial photographs. The previous inventory used field-based attributes, but the boundaries were based on the National Wetlands Inventory (NWI). The NWI is a good reference, but is not accurate enough to substitute for a current wetland inventory. This revised database replaces the former inventory. Review and updating of the 1998 inventory was needed as many of the former basins were not mapped correctly, mapped basins were not present, and some wetlands may have been missed. The results of the 2008 inventory are shown in Figure 13, which includes the management classification for each wetland. The official inventory will reside within the City's GIS database. Table 7 lists the distribution of the wetlands identified in the 2008 inventory.

**Table 7 - Comparison Between the National Wetland Inventory and the 1997 Wetland Inventory (SEH 1998)**

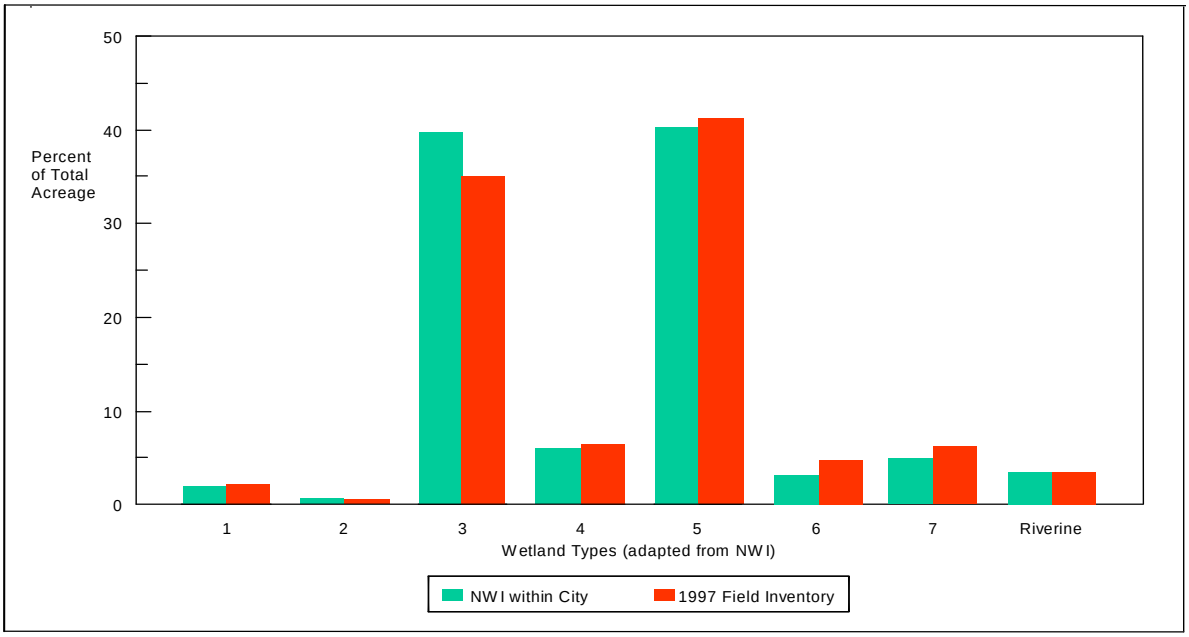
| Wetland Type | Number of Basins | | | Total Area (acres) | | |
|---|---|---|---|---|---|---|
| | NWI | 1997 | Net Change | NWI | 1997 | Net Change |
| Type 1 | 24 | 18 | -6 | 58 | 62 | +4 |
| Type 2 | 2 | 12 | +10 | 14 | 8 | -6 |
| Type 3 | 179 | 97 | -82 | 1108 | 944 | -164 |
| Type 4 | 95 | 66 | -29 | 170 | 174 | +4 |
| Type 5 | 137 | 83 | -54 | 1121 | 1103 | -18 |
| Type 6 | 34 | 10 | -24 | 88 | 128 | +40 |
| Type 7 | 59 | 25 | -34 | 136 | 166 | +30 |
| Riverine | 2 | 3 | +1 | 95 | 93 | -2 |
| **Totals** | **532** | **314** | **-218** | **2790** | **2678** | **-112** |

**Summary of Basins Based on Wetland Type 2008 Update**

| Wetland Type | Description | Number of Basins | Total Area (acres) |
|---|---|---|---|
| Type 1 | Seasonally Flooded | 16 | 55 |
| Type 2 | Wet Meadow | 11 | 12 |
| Type 3 | Shallow Marsh | 72 | 1,041 |
| Type 4 | Deep Marsh | 54 | 73 |
| Type 5 | Shallow Open Water | 50 | 128 |
| Type 6 | Scrub Shrub | 7 | 35 |
| Type 7 | Wooded Swamp | 18 | 418 |
| Riverine | Rivers and Streams | 1 | 1 |
| Pond | WCA-regulated Storm Water Ponds | 35 | 31 |
| **Total** | | **268** | **1,794** |

The distribution of wetland types as a percent of the total is shown in Figure 12. Figure 12 also shows a comparison between the distribution identified by the NWI within the City of Burnsville and that identified by the 1997 field inventory. Figure 13 illustrates the location of various management classes of wetlands throughout the City as presented in the updated 2008 Wetland Protection and Management Plan.

**Figure 12 - Comparison of Wetland Types**




One of the requirements of a Wetland Protection and Management Plan was to provide a wetland inventory and functions and values analysis. This was completed with the 1998 Plan, but has been reevaluated with the 2008 revision. This is necessitated as several issues have been detected through review of the 1998 inventory. One of the biggest needs was to differentiate wetlands from other water features. The 1998 plan includes many storm water treatment ponds, which may still be regulated under the WCA, but would not be subject to buffer, bounce, and water quality pretreatment standards. The 1998 inventory also included lakes, which would also not be regulated as wetlands, but would remain protected as Public Waters, and through the Surface Water Management Plan.

The primary goals of the updated wetland inventory were to:

- Improve the accuracy of the wetland inventory.
- Differentiate wetlands from other water features.
- Prioritize wetland regulations based on functions and values.
- Identify the status and trends of wetlands from the 1998 inventory through the 2008 revision.

Each basin within the city has been classified into one of four categories. These categories are the basis for which protection standards have been established. The 1998 inventory attributed classifications based on the Natural Resource Evaluation,

supplemented with data from the City's 1994 Storm Water Management Plan, the Dakota County Biological Survey and other sources.

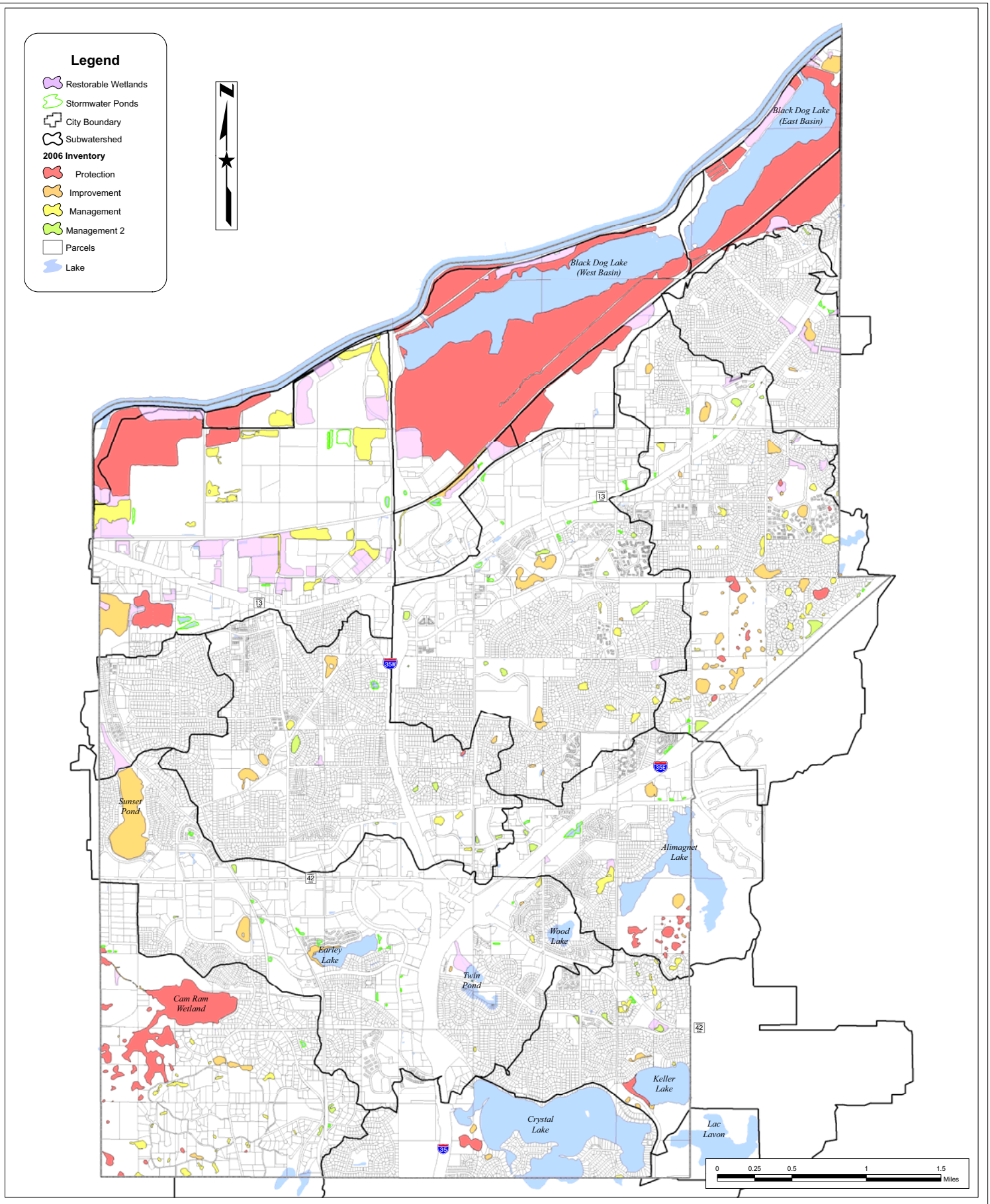
The database and supplemental information were used to determine the classification of each wetland basin by sorting the data according to total points and applying the ranking strategy. The resulting classifications include the following categories:

*Protection Areas* - Basins with Native Grades of A or B, sites with complete Community Structure, any sites supporting rare species, and any sites within or adjacent to significant natural communities as identified by the Dakota County Biological Survey. This is comparable to the Preserve Classification used in the MnRAM.

*Improvement Areas* - Basins with 3 of 4 of the Community Structure criteria, sites greater than ten acres in size, Minnesota Department of Natural Resources Protected Waters and Wetlands (Public Waters), and basins within existing City parks that are not classified as Protection Areas. Although there is some overlap, this classification is similar to the Manage I and Manage II MnRAM classifications.

*Management Areas* - Remaining wetlands, but generally of low quality and located outside of protected areas. Management wetlands are also likely to receive untreated storm water runoff, but have not been altered to enhance treatment capabilities. This classification is comparable to the Manage II and Manage III MnRAM classifications.

*Management II Areas* – These basins include any of the water features that may have been historic wetlands, and would remain subject to the requirement of the Wetland Conservation Act. These basins will have minimal protection standards as they currently function primarily to provide storm water management.





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# Wetland Classification Map

BURNVSILLE, MINNESOTA

Figure

13

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## NATURAL COMMUNITIES AND RARE SPECIES

In 1999, Burnsville created its first Natural Resource Master Plan, and one of the first in all of the Minneapolis/St. Paul metropolitan area. This progressive act set in motion programs and policies to protect Burnsville's natural resources, such as a prairie management plan, a water resources management plan, and goose and deer management policies, and initiated a policy to direct the private development of remaining open space in an environmentally sound manner.

The City completed an update to the Natural Resources Master Plan in 2007 (Barr) and the work behind it assesses the current state of natural resources in Burnsville and makes recommendations for their preservation and restoration on both public and private lands. The updated plan also reviews and makes recommendations for Burnsville's various natural resources related plans and policies, in order to synchronize the effort to manage natural resources.

In creating this document, a study was conducted to survey the ecological status of Burnsville's publicly owned upland natural areas. New in this plan is an extensive urban forestry component which evaluates and makes recommendations for street trees, developed park trees and natural areas forests. The entire city, including private lands, was mapped for land cover type which maps developed and undeveloped land throughout the city. The inventory found that Burnsville has made great strides in protecting and improving water resources, protecting and restoring prairies, and is taking an ecological approach in developing private open space.

Forces degrading Burnsville's natural resources, however, are mounting, and Burnsville should next direct attention to its upland natural resources, in particular its remaining natural woodlands and trees in built areas. Degradation caused by invasive plant species encroachment, and the stress put on native plant communities due to the urban heat island effect (caused by heat accumulated on pavement) and climate change are occurring at a surprisingly rapid rate and are degrading Burnsville's natural areas. Communities throughout the metro area are all facing these challenges.

To complement Burnsville's current work to protect natural resources, the NRMP recommends actions to be taken to protect and enhance its vulnerable natural resources. The plan makes recommendations for monitoring, land management and restoration of publicly and privately owned lands. Focus has now shifted to upland natural resources, since diligent work has accomplished significant protection to the city's water resources.

The Minnesota DNR produces the Minnesota County Biological Survey identifying natural communities and rare species. The Dakota County survey map was completed in 1997. It identifies where evidence indicates the presence of rare plant and animals. The survey shows the presence of rare plants and animals in Burnsville: along the western border of the City, in and near Murphy-Hanrehan Regional Park; in southern Burnsville, west of Crystal lake and I-35; and just east of I-35W, between Highway 13 and Burnsville Parkway. The survey also identifies the original vegetation in the area of the WMO as a mixture of brush prairie, oak openings and barrens, aspen-oak land, and upland deciduous forest.

The Black Dog Scientific and Natural Area, calcareous fens and additional rare plants and animals are in the Lower Minnesota River Watershed District.

The Burnsville Natural Resource Master Plan (SEH, 1999) set the stage for how natural resource inventory, evaluation, and management will be undertaken in the future. The purpose of the Plan was to identify existing natural resources in the City; identify strategies to protect, preserve, and manage those resources and educate the community about the importance of doing so. Natural resources include terrestrial (upland), wildlife, and aquatic resources and the adjacent areas needed to maintain them, irrespective of land ownership boundaries. The City's Wetlands Plan (SEH, 1998, updated 2008) evaluated aquatic resources (rivers, lakes, wetlands, and ponds). The results of the Wetlands Plan were integrated into the Natural Resources Master Plan such that the protection and management categories are consistent.

The 1997 “report card” on the status of Burnsville natural resources had mixed results. There were a handful of wooded and wetland sites which were above average quality. Most sites were of average quality which is not surprising for an urban setting. Management techniques for maintaining and improving the grades of these natural resources identified in the Natural Resources Master Plan.

Trout streams listed in the Minnesota Metro Trout Stream Watershed Program were identified and considered in the Natural Resource Management Plan. These trout streams within Burnsville are illustrated in Figure 10.

### Terrestrial Resources

Terrestrial communities (woodland, prairie, meadow) selected for field inventory were identified on half section aerial photographs. Minnesota Department of Natural Resources (Mn/DNR) County Biological Survey sites were not reevaluated.

### Wildlife and Rare Resources

Based on information from the Minnesota Department of Natural Resources County Biological Survey, rare animal species documented in Burnsville are Peregrine falcon, Bell's vireo, Blanding's turtle, Acadian flycatcher, Hooded warbler, Red-shouldered hawk, and Cerulean warbler. The first three were all in the vicinity of the Minnesota River Valley within the Bluff Valley Resource Management Unit (RMU) and the others fall within the Southwest RMU. Additional rare species in Burnsville are plants. They are found in several locations but primarily together in undisturbed natural communities.

### Greenways and Corridors

Greenways and corridors potentially serve as movement pathways for plants and animals and bridge disjunct complexes of natural communities. Often they are linear and follow streams and rivers.

It was found that no significant linear greenways or corridors run through Burnsville, other than the river valley. The Minnesota River Valley runs along the northern border of the City of Burnsville and this area should be the focus of any efforts to connect areas managed by Burnsville and state and federal government agencies.

### Resource Management Units

Resource management units (RMUs) are high concentrations of natural resource sites and important lakes and rivers. Lakes and rivers are not listed in the sites database for the reasons explained under inventory. All lakes in RMUs are considered high priority natural resources and as such are justified for the same staff and funding as high priority resources in the sites database.

RMUs contain high (protection), medium (improvement), and low (management) priority sites. The focus of management activities will be on the high priority sites. From an ecological perspective low and medium priority sites can have an effect on high priority sites and will be protected and managed to the extent that they affect high priority sites. All sites will be managed to at least maintain their current qualities to the extent possible.

The three categories of sites are:

1. High Priority Sites (Protection) - Sites with native community grades of A and B, any sites with rare species, and sites with complete community structure. These sites will receive priority for protection and management and priority for funding, regardless of whether or not they fall within a Resource Management Unit.

2. Medium Priority Sites (Improvement) - Sites with native community grades of C, all sites greater than 10 acres, and areas which meet 3 or 4 of the community structure criteria. These sites will be focused on for improvement when they are part of a Resource Management Unit.

3. Low Priority Sites (Management) - Sites with native grades of D, and areas which meet only 1 or 2 of the community structure criteria. Resources will be directed towards maintaining these sites, unless part of a Resource Management Unit Improvement Plan.

### Map Inventory

Mapping was performed using Geographic Information System (GIS) data layers. Existing data layers on wetlands, ponds, lakes, and rivers were integrated with a new terrestrial data layer and the existing Mn/DNR natural communities and rare species. All terrestrial, aquatic, and Mn/DNR sites are shown in Figure 10.

## MINNESOTA VALLEY NATIONAL WILDLIFE REFUGE, RECREATION AREA AND STATE TRAIL

The Minnesota Valley National Wildlife Refuge, Recreation Area and State Trail (shown on Figure 14) were established as a result of efforts of local citizen groups to protect the Lower Minnesota River Valley. The Minnesota Valley Trail was authorized by the state legislature in 1969. Federal legislation entitled "The Minnesota Valley National Wildlife Refuge Act of 1976" declared that the policy of the Congress would be to preserve the Minnesota River Valley and, as a federal action, establish the 9,500-acre Minnesota Valley National Wildlife Refuge and an adjacent 8,000-acre wildlife recreation area.

There are approximately 24,000 acres of existing and authorized wildlife refuge, parks, trails, and open space located along the Minnesota River corridor. These lands are managed in accordance with the "Minnesota Valley National Wildlife, Recreation Area, and State Trail: Comprehensive Plan, July 1984." The plan was produced by the Department of the Interior, U.S. Fish and Wildlife Service, and the Minnesota Department of Natural Resources.

The refuge portion of the area is managed by the U.S. Fish and Wildlife Service with two main objectives: to provide habitat for a diversity of plants and animals and to provide opportunities for people to observe and learn about the valley's wildlife.

The recreation area is managed by local, city, and county governments and by the DNR. These agencies are developing recreational and educational opportunities that are compatible with the valley's natural resources.

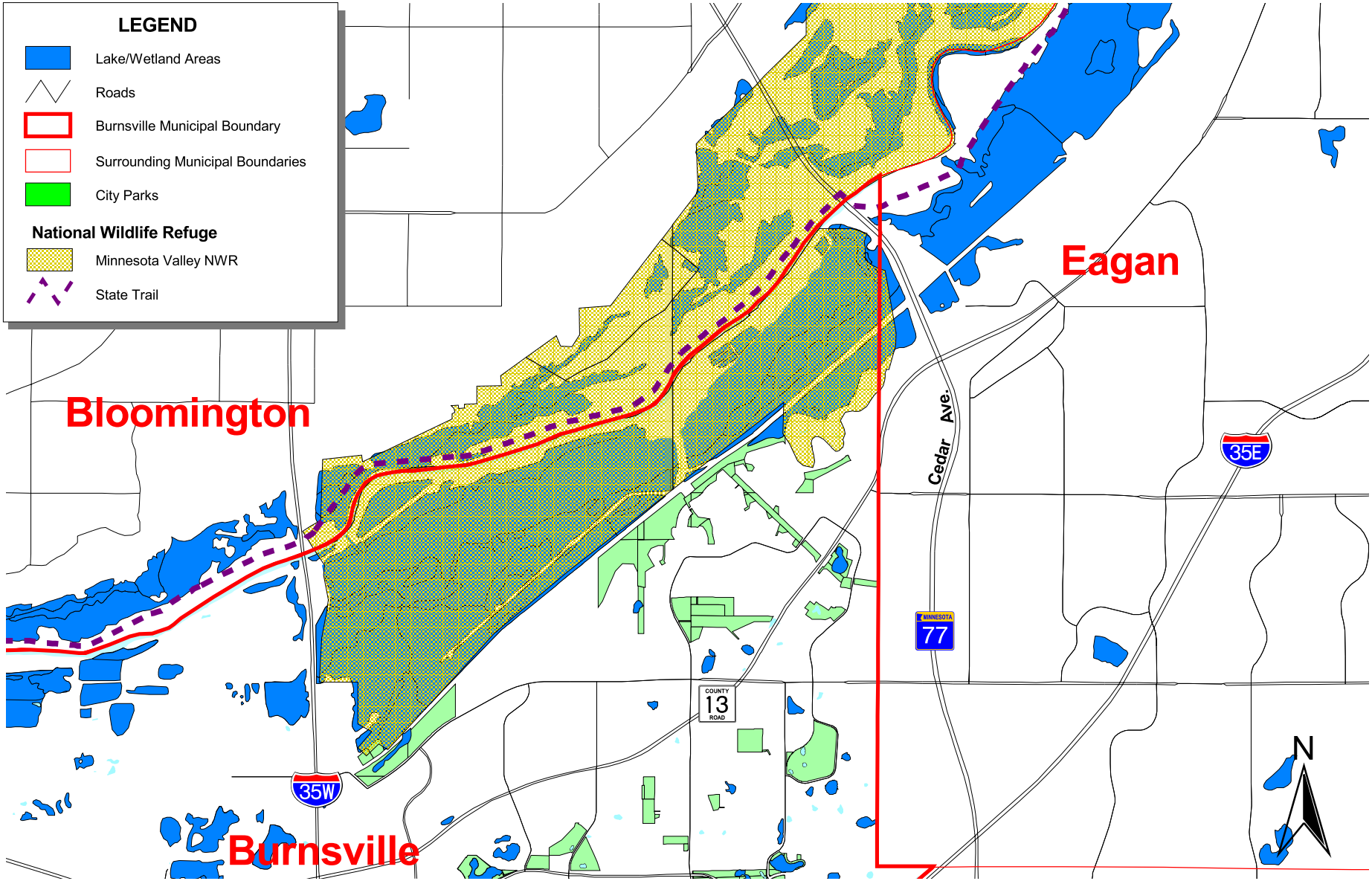
The state trail is managed by the DNR's Division of Parks and Recreation. Management objectives are to develop an accessible, scenic, recreational travel route between Fort Snelling State Park and Le Sueur. Upon completion, this state trail will be a multi-use recreational corridor through the entire Lower Minnesota River Valley. It will link with other metro area trails and provide hiking, bicycling, horseback, riding, snowmobiling and cross-country skiing opportunities for the two million people who live in the Twin Cities metro area.

## PUBLIC AREAS FOR WATER-BASED RECREATION AND ACCESS (OSM, 1994)

Burnsville has numerous water bodies totally or partially within its borders that are used for water based recreation. The City has two water bodies which are used for a variety of motorized boat recreation: Crystal Lake and Alimagnet Lake. Crystal Lake has a public boat launch and is very heavily used by motorized boats. Alimagnet Lake only has a public canoe launch making motorized boat launching difficult and as a result of the motorized use tends to be limited to lakeshore owners. Internal combustion motors are prohibited on all other lakes and ponds in Burnsville with the exception of Keller Lake, which has a 5-horsepower limit. Electric trolling motors are

allowed on all lakes except Sunset Pond. More detailed information on water use restrictions for each lake is provided in the Watershed Sections of this Plan.

The public does use other lakes in Burnsville for water-related recreation such as non-motorized boating, fishing, hiking on trails adjacent to water and birdwatching. The primary lakes are Keller Lake, Lac Lavon, Sunset Pond, Earley Lake and Wood Lake. The City has parkland adjacent to each of these as well as Crystal and Alimagnet Lakes.




1" = 4000'

Source: Lower Minnesota River Watershed District

| | | | | |
|---|---|---|---|---|
| SEH | 9/20/02<br>watershed.apr<br>naf | MINNESOTA VALLEY<br>NATIONAL WILDLIFE REFUGE | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>14 | |

## NAVIGATION (BARR, 1999)

The Minnesota River is navigable from the confluence with the Mississippi River to the Carver Rapids, just above the City of Carver. The effect of the Hastings Dam, located on the Mississippi River at Hastings, Minnesota, on the Minnesota River extends as far as the Carver Rapids. The Carver Rapids are just upstream of the most westerly boundary of the District. The Hastings Dam controls the water surface of the Minnesota River within the District.

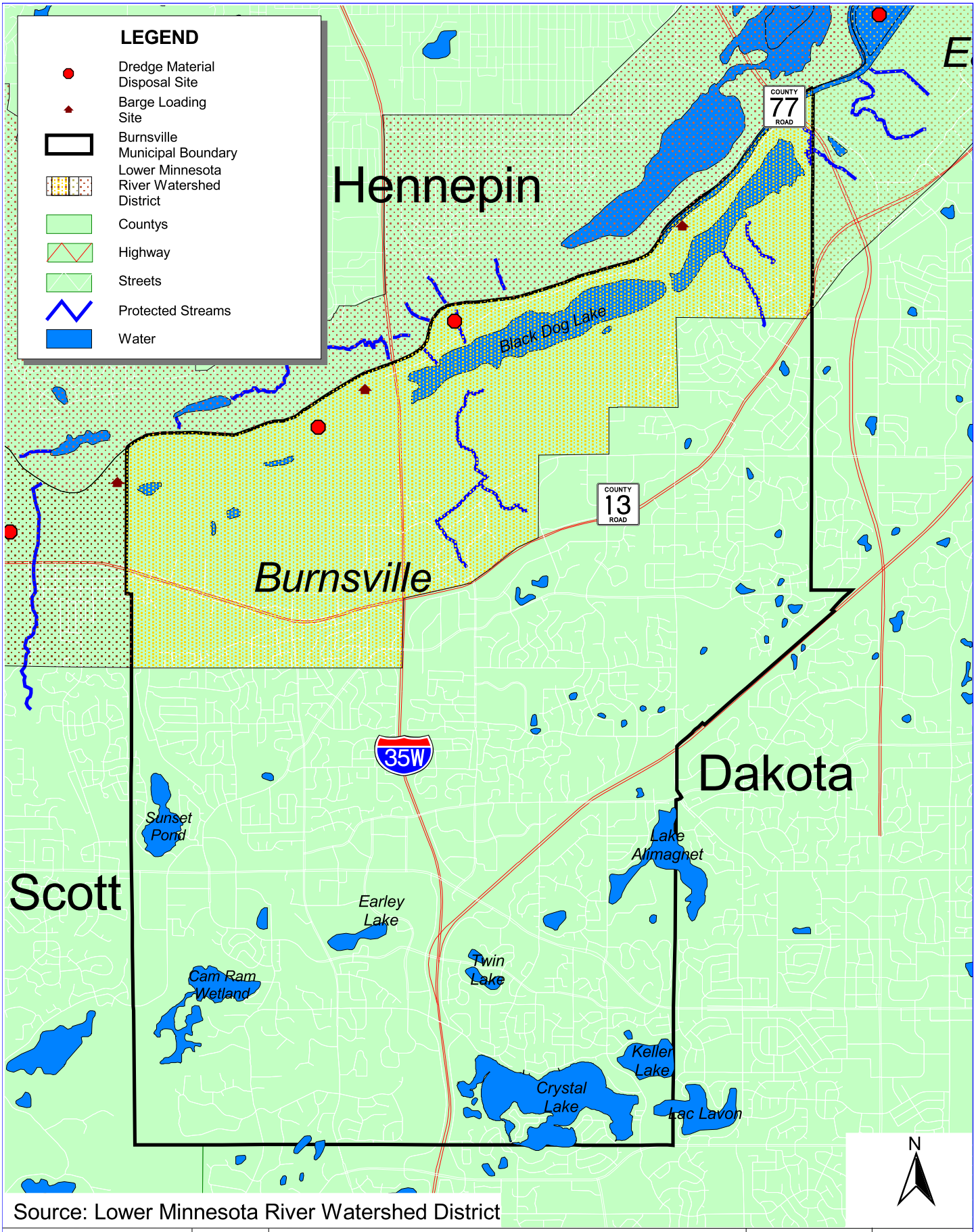
Construction of a navigation channel on the Minnesota River was first authorized in 1892. In that year, Congress authorized the Minnesota River navigation project which provided for the construction of a 4-foot channel from the mouth of the Minnesota River at its confluence with the Mississippi River upstream for a distance of 25.6 miles to Shakopee. This authorization is still in effect, and the U.S. Army Corps of Engineers (COE) is required to provide for this maintenance.

In 1942, a channel 9 feet deep and 100 feet wide was dredged by the COE from the mouth of the Minnesota River to Savage (13.2 river miles) at the expense of local interests. The 1958 River and Harbor Act authorized improvements on the Minnesota River from its mouth upstream to river mile 14.7, a point one-half mile above the railroad bridge near Savage. Under this authorization, a channel 9 feet deep and 100 feet wide was provided. Three cutoffs to eliminate bends in the river were made to aid navigation. Wide passage or turnouts were provided to permit tows to pass safely.

Maintenance of this channel is accomplished by cooperative agreement between the Lower Minnesota River Watershed District and the COE. Periodic dredging is required to maintain the navigation channel.

Both private pleasure craft and commercial traffic navigate the Lower Minnesota River, but commercial barge traffic dominates. The major commodity transported on the river is bulk grain or grain products, shipped from five storage and loading terminals operated by Peavy, Continental, GTA, Bunge, and Cargill grain companies. Other commercial terminals handle petroleum products (Richards Oil Co.), salt (U.S. Salt Co.), and coal (Northern States Power Co.).

Figure 15 illustrates commercial navigation on the lower Minnesota River.




Source: Lower Minnesota River Watershed District

| | | | | |
|---|---|---|---|---|
| SEH | 9/20/02 | COMMERCIAL NAVIGATION | FILE NO. ABURNS9904.00 | |
| | watershed.apr naf | | FIG NO. 15 | |

## POLLUTANT SOURCES (BARR, 2000)

The following environmentally contaminated sites have been identified within Burnsville:

1. Safety Kleen Corporation, 1401 Cliff road – an RCRA Treatment, Storage, and Disposal Facility.
2. Freeway Sanitary Landfill, 113th Street West and I-35W.
3. Old Freeway Dump, east of I-35W and 1/4 mile north of 121st Street West.

The MPCA identified numerous leaking underground storage tank (LUST) sites in Burnsville. The MPCA also has lists showing registered above- and underground storage tanks, according to City. The MPCA also has information on permitted feedlots and permitted wastewater discharges.

Information on pollutant sources is available from the MPCA (651.296.6300). This detailed information has not been included here as it is subject to frequent change and may be obtained by calling the MPCA at the number listed or visiting the MPCA's website. The MPCA's website (www.pca.state.mn.us) has information on various pollutant sources and related regulatory programs.

Pollutant source information is also available from the Dakota County Environmental Management Department. The Department maintains maps and a database that display MPCA-reported LUSTs, MPCA-reported spills, MPCA-registered ASTs and USTs and Dakota County-licensed hazardous waste generators. This information maybe accessed by the public upon reasonable request to the County.

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## GOALS AND POLICIES

Minnesota Rules 8410 - Surface Water Management (BWSR, 1992) require the establishment of Goals and Policies for the effective management of water resources. The italic passages that follow are from the 8410 rules, illustrating consistency between the WMO Plans and the City's plan. Many of the requirements listed are specific to WMO plans and do not apply directly to Local Plans. However, they are provided to illustrate how the City's Plan goes beyond the requirements for local plans by addressing many of the components of WMO plans.

*M.R. 8410.0080 - Establishment of Goals and Policies (WMO Plans)*

*Subpart 1. Plan Contents. Each plan must contain specific goal statements and corresponding policies relating to the overall purposes specified in Minnesota Statutes, Section 103B.201. The goals and policies of the Watershed Management Organization shall attempt to avoid conflict with County, regional, or state goals and policies. The goals must be outlined in sufficient detail to provide direction regarding what the policies should accomplish, provide direction to the organization's board, and allow for the success or failure of the goals and policies to be quantified. The goals and policies should recognize the fundamental relationship between water quality and land use. Development of goals and policies must, at a minimum, address the issues in Subparts 2 to 9.(BWSR, 1992).*

*M.R. 8410.0170 Subp. 5. Establishment of policies and goals. (Local Plans)*

*Each local plan must state specific goals and corresponding policies related to the purpose of these plans, be consistent with the policies and goals of the organization plans within the city or township, and address the relation of the local plan to the regional, state, and federal goals and programs outlined in part 8410.0070.*

### END STATEMENTS ON THE ENVIRONMENT

In 1997, City Council adopted an "End Statement on the Environment," which reads:

> ***"People find Burnsville is an environmentally sensitive community ensuring preservation and enhancement of its natural resources."***

This Plan supports the City's End Statement on the Environment by developing specific goals and policies and by translating them into action.

#### Goals

A ***goal*** is a desired end toward which water management efforts are directed. This section of the plan identifies goals for water resources planning and management functions and for specific water bodies. The goals of this plan were established in accordance with the purposes of the water management programs required by

Sections 103B.201 to 103B.251 and in conformance with the goals of the watershed management organizations having jurisdiction in Burnsville including the Vermillion River Water Management Organization, Black Dog Watershed Management Organization and the Lower Minnesota Watershed District.

The Plan proposes goals across 12 perspectives. These goals also satisfy the requirements of Minnesota Statutes, Section (103B.235) and Minnesota Rules, Chapter 8410 for local water resource management planning. The plan goals are summarized in Table 8.

**Table 8 - Summary of Plan Goals**

| Goal Number | Goal | Goal Statement |
|---|---|---|
| 1 | **Water Quantity (Flood Control)** | Control flooding and minimize related public capital and maintenance expenditure necessary to control excessive volumes and rates of runoff. |
| 2 | **Water Quality** | Achieve water quality standards in lakes, streams, and wetlands consistent with the intended use and classification and to maintain or improve water quality relative to current conditions. |
| 3 | **Erosion Control** | Minimize soil erosion through increased education and enforcement. |
| 4 | **Wetlands** | Maintain or increase wetland acreage and increase wetland values in accordance with the adopted Comprehensive Wetland Protection and Management Plan. |
| 5 | **Public Participation, Information and Education** | Increase public participation and knowledge in management of the water resources. |
| 6 | **Monitoring** | Implement a comprehensive water resources monitoring program. |
| 7 | **Maintenance and Inspection** | Preserve the function of water resource facilities through routine inspection and regular maintenance activities. |
| 8 | **Recreation, Fish and Wildlife** | Manage water recreation activities and improve fish and wildlife habitat. |
| 9 | **Ground water** | Prevent contamination of the aquifers and promote ground water recharge. |
| 10 | **Regulatory Responsibility** | Maintain regulatory authority at the local level while recognizing the role of other local, state and federal entities and complying with specified programs and requirements. |
| 11 | **Finance** | Establish funding sources to finance water resources management activities. |
| 12 | **Land Use** | Recognize the relationship between land use cover and water resources management. |

### Policies

Each goal has several corresponding policies. A policy is a governing principle that provides the means for achieving established goals.

### Standards

Standards are an extension of the policies. They provide specific, detailed guidance regarding water management practices. Plan standards are included in Appendix D of this Plan.

### Action Plans

Specific Action Plans have been developed for each of the major lakes. The Action Plans identify problems related to achieving the stated goal and solution for addressing the problems.

### Implementation Plans

For each of the goals, a related Implementation Plan has been established. The Implementation Plan corresponds directly to the stated goal and policies, and to the identified subwatersheds. The Implementation Plans include specific activity steps, available resources, and the means of measuring the completion of the activity step, a target date for completion and an estimated budget. A lead department is also identified in the annual implementation plan summaries in the Implementation section of this Plan. The combination of these implementation plans will formulate the overall strategy for implementing the Water Resources Management Plan.

## GOAL 1: WATER QUANTITY

*M.R. 8410.0080, Subpart 2. Water Quantity. Each (WMO) plan must outline goals and policies describing how storm water runoff will be managed. The maximum allowable peak runoff must be established for appropriate subwatersheds to the extent necessary to assure that the goals and policies of the organization will be met and address how runoff from developments creating more than one-acre of new impervious surface will be managed* [note: this requirement is no longer in Statutes] *with respect to Minnesota Statutes, Section 103B.3365. The plan must describe the criteria used for defining "appropriate subwatersheds."*

**Goal: Control flooding and minimize related public capital and maintenance expenditure necessary to control excessive volumes and rates of runoff.**

Traditional storm water management deals with just one component of the hydrologic cycle; surface runoff. Large amounts of energy are directed towards alleviating significant negative impacts of surface runoff and flooding on the cultural, water, and natural resources. The primary management strategy is shifting from detention in both existing natural (wetland) and constructed basins, to low impact development (LID) techniques and Integrated Management Practices (IMPs) that emphasize reduction of runoff volume and on-site runoff control via infiltration or small volume storage to mimic predevelopment hydrology for more frequent rainfall events. This trend will help remedy the negative impact of storm runoff on lake quality. With increased value placed on wetlands, the number and extent of wetlands that can be used for detention will decline. The approach to water quantity management relates directly to water quality, wetland management, erosion control, and land development strategies. By doing a better job at managing the quantity of runoff, the other goals of this Plan are more easily and efficiently achieved.

**Atlas 14 – Rainfall Frequency Update (2013-2014)**

The National Oceanic and Atmospheric Administration (NOAA) published new precipitation frequency estimates for the Midwestern States in Atlas 14 Volume 8. This information supersedes Technical Paper (TP)-40 published in1961 and NOAA Technical Memorandum NWS Hydro 35 published in 1977 that are the sources of precipitation frequency data and Intensity-Duration-Frequency (IDF) curves recommended in the MnDOT Drainage Manual and that have been the basis of design throughout much of Minnesota for highway and municipal drainage design.
MnDOT Technical Memorandum No. 13-08-B-04 establishes the State of Minnesota's policy and guidelines for use of the new precipitation estimates for design of drainage systems The MnDOT memorandum states the following:

**Implementation**
The guidelines contained in this Memorandum are effective immediately for trunk highway projects where feasible. Use the Atlas 14 precipitation data for hydraulic design on all trunk highway projects let after June 30, 2014. Local road authorities are encouraged to adopt these or similar guidelines.

**Guidelines**
Use Atlas 14 Precipitation Frequency Estimates when using rainfall-runoff models to compute hydrology for the design of hydraulic infrastructure. The data is obtained from NOAA's Precipitation Frequency Data Server (PFDS) at http://hdsc.nws.noaa.gov/hdsc/pfds/ based on the project location.

For rainfall-runoff models that use the Natural Resources Conservation Service (NRCS) rainfall distributions, if feasible, use a rainfall distribution based on the Atlas 14 data. Use the NRCS Type II rainfall distribution for NRCS peak flow methodology or for other projects where developing a rainfall distribution is not feasible.

Atlas 14 precipitation data should be used immediately for trunk highway projects using rainfall-runoff models provided its application does not jeopardize letting dates of projects already in the design phase. Use the Atlas 14 precipitation data for the hydraulic design of all trunk highway projects let after June 30, 2014. Where use of Atlas 14 is not feasible, evaluate the impacts of using Atlas 14 and document the justification for using the criteria from the Drainage Manual (2000). Notify the State Hydraulics Engineer about projects designed with rainfall-runoff models let after June 30, 2014, that are not designed with Atlas 14 precipitation data.

As a result of the updated rainfall frequency estimates, the City of Burnsville has updated its current design standards and ordinances to be consistent with this new information. An example of the significance of the new data relates to the total rainfall depth for a 100-year 24-hour storm event changing from 6.0 inches to a depth of 7.5 inches. More detail is provided in the standards section of the Plan.

### Effect on Flood Maps

In addition to the policy changes relating to project specific analysis, the updated Atlas 14 precipitation data may ultimately be used to develop updated Flood Insurance Rate Maps (FIRM). However, the FIRM map panels for Dakota County and the City of Burnsville were recently updated and the Minnesota Department of Natural Resources currently has no immediate plans to update these maps to reflect the Atlas 14 data. Therefore, existing FIRM maps will remain in effect and will continue to serve as the basis for the City implementing its floodplain ordinance.

### Water Quantity Objectives

At the August 15, 2000, Council work session, there was a clear consensus that water quantity issues should be the highest priority in the plan. Flooding in several areas of the City in July 2000 played a key role in establishing water quantity (i.e., flooding) issues as the highest priority of this Plan. Figure 16 illustrates the location of flooding resulting from the July 2000 storms. The following paragraphs summarize a few of the City's highest profile water quantity issues.

Earley Lake

Following a flood event in July 2000, interest in developing an immediate solution to the Earley Lake problem was renewed as one of the top priorities for storm water management in the City. A feasibility study was completed in the spring of 2001 that explored several alternatives to reduce or eliminate these problems. Two alternatives from the report were selected by the City Council as capital improvement projects. Hydrologic/hydraulic modeling for Earley Lake assuming both improvements showed a significant reduction in the flood levels for a 100-year storm event. Construction began in the fall of 2001 and was completed in the spring of 2002.

River Hills/ Northeast Burnsville

Heavy rains in July 2000 focused attention on area-wide drainage problems in northeast Burnsville. A detailed model of pipe capacities was completed as part of the planning process. The model is based on field-verification of the in-place drainage system and a specific analysis of the inlet capacities of existing catch basins. Improvements at Galtier/Highway 13 and Chandler Court Pond were implemented during late 2000 and early 2001. Improvements in water quality also resulted from this project.

Additional storm sewer improvements that will address flooding problems in northeast Burnsville were completed between 2002 and 2007 as part of the City's street reconstruction program. This work included portions of Hayes Drive, Hayes Court, 27th Avenue North, 27th Place, London Drive, London Court, and Prescott Court.

South Twin Lake

Local flooding relative to existing flood easements continues to be a problem. Proposed modifications to the existing outlet structures could increase the discharge capacity at lower water levels. However, during further evaluation of this system, it was determined not to result in substantial improvements, without major modifications to the downstream conveyance system in South Cross Boulevard. Improvements were completed to install a trash guard at the outlet to help reduce the plugging of the outlet by floating debris.

Crystal Lake

Crystal Lake's high water levels have created concerns relative to lost recreational opportunities and shoreline erosion. Modifications to the outlet system were identified that will significantly reduce the duration of high water levels on the lake. During the July 2000 public meeting, Crystal Lake residents indicated that their preference was to first address water quality issues on Crystal Lake. Therefore, structural modifications of the Lake's outlet system will be a lower priority in the Plan.

Keller Lake

In the mid-90s, a study was prepared to evaluate options to increase the discharge from Keller Lake to Crystal Lake (SEH, 1996). No improvements to the system were made. The conditions that precipitated the study appear to have been short-term.

However, improvements to Crystal Lake's outlet may improve the conditions that were studied in 1996.

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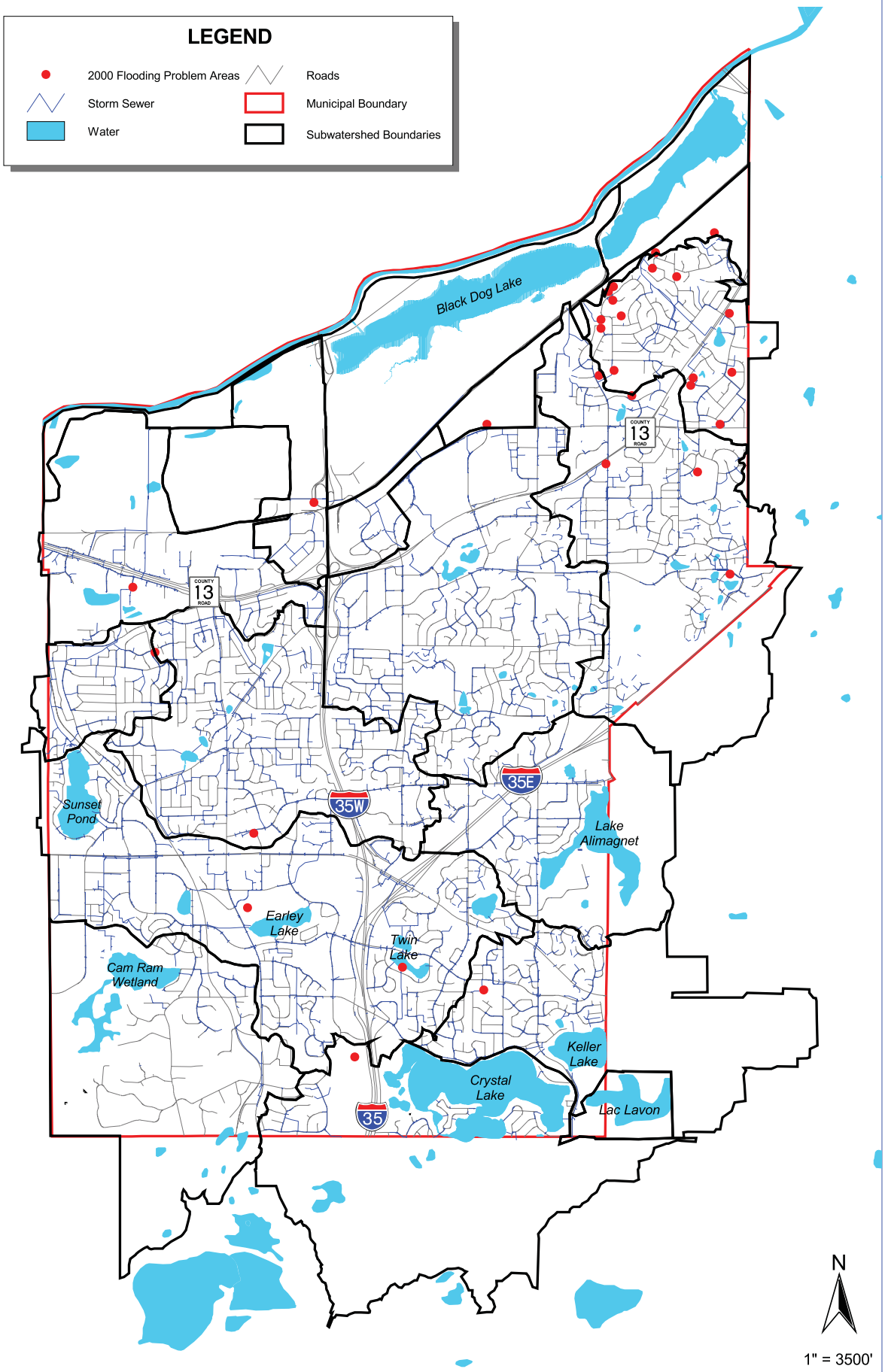


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|---|---|---|---|---|
| SEH | 9/20/02<br>watershed.apr<br>naf | JULY 2000 WATER QUANTITY PROBLEM AREAS | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>16 | |

### Policies and Implementation Plan

Tables 9 and 10 present policies and implementation activity steps the City has developed to meet the water quantity goals of this plan.

**Table 9 - Water Quantity Policies**

| | |
|---|---|
| **Subject:**<br>➢ Storm Water Runoff (Rate and Volume) Management | |
| **Purpose:**<br>➢ Control runoff | |
| **Goal:**<br>➢ Control Flooding and Minimize related public capital and maintenance expenditure necessary to control excessive volumes and rates of runoff. | |
| **Water Quantity Policies** | |
| ***Policy 1.1:*** | Low Impact Development (LID) techniques (or volume control/infiltration practices), along with conventional constructed detention ponds for large, infrequent rainfall events, should be relied upon to help mimic pre-development hydrology and to control downstream flooding. Existing peak flow rates shall not be exceeded. |
| ***Policy 1.2:*** | Increases in the volume of runoff should be minimized by utilizing infiltration and/or filtration practices to control the runoff volume from frequent rainfall events to existing levels, in areas where soils and site constraints are favorable. |
| ***Policy 1.3:*** | Where LID techniques are not feasible, the City prefers regional detention areas to small, on-site ponds for large, infrequent storm event runoff rate control, whenever practical. |
| ***Policy 1.4:*** | Emergency overflows or outlets to drainage systems that are below the low-slab elevation of adjacent structures, or other provisions designed to minimize flooding, shall be provided to prevent flood damages. |
| ***Policy 1.5:*** | Encroachment into the flood plain and flood way (volume) below the established 1-percent critical flood levels shall be prohibited except when mitigating action is demonstrated to preserve the storage capacity, prevent a surcharge in the flood profile, and minimize excessive velocities. |
| ***Policy 1.6:*** | The minimum building elevation shall be elevated to prevent flood damage from the established 1-percent critical duration storm event, in accordance with established City ordinances and the standards of this plan. Future development areas adjacent to landlocked basins will be evaluated in more detail through evaluations of updated hydrologic modeling tools. |
| ***Policy 1.7*:** | The City encourages projects to reduce discharge rates and volumes of runoff to pre-development levels where feasible, and to use alternative landscape techniques and materials towards meeting these reductions. |
| ***Policy 1.8:*** | The City shall acquire easements covering ponds, wetlands, flood plains and ditches as part of land development approvals. |
| ***Policy 1.9:*** | For runoff tributary to the Credit River or to the Lower Minnesota River Watershed District from: a. undeveloped subwatersheds, post-development discharge rates leaving the watershed shall be maintained at or below predevelopment rates for all flood events up to and including the critical 100-year event; and b. from fully developed subwatersheds, discharge rates leaving the watershed shall be maintained at existing rates for all flood events up to and including the critical 100-year event. |
| ***Policy 1.10:*** | The City will not limit itself to the use of gravity flow stormwater conveyance systems and may consider pumps in areas where feasible to reduce watershed to lake area ratios. |

## Table 10 - Water Quantity Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1 Implement improvements to reduce flood levels and duration on Earley Lake | • Water Resources Management Plan<br>• Area developers<br>• Burnsville Center<br>• As built drawings<br>• Hydraulic modeling | • Feasibility Study<br>• Public Hearing<br>• Construction Contract<br>• Completed Improvements | Done | NA |
| 2 Implement trunk storm sewer improvements in Northeast Burnsville (South River Hills) to mitigate flooding problems | • Water Resources Management Plan<br>• Area developers<br>• As built drawings<br>• Hydraulic modeling | • Feasibility Study<br>• Construction Contract(s)<br>• Construction Improvements | 2002<br>2002<br><br>2003<br><br>2008 | $15,000<br>NA<br><br>$400,000<br><br>$600,000 |
| 3 Update hydrologic models for Credit River, Black Dog Fen and trout stream tributaries and promote reductions in peak flow rates. | • Developer's engineer files<br>• City's consulting engineer design files<br>• State/County/WMO design files<br>• Contour maps<br>• Land use maps<br>• Soils maps<br>• Black Dog Fen Investigation, | • Model<br>• Technical memo and revised data tables | 2003 | $35,000 |
| 4 Identify known flooding and drainage problem areas using GIS | • City maintenance staff<br>• Field review<br>• Reports of resident complaints | • Map of problem areas<br>• Implement local drainage improvements | Annual<br><br>2002-2006<br>2007-2009<br>2010-2016 | NA<br><br>$50,000<br>$60,000<br>$70,000 |
| 5 Develop a model site to establish, promote and monitor the effectiveness of alternative landscape features and innovative stormwater measures | • Available Alternative landscape resources<br>• Heart of the City Storm Water guide for developers<br>• Earley Lake Infiltration Garden<br>• Water Quality Implementation Plan | • Site acquired<br>• Site developed<br>• Monitoring data and report | 2003<br><br>2004 | See Table 13 #4 |
| 6 Oliver Court storm sewer improvements to increase capacity (Black Dog Watershed – West Subwatershed) | • Drainage Study (URS/BRW Dec. 2000) | • Completed plans and construction | 2003 | $110,000 |

## GOAL 2: WATER QUALITY

*M.R. 8410.0080, Subpart 3. Water Quality. Each (WMO) plan must outline specific water quality goals and policies for natural surface water storage and retention systems within the organization. Goals should be related to parameters or quantities that can be measured. The relationship of land use to water quality should be considered when developing goals and policies. The goals and policies should be developed to strive for compliance with applicable water quality standards and be suitable for the intended uses of natural surface water storage and retention.*

**Goal: Achieve water quality standards in lakes, streams, and wetlands consistent with the intended use and classification and to maintain or improve water quality relative to current conditions.**

Water quality is often directly related to the level of nutrients in the water body. While nutrients comprise only one category of substances that can effect water quality, nutrients, principally phosphorous, must be controlled to achieve the water quality goals of this Plan. Phosphorous is almost always the limiting factor to plant growth. Increase the phosphorous and the plant species dominating the lakeshore, open water, or marsh will certainly shift to favor those plants which can best take advantage of the increased supply of phosphorous.

### Controlling Nutrients through Housekeeping Practices

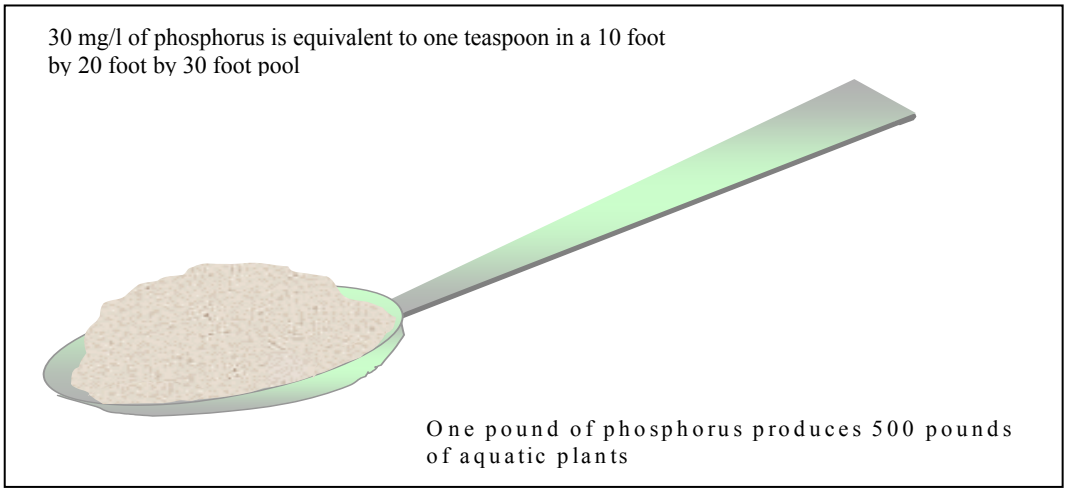
Housekeeping practices are a way for individuals to make a difference. According to the Minneapolis Chain of Lakes Clean Water Partnership, many people do not realize that organic materials, like leaves and grass clippings, fertilizer and pesticides, and pet waste can disrupt the fragile ecosystem of a lake.

#### Leaves and Grass Clippings

Leaves and grass clippings that make their way to lakes are doing even more damage than fertilizers, pesticides and motor oils, according to the Minneapolis Chain of Lakes Clean Water Partnership. Once in the lakes, these organic materials decay, releasing phosphorus. The excess phosphorus increases algae growth, inhibiting the growth of other aquatic plants. When algae die and decay, they exert a biochemical oxygen demand (BOD) on the lake, depleting available oxygen for fish.

#### Fertilizer Application

Fertilizer may be necessary for a healthy lawn, but the nutrients in fertilizer can be harmful to lakes and wetlands. Phosphorus from fertilizers runs off lawns and ultimately discharges to area lakes and wetlands. One pound of phosphorus can yield 500 pounds of algae. Algae can turn a lake green and damage or even kill the lake's ecosystem.




Fifteen to thirty percent of phosphorus in urban runoff comes from lawns. In general, the soils in Burnsville are already rich in phosphorus. Applying the right fertilizer, in the right amount, ensures a healthier lawn and healthier lakes and healthier wetlands. The City adopted a phosphorus free fertilizer ordinance in 2001 in direct response to this planning process. The City's fertilizer ordinance prohibits fertilizers near water bodies, requires commercial applicators to be licensed, and requires everyone to use phosphorus-free fertilizer unless a soil test is conducted to verify the need for phosphorus.

### Animal Waste

From time to time, metro area beaches are occasionally closed for short periods during the peak swim season. It is not because of high nutrient concentrations, poor water clarity or swimmers itch. The beaches close as a result of high fecal coliform bacteria levels. Fecal coliform is a direct result of pet and migratory waterfowl (especially Canadian geese) waste. An education-based approach can reduce this problem. Although many people enjoy seeing Canadian geese, the birds often wear out their welcome when they become too numerous on lawns, parks and golf courses. Yards, beaches and docks become fouled with their feces. The fecal matter contributes to poorer water quality by increasing nutrient loading. See the Recreation, Fish and Wildlife Section (Goal 8) for more detail on the City's goose control strategies.

The City completed a Goose Control Plan in 2001 to help address problems with Canada Geese.

### Highly Impervious Areas

Part of the planning process for developing water quality treatment projects was to identify highly impervious areas throughout the City that could be targeted for future water quality treatment practices. Treatment practices will be considered by the City in newly developed areas as well as for retrofitting existing storm systems in highly

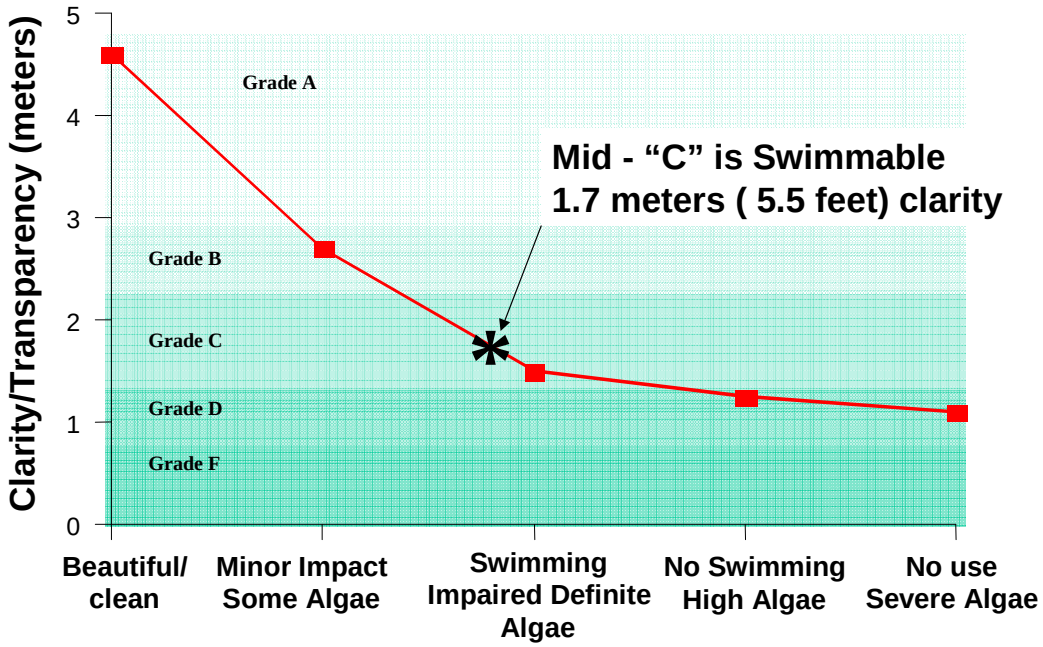
impervious areas of the City. The following list summarizes a few of the targeted areas.

- Burnsville Center;
- Heart of the City at Nicollet Avenue and TH 13;
- Office/Industrial Park areas along County Road 42 near Burnsville Parkway and Southcross Drive;
- Highway Commercial/Industrial areas along TH 13 in northwest Burnsville; and
- General Business Park areas on Nicollet Avenue north of TH13.

### Water Quality Objectives

The goal setting process for Burnsville lakes revolves around their recreational suitability. In 1990, the MPCA completed a questionnaire survey related to negative lake user perceptions (Heiskary, S. and C. B. Wilson, 1990). The survey involved 200 participants within MPCA's Citizen Lake Monitoring Program. The survey focused on individual perception of both the physical appearance of their lake, along with the perceived impacts on whole-body contact recreation (i.e., swimming). Results were analyzed as a function of Secchi disc transparency. Figure 17 illustrates how citizen perception drops with water transparency and how it relates to the Metropolitan Council's grading system.

**Figure 17 - Citizen Perception of Lake Quality versus Lake Clarity**




The water quality objectives of the Plan are centered on Burnsville lakes that support a full range of recreation uses including full-body contact recreation (i.e., they are

swimmable). The priority lakes include Lac Lavon, Crystal Lake, Lake Alimagnet and the future (Kraemer) Quarry Lake. In addition, other significant water bodies have specific water quality goals established based on community input.

During the annual planning session in January 2000, the City Council discussed the issue of having "Grade B" lakes in Burnsville. The idea stems from a system used by the Metropolitan Council to establish lake quality report cards. The Metropolitan Council grading system ranges from A (best) to F (worst). The grading curve represents three water quality indicators (See Table 2 – Executive Summary).

The three variables used in the grading system strongly relate to open-water nuisance aspects of a lake such as algal blooms. These conditions can also indicate accelerated cultural eutrophication (i.e., aging). In-lake phosphorus levels are related to the abundance of algae, chlorophyll a is a measurement of algae abundance and Secchi disc transparency relates to the appearance of the lake. This data supports the conclusion that the less algae in the lake, the better the clarity. Nuisances such as aquatic macrophytes (i.e., weeds) are not indicated with this grading system. Recent grades of selected lakes within the City (see Table 3 – Executive Summary).

Based on the current (Year 2002) grade of selected Burnsville lakes, the question was asked: "Is it possible to achieve Grade B lakes in Burnsville?" Certainly in the case of Lac Lavon, the goal should remain Grade A, as should the goal for future Kraemer/Quarry Lake in northwest Burnsville. But for the other significant water bodies, the question is one of dollars and practicality. If we throw enough dollars at any water body it is possible to achieve Grade B quality. However, the means and methods necessary to achieve the goal, if even financially feasible, still may not be acceptable to the public.

Based on citizen input, the City Council established the lake clarity goals shown in Table 11. For the purpose of future management, the goals will shift from an overall lake grade (i.e., A to F) to the Secchi disc transparency listed in Table 11.

Note that when comparing the City's clarity goal to the action level specified for strategic lakes in the Black Dog WMO, one must understand the differences in these approaches. For example, the City's 2002 clarity goal of 2.6 meters for Crystal Lake was the desired end point or level to achieve. The Black Dog WMO action level of 1.6 meters for Crystal Lake, however, reflected the level for maintenance of existing water clarity. When the clarity varies from the action level, up or down, some action will take place. This discussed in more detail in the Black Dog Watershed Section of this Plan for the four strategic water bodies in Burnsville under the jurisdiction of the WMO, as well as for Lake Alimagnet in the Vermillion River Watershed Section. The 2002 Plan recognized that for any of the water bodies listed in Table 11, the water clarity goal(s) would be re-evaluated upon completion of any diagnostic studies completed.

The 2008 Plan includes updates to the water quality goals for Lake Alimagnet, Crystal Lake, Keller Lake based on studies completed after the publication of the

2002 Plan. In addition, Twin Lake was separated into to distinct water bodies for management purposes and is shown with two separate water clarity goals for North and South Twin individually. The completed studies detail new water quality goals and proposed capital improvement projects intended to facilitate improvements to meet the revised goals**.**

**Table 11 - Lake Water Clarity Goals**

| Lake | 2008 Clarity Goal (meters) [2] | 2002 Clarity Goal (meters) [2] | 3-Year Average Clarity (meters)[1] |
|---|---|---|---|
| **Lac Lavon** | 3.6 | 3.6 | 3.8 |
| **Quarry Lake** | 3.6 | 3.6 | N/A – Future Lake |
| **Crystal Lake** | 2.1 | 2.6 | 1.7 |
| **Wood Pond** | TBD | 1.7 | 1.5 |
| **Lake Alimagnet** | 1.3 | 1.7 | 0.6 |
| **Earley Lake** | 1.7 | 1.7 | 1.7 |
| **Keller Lake** | 1.8 | 1.7 | 1.3 |
| **Sunset Pond** | 1.7 | 1.7 | 2.4 |
| **North Twin Lake** | 1.7 | 1.7 | 1.7 |
| **South Twin Lake** | 1.4 | 1.7 | 1.7 |
| **Black Dog Lake** | | To be developed | No data available |

1. Based on most recent three years of monitoring data available.
2. Average secchi disk reading.

The basic premise behind revising these goals is to establish realistic clarity goals, such that when the goal is met, it will allow the water body (if impaired) to be removed from the impaired waters list. The revised clarity goals are based on the most recent lake monitoring data and lake management plans prepared for each water body. The Water Resources Management Plan allocates funding to implement the strategies identified in the lake management plans to achieve these revised goals. The City will re-evaluate all water quality goals when this Plan is updated in 2016 to consider whether clarity goals should be adjusted or added for any of the community's water bodies. For waters that are impaired, the City plans to work cooperatively with the local watershed organizations and MPCA to convert the lake management plans in to Total Maximum Daily Load (TMDL) studies.

### Policies and Implementation Plan

Tables 12 and 13 present the policies and implementation activity steps the city has developed to achieve the water quality goals of this Plan.

**Table 12 - Water Quality Policies**

| | |
|---|---|
| **Subject:** | |
| ▸ Water quality in lakes, streams and wetlands. | |
| **Purpose:** | |
| ▸ To protect and improve water quality. | |
| **Goal:** | |
| ▸ Achieve water quality standards in lakes, streams, and wetlands consistent with their intended use and established classification. | |
| **Water Quality Policies** | |
| ***Policy 2.1:*** | Development that disturbs one-half acre or more, or creates 5000 square feet or more of new impervious surface, shall demonstrate that the project meets the volume control/infiltration standards or total phosphorus and total suspended solids reduction described in Appendix C of this Plan and the discharge standards in the City Comprehensive Wetland Protection and Management Plan. |
| ***Policy 2.2***: | Development that meets the thresholds for coverage under the NPDES Construction Storm Water Permit, shall meet the permit requirements for discharges to all waters and follow specific requirements resulting from approved TMDL implementation plans. |
| ***Policy 2.3:*** | Proposed developments must identify all reasonable steps to avoid water quality impacts, and to mitigate impacts with appropriate best management practices (BMPs), to prevent water quality in receiving waters from falling below established standards, and to meet erosion control standards. |
| ***Policy 2.4:*** | The City shall maintain a response plan to minimize the impact of hazardous spills. |
| ***Policy 2.5:*** | The City shall supplement its regulatory approach with an education-based approach to achieve proper yard care measures that will reduce nutrient loading to lakes, creeks and wetlands and to reduce the impacts of animal waste. |
| ***Policy 2.6:*** | The City shall promote the reduction or minimization of hard surfaced areas. |
| ***Policy 2.7:*** | The City will balance protection of wetlands and utilization of wetlands to protect the water quality of other water resources (i.e., wetland, lake, stream) based on wetland classifications in the City Comprehensive Wetland Protection and Management Plan. |
| ***Policy 2.8:*** | The City encourages the use of alternative landscape techniques and materials and low impact development (LID), integrated management practices (IMPs), and green infrastructure systems to reduce water quality impacts. |
| ***Policy 2.9:*** | The City will manage public properties in accordance with the appropriate best management practices. |
| ***Policy 2.10:*** | The City will play an active role in participating in TMDL studies for impaired waters within its boundaries, or within 1-mile of its boundaries and to which the City has discharges. The City will be a participant in developing and implementing the TMDL load allocations. The City will also work with the BDWMO in developing and implementing water quality improvement plans. |

## Table 13 - Water Quality Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Continue citizen participation programs to encourage stewardship of lake water quality | • City staff<br>• Dakota County<br>• MPCA<br>• Metropolitan Council (CAMP) | • Lake water quality grade | Annual | NA |
| 2. Implement City Goose Management Program | • Minnesota DNR<br>• Home owners<br>• Available programs from other communities<br>• Minnesota DNR<br>• City Goose Management program<br>• Recreation, Fish & Wildlife Plan Goal | • Lake water quality | Annual | $13,000 |
| 3. Develop and implement a program to investigate the nutrient characteristics of existing ponds on a prioritized subwatershed basis | • Prioritized list of subwatersheds<br>• GIS database<br>• U of M Approach<br>• Black Dog WMO Study | • Documentation and database revision | 2003-2016 | See Table 27 #1 |
| 4. Develop a model site to establish, promote and monitor the effectiveness of alternative landscape features and innovative stormwater measures | • Available Alternative landscape resources<br>• Heart of the City<br>• See Water Quantity Goal | • Site acquired<br>• Site developed<br>• Monitoring data | Ongoing | See Table 61 #4<br>See Table 72 #1 |
| 5. Develop specific water quality enhancement strategies for Burnsville Center | • Available as-built drawings<br>• Parking studies<br>• Future use and operational plans | • Documented strategies and schedule | 2004 | $25,000<br>$3,250,000 |
| 6. Implement water quality improvement projects | • Heart of the City, Block #1 Bioretention (2002)<br>• Wetland restoration site (0.8 acres) south and east of Crystal Lake Beach Parking Lot.<br>• Judicial Pond/Judicial Road<br>• Water quality projects in other areas of the City<br>• North Twin Lake (Wetland banking credits) | • HOC Block #1<br>• Water quality improvements | 2002<br>2005<br>2007<br>2008<br>2009<br>2010<br>2011 - 2016 | $50,000<br>$200,000<br>$575,000<br>$35,000<br>$450,000<br>$370,000<br>$1,020,000 |
| 7. Provide adequate treatment to address potential discharge of storm water to future Quarry Lake | • Industrial Park Pond Study (SEH, 2001)<br>• Future zoning and land use for Northwest Burnsville | • Completed land acquisition and constructed project<br>• Revised zoning | 2002<br>2002 | See Table 80 #2 |
| 8. Encourage development to include low impact development techniques, use of alternative landscapes and promotion of infiltration | • Available Information<br>• Example projects (see Heart of the City Subcatchment – Black Dog Watershed) | • Approved narrative with development plan<br>• Implemented project | 2002 | See Table 61 #4 |

## GOAL 3: EROSION CONTROL

*M.R. 8410.0080, Subpart 9. Erosion. Each (WMO) plan must identify specific goals and policies that will control soil erosion consistent with the goals and policies outlined in this part.*

**Goal: Minimize soil erosion through increased education and enforcement.**

### Soil Erosion's Connection to Water Quality

Water quality problems are frequently linked to high phosphorus concentrations. Phosphorus is often transported to surface water through soil erosion but can also be transported to waters in a variety of other mechanisms**.** Nevertheless, erosion control is extremely important in the effort to improve water quality. Soil erosion and sediment deposition also can create pond and drainage way performance and maintenance issues.

Ponds and drainage facilities are impacted by erosion and sediment from a variety of sources including construction sites and street sanding in the winter. The coarse sediment accumulates in ditches and ponds where runoff velocities are low. Usually a sand delta appears at a storm sewer outfall that is a visible indication of the effectiveness of erosion and sediment control measures and road maintenance activities of the past winter. As the sediment builds up over time, it reduces the capacity of the drainage system and the pollutant removal capabilities of ponds by reducing storage volume below the outlet, and reduces infiltration rates. Extending the life of facilities involves source control and elimination of the material that causes the problem. Regulatory aspects will control a major portion of the sediment. Street maintenance and an effective sweeping program (see Maintenance and Inspection) will also have a positive impact.

### Stream and River Bank Erosion

Stream bank erosion occurs as a result of increasing peak flow rates and sustained high flows which can severely damage stream bank vegetation, cause bottom scour and accelerate the erosion process. Each of the Watershed Organizations in Burnsville is specifically addressing this issue. Burnsville's efforts to control the rates of discharge provide adequate control at this time. The City Plan will be amended in the future to remain consistent with future stream protection strategies of the Watersheds.

The City will consider opportunities to implement bioengineering practices and approaches to help stabilize the river bank and reduce bank erosion along the Minnesota River. The City will also work with LMRWD to address identified slope erosion issues on the bluffs adjacent to the River.

### Policies and Implementation Plan

Tables 14 and 15 present policies and implementation activity steps the City has developed to achieve the erosion control goals of this Plan.

## Table 14 - Erosion Control Policies

| | |
|---|---|
| **Subject:**<br>➢ Erosion control | |
| **Purpose:**<br>➢ To control erosion and sedimentation | |
| **Goal:**<br>➢ Minimize soil erosion through increased education and enforcement | |
| **Erosion Control Policies** | |
| ***Policy 3.1:*** | Erosion and sedimentation control plans shall be reviewed and enforced by the City of Burnsville for all grading activities. These plans shall conform to the general criteria set forth by the City's erosion and sediment control ordinance and applicable NPDES Construction Site Erosion Control Permits (MPCA). |
| ***Policy 3.2:*** | The City shall implement the erosion control ordinance to control erosion and sediment to extend the effective life of water resources facilities and reduce pollutant loading. |
| ***Policy 3.3:*** | The City shall develop proactive measures such as education, incentives and recognition of erosion control efforts to prevent soil erosion. |
| ***Policy 3.4:*** | Construction site inspection by the City must be completed prior to commencing earthwork activities to ensure the proper best management practices are in place. |
| ***Policy 3.5:*** | Horizontal, terrestrial buffer zones of 20 feet are encouraged around existing wetlands and storm water ponds. New development or redevelopment projects must provide the 20 foot buffer zone around wetlands and are encouraged to provide 20 foot buffers around existing storm water ponds. Buffers are required around new storm ponds, resulting from new development or re-development. Buffers shall be maintained in native vegetation, to provide habitat for wildlife. (See also Table 16.) |
| ***Policy 3.6:*** | The City will maximize the use of bioengineering approaches whenever possible for all slope stabilization and permanent erosion control projects, including consideration of reducing slope stability and bank erosion along the Minnesota River and the bluffs adjacent to the River. |

## Table 15 - Erosion Control Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Budget |
|---|---|---|---|---|
| 1. Include an erosion and sedimentation component to the inspection and maintenance program | • See Maintenance and Inspection Goal and implementation plan | • Annual inspection process | NA | NA |
| 2. Develop an erosion and sediment control guidance manual | • City ordinance<br>• Existing practice manuals | • Approved document | 2003 | $15,000 |
| 3. Add a half-time staff position dedicated to erosion control activities | • Storm water utility | • Inspections | Annual (Start 2002) | $25,000 |

## GOAL 4: WETLANDS

*M.R. 8410.0080, Subpart 8. Wetlands. Each (WMO) plan must outline specific goals and policies regarding the management of wetlands within the organization and identify high priority areas for wetland preservation, restoration, and establishment. Wetland management goals and policies should address utilization, protection and preservation, and the enhancement or restoration of wetlands identified in the organization. Each plan must also evaluate the need to establish wetland-banking system.*

**Goal: Maintain or increase the amount of wetland acreage, and increase the wetland functions and values within the City, in accordance with the adopted Comprehensive Wetland Protection and Management Plan.**

The key to meeting the City's wetland goal is the implementation of a Comprehensive Wetland Protection and Management Plan (WPMP). In 1997, the City received a grant from BWSR to develop a wetland plan. The plan was completed in 1998 and adopted by City Council. The wetland inventory was based on the wetlands shown on the National Wetland Inventory (NWI) and the City's Water Resources Management Plan (WRMP). In addition, the evaluation of each of the basins included in the inventory consisted only of a brief visit and visual analysis of each wetland. Field delineation, assessment of hydrology, identification of all plant species and characterizations of soils were not performed.

The City completed an update to the Wetland Protection and Management Plan (WPMP) in 2008 The main objective for the updated WPMP is to provide a current inventory of the wetland resources in the City, differentiate regulated wetlands from other water features, and develop a comprehensive approach to regulate and protect wetlands based on wetland functions and associated public values.

The WPMP includes an update of the results of a complete field inventory of the City along with an assessment of the quality of the wetland resources completed in 1998. It is intended to provide a guide for City staff and residents to make informed decisions about the future development and redevelopment of the City with respect to the protection, conservation, and management of wetland resources.

### Strategies

It is a priority in the City of Burnsville to preserve and enhance the quality of the natural resources in the community. The following are the strategies that will be utilized by the city of Burnsville to preserve and evaluate the community's wetland resources.

- Maintain primary responsibility for managing water resources at the local level but continue coordination and cooperation with other agencies and organizations.

- Establish appropriate protection criteria based on wetland functions and values.
- Achieve water quality standards in lakes, streams, and wetlands consistent with their designated uses and established classifications.
- Protect and rehabilitate wetlands to maintain or improve their function and value.
- Minimize soil erosion and sedimentation in wetlands. Improve Water Quality.
- Use GIS and available resources on restorable wetlands to identify likely areas of wetland restoration. Identify opportunities to control invasive species.
- Provide information and educational resources to improve knowledge and promote an active public role in management of water resources.

Table 16 provides a summary of the updated buffer requirements as they affect each of the different wetland classifications. A map of the updated 2008 wetland inventory is provided as Figure 13, which is discussed in more detail in the Land and Water Resources Inventory section of this plan.

**Table 16 - Summary of Wetland Buffer Requirements**

| Wetland Classification | Permanent Buffer Strip Average Width (feet) | Minimum Permanent Buffer Zone Width (feet) | Percentage Native Vegetation |
|---|---|---|---|
| Protection | 50 | 30 | Entire |
| Improvement | 35 | 25 | Entire |
| Management | 25 | 20 | Majority |
| Management II | 20 | 20 | Majority |

### Policies and Implementation Plan

Tables 17 and 18 present policies and implementation activity steps the City has developed to help achieve the wetland management goals. Please refer to the Wetland Protection and Management Plan (SEH 2008) for more detail.

**Table 17 - Wetlands Policies**

| | |
|---|---|
| **Subject:**<br>➢ Wetland Management | |
| **Purpose:**<br>➢ To utilize, protect, preserve and enhance wetlands. | |
| **Goal:**<br>➢ Maintain or increase the amount of wetland acreage, and increase the wetland functions and values within the City, in accordance with the adopted Comprehensive Wetland Protection and Management Plan | |
| **Wetland Policies** | |
| ***Policy 4.1:*** | The City shall administer wetland protection and mitigation in accordance with the Minnesota Wetland Conservation Act and the City's Wetland Ordinance. |
| ***Policy 4.2:*** | The artificial water level fluctuation (bounce) in wetlands resulting from storm water runoff shall be managed in accordance with the City's wetland classifications. |
| ***Policy 4.3:*** | Where open water areas are permitted to be excavated in wetlands for the purpose of creating habitat diversity, the excavation shall be done in conformance with DNR regulations and the Minnesota Wetland Conservation Act and the City's wetland ordinance. |
| ***Policy 4.4:*** | The City will identify all restorable wetlands. |
| ***Policy 4.5:*** | The City will require conformance to the buffer requirements in the Wetland Management Plan and as prescribed in the wetland ordinance. |
| ***Policy 4.6:*** | The City of Burnsville will utilize the available technical resources of outside agencies, such as the Department of Natural Resources, Dakota Soil and Water Conservation District, the Board of Water and Soil Resources and/or the Watershed Management Organization, for review of private developments and City-proposed projects that may affect wetland resources. |
| ***Policy 4.7:*** | The City will utilize the U.S. Fish and Wildlife Service for review of projects that may impact the Refuge. |
| ***Policy 4.8:*** | Developers must provide field delineation in accordance with applicable rules and regulations to determine the jurisdictional boundaries of wetlands, including a report of the results of the field delineation, detailing the methodology and findings of the delineation. A printed and electronic copy of the approved delineation boundary will be required. |
| ***Policy 4.9:*** | Prior to any site development activities, the City will verify through a wetland boundary determination to identify the location and extent of any wetlands present. The results of the wetland boundary determination will be compared to the field delineation data provided by the developer. |
| ***Policy 4.10*:** | Any review of a proposed wetland encroachment will first address the issue of avoidance and project alternatives. Prior to allowing any wetland encroachment, all reasonable attempts to avoid such alteration must be demonstrated. This avoidance must also consider the reasonableness of the no build alternative. Mitigation of unavoidable wetland impacts shall be accomplished through restoration (first priority); enhancement (second priority); or creation (third priority). |
| ***Policy 4.11:*** | Sequencing Flexibility, as defined in the Wetland Conservation Act, may be applied to Management II wetlands. Sequencing Flexibility shall not apply to wetlands classified as Improvement or Protection Areas. |

**Table 17 (Continued)**

| | |
|---|---|
| ***Policy 4.12:*** | Replacement for unavoidable wetland impacts will be provided by the developer (if possible, within the same subwatershed), in accordance with the requirements of the City Comprehensive Wetland Protection and Management Plan. |
| ***Policy 4.13:*** | The City will not allow excavation, or other non-filling related alterations to an existing wetland without the expressed written approval of the City Manager or designee. Excavation within the boundaries of existing wetlands will be allowed only if the action will not change the use or character of the basin. Excavation will be allowed without replacement in basins as Management Areas. Excavation will not be allowed in basins classified as Improvement or Protection Areas unless it can be shown that the proposed excavation will improve or enhance the functions and values of the basin. |
| ***Policy 4.14:*** | Management II wetlands having existing direct storm water discharges will be managed primarily for the purpose of storm water storage and treatment. Additional storm water runoff can be directed to these basins though existing outlets without creating additional (dead storage) treatment volume as long as the developer shows that the existing treatment capacity meets City standards and other wetland functions and values are not adversely affected. New direct discharge points to all wetlands and waters must at least include pretreatment. New discharges to Management II wetland must have at least grit removal prior to discharge. |
| ***Policy 4.15:*** | Pretreatment of storm water runoff discharged directly into Management Area wetlands having no existing direct discharges of storm water shall be provided by the developer in accordance with City standards. |
| ***Policy 4.16:*** | Storm water runoff discharged directly into Improvement or Protection Area wetlands shall be pretreated in accordance with City standards. |
| ***Policy 4.17:*** | The City of Burnsville supports the use of banking wetland credits for the replacement of wetland impacts to Management Area wetlands. Those proposing banking projects are encouraged to locate mitigation banks in those subwatersheds within the City having lost significant wetland habitat and at sites approved by the City. Restoration of wetland habitat is preferred to wetland creation. Priorities for wetland banking include the potential restoration sites identified in this plan, interspersion of wetland types, successful revegetation with diverse native species, areas greater than 10 acres in size and position within a watershed that provides needed functions. |
| ***Policy 4.18:*** | The City will encourage developers to include wetland improvement as well as wetland protection strategies in proposed development and redevelopment projects. Public Value Credits (PVCs) may be provided for improvement of existing wetland habitat associated with development and/or wetland replacement projects, in accordance with established WCA rules. |

**Table 17 (Continued)**

| | |
|---|---|
| ***Policy 4.19:*** | Annual monitoring of wetland replacement, banking and improvement projects will be required as specified in the rules of the Wetland Conservation Act. The City will maintain an escrow account for each development or redevelopment project requiring wetland monitoring. A portion of the escrow will be returned to the developer each year upon receipt of the annual report. Any remaining balance in the account will be returned to the developer upon approval for the project by the Technical Evaluation Panel |
| ***Policy 4.20:*** | The City will continue its involvement in the Wetlands Health Evaluation Program (WHEP). |
| ***Policy 4.21:*** | The City will assess opportunities for purchase of vacant properties with restoration or wetland improvement opportunities. Incentive to explore property acquisition may include the need for wetland mitigation or banking for City projects, identification of a significant resource needing preservation, identification of tax forfeited property or offer of purchase by the property owner. |
| ***Policy 4.22:*** | The wetlands and associated recreational and wildlife habitat opportunities within the areas zoned as Conservancy Districts will continue to be protected to a maximum practical extent. |

**Table 18 - Wetland Implementation**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Continue citizen participation programs to encourage stewardship of wetland resources | • City Natural Resources Staff/Intern<br>• Dakota County Staff<br>• MPCA<br>• WHMP | • Index of biological integrity | Annual | NA |
| 2. Prepare and mail newsletter for public education about the importance of wetland resources and their protection and management | • City Natural Resource Staff<br>• Burnsville Bulletin | • Completed Document<br>• Mailing List | Annual | NA |
| 3. Develop guidelines for developers that summarize City policies and requirements for development and redevelopment that may affect wetland resources | • City Natural Resources Staff<br>• Comprehensive Wetland protection and Management Plan<br>• Natural Resources Master Plan | • Published Guidelines | Complete | NA |
| 4. Assess opportunities for wetland restoration and wetland banking in City parks and other vacant parcels | • City Staff | • Records of restoration and banking sites and access | Annual | NA |

## GOAL 5: PUBLIC PARTICIPATION, INFORMATION & EDUCATION

*M.R. 8410.0080, Subpart 5. Enhancement of Public Participation; Information and Education. Each (WMO) plan must outline goals and policies describing who will participate and when public participation will be encouraged. Goals and policies must at least address the creation and purposes of advisory committees and public information programs.*

**Goal: Increase public participation and knowledge in management of the water resources.**

Public involvement is a strategy that recognizes people want to be involved in decisions that affect any facet of their life. It creates and implements opportunities for the public to participate in the processes that lead to decision-making.

The City's web site (www.ci.burnsville.mn.us) is an alternative medium to provide municipal information to both City residents and those people who live outside Burnsville. An electronic version of the water resources management plan will ultimately be accessible on the web. Because the Plan has such a wide audience from engineers and planners, to developers and citizens, to scientists and educators, electronic access to the text and mapping creates a better understanding of the goals, policies and activities of this Plan.

The City will continue to distribute information on pertinent water and wetland management issues via the Burnsville Bulletin. The Bulletin will promotes opportunities for residents to participate in water resources management activities.

The City will make an ongoing effort on both a City-wide and watershed level toward educating the public by distributing information to its residents on responsible practices they should employ to protect water resources within the community. The program shall also educate residents on the benefits of using phosphorus-free fertilizer. Educational information shall also be provided regarding the proper use of a wide range of lawn chemicals.

### Policies and Implementation Plan

Tables 19 and 20 present policies and implementation activity steps the City has developed to achieve the goals of this plan.

**Table 19 - Public Participation, Information and Education Policies**

| | |
|---|---|
| **Subject:**<br>➢ Enhancement of Public Participation, Information and Education | |
| **Purpose:**<br>➢ Encourage active community involvement in water resources management. | |
| **Goal:**<br>➢ Increase public participation and knowledge in management of the water resources of the community. | |
| **Public Involvement Policies** | |
| ***Policy 5.1*:** | The City will use a public involvement process in resource management decision-making (i.e., the Parks and Natural Resources Committee). |
| ***Policy 5.2*:** | The City will use a variety of media, including newsletters, local cable television and the City's Website, to inform the community about water resource issues program including alternative landscapes, phosphorus free fertilizer, aquatic plant management, etc. The City will make an ongoing effort on both a local and regional level by distributing information to residents on responsible practices to protect water resources. Educational information will also be provided regarding the proper use of a wide range of lawn chemicals and proper disposal of hazardous household materials. |
| ***Policy 5.3:*** | The City will work with existing public and private resources to increase public participation in water resources management and disseminate information regarding each of the local watershed management organizations having jurisdiction within the City. |
| ***Policy 5.4:*** | The City will establish model interpretive sites for public education. |
| ***Policy 5.5:*** | The City will continue to educate elected officials on water resources management needs and issues. |

## Table 20 - Public Participation, Information, and Education Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Budget |
|---|---|---|---|---|
| 1. Conduct Public Education Program to develop an understanding of goals, policies and implementation of the Water Resources Management Plan (WRMP) | • City staff<br>• Lake association members<br>• Environmental Quality Fairs<br>• Earth Day Activities<br>• Water resources management plan<br>• City newsletter<br>• Local Newspaper | • Public participation meetings<br>• Resident Survey<br>• Response to feedback<br>• Lake plan revisions<br>• City newsletter | Annual | NA |
| 2. Involve civic, neighborhood groups, business, industry and schools to promote activities which improve water quality | • City staff<br>• Schools<br>• Existing stenciling program<br>• Newsletter<br>• Phosphorus free fertilizer ordinance | • Completed presentation<br>• Presentation evaluations | Annual | NA |
| 3. Expand the City's Web Site, describing this plan and citizen involvement opportunities | • City Staff | • Complete home page<br>• System support and update | 2002 | NA |
| 4. Continue to publicize and support the existing Parks and Natural Resources Commission | • City newsletter<br>• PNRC Annual Plan<br>• City Council | • Evaluate progress towards annual goals | Annual | NA |
| 5. Pursue education related grants | • List of applicable programs<br>• Grant applications | • Completed applications<br>• Grant award | Annual | NA |
| 6. Continue citizen program to assist in watershed monitoring | • Monitoring Goal | • See Monitoring Plan | Ongoing | NA |
| 7. Involve stake holders in making decisions about water resources | • City staff<br>• Lake association members<br>• Environmental Quality Fairs<br>• Earth Day Activities<br>• Water resources management plan<br>• City newsletter<br>• Local Newspaper | • Public participation meetings<br>• Resident Survey<br>• Response to feedback<br>• Lake plan revisions | Ongoing | NA |
| 8. Explore an annual City Council recognition program for environmental projects completed in the City | • City Staff<br>• BDWMO<br>• Lower MN WD<br>• Lake Association | • Recommendation to Council for recognition program | 2004 | NA |

## GOAL 6: MONITORING

*MR 8410.0100, Subp. 5 Data Collection Programs. Each (WMO) plan must establish water quality and quantity monitoring programs tat are capable of producing accurate data to the extent necessary to determine whether the water quality and quantity goals of the organization are being achieved. The programs shall, at a minimum, include the location of sampling, the frequency of sampling, the proposed parameters to be measured, and the requirement of periodic analysis of the data.*

**Goal: Implement a comprehensive water resource monitoring program.**

### Types of Monitoring (Wells, 1992)

Water resources monitoring is not a one-dimensional activity. Monitoring takes different forms and has different characteristics, depending on its purpose and intended uses. Typically, three general types of monitoring are conducted:

1. ambient;
2. compliance; and
3. special research or study monitoring.

*Ambient monitoring* focuses on describing baseline conditions and possible trends in water quality or quantity. Ambient monitoring provides "early warnings" of problems or resources needing particular attention. Ambient monitoring also gives the information needed to evaluate the effectiveness of management programs and projects.

*Compliance monitoring* is usually done in response to a specific statute, ordinance, or rule. Depending on the regulatory program, this monitoring may be conducted either by the regulated community or the regulatory agency. It is probably the least useful for determining water quality baselines and trends.

*Special research* and study monitoring is conducted to develop basic information about a specific issue, concern, or theme where such information is missing or incomplete. Monitoring results must be used carefully to make broad-based conclusions because it is often short-term in nature. Still, when compliance and special research and project monitoring data are properly integrated with ambient data, more complete analysis of ambient conditions or trends will result.

### Local Data Collection

The DNR, Metropolitan Council, the WMOs and citizen volunteers have conducted monitoring in Burnsville. The future contribution of local governments to water data collection must be recognized, encouraged, and developed. Current lake water quality data for many of Burnsville's lakes is generally insufficient to establish baseline water quality. Clearly there is a need to expand the existing monitoring at the local level, even beyond that potentially available from citizen-volunteers. There is also a need

for the City to acquire additional water quality data, based on a review of existing information.

### Lake Monitoring

Citizen Lake-Monitoring Program (CLMP)

The CLMP is a cooperative program combining the technical resources of the MPCA and volunteer efforts of citizen to collect water quality data on lakes (MPCA). Volunteers collect water transparency data using a Secchi disk on a once-per-week frequency. Long term transparency monitoring helps detect signs of water quality degradation. Data compiled from Secchi readings is used by MPCA staff to prepare water quality reports, compile trends analysis, plan lake protection strategies and define lake characteristics by region. There is a one-time fee for volunteers, to cover the cost of equipment. Volunteers receive instructions on using the disk, data sheets and a copy of annual lake water quality reports in their region.

Citizen-Assisted Monitoring Program (CAMP)

The CAMP program began in 1992 as a cooperative program between the Metropolitan Council and local governments. The purpose of the program is to obtain a profile of the water quality in the metro area. Data collected is analyzed by the Metropolitan Council and an annual report is produced for participating local governments. CAMP is similar to the CLMP, except that it is regional, not statewide, in nature. Through the CAMP program, Metropolitan Council collects water quality samples for basic water chemistry analysis.

Volunteers monitor lakes and make general observations about water color, temperature and odor; wind conditions; water surface conditions; cloud cover; lake level; air temperature; amount of aquatic plants; the lake's physical condition and its suitability for recreation. Volunteers may also collect water samples, and take detailed measurements of water clarity. Water samples are then analyzed by the Metropolitan Council for nitrogen, chlorophyll and phosphorus levels.

Water quality data including Secchi disc depth (clarity), total phosphorus and chlorophyll –a concentrations were collected at the lakes below, in the years listed:

- Crystal Lake – 1973, 1980, 1983, 1989, 1994-2007
- Keller Lake – 1996-2007
- Lac Lavon –Secchi disc only 1989 – 1991, 1997-2007.
- Earley Lake – 1994-2007
- Wood Lake – 1996-2007
- Sunset Pond – 1994-2007
- Twin Lakes – 1999, 2001-2007

### Wetland Monitoring

Land use changes and landscape level activities will influence the functional status of wetlands. Changes in the amount of surrounding open space, surface water systems, and ground water can lead to changes in wetland bio-diversity, habitat, dominant vegetative cover, and hydrology.

Burnsville, in partnership with the Dakota County Environmental Education Program, operates a volunteer wetland monitoring program named the Wetland Health Evaluation Program (WHEP). Burnsville's WHEP program allows citizens to assist in monitoring the health of several wetland areas in the City by sampling and documenting wetland plant, frog, and invertebrate communities. Volunteers are trained in how to gather and document the health assessment information. Funding for the program was approved by the Minnesota Legislature in 1999 under the LCMR Trust Fund.

### Stream Monitoring

The City acknowledges the stream protection efforts in Burnsville by the Lower Minnesota River Watershed District and the DNR. Monitoring trout stream segments in the City will also be evaluated and coordinated with the WMOs and DNR.

### Storm Water Runoff Characterization

As part of the Water Resources Management Plan, six different locations were monitored during the 1999 growing season. These areas are shown in Figure 18 and include the following:

- Inflow to Wood Park Pond;
- Runoff from Burnsville Center;
- Industrial area near Southcross;
- Inflow to Crystal lake;
- Crystal Lake discharge to South Twin; and
- Inflow to Lake Alimagnet.

The sampling units used for this project were the Sigma Samplers, 900 Series. These sampling units were installed in storm sewer manholes, with the intake tube and flow sensor attached to the bottom of the manhole. No rain gauges were available, so the sampling units were programmed to collect samples once the water level in the manhole reached a certain depth. This depth varied between sites, with the average depth being between 0.4 and 1 inch. There were only two Sigma units available for use in the monitoring, so the units had to be rotated between the sites. Monitoring occurred from June until November 1999.

No samples were taken at Site #5, the flow from Crystal Lake to South Twin Lake. This was due to a large baseflow in the storm sewer system, and the difficulty in installing the sampling unit.

Only one set of data was taken at each site. The results can be seen in Table 21 for the following parameters that were analyzed:

- Total Suspended Solids (TSS)
- Total Phosphorus (TP)
- Total Kkjeldahl Nitrogen (TKN)
- Soluble Phosphorus
- Nitrate/nitrite as N
- Copper
- Lead
- Zinc

A comparison of the EPA's Results of the Nationwide Urban Runoff Program (NURP) Volume I-Final Report is illustrated in Table 22. Table 22 gives the median event mean concentration (EMC) by land use category. The EMC is defined as the total constituent mass discharge divided by the total runoff volume.

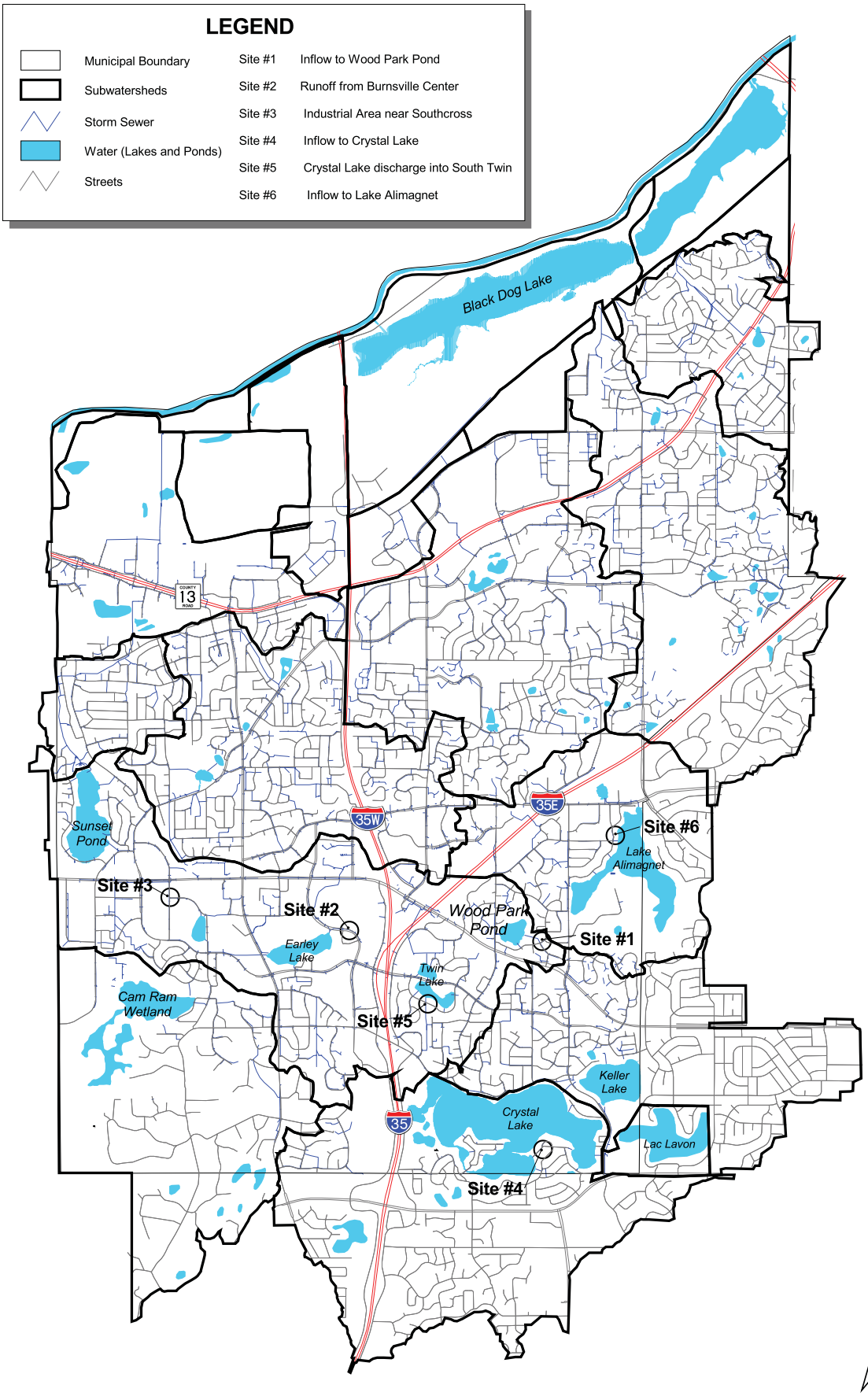
**Table 21 - Summary of Burnsville Water Quality sampling**

(1999 growing Season)

| | **Site 1** | **Site 2** | **Site 3** | **Site 4** | **Site 5** | **Site 6** | **NURP Averages** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Land Use** | **Res.** | **Commer** | **Indust.** | **Res.** | **Res.** | **Res.** | **Res.** | **Commer** | **Indust.** |
| **Location** | Wood Park Pond | Burnsville Center | Inndustrial Area | Inflow to Crystal Lake | From Crystal to So. Twin | Inflow to Alimagnet | | | |
| **Total Susp. Solids - TSS (mg/l)** | 46 | 3* | 63 | 80 | NS | 20 | 101 | 69 | 69 |
| **Total Phosphorus – TP (mg/l)** | 0.2 | 0.086 | 0.37 | 0.29 | NS | 0.48 | 0.383 | 0.201 | 0.201 |
| **Total Kjeldahl Nitrogen TKN (mg/l)** | 0.3 | 0.6 | 1.8 | 1.5 | NS | 1.7 | 1.9 | 1.18 | 1.18 |
| **Soluable Phosphorus (mg/l)** | 0.087 | 0.083 | 0.19 | 0.19 | NS | 0.42 | 0.143 | 0.08 | 0.08 |
| **Nitrate/Nitrate (mg/l)** | 0.36 | 0.33 | 2.5 | 0.7 | NS | 0.62 | 0.736 | 0.572 | 0.572 |
| **Copper (:g/l)** | 10 | 10 | 10 | 10 | NS | 10 | 33 | 29 | 29 |
| **Lead (:g/l)** | 40 | 40 | 40 | 40 | NS | 40 | 144 | 104 | 104 |
| **Zinc (:g/l)** | 90 | 20 | 30 | 20 | NS | 20 | 135 | 226 | 226 |

* This sample was received outside of the EPA recommended holding time
NS = No sample taken.

Left blank intentionally.




1" = 3500'

| | | | | |
|---|---|---|---|---|
| SEH | 9/20/02<br>watershed.apr<br>naf | WATER QUALITY SAMPLING LOCATIONS | FILE NO. ABURNS9904.00<br>FIG NO. 18 | |

**Table 22 - Median EMCs for All Sites by Land Use Category**

(Source: Results of the Nationwide Urban Runoff Program Volume 1 Final Report, EPA 1983)

| Pollutant | | Residential | | Mixed Use | | Commercial | | Open/Nonurban | |
|---|---|---|---|---|---|---|---|---|---|
| | | Median | CV | Median | CV | Median | CV | Median | CV |
| Biochemical Oxygen Demand (BOD) | mg/l | 10.0 | 0.41 | 7.8 | 0.52 | 9.3 | 0.31 | - | - |
| Chemical Oxygen demand (COD) | | 73 | 0.55 | 65 | 0.58 | 57 | 0.39 | 40 | 0.78 |
| Total Suspended Solids (TSS) | | 101 | 0.96 | 67 | 1.14 | 69 | 0.85 | 70 | 2.92 |
| Total Lead | :g/l | 144 | 0.75 | 114 | 1.35 | 104 | 0.68 | 30 | 1.52 |
| Total Copper | | 33 | 0.99 | 27 | 1.32 | 29 | 0.81 | - | - |
| Total Zinc | | 135 | 0.84 | 154 | 0.78 | 226 | 1.07 | 195 | 0.66 |
| Total Kjeldahl Nitrogen | | 1900 | 0.73 | 1288 | 0.50 | 1179 | 0.43 | 965 | 1.00 |
| $NO_2 – N + NO_3 – N$ | | 736 | 0.83 | 558 | 0.67 | 572 | 0.48 | 543 | 0.91 |
| Total P (TP) | | 383 | 0.69 | 263 | 0.75 | 201 | 0.67 | 121 | 1.66 |
| Soluable P (TP) | | 143 | 0.46 | 56 | 0.75 | 80 | 0.71 | 26 | 2.11 |
| SP/TP – median – 0.30 | | 0.37 | | 0.21 | | 0.40 | | 0.21 | |

*CV = Coefficient of Variation

Most concentrations for the sampled sites were under the EPA's guidelines. The Industrial area by Southcross Drive had the most parameters over the median EMC. TKN, soluble phosphorus, and nitrate/nitrite as N all exceeded these guidelines. In general, industrial sites tend to have higher pollutant loading due to their larger amounts of impervious area. The inflow to Crystal Lake had an inflated soluble phosphorus concentration by approximately 0.05 mg/L over the median EMC. The inflow to Lake Alimagnet had a high concentration of both TP and soluble phosphorus.

High nutrient loadings to water bodies can cause many water quality problems. It can lead to eutrophication issues, which can affect the biology of the lake along with the recreational use and aesthetics of the lake. The results from the water quality monitoring can be used in the future to target areas where more storm water management techniques could be applied, and water quality treatment facilities could be built.

The Black Dog WMO continues to monitor the quality outfalls from the Burnsville system including the box culvert behind Cub Foods at TH13, through Metropolitan Council's Watershed Outlet Monitoring Program (WOMP) (Barr, 2001). In addition, Citizen Lake monitoring and monitoring by Metropolitan Council continues to add to the significant database that exists for Burnsville's water resources. A monitoring element in the implementation plan will facilitate future trends analysis.

### Current Monitoring Strategy

It is the City's intent to implement a monitoring program that meets or exceeds the monitoring requirements of the agencies having jurisdiction within the City. In addition to "traditional" monitoring elements, aesthetic and habitat indicators will also be monitored. Table 23 summarizes the City's monitoring program strategy.

**Table 23 - Water Resource Monitoring Program Summary**

| Monitoring Location | Type of Monitoring | Monitoring and Follow-up Activities |
|---|---|---|
| Black Dog Lake | Monitoring by Xcel and City. | City to work with Xcel to analyze monitoring data.<br>Consultant to review Xcel data, prepare a report and summarize for Council<br>Report to Council on status of Black Dog Lake |
| Alimagent, Keller, Crystal, Lac Lavon | Annual participation in CAMP program | Annual aesthetic and habitat monitoring per BDWMO |
| Wood Pond, Earely Lake, Sunset Pond, Twin Ponds | Annual participation in CAMP program | Aesthetic and habitat monitoring every three years per BDWMO |
| Wetland Monitoring | Reference wetlands to be selected by the City | |
| Storm Water Ponds | Visual and Sediment accumulation surveys | On an as-needed, complaint or project specific basis |
| Remnant Trout Streams | Annual thermal and chemical (Cu) monitoring | |
| Key storm water outfalls | Minimum of three representative storm water events | |

### Policies and Implementation Plan

Tables 24 and 25 present policies and implementation activity steps the City has developed to meet the monitoring goals of this plan.

**Table 24 - Monitoring Policies**

| | |
|---|---|
| **Subject:**<br>➢ Water Resource Monitoring Program | |
| **Purpose:**<br>➢ To make informed data-supported water resource management decisions at the local level. | |
| **Goal:**<br>➢ Implement a comprehensive water resource-monitoring program. | |
| **Monitoring Policies** | |
| ***Policy 6.1:*** | The City will conduct monitoring programs to develop baseline and long-term water quality records. |
| ***Policy 6.2:*** | The City will cooperate with all public agencies to conduct monitoring projects and share monitoring data with them. |
| ***Policy 6.3:*** | The City will establish citizen-monitoring programs. |
| ***Policy 6.4:*** | The City will establish private-monitoring agreements related to private ponds and wetlands. |

## Table 25 - Monitoring Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Implement water resource monitoring plan for the City to track water quality trends and monitor the effectiveness of water quality management programs | • Water Resources Management Plan<br>• Natural Resources Department Budget<br>• WMOs<br>• Metropolitan Council<br>• City staff<br>• Lake Associations<br>• Schools<br>• Newsletter<br>• Neighborhood meetings<br>• Agency support<br>• Dakota County | • Completed monitoring plan matrix<br>• Formation of and active monitoring by citizen groups<br>• Annual monitoring including report | Annual | $25,000 |
| 2. Maintain GIS database and establish a process for collection and retrieval of water quality data on GIS | • Monitoring reports<br>• City GIS<br>• Existing Filing System<br>• GIS Records Management | • Electronic map - access to monitoring data<br>• Adopted process and annual maintenance of data acquisition model | Annual<br>2006 | NA<br>$10,000 |

## GOAL 7: MAINTENANCE AND INSPECTION

*M.R. 8410.0100, Subp. 6. Management programs. Each organization (WMO) plan must assess or require local plans to assess the need for periodic maintenance of public works, facilities, and natural conveyance systems and specify any new programs or revisions to existing programs needed to accomplish its goals and objectives. Each plan must further identify which units of government or private parties are responsible for maintenance. Each plan must, at a minimum, assess or require local plans to assess:*

*A. the need and frequency for sweeping of public and private streets and parking lots;*

*B. the need and frequency for inspecting stormwater outfalls, sumps, and ponds;*

*C. the adequacy of maintenance programs for stormwater facilities and water level control structures owned by both organization members and nonmembers;*

*D. the condition of public ditches constructed under Minnesota Statutes, chapter 103D or 103E, if the organization has jurisdiction over these systems;*

*E. the need to establish a water body management classification system to provide for water quality and quantity management based on a hierarchical basis;*

*F. the need to establish local spill containment clean-up plans; and*

*G. the need for other management programs as considered necessary.*

*All proposed management programs establishing a classification system for the management of water bodies shall be consistent with chapter 7050. If organization classifications are inconsistent, the organization shall petition the Pollution Control Agency to revise the classifications in chapter 7050. (BWSR, 1997)*

**Goal: Preserve the function of water resource facilities through routine inspection and regular maintenance activities.**

Inspections help to spot potential problems before they become major problems. Routine maintenance reduces the long-term costs related to drainage system maintenance, while achieving water quantity and water quality goals. The application of development standards ensures consistency in the work produced and the documentation of the constructed systems. Appropriate land use controls can be used to maximize the preservation of the natural drainage systems and to control increases in runoff rate, volume and pollutant loading.

Pond maintenance raises questions about the nature of the accumulated sediment and methods for disposal. Based on empirical data, the cycle for pond clean out averaged 25 years (Yousef, et. al, 1991). The rate of accumulation in Burnsville ponds will be faster due to sand/salt application in the winter. Local sediment testing should be

considered on a case-by case- basis to determine how material should be handled. Pond maintenance agreements with private pond owners can ensure that ponds are kept in good operating condition and that routine maintenance occurs. In addition, documentation and acquisition of proper ponding easements is very important.

### An Effective Storm Drainage Maintenance Program

There are four basic steps to developing an effective storm drainage maintenance program.

- Evaluate Problems, Needs, and Opportunities;
- Definition of Goals and Objectives;
- Establishment of Policies, Programs and Priorities; and
- Development of Criteria and Standards for Evaluating Performance and Assessing the Degree of Attainment of goals.

Each of these four elements is covered by this WRMP. However, to be effective, three needs must be addressed: the need for good management; the need for good data; and the need for sound financing. Many well-conceived maintenance plans are never fully implemented because of the lack of funding. A sound and continuous source of revenue is vital to an effective maintenance program.

### Stormwater Drainage Maintenance Plan

The City of Burnsville's Public Works Department developed a Stormwater Drainage System Maintenance Plan in November 1992 (OSM, 1994). This Plan was developed to assure that the City's system of stormwater retention/treatment basins and stormwater conveyance systems are adequately inspected and maintained to assure that they meet their design functions. Outlined below is a description of the various inspection and maintenance activities the City intends to undertake in regard to achieving this goals:

- Inspect stormwater retention and treatment basins a minimum of once every five years to determine if the basin's retention and treatment characteristics are adequate.
- The City's storm sewer system will be inspected at a minimum of two times annually. During these inspections, debris present at trash grates, catch basins grates, and other places within the system will be removed so as to provide reasonable assurances that the system will operate in an unobstructed manner during rainfall events.
- The City will sweep the streets in accordance with the water quality management provisions outlined within this report. Specifically, this will require prioritization of sweeping activities to be focused around areas draining to water bodies having high recreational use potential. Spring sweeping is anticipated to be completed no later than May 10th in these priority areas.

- On an annual basis, inspect storm sewer outfalls for evidence of scouring or the presence of significant deposition of silt. Scouring problem areas will be noted and stabilized. In areas where silt deposition is evident which is indicative of significant erosion upstream, an inspection will be made of the upstream watershed to identify the source of erosion. Suitable corrective measures will then be undertaken to correct the erosion problem.

The City is responsible for maintenance of storm water practices on City property and drainage easements, Dakota County and MnDOT are responsible for maintenance of practices on their respective properties and private systems are the responsibility of the property owners. The City will encourage the use of structural and non-structural storm water BMPs in private lands, including parking lot areas (such as those at Burnsville Center and other highly – impervious areas). The City intends to work with these private owners to develop maintenance plans and agreements.

### Street Sweeping

The City currently sweeps streets a minimum of twice per year, with more frequent sweeping completed as staff resources are available. In the spring, broom sweepers are used to clean sand from the streets. Depending on weather, the work begins in March. The City purchased two high dump sweepers in the late 1990's and stopped contracting out this work. The street sweeping budget decreased while the work was completed earlier and more efficiently. Fall leaf sweeping of the whole City was conducted for the first time in 2001.

The street-sweeping plan will focus resources on areas around the highest quality resources first, before moving out farther into the watershed. The City plans to purchase a vacuum sweeper and hire additional staff to operate sweepers in 2004 to further expand and enhance the street sweeping program.

### Storm Water Facility Maintenance Agreements

Many communities require pond maintenance agreements with private pond owners for ponds constructed to meet City standards due to development. A model storm water facility maintenance agreement is provided in Appendix E. The agreement is intended to ensure that storm water facilities are in good operating condition and that routine maintenance occurs. The agreement is intended to used as a model for establishing maintenance agreements on ponds and non-pond storm water facilities (e.g., rain gardens, bioretention areas, porous pavements, etc.).

### Removal and Disposal of Accumulated Sediment

Pond maintenance raises questions about the nature of the accumulated sediment, whether or not it is contaminated, and methods for disposal. Research in Florida (Yousef, et al. 1991) focused on sediment accumulation rates, heavy metal enrichment (Cd, Cr, Cu, Fe, Pb, Ni and Zn) and leaching of metals from sediments using Toxicity Characteristics Leaching Procedure (TCLP), developed by USEPA,

from bottom sediments in detention /retention ponds. The two-year study of nine ponds found the following:

- Accumulated top sediments showed a higher percent volatile matter, and nutrient and heavy metal content than the more dense underlying soil;
- Metals are retained in the sediment;
- TCLP results suggest that these sediments are not hazardous waste; and
- Land disposal of the sediments could be possible on non-agricultural land, within diked areas or depressions in the vicinity of the pond, or transferred to landfills.

Local sediment testing should be considered on a case by case basis to determine how material should be handled. Table 27 identifies the level of effort the City has expended as part of their annual pond clean-out program.

### Environmental Manhole Cleaning

Sump manholes have been constructed in strategic areas to trap coarse sediment. The manholes are cleaned annually. The following locations having environmental manholes are identified on Figure D-1 (See Appendix D):

- Lac Lavon Drive;
- Blue Bill Bay;
- Pershing Circle;
- Maple Island;
- East Crystal Lake Road;
- Sue Fischer Memorial Park (Youth Athletic Complex); and
- Burn-Haven Drive at the Regent at Burnsville Senior Housing Community.

### Sanding Priorities

In 2006-2007 the City revised its policy on street sanding and went to all salt application for ice control. Only on very rare occasions does the City use sanding to supplement the salt applications. The City has also been experimenting with pre-wetting of the pavements and using anti-icing agents. The City has identified the four high-priority snow and ice control areas and has established a priority system for street deicing activities. The system generally follows the order below.

- Thoroughfares;
- Commercial/Industrial;
- Collectors and steep grades; and
- Residential intersections.

### Policies and Implementation Plan

Tables 26 and 27 present policies and implementation activity steps the City has developed to achieve the maintenance and inspection goals of this plan.

### Table 26 - Maintenance and Inspection Policies

| | |
|---|---|
| **Subject:**<br>➢ Maintenance and inspection of the drainage system, ponds and water quality treatment practices | |
| **Purpose:**<br>➢ To maximize system performance and comply with NPDES Permit requirements. | |
| **Goal:**<br>➢ Preserve the function of water resource facilities through routine inspection and regular maintenance activities. | |
| **Maintenance and Inspection Policies** | |
| ***Policy 7.1:*** | The City will implement an annual inspection and maintenance plan for water resource facilities. |
| ***Policy 7.2:*** | The City shall require maintenance of privately constructed water quality treatment ponds through formal maintenance agreements. |
| ***Policy 7.3:*** | The City shall require adequate maintenance-related access for public and private water resources facilities (i.e., ponds, etc.). |
| ***Policy 7.4:*** | Pond clean-out activities shall be permitted under the City's Comprehensive Wetland Protection and Management Plan, and the State Wetland Conservation Act, which requires the issuance of an exemption. |
| ***Policy 7.5:*** | The City of Burnsville will sweep the streets at least two times annually. Future purchases of street sweeping units will give consideration to regeneraitive sweepers which have the greatest ability to pick up fine sediment and associated nutrients from the streets within the community. All streets will be swept as early as is practical and feasible, and the streets within the watersheds of priority water resources will be given first priority. |
| ***Policy 7.6:*** | The City will clean all sump catch basins or sump manholes at least annually and more often if inspection demonstrates that more frequent clean out is necessary. |
| ***Policy 7.7:*** | The City will establish and implement a snow plowing and snow/ice control policy that balances public safety and environmental protection. The City will consider the recommendations in *Minnesota Snow and Ice Control*, MNDOT, August 2005, as changes and improvements in deicing operations progress. |

## Table 27 - Maintenance and Inspection Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Develop and implement annual inspection program for documentation of the condition of ponds and drainage system.<br>Ensure proper inspection and maintenance of sump catch basins or sump manholes and retention/ treatment ponds | • Intern(s)<br>• City staff<br>• Specialized equipment<br>• Annual inspection report<br>• Follow-up field investigation<br>• Public works staff | • Completed annual inspection & report<br>• Pond cleanout program<br>• Maintenance, improvements and equipment acquisition | Annual (Beginning in 2004)<br>2002 – 2004<br>2005 – 2006<br>2007 – 2008<br>2009 – 2016<br>Annual (Beginning 2004) | $40,000<br>$200,000<br>$250,000<br>$200,000<br>$150,000<br>$50,000 |
| 2. Acquire, write and preserve easements for the purpose of maintenance, including control of vegetation in easement | • Documentation from annual inspection reports<br>• Property records | • Written easement descriptions<br>• Executed easements | Annual (Beginning in 2003) | $10,000 |
| 3. Develop a prioritized plan for street-sweeping areas directly contributing to protected class wetlands | • Utility base maps<br>• Equipment<br>• Ice control practices | • Written street-sweeping program<br>• Annual post-sweeping field review | 2002<br>Annual | NA<br>NA |
| 4. Continue to sweep the streets in the spring, fall and spot sweeping in summer, giving priority to streets with the drainage area of priority water resources | • City Streets and Storm Sewer Department<br>• Mechanical sweepers<br>• (Purchased) Vacuum sweepers | • Annual sweeping program<br>• Staff to operate sweeper<br>• Purchase vacuum sweeper | Annual<br>Annual (beginning 2004)<br>2004 – 2008 | NA<br>$60,000<br>$48,000 |
| 5. Evaluate snow and ice control program with emphasis on reducing sand use. Evaluate use of salt alternatives. | • City Streets department<br>• BMPs of other agencies and available research | • Study salt alternatives<br>• Evaluation of winter conditions, implement salt alternatives | 2002<br>Annual (beginning 2003) | NA<br>NA |
| 6. Establish private maintenance and monitoring agreements | • Similar communities agreement<br>• Example in Appendix E | • Approved agreements | Annual | NA |
| 7. Storm Sewer Replacement Program | • Engineering and Infrastructure Department | • New/upgraded storm sewer system | 2002<br>2003<br>2004 – 2007<br>2009 – 2012 | See 76-4-2<br>$200,000<br>$325,000<br>$350,000 |

## GOAL NO. 8 - RECREATION, FISH AND WILDLIFE

*M.R. 8410.0080, Subpart 4. Recreation, Fish and Wildlife. Each (WMO) plan must outline how water resource based recreational activities and wildlife interests will be protected or improved through the implementation of the plan. In consideration of these issues, the plan must determine whether there is need to classify or prioritize individual water resources for management purposes.*

**Goal: Manage water recreation activities and improve fish and wildlife habitat.**

### Fisheries Management

Fisheries and Wildlife Management Responsibility

The goal of the DNR Division of Fish and Wildlife (DFW)-Section of Fisheries is to protect and enhance the fishery resource and the aquatic biological community for their long-term recreational, ecological, aesthetic, and economic benefits to the state. (Anon., 1993). DNR is the agency with exclusive responsibility for the management of fisheries in the waters of the state. The concept of ecosystem management requires that not just a species of interest be managed in a given water body, but that all plants, animals, and the physical and chemical constituents of the environment be part of the management program. (Anon., 1993).

Habitat Management

Habitat management on the part of the DNR involves several components:

- Stream habitat protection and improvement;
- Stream and Lake Crossings (roadways, utilities);
- Stream Channelization;
- Water Appropriation (from surface waters);
- Aeration;
- *Winter Aeration* is generally supported by DNR (Anon., 1993) when it benefits and/or does not harm the fishery;
- *Summer Aeration* should be used with caution, because the impacts these systems have on nutrient dynamics and fisheries is difficult to predict on individual lakes. (Anon., 1993) Summer aeration may be beneficial, neutral, or detrimental to the fishery, depending on the lake and the system used. (Anon., 1993);
- Shoreland Modification;
- Spawning Area Development and Management;
- Aquatic plant management; and
- Artificial habitat structures/fish attractors.

Biological Community Management efforts of DNR include (Anon., 1993):

- Lake Surveys and Fish Population Assessments; and
- Catch Surveys.

Fish Stocking

DNR will stock fish on a case by case basis, if justified in several situations including newly rehabilitated waters, winterkill lakes, or to introduce or maintain desirable species, compatible with the management of the indigenous fishes, to balance predatory species with prey. Stocking may be used to achieve the lake management plan presented in the Watershed sections of this plan. Lake stocking histories for Burnsville were not specifically researched as part of this plan.

### Lake Rehabilitation

*Where possible, watershed problems that have contributed to changes in the fishery resource should be corrected before rehabilitation is undertaken. However, in many situations, it is very difficult or impractical to determine or correct these watershed problems and rehabilitation must be decided on a benefit/cost ratio. Although the primary objective of rehabilitation is the establishment of a recreational fishery, where feasible, re-establishment of biological diversity by stocking endemic non-game fishes should be considered. In general, only headwater lakes that are isolated waters inhabited by undesirable fish species and have a barrier to prevent the immigration of fish should be considered for rehabilitation (Anon., 1993).*

Lake rehabilitation is the complete or partial elimination of fishes by the application of chemical fish toxicant, followed by restocking of the treated waters with game fish in combinations that will result in good fishing. The objective of rehabilitation is to provide good public fishing for stocked fishes and their offspring for enough years to justify costs. Chemical treatment is necessary in situations where control of undesirable species and recreation of a fishery by other means is not feasible. Lake rehabilitation techniques to improve a fishery are feasible when they can be justified by a favorable benefit/cost ratio or as a part of a general watershed management plan.

Two chemical treatment options are applicable to Burnsville lakes: (1) waters that are capable of supporting various game fish populations but have become predominated by carp or slow-growing panfish and (2) waters predominated by bullhead that have gained an advantage over game fish after occasional winters of low oxygen. Lake rehabilitation may be an option for achieving water quality goals in some of the City's lakes.

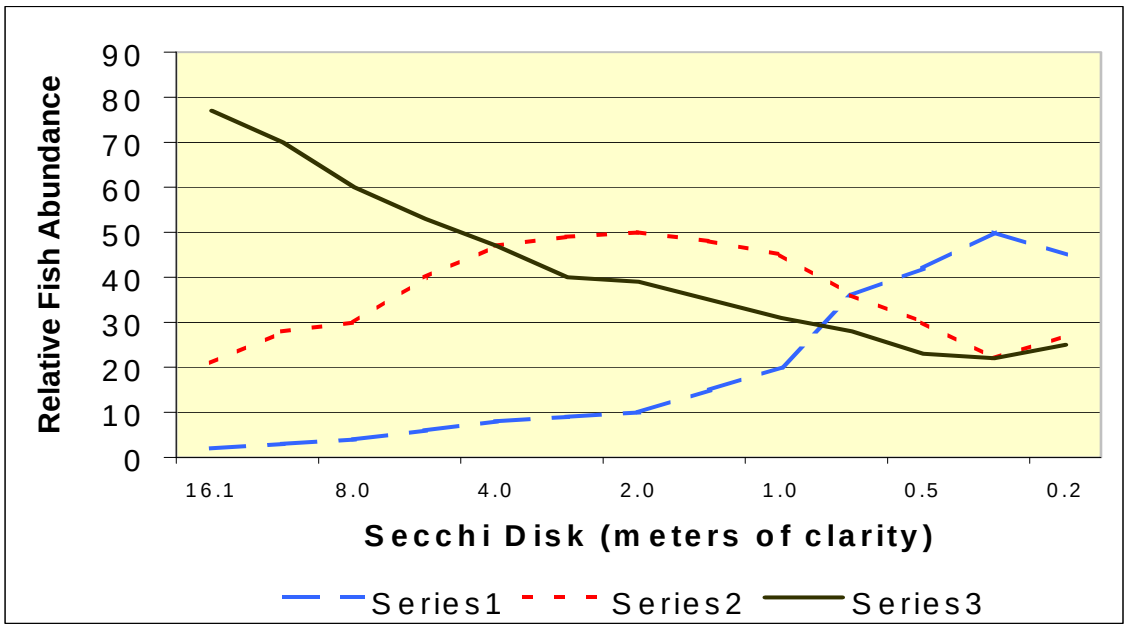
### Fishery and Water Quality

Perhaps the best indicators of water quality are the yellow and black bullheads (Interagency Lakes Coordinating Committee, 1996). Yellow bullheads are found in abundance in lakes with clear water. In contrast, black bullheads reach their greatest abundance in very turbid, eutrophic waters. Similarly, northern pike are more

abundant in clear water because vision is an important factor for feeding. Members of the sunfish family also reach their highest abundance in clear, clean waters. Where small or largemouth bass, rock bass, bluegill and pumpkinseed sunfish are common, the lake is likely to be in good condition. Of these, sunfish, smallmouth and rock bass are usually associated with the highest quality. White and black crappie are more tolerant of a wide range of conditions. Both reach higher numbers in turbid water. However, presence of black crappie should not be taken as a sign of poor water quality. Walleye usually do not do well in small, clear lakes.

Based on fish abundance and trophic status, the relationships in Figure 19 were developed.

**Figure 19 - Statewide Fish Abundance versus Water Clarity**




Series 1: Black Crappie, Black Bullhead, White Crappie
Series 2: Walleye, Yellow Perch, Bluegill Sunfish
Series 3: Northern Pike, Yellow Bullhead, White Sucker

### Public Access

Recreation from a fisheries perspective means public access, per DNR Policy No. 5, and fishing piers (Anon., 1980). Public access is not provided at each of Burnsville's eight major water bodies. New public access points and improvements to existing public access are consistent with lake rankings analysis presented in the Watershed Assessment Section of this Plan, and the lake management plans as presented in the specific watershed sections.

### Water Recreational Activity: Power Boating Impacts

Studies dating back to the early 1970's found powerboat engines could produce significant stirring of bottom sediments in shallow lakes. (Wright, 1991).

Those same studies, according to Wright (1991), found that the activity of a 100-hp outboard motor causes significant increases in turbidity, orthophosphorus and total phosphorus. As powerboats stir up the nutrient-rich bottom sediments, phosphorus can be released, accelerating algae growth. The same studies establish a clear relationship between engine size and mixing depth as illustrated in Table 28. Mixing depth is defined as the maximum depth at which the engine stirred up the water.

Wright (1991) concludes by indicating that although the scientific literature cannot resolve the political issues related to powerboat controls, power boating is likely to have harmful impacts on shallow lakes.

**Table 28 - Mixing Depths of Power Boats**

(Reported by Wright, 1991, based on Yousef. 1974)

| Horsepower | Mixing Depth |
|---|---|
| 10 | 6 feet |
| 28 | 10 feet |
| 50 | 15 feet |

Power boating restrictions were discussed with the public during the preparation of the City Comprehensive Storm Water Management Plan. Based on the discussions, powerboat restrictions were not adopted as a current water quality tool.

### Wildlife Habitat

Open Water versus Habitat

Wetlands and associated habitat are often lost because of misdirected management efforts and related detrimental water level modifications. According to Weller (1981), increased water levels often are cited as desirable goals because the general feeling is that such marshes are more attractive to wildlife. In reality, they are just more attractive to man, both aesthetically and economically.

The increase in property value adjacent to ponds and wetlands (or the “Pond Premium”) averages about 10 percent and may be as high as 30 percent (Anon., 1995). Stevens (1995) found that respondents to a New England study were willing to pay an average of between $74 and $80 per year over a five year period for wetlands providing flood protection, water supply and water pollution control (defined herein as public works values) and between $81 and $96 per year for wetlands containing rare species of plants. Stevens calls most of this value “non-use” or existence value.

He cautions that failure to consider "non-use" values in decision making can therefore understate the value of preservation by substantial margins.

There is a distinct relationship between wetland ecology and open water. Table 29 illustrates this relationship.

**Table 29 - Wildlife Habitat Factors Related to Open Water**

(Weller, 1981)

| | **Degree of Open Water** | | |
|---|---|---|---|
| **Factor** | **Less than 12%** | **50-75%** | **Over 80%** |
| Water Depth | Shallow | Medium | Deep |
| Vegetation | Dense | Moderate | Sparse |
| Vegetation Type | Cattail Mono-culture | Cattail fringe with hard-stem shore | Hard-stem shore with no cattails |
| Bird Populations | Numerous Individuals | Many Individuals | Few Individuals |
| Bird Species Richness | Few Kinds | Many Kinds | Few Kinds |
| Muskrats | Few | Many | Few |

The most crucial force dramatically influencing changes in wetland vegetation and associated wildlife communities is changing water depth, according to Weller (1981). Changing water level is the deciding influence on what plants grow where and what plant life forms dominate. Changing water levels also create stress for established plants.

Goose Problems

Although many people enjoy seeing Canada geese, the birds often wear out their welcome when they become too numerous on lawns, parks and golf courses. Yards, beaches and docks become fouled with their feces, and the fecal matter ultimately contributes to poorer water quality.

City staff recently prepared a comprehensive goose control plan (Burnsville, Canada Goose Management Program, July 2001). Burnsville has limited quality breeding sites for Canada geese, as many of the City's ponds are deep, have steep slopes and are without islands. These conditions limit the amount of emergent vegetation that normally provides ideal goose habitat. One exception is Sunset Pond, which is considered among the top three Canada goose breeding sites in the Metropolitan area.

The following list summarizes the key activities of the City's goose management program:

- Document goose damage through a complaint/damage recording system;
- Implementing an ordinance to prohibit water fowl feeding;
- Inform citizens through a variety of media and an annual workshop;
- Removal of aggressive geese or problem geese that may create traffic hazards;
- Reduce population of geese near beaches to fewer than 15 birds;
- For safety purposes, reduce population of geese to fewer than 10 birds in the summer near elder care facilities;
- Reduce population to fewer than 30 birds near Alimagnet, Crystal, Kraemer, and Sunset Pond Parks; and
- Reduce population to fewer than 15 birds near small parks, wetlands, residential and commercial areas and cemeteries where damage has been noted.

### Aquatic Plant Management

Aquatic plants are an essential part of lake and wetland communities. Aquatic plants:

- Remove coliform bacteria and nutrients from the water and lake bottom;
- Help prevent shoreline erosion by breaking up wave action;
- Provide natural food and shelter for fish and wildlife; and
- Are one of the primary producers in the aquatic food chain; and affect the chemical, physical and biological characteristics of our lakes. For instance, a one-acre stand of bulrush can remove an amount of phosphorus equal to that present in wastewater created by 33 persons during the four-month growing season.

Permitting

The DNR requires permits for controlling or destroying aquatic plants or invertebrates in protected waters or wetlands. The permit program is based on Minnesota Rules, Department of Natural Resources, Chapter 6280 Aquatic Nuisance Control. The permits do not allow the following:

- Destroying or preventing the growth of vegetation by placing mats or plastic sheets or similar material on the bed of protected waters;
- Destruction of aquatic vegetation within posted spawning areas;
- Improving the appearance or aesthetics of undeveloped shoreline through aquatic plant removal; and
- Aquatic plant control where the vegetation does not interfere with swimming, boating, or other aquatic recreational activity.

DNR Permits are required to:

- Cut and pull by hand or mechanically control vegetation in an area over 2500 square feet;
- Apply herbicides or algaecides in protected waters;
- Move a bog of any size that is free floating or lodged in any area other than its original location;
- Destroy emergent aquatic vegetation in protected waters;
- Transplant aquatic plants into protected waters; and
- Use any machine that mechanically sifts lake bottom materials from protected waters lakeward of the ordinary high water level.

Chemical Control of Aquatic Plants

According to Chapter 6280, the lesser of fifteen percent (in home rule charter or statutory City, or a town only) of the littoral area or 100 feet of shoreline per individual riparian property owner may be treated. There is an associated fee with the permit.

### Controlling Algae and Excess Vegetation in Lakes

Alum Treatment (General Chemical Corp, 1996)

A straightforward and proven way to reverse the buildup of aquatic plants in recreational water bodies involves controlling a key nutrient, phosphorus, with alum (aluminum sulfate). Alum has been widely used to clarify and purify drinking water. A single treatment with alum generally prevents algae blooms for two to five years or more, depending on how much phosphorus enters the lake and its hydraulic residence time.

Aquatic plants need many nutrients. An over abundance of phosphorus from runoff frees algae and plants to grow excessively. Controlling phosphorus levels limits its

availability as a nutrient and halts biomass growth. If watershed management alone cannot eliminate algae blooms and other signs of eutrophication, the next step may be to bind phosphorus in the sediments with alum.

Alum is injected under water, usually in a rigid polyvinyl chloride (PVC) pipe. When alum is applied near the water surface, it improves clarity and removes phosphorus in the water column, as well as inactivating phosphorus in sediment. In severely stressed, hypereutrophic lakes, alum is most effectively dispensed near the bottom to treat sediment that becomes a nutrient sink, rather than a source.

Alum reacts with lake water to form two precipitates - aluminum hydroxide in reaction with the water itself and aluminum phosphate in reaction with dissolved organic and inorganic phosphates. The gelatinous aluminum hydroxide floc clarifies the water column by sweeping suspended solids and colloids from the water column as it sinks. When this floc reaches the bottom, it reacts with phosphorus in the sediment, binding the nutrient as insoluble aluminum phosphate complex. As this aluminum phosphate floc sits on the bottom, it coats the sediment as a thin layer that coalesces the fine sediment and limits suspension of phosphorus-rich silt by waves, currents or boating activity. Aluminum phosphate is a stable molecule that is unavailable as a plant nutrient. It will not revert back to a nutrient form under anoxic or anaerobic conditions often found in the lowest layer of a lake or in its bottom sediments.

Alum treatment requires extensive planning, in particular to determine the amount of alum needed. And, appropriate permits from the DNR are needed. Published values of batch applications, or the application from a boat or barge, range from $600 to $2,500 per acre (1996 dollars). The 1997 alum treatment of Wood Park Pond was completed at a cost of $22,000. The batch application cost was $1,133 per acre with consultant and laboratory costs of $1,311 per acre. A more detailed discussion of the Wood Park Pond project can be found in the Black Dog Watershed section of the Plan.

Copper Sulfate

Some locales treat lakes with copper sulfate ($CuSO_4$ $5H_2O$). The cupric ions ($Cu_2^+$) inhibit both respiration and photosynthesis in algae. Copper sulfate is more toxic in soft, acid water than in alkaline water. Copper sulfate is an excellent algaecide, but it is without appreciable residual toxicity. Although copper sulfate may be quite effective in reducing phytoplankton abundance in lakes and ponds, it does little for the long-term condition. In other words, phytoplankton photosynthesis quickly returns to pre-treatment levels. As dead algae fall to the bottom and decompose, their phosphorus content is released to support another round of plant growth. In addition, the dissolved oxygen content (DO) of the lake/pond may be lowered or be completely depleted. Concentrations of copper sulfate used for phytoplankton control are seldom directly toxic to fish, but they do kill large numbers of invertebrate fish food organisms.

Weed Harvesting

Weed harvesting falls into two categories; mechanical and non-mechanical. Mechanical harvesting entails a barge-like machine to cut and collect lake weeds. Harvesters need at least two feet of freeboard to operate, creating a lot of floating vegetation. Most operations dispose of aquatic plants by using a shore conveyor, a transport barge or by making multiple trips to shore. Mechanical harvesting can produce weed fragments. Approximately 5 to 15 percent of the total cutting cannot be cleaned up immediately because of wind and wave action that washes the vegetation away. A partial solution is to use a cutter, because plants are not stacked on the back of the unit weighing it down like they are with a harvester. A cutter can work in as little as 9 inches of water.

Non-mechanical harvesting includes hand harvesting (pulling), raking, hand-held weed cutters and dragging. Non-mechanical harvesting can be highly effective. Careful pulling and hand raking can remove roots as well as stems and leaves, thereby minimizing re-growth of the plants for several years.

Forest Lake in northern Washington County is an example of a successful harvesting program. Harvesting began on the lake in 1982. Approximately 300 hours per year are devoted to operating the specialized harvester. The harvester is capable of cutting between 2000 and 2500 cubic feet of weeds per day. Cut weeds are transported by conveyor to trucks. Cuttings are transported to the local composting site. New harvesting equipment can cost $75,000 - $100,000 or more depending on specifications.

### Aeration

Whole-lake or hypolimnetic (bottom water) aeration has been utilized to improve water quality. In general, whole lake aeration is used to avoid winter fish kill. *Winter Aeration* is generally supported by DNR (Anon., 1993) when it benefits and/or does not harm the fishery. *Summer Aeration* should be used with caution, because the impacts these systems have on nutrient dynamics and fisheries is difficult to predict on individual lakes. (Anon., 1993) Summer aeration may be beneficial, neutral, or detrimental to the fishery, depending on the lake and the system

### Purple Loosestrife (Skinner, 1996)

Purple loosestrife *Lythrum salicara* L. is a perennial plant of European origin that is invading and degrading wetlands all across North America. Purple loosestrife forms dense, monotypic stands that replace native plant species in wetlands and lake shore habitats, degrading food, shelter, and nesting sites for native wildlife. The plant will grow in up to seven feet of water. Purple loosestrife's high seed production (each plant can produce 120,000 seeds) produces large seed banks that can last for many years, allowing the plant to recover quickly after disturbance.

Common native plants such as cattails, sedges, smartweed and others cannot compete with purple loosestrife. Consequently, animals that rely on native plant vegetation for food, shelter, and breeding areas are displaced. Loosestrife infested wetlands are also

less suitable to waterfowl because of the elimination of nesting sites and valuable food plants (waterfowl do not feed on loosestrife). Wetland mammals, like muskrats cannot utilize the plant in any way. Loosestrife is thought to be a poor nutrient assimilator.

Currently there is no chemical or mechanical means that provide long-term control of established stands of purple loosestrife. However, biological control, the use of natural enemies to control a pest, shows promise as a long-term method of reducing the effects of purple loosestrife on native aquatic environments.

Efforts to control these infestations mechanically or with herbicides are very costly, must be repeated annually and do not provide long-term control. Conventional control, including cutting, burning, water level manipulation and herbicide treatment, have been largely unsuccessful except where small, isolated stands can be removed by hand or treated with herbicide. While conventional methods do kill purple loosestrife plants, once it has become established, its large seed banks, which are nearly impossible to destroy, allow rapid reestablishment. Each cut segment can generate a new plant.

Biological techniques reunite pest species, like purple loosestrife, with their natural enemies, such as insects, can keep many plant species from becoming pests. Successful biological control will not eradicate purple loosestrife, but it will significantly reduce the plant's negative effects on native species.

Four species of European insects have been released in North America to control purple loosestrife since 1992; one root-mining weevil, one flower-feeding weevil, and two leaf eating beetles. Of the species, the root-mining weevil and the leaf eating beetles will be the most important for the control of purple loosestrife due to the damage they cause to plant roots, leaves and stems. Burnsville is trying biological control of purple loosestrife at Crystal West Park and Alimagnet Park.

### Eurasian Watermilfoil (Anon., 1993)

Eurasian watermilfoil can severely limit water recreational activities such as swimming, boating and fishing. It forms dense rooted mats of vegetation that reach the water surface. It can shade and crowd out native plants, reducing the biodiversity of aquatic ecosystems and harming fish and wildlife. There is little hard evidence so far for negative ecological impacts. However, given these concerns, it is necessary to confine this exotic plant and limit its spread in Minnesota.

Eurasian watermilfoil is a submerged aquatic plant native to Europe and Asia. Since its introduction to North America, during the 1940's, it has spread to nearly 40 states and three Canadian provinces. In Minnesota, milfoil was first discovered in Lake Minnetonka in 1987. By 1992, 55 Minnesota lakes had Eurasian watermilfoil infestations.

Eurasian watermilfoil is a perennial plant that spreads by vegetative propagation. It spreads when the plant fragments into pieces, which can taker root and grow into new plants. Milfoil plants break into fragments naturally or when watercraft got through milfoil beds. Water currents can carry fragments within and between water bodies.

Current attempts to eradicate or control milfoil in Minnesota rely primarily on herbicides. However, in consideration of public and professional concerns regarding herbicides, DNR has begun to investigate alternative control methods. According to DNR (Anon., 1993), efforts should now be made towards an Integrated Pest Management (IPM) approach for milfoil control that could ultimately include a combination of biological controls, improved use of herbicides and alternative methods such as mechanical control.

The DNR plan includes four major goals:

- Contain milfoil in Minnesota to existing water bodies and prevent the establishment of new infestations;
- Eradicate or control milfoil infestations in Minnesota in a way that does as little harm as possible to lake ecosystems;
- Support and conduct research needed to improve milfoil management; and
- Ensure that milfoil is considered in lake management.

Euarsian watermilfoil exists in Lac Lavon, Crystal Lake and South Twin Lake. The City is currently treating these lakes and discouraging any mechanical harvesting.

### Zebra Mussels (Hansen, 2001)

Zebra mussels are a devastating aquatic invader that has recently been found in inland lakes of northeastern Wisconsin. The discovery of zebra mussels in a Forest County Wisconsin lake is a clear warning that Minnesota Lakes are vulnerable. Zebra mussels were introduced into the midwest in 1990 – likely carried in the ballast of European cargo ships – and have spread to at least 24 inland lakes in Wisconsin, the Mississippi and St. Croix Rivers and Lake Superior and Lake Michigan.

Once introduced, the tiny mussels can quickly overtake a lake. Just one of the zebra-striped, clam-like creatures – which grow to the size of a fingernail – can produce 30,000 to 40,000 eggs per season. Zebra mussels can form dense colonies on rocks, wood, metal and cement surfaces. They out-compete native mussel species for food and oxygen.

Zebra mussels feed on algae and water fleas, out-competing fish and potentially impacting the fishery by improving water clarity which allows young fish or small fish to be more easily preyed upon. The overall impact of an infestation would be a diminished recreation use of a particular lake.

### Dredging

During preparation of the plan, lake dredging was identified by the public and the Council as a preferred lake management tool. Dredging is addressed by Minnesota Rules 6115.200 Excavation of Protected Waters (pp 5369 – 5377). In general, the DNR does not issue permits for lake dredging projects intended to improve lake depths and recreation opportunities.

### Policies and Implementation Plan

The City has developed policies and implementation activity steps to achieve the goal of this section. These policies and activities are presented in Tables 30 and 31, respectively.

**Table 30 - Recreation, Fish and Wildlife Policies**

| | |
|---|---|
| **Subject:** | |
| ➢ Water resource-based recreational activities and wildlife interests | |
| **Purpose:** | |
| ➢ To enhance water recreational facilities, and fish and wildlife habitat. | |
| **Goal:** | |
| ➢ Manage water recreation activities and improve fish and wildlife habitat. | |
| **Recreation, Fish and Wildlife Policies** | |
| ***Policy 8.1:*** | Natural areas, and wildlife habitat intended for preservation, shall be protected with appropriate BMPs during construction. |
| ***Policy 8.2:*** | Horizontal, terrestrial buffer zones of 20 feet are encouraged around existing wetlands and storm water ponds. New development or redevelopment projects must provide the 20 foot buffer zone around wetlands and are encouraged to provide 20 foot buffers around storm water ponds. Buffers shall be maintained in native vegetation, to provide habitat for wildlife. (See Table 16.) |
| ***Policy 8.3:*** | The City shall support programs for controlling exotic and invasive species of plants and animals. |
| ***Policy 8.4:*** | The City recognizes the need to balance water recreational activity with water quality and habitat issues. |
| ***Policy 8.5:*** | The City will explore new opportunities to integrate water resources based recreation activities and wildlife interests within wildlife corridors. |
| ***Policy 8.6:*** | The City will Pursue acquisition and/or preservation of the Priority Sites identified in the Natural Resources Master Plan. |
| ***Policy 8.7:*** | The City will Promote intergovernmental cooperation in protecting and improving areas with shared responsibility, such as sites in the Minnesota River Valley. |
| ***Policy 8.8:*** | The City will encourage changes to current landscaping requirements which will encourage the use of native plant materials and maximizing biodiversity. |
| ***Policy 8.9:*** | The City will encourage development along the Minnesota River Valley Area which will enhance its use as a recreational area and support the preservation of natural resources in a manner consistent with this Plan. |
| ***Policy 8.10*:** | The City will review request for funds to assist lake homeowners groups with the control of aquatic weeds on all lakes which offer community wide opportunities for boating, swimming, and fishing. These lakes are: Alimagnet, Lac Lavon, and Crystal/Keller. The City will provide technical support to homeowner groups that wish to control aquatic weeds on all other water bodies. |

**Table 31 - Recreation, Fish and Wildlife Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Manage Eurasian Watermilfoil, Purple Loosestrife and invasive plant and animal species | • City Water Resources Staff<br>• DNR representatives<br>• DNR policies<br>• Available research<br>• Volunteers for identification of problem area<br>• Public Process<br>• Current efforts on Burnsville Lakes<br>• Experiences of Lake Minnetonka<br>• University of Minnesota<br>• City Goose Management Program | • Identification of infestation areas<br>• Policy and financing<br>• Annual measurement of observed areas and control and reduction measured on the basis of annually observed areas<br>• Goose Program Implementation | 2002<br>2002<br>Annual (Beginning 2004)<br>Annual | $8,000<br>$2,000<br>$25,000<br>See Table 13 #2 |
| 2. Explore aquatic plant harvesting options and opportunities | • Vendors<br>• Other communities | • Weed harvesting recommendations<br>• Purchase Equipment | 2004<br>2005 | $10,000<br>$100,000 |

## GOAL 9: GROUND WATER

*M.R. 8410.0080, Subpart 7. Ground water. If County ground water plan has not commenced at the time the plan or plan amendment is initiated, the organization shall assess the need and degree of involvement the organization (WMO Plan) has in ground water management and establish appropriate goals and policies.*

**Goal: Prevent contamination of the aquifers and promote ground water recharge.**

### Wellhead Protection Plan (WHPP)

The City has completed its WHPP in 2006 following review by the Minnesota Department of Health. The overall goal of a WHPP is to protect the public water supply from harmful contaminants. It is a preventative program, keeping harmful contaminants from entering the public water supply system. Dakota County also has a Ground Water Protection Plan that was adopted in April 2000. The information in the WHPP was used to help the City develop the prohibited infiltration zone that is part of the surface water management standards. The City updated the WHPP in 2014 and the updated maps provide the basis for the prohibited and restricted infiltration zones established in Appendix C of this WRMP.

#### Prairie du Chien - Jordan Aquifer

The sensitivity of the Prairie du Chien - Jordan Aquifer to pollution was assessed by the Minnesota Geological Survey (MGS) in the Geologic Atlas for Dakota County. The relative sensitivity to ground water contamination of the aquifer underlying Burnsville ranges from very low to very high. This highly variable sensitivity is due a variable surficial geology and depths to bedrock. The sensitivity assessment is based on the soil type encountered, vertical conductivity, and depth to water table. The ratings are based on the relative travel times for contaminants to reach the ground water. There are numerous other factors that can effect the time it takes for a contaminant to move through the soils that are not considered in this rating.

#### Recharge Zones

Recharge to the bedrock aquifers beneath the City of Burnsville occurs in two ways, vertically and laterally. Vertical recharge occurs through overlying glacial sediments and other bedrock aquifers. This is accomplished because even low permeability units allow some leakage of ground water through them. Lateral recharge occurs as ground water moves laterally from outside the City or County, through the aquifer. Generally lateral recharge to the bedrock aquifers in Burnsville comes from the south.

Recharge to the water table aquifer occurs primarily from precipitation and surface water ground water interactions as well as laterally from outside the City. The lateral recharge to the water table aquifer comes from the southeast.

#### Groundwater/Surface Water Interaction

Burnsville has developed a multi-layered groundwater model focusing on the Burnsville well field, Kraemer Quarry, Black Dog Fen and Savage Fen. The model

will be utilized in design of groundwater withdrawal and minimization of impacts to protected surface waters. The City is currently working with the Minnesota Department of Natural Resources and Metropolitan Council in developing a groundwater management plan.

Individual Sewage Treatment Systems

The Individual Sewage Treatment System (ISTS) Act was signed into law on May 10, 1994 (Anon., 1994), to reduce contamination of surface and ground water caused by inadequate septic systems. The law includes requirements for minimum sewage treatment standards, new construction, replacement of ISTS, disclosure of sewage-system information to property buyers and a mandatory licensing program for all ISTS professionals, including designers, site evaluators, installers, inspectors and pumpers.

Approximately 229 properties in southwest Burnsville continue to be served by on-site waste water systems. Figure 20 illustrates properties in the City where an ISTS exists based on the City parcel data base and sanitary sewer system as-builts.

A poorly maintained system can represent a significant threat to water quality, especially when the system is adjacent to significant wetlands and/or lakes. It is the responsibility of the property owner to maintain the system in proper working order.

In 2000, all existing individual systems were converted over to “A” systems. Theses locations must comply with a program that require inspection and pumping every three years.

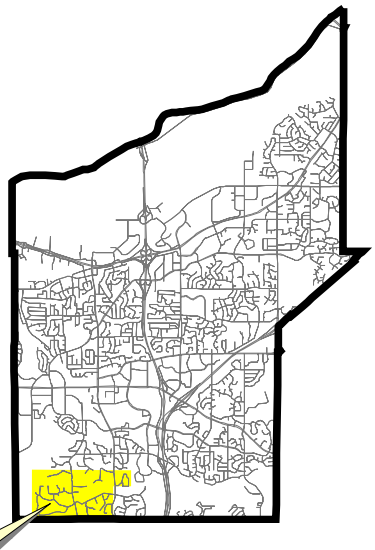
### Policies and Implementation Plan

Tables 32 and 33 present policies and implementation activity steps the City has developed to achieve the ground water goals of this plan.

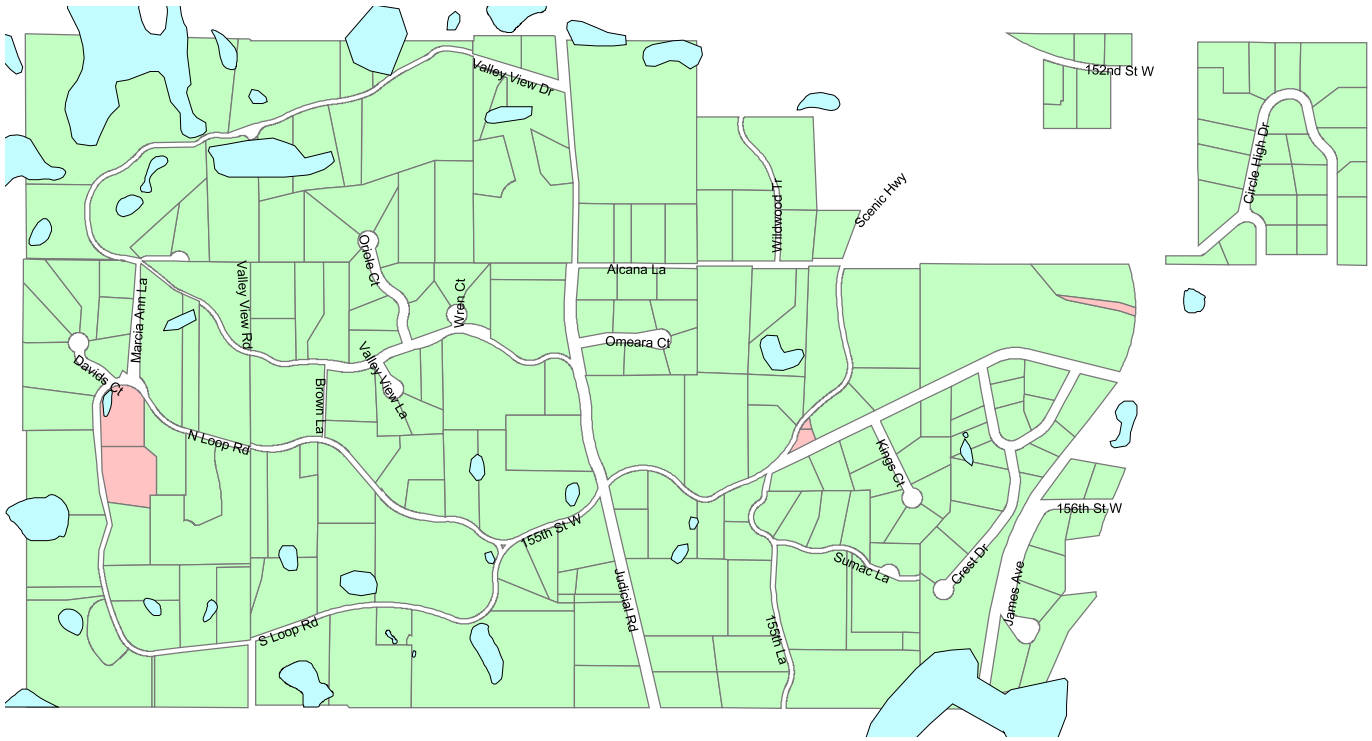
## LEGEND

- Vacant Lots
- Occupied Lots
- Water

TOTAL UNSEWERED LOTS = 229
(ISTS SITES)



ISTS sites in Southwest Burnsville




N

| | | | | |
|---|---|---|---|---|
| SEH | 10/15/02 | UNSEWERED PARCELS (ISTS) IN SOUTHWEST BURNSVILLE | FILE NO. ABURNS9904.00 | |
| | watershed.apr sh | | FIG NO. 20 | |

**Table 32 - Ground Water Policies**

| | |
|---|---|
| **Subject:**<br>➢ Ground water Protection | |
| **Purpose:**<br>➢ To protect ground water by understanding and accounting for ground water/surface water interactions. | |
| **Goal:**<br>➢ Prevent contamination of the aquifers and promote ground water recharge. | |
| **Ground water Protection Policies** | |
| ***Policy 9.1:*** | The City shall develop and implement ordinances to protect identified wellhead areas. |
| ***Policy 9.2:*** | The City shall promote proper well abandonment. |
| ***Policy 9.3:*** | The City will consider alternatives to conventional storm water detention to enhance ground water recharge through infiltration in areas of the City that are not highly susceptible to groundwater contamination. |
| ***Policy 9.4:*** | Design and installation of on-site wastewater systems shall be in accordance with the standards set forth in Minnesota Rules, Chapter 7080 and the Individual Sewage Treatment System (ISTS) Act. |
| ***Policy 9.5:*** | The City will implement and enforce the existing Water Conservation Plan. |
| ***Policy 9.6:*** | The City shall encourage the use of alternative landscape techniques and materials to reduce dependency on ground water supplies. |
| ***Policy 9.7:*** | The City shall minimize the use of City wells in the Black Dog Fen and Savage Fen impact areas. |
| ***Policy 9.8:*** | The City will encourage the use of "gray water" and/or storm water to reduce reliance on potable water for lawn irrigation purposes. |

**Table 33 - Ground Water Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Prepare Wellhead Protection Plan (WHPP) in accordance with the Minnesota Department of Health rules | • Minnesota Department of Health Rules<br>• Water Contingency and Conservation Plan<br>• Groundwater Framework –<br>• GIS data | • Completed plan | 2002 | NA |
| 2. Update private well and individual sewage treatment system data | • MPCA (7080 Rules)<br>• Private well driller records<br>• GIS<br>• Dakota County (wells) | • Complete data record via GIS | 2004 | $10,000 |
| 3. Include available alternative landscape design guidelines in developer packets and as part of grading plan review | • Available Alternative landscape resources | • Completed City packet for re-distribution | 2005 | $10,000 |
| 4. Develop a model site to establish, promote and monitor the effectiveness of alternative landscape features | • Available Alternative landscape resources<br>• See Goals 1 and 2 | • Site acquired<br>• Site developed and monitoring data | 2003<br>2004 | See Table 13 #4 |
| 5. Update City's Water Contingency and Conservation Plan | • Water Contingency and Conservation Plan (OSM, August 1994)<br>• DNR rules and guidelines | • Updated plan and report to city staff on changes to plan | 2004 | $25,000 |
| 6. Evaluate policies and approaches to protect water resources in the areas of sand and gravel operations in the City (active and inactive). | • City Staff<br>• Dakota County | • Established Policies | 2004 | NA |

## GOAL 10: REGULATORY RESPONSIBILITIES

*M.R. 8410.0100, Subp. 2. Regulatory Controls. In establishing required regulatory controls, items A to E must be considered by WMO Plans. (Note: Items A to E of M.R. 8410.0100 Subp. 2 are not repeated here).*

**Goal: Shift regulatory authority to the City while recognizing the role of other local, state and federal entities.**

Several entities will have administrative responsibilities within the planning area. For a local water management effort to be successful, each entity's commitment and role must be clearly understood. Those currently having some level of administration responsibility include the City, WMOs, Dakota County, MnDNR, MPCA, and the U.S. Army Corps of Engineers and BWSR.

### City of Burnsville

The major task of administering this plan will be in the permitting process. It is the intent of the City to assume the role of permitting for all land alteration, thereby enforcing the policies and standards of this plan.

The City's existing permit procedures include water management elements outlined in this Plan. Surface water management elements will be reviewed at the same time all other permits are reviewed. The storm water elements will meet the design standards of this plan (Appendix D).

To ensure conformance to this plan, the City's preliminary and final platting process and site plan approval should require more detailed information. Erosion control, water quality and other pertinent information such as rate and volume control, regarding local plan standards are among the elements that should be addressed on final plan and/or final plats. Conditional approvals by the Planning Commission and/or Council must require the incorporation of conditional elements into the final plan to ensure compliance.

The final plan should be re-distributed to City staff to confirm the inclusion of the provisions under which the plans were approved. The Building Permit issuance process can be the check-point for staff to review final plans for compliance while holding the condition of building permit issuance as the incentive. Engineering and Natural Resources staff should have a sign-off procedure prior to Building Permit issuance.

The City's administrative responsibilities include, but are not limited to the following:

- Comprehensive Plan update(s);
- Land use regulation;
- Ordinance review and amendment;
- Local plat review and amendments;
- Permits;

- Wetland Management as LGU;
- Sediment and erosion control (ordinance);
- Groundwater - wells;
- Participation and cooperation with the programs of the WMOs, DNR and Dakota County;
- Hydrologic model update with comprehensive plan changes;
- Financing Alternatives;
- Capital improvements; and
- Conveyance system/pond maintenance;

**Watershed Management Organizations (WMOs)**

WMO responsibilities and authorities may include but are not limited to the following:

- Monitoring;
- Establishing land use or ordinance requirements;
- Local plan review and approval;
- Administering a permit program;
- Projects of regional significance; and
- Verification of local plan implementation.

**Watershed Districts (WDs)**

Watershed districts responsibilities and authorities may include, but are not limited to the following:

- Data collection, assessment and planning;
- Development review;
- Project inspections;
- Financial assistance for projects;
- Commercial navigation issues; and
- Administering a permit program.

**Metropolitan Council: Comprehensive Plan Amendment**

Metropolitan Council has a regional review authority regarding surface water management including:

- Local Plan review; and
- Regional controls related to nonpoint source pollution.

This plan and all subsequent amendments will become part of the City's Comprehensive Plan (adopted by reference), in accordance with Environmental Review 21040, 1995 revisions to Minnesota Statutes 103B.235, Subd. 3A and 473.859, Subd. 2 (Chapter 176, Laws of Minnesota 1995), as part of the adoption process for this plan.

The plan does not have to be re-submitted as a formal comprehensive plan amendment, subject to additional review, at a latter date. The adopted City Plan will satisfy Metropolitan Council's requirements and will be thereby recognized as an amendment to the City's Comprehensive Plan.

**MPCA Phase II Storm Water Permit**

Implementation of the USEPA's Phase II Storm Water Regulations (Title 40 Code of Federal Regulations, Part 122). The approach of the Phase II permit is to address water quality by focusing on six specific programming elements as shown in the inset below, for implementation of Best Management Practices (BMPs).

**Six Minimum Control Measures for the NPDES Permit**

(1) Public education and outreach on storm water impacts;
(2) Public involvement/participation;
(3) Illicit discharge detection and elimination;
(4) Construction site storm water runoff control;
(5) Post-construction storm water management in new development and redevelopment; and
(6) Pollution prevention/good housekeeping for municipal operations.

The Minnesota Pollution Control Agency is the NPDES permitting authority for the federal rule implementation. The MPCA implemented the Municipally Separate Storm Sewer System (MS4) permit program in 2003 and made revisions to the permit in 2006. The City prepared its original Storm Water Pollution Prevention Plan (SWPPP) in 2003 and applied for coverage under the permit as required by MPCA. The City's 2003 SWPPP was approved and the City operated under the permit by completing the measurable goals identified in each of the Best Management Practices (BMPs) within the SWPPP.

The MPCA finalized revisions to the permit again in 2013 and required permit holders to apply for reauthorization of coverage for the revised permit. The revisions included additional water quality treatment provisions, additional work on inventories of the storm system and updating ordinances and official controls to be consistent with the new permit requirements. The City applied for coverage in December of 2013 and the MPCA placed the City's proposed updates on Public Notice in February 2014. Following the public notice period the City received approval of coverage under the new permit in April 2014.

Nondegradation Assessment

The reissuance of the permit by MPCA in 2006 required cities to revise their SWPPPs and reapply for permit coverage. The City reapplied and obtained coverage based on the 2006 SWPPP and has since added BMPs that address Nondegradation

requirements and a process for tracking impaired waters within the City and responding to planned or competed Total Maximum Daily Load (TMDL) studies and implementation programs.

The City was one of 30 cities required to complete a Nondegradation Assessment and Report that looked at the average annual loading of three pollutants (listed below) at 1988, 2005 and projected 2020 land use conditions. The three pollutants are:

- Total Suspended Sediment (TSS)
- Total Phosphorus (TP)
- Annual Runoff Volume

Following a required public input process and review by the local water management agencies, the City completed the study and submitted the Report to MPCA for review in 2007. The MPCA will conduct a separate public review process and notify the City of any comments or questions relating to the report.

**Summary of Loading Assessment Results**

| Year | Imp. surface (acres) | Imp. % | Runoff Volume (ac-ft) | Annual TSS (tons) | Annual TP (lbs) | Comments |
|---|---|---|---|---|---|---|
| 1988 | 5,723 | 33.1% | 10,145 | 1,379 | 9,104 | Assuming No Storm Water Treatment |
| 2005 | 6,563 | 38.0% | 11,409 | 1,551 | 10,238 | Assuming No Storm Water Treatment |
| 2020 | 7,464 | 43.2% | 12,925 | 1,757 | 11,599 | Assuming No Storm Water Treatment |
| 2005 | 6,563 | 38.0% | 11,409 | 1,134 | 9,162 | Assuming Storm Water Treatment by Ponds Only - Based on Ponds Created between 1988 and 2005 |
| 2020 | 7,464 | 43.2% | 10,987 | 1,016 | 8,717 | Runoff volume, TSS, and TP loads are assumed for the new impervious areas. Revised development and redevelopment standards considered. |
| 1988 to 2005 relative changes | +840 | +14.7% | +12.4% | -17.7% | 0.65% | Increase in Runoff Volume, Reduction in TSS and minor increase in TP loading |
| 2005 to 2020 relative changes | +901 | +13.7% | -3.7% | -10.4% | -4.9% | Decrease in Runoff Volume, TSS and TP levels. TP and TSS reductions below 1988 levels and volume below 2005 levels. |

While the 1988 to 2005 loading assessment shows an increase in the runoff volume due to the expansion of impervious surfaces from 1988 to 2005, TSS loadings have decreased, and the TP loadings increased only slightly relative to 1988 levels. This

result relates chiefly to the fact that numerous storm water treatment ponds accompanied the new development and re-development that occurred between 1988 and 2005. The results show that these ponds are working to remove significant amounts of total suspended sediment and phosphorus from storm water runoff.

Looking into the future, the projected level of development between 2005 and 2020 will continue to add impervious surface and result in additional annual runoff volume. Runoff infiltration is expected to play an increasingly important role in storm water management. The City is currently in the process of adopting new standards for storm water management which will place the focus on infiltration or filtration. The proposed standards will essentially translate into runoff volume control for both new development and redevelopment. The runoff infiltration practices have the potential to offset the increase in runoff volume caused by the expansion of impervious surfaces.

There is significant flexibility within the regulatory structure for regulators and communities alike (Treadway, 2000). With flexibility comes less certainty on cost impacts. The two biggest cost items will tend to be municipal operations/maintenance and capital investments to protect or improve water quality. USEPA has estimated the average annual cost per household for a Phase II implementation program to be $9.16 (Federal Register, December 8, 1999. Volume 64, No. 235, page 68791). Such costs would entail application preparation, record keeping and the reporting requirements for rule implementation. For the City of Burnsville, the total estimated annual Phase II implementation cost would be approximately $216,973 based upon a total number of households of 23,687 (U.S. Census Bureau, Census 2000, Table DP-1. Profile of General Demographic Characteristics: 2000, page 1991).

### Total Maximum Daily Load Program

In October, 2001 the Minnesota Pollution Control Agency (MPCA) issued draft 303(d) list of impaired waters in accordance with the federal Clean Water Act. The following water bodies within Burnsville, were included on the list:

- Lake Alimagnet (19-0021);
- Earley Lake (19-0033);
- Keller Lake (19-0025);
- Crystal Lake (19-0027);
- Sunset Pond (19-0364).; and
- Minnesota River, Carver Creek to the Mississippi River (07020012-201).

Each of the water bodies were listed as having a "swimming" use impairment resulting from excess nutrients (principally, phosphorus). The MPCA is required to investigate the source(s) of nutrient loading both from point and non-point sources and develop a plan to reduce the loading to bring the water bodies into compliance with water-quality standards. This process is called the Total Maximum Daily Load (TMDL) analysis.

Whether the MPCA's Phase II storm water rule and the TMDL analysis for these lakes is tied together as an implementation procedure is unknown at this time (February 2002). However, based upon TMDL implementation elsewhere in the United States, it appears likely that this will transpire.

The MPCA has updated the 303(d) Impaired Waters list every two years, with the most recent draft list published for 2008. The City will take an active role in developing TMDL studies and implementation plans for the phosphorus impairments to these waters. City is currently partnering with the Black Dog WMO to complete studies on Earley, Crystal and Keller Lakes and intends to convert these lake studies into TMDL studies pending approval of the MPCA. The MPCA is leading the efforts to address mercury on a much larger scale. The following water bodies within Burnsville are listed along with the reason(s) for the impairment:

- Lake Alimagnet — Total Phosphorus
- Earley Lake — Total Phosphorus
- Keller Lake — Total Phosphorus
- Crystal Lake — Total Phosphorus; Mercury in fish tissue

In addition to these waters, portions of the City eventually discharge to downstream water bodies that are on the impaired water list including the Vermillion River (fecal coliform bacteria), the Minnesota River and Lake Pepin. As part of the City's NPDES permit program, the City will continue to track activity related to TMDL studies on each of these waters and respond according to the requirements of the permit program.

### Local Regulatory Controls

The City of Burnsville has several codes and ordinances that relate to surface water management. The City's regulatory controls satisfy state and local requirements for water resources management. No new regulatory controls are required to insure plan implementation per Minnesota Statutes 103B and 8410 Rules. However, Table 34 indicates where modification to existing ordinances will help the City better realize the goals of this plan and the current status of each.

A summary of the key steps in the City's permit process for development activities is provided in Appendix F. A checklist for development projects is also included. Hydrologic and hydraulic analysis, design information and requirements are provided in Appendices C and D.

**Table 34 - Regulation Status**

| Ordinance | Specifically Covered by Existing Code /Ordinance No. |
|---|---|
| Shoreland Mgmt.<br>(DNR Approved) | Title 10,<br>Chapter 8-10 |
| Flood Plain Mgmt. | Title 10,<br>Chapter 10 |
| Wetland Protection | Title 10<br>Chapter 8-5, Comprehensive Wetland Protection and Management Plan |
| Erosion Control | Title 10,<br>Chapter 8, Section 6,7,8 |
| Woodland Protection | Title 10,<br>Chapters 8 and 9 |
| Public Utilities | Title 7<br>Chapter 2,Section 1 |
| | Title 11<br>Chapter 5, Section 4 |
| Environmental Protection | Title 10,<br>Chapter 8 |
| Storm Water Management | Title 4<br>Chapter 4, Section 3 |
| | Title 7<br>Chapter 2, Section 15 |
| Storm Water Utility | Title 7<br>Chapter 2 , Section 23 |
| Ground Water (Wellhead) Protection | 2001 Outdoor water restrictions |
| Low Impact Development Techniques and Incentives | Title 11<br>Chapter 5, Section 3 |
| Non-Phosphorus-Based Fertilizer | Title 3<br>Chapter 26 |

### Policies and Implementation Plan

The City has developed the policies and implementation activity steps in Tables 35 and 36, respectively, to help meet the regulation goals of this Plan.

### Table 35 - Regulatory Policies

| |
|---|
| **Subject:**<br>➢ Regulatory Responsibility |
| **Purpose:**<br>➢ Align regulatory controls with storm water practices to maximize the protection of water resources |
| **Goal:**<br>➢ Maintain regulatory authority at the local level while recognizing the role of other local, state and federal entities and complying with specified programs and requirements. |
| **Regulatory Responsibilities – Policies** |
| ***Policy 10.1:*** The City shall develop and implement a storm water management ordinance.<br>***Policy 10.2:*** The City shall implement ordinances and programs to remain consistent with local, regional and national programs related to storm water management.<br>***Policy 10.3:*** The City will consider amendments to existing ordinances which present barriers to utilizing Low Impact Development techniques and other creative approaches to on-site storm water treatment.<br>***Policy 10.4*** The City will inform BDWMO of any projects performed on public waters within the BDWMO. |

### Table 36 - Regulatory Responsibilities Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Prepare a storm water management ordinance | • Existing codes and ordinances<br>• Similar ordinances<br>• Public Input<br>• City staff | • Completed ordinances | 2002 | NA |
| 2. Finalize revisions to the shoreland ordinance | • Existing work completed to date | • Completed ordinances | 2002 | NA |
| 3. Prepare Phase II Stormwater Permit as required by EPA/MPCA and comply with Total Maximum Daily Load (TMDL) requirements | • Rulemaking – MPCA rules<br>• Available monitoring data<br>• Water Resources Management Plan<br>• Phase II permit<br>• Load allocation modeling<br>• Storm drainage system information<br>• GIS | • Rules received<br>• Phase II Permit Application<br>• Develop pollution control plan<br>• Comply with TMDL's | 2002<br>2003<br><br>2004 | NA<br>$70,000<br><br>$25,000 |
| 4. Review low impact development techniques for proposed development projects | • Existing codes and ordinances<br>• Water Resources Management Plan<br>• Low Impact Development Techniques | • Revised City code | Ongoing | NA |

## GOAL 11: FINANCE

*M.R. 8410.0110, Subp. 2. Financial impact on local government. Each (WMO) plan shall contain an analysis of the financial impact of implementation of the proposed regulatory controls and programs identified under part 8410.0100. The analysis shall include, at a minimum, an estimate of the costs associated with the (WMO) plan's implementation and anticipated sources of revenue.*

**Goal: Establish funding sources to finance water resources management activities.**

Paying for water management projects has become more complex in recent years. In the past, special assessments against benefited properties financed most of the necessary improvements. However, the financial options have broadened considerably. The question is, which method(s) best suit the needs of the City.

The major categories of funding sources are (1) Ad Valorem Taxes; (2) Special Assessments; (3) System Development Charges (Building Permits, Land Development Fees); (4) User charges; and (5) Grants. Following is a description and financing principles used with each of these financing mechanisms.

Table 37 illustrates the advantages and disadvantages of the different financing methods.

### Ad Valorem Tax

General taxation is the most common revenue source used to finance government services including minor maintenance measures for drainage and water quality facilities. Using property tax has the effect of spreading the cost over the entire tax base of a community.

The tax district is similar to the administrative structure under general taxation except that all or part of the community may be placed in the tax district. The principle is to better correlate improvement costs to benefited or contributing properties.

Lake improvement districts, provide a method to address lake problems and concerns at a local level that may not be addressed by other governmental bodies. A Lake improvement districts is a local unit of government that provides the opportunity of greater landowner involvement in lake management activities. Lake improvement districts may construct, own and or operate water control structures, conduct planning studies and receive federal and state financing. Lake improvement districts may be initiated by a petition to the County Board. The petition must be signed by 26 percent of the property owners within the lake improvement districts. The County Board may also initiate a lake improvement district.

**Table 37 - Advantages and Disadvantages of Different Funding Alternatives**

| Funding Method | Advantages | Disadvantages |
|---|---|---|
| Ad Valorem Tax | 1. Administrative structure for collection in place.<br>2. Simple and accepted source of revenue.<br>3. Allows for a larger revenue base.<br>4. Through tax districts contributors pay. | 1. No incentive to reduce runoff or pollution.<br>2. No relationship to level of benefits received.<br>3. Discontinuous source of revenue.<br>4. Limitations on amount of expenditures due to budget constraints.<br>5. Competition with other City services (i.e., police, fire). |
| Special Assessments | 1. Only benefited properties pay.<br>2. Revenues from assessment are applied to a specific project cost. No competition with general services.<br>3. Benefits directly related to cost for service.<br>4. Assessment can be deferred in hardship cases. | 1. Rigid procedural requirements.<br>2. Runoff contributions cannot be assessed.<br>3. Difficult to determine and prove benefit.<br>4. May place an unfair burden on some segments of the population. |
| System Development Charges | 1. New development generating runoff pays for runoff management.<br>2. Administrative structure for reviewing plans and collecting fees is in place.<br>3. Systems can be tailored to the specific needs through regulatory changes.<br>4. Revenues are applied to water management. No competition with general services. | 1. Only addresses problems within the vicinity of the new development, not usually in existing developments.<br>2. Only address prevention not correction of major problems.<br>3. Limited usefulness as a financing mechanism. |
| User Charges or Storm Water Utility<br><br>(already in-place in Burnsville) | 1. Properties causing or contributing to the need for runoff management pay relative to their contribution to the problem.<br>2. Self-financing system not in competition with general services funds.<br>3. Existing and new developments both pay.<br>4. Flexibility in the system.<br>5. Continuous source of revenues.<br>6. Specific dedicated fund.<br>7. Administrative structure for collection already in place. | 1. Some initial costs in development of rate formula and philosophy.<br>2. May require an expanded administrative structure. |
| Grants | 1. Reduce cost burden to residents in the community. | 1. Undependable source of revenue.<br>2. Increase administrative costs for securing and managing the funds.<br>3. Most often grants require cost sharing and thus additional funding source. This results in double administrative costs due to several funding sources.<br>4. Limited availability on an irregular schedule.<br>5. Requires considerable lead-time from application to receiving funds. |

To finance lake improvement districts projects, the County Board may use assessments, against benefited properties, service charges, general obligation bonds or ad valorem tax on property in the lake improvement districts in any combination.

There were 14 lake improvement districts in Minnesota as of February 2001.

### Special Assessments

Municipalities are familiar with the use of special assessments to finance special services from maintenance to construction of capital improvements. The assessments are levied against properties benefiting from the special services. The philosophy of this method is that the benefited properties pay in relation to benefits received. The benefit is the increase in the market value of the properties.

### System Development Charge

Trunk charges or System Development Charges (SDCs) are one-time charges paid by new development to finance the construction of public facilities. SDCs are generally used for four basic reasons.

1. To shift the burdens from existing development to new development;
2. To synchronize the construction of new or expanded facility capacity with the arrival of new development;
3. To subject new development decisions to pricing discipline; and
4. To respond to anti-tax sentiments.

There are seven factors to determine the proportionate share of costs to be borne by new development:

1. The cost of existing facilities;
2. The means by which existing facilities have been financed;
3. The extent to which new development has already contributed to the cost of providing excess capacity;
4. The extent to which existing development will, in the future, contribute to the cost of providing existing facilities used community-wide or by non-occupants of new development;
5. The extent to which new development should receive credit for providing, at its cost, facilities the community has provided in the past without charge to other development in the service area;
6. Extraordinary cost incurred in serving new development; and
7. The time-price differential inherent in fair comparisons of amounts of money paid at different times.

To adequately address the issue of Storm Drainage Trunk Charge for New Development or SDCs, a comprehensive review of the existing water resources management plan would be conducted. Next, a capital improvements plan (CIP) would be refined. Work with legal counsel would be undertaken to establish the legal basis for SDCs. Finally, the SDC determination will be developed based on development needs, land use and total systems cost. Lastly, a public information element will be used to introduce the system to the community. The public information element will illustrate the approach as equitable and will dispel any myths our criticisms that may exist.

### User Charges or Storm Water Utilities

User charges, which support storm water utilities, are a mechanism by which a City can generate funds through billings similar to water and sewer billings. The principle is to charge for services rendered to properties generating runoff, as well as the service to properties being protected from the effects of runoff, without consideration to an increase in market value of the property.

The City's storm water utility generated approximately $1.77 million in 1999. Eight different land use classifications are used to calculate specific rates. There is strong consensus that the new costs should be apportioned based on overall property contributions to runoff and pollutant loading. This is the current philosophy behind the City's storm water utility.

### Infrastructure Trust Fund

A unique aspect of Burnsville's system of financing infrastructure improvements is the Infrastructure Trust Fund (ITF). The ITF, which was created by ordinance in 1996, essentially charged depreciation to existing taxpayers who are utilizing the benefits of the existing systems such as streets and parks, as well as drainage system infrastructure, instead of leaving the replacement costs to the next generation. The City Council appropriates money to the ITF from a tax levy fund or other available source, with a limit on the amount committed to the fund annually. Several project-specific spending limitations also apply to money in the ITF. The fund is intended to provide the basic funding for future infrastructure replacement costs.

### Grants

Grants are available for surface water management and nonpoint source pollution. However, it is generally not a good financial practice to rely on grants for a service program. This source of revenue is not dependable and requires constant speculation as to its availability. Grants are useful but should only be used to supplement a planned local revenue source. Examples of some available granting agencies and past grant programs are shown in Table 38.

**Table 38 - Example Grant Programs**

| Granting Agency | Grant Program |
|---|---|
| Environmental Protection Agency | 604b Urban Water Quality Grant |
| | Underground Injection Control Program |
| | Environmental Education Grant |
| | Clean Lakes Grant |
| | Section 319 – Clean Water Act |
| U.S. Army Corps of Engineers | Section 22 Planning Assistance to States |
| U.S. Fish and Wildlife Service | Wallop-Breaux Funds |
| | Federal Aid in Wildlife Restoration Act |
| | Sport Fish Restoration Act |
| Minnesota Department of Natural Resources (1999) | Flood Hazard Mitigation Program |
| | Conservation Partners Grant (habitat) |
| | Metro Greenways Planning Grant |
| | Outdoor Recreation Grant Program |
| | Dam Safety Grant Program |
| | Water Recreation Cooperative Acquisition and Development Program |
| | Fishing Pier Grant Program |
| | Natural and Scenic Area Grant Program |
| Metropolitan Council | Water Quality Initiative Grant |
| | MetroEnvironment Partnership Grant |
| | Livable Communities Fund |
| Minnesota Pollution Control Agency | State Revolving Loan Fund |
| | Clean Water Partnership |
| | Clean Water Legacy Act |
| Lower Minnesota River Watershed District | |
| Black Dog Watershed Management Commission | |
| Legislative Commission on Minnesota Resources | |

### Policies and Implementation Plan

The City has developed policies and implementation activity steps to achieve the finance related goals of this Plan, as shown in Tables 39 and 40, respectively.

**Table 39 - Finance Policies**

| | |
|---|---|
| **Subject:**<br>➢ Paying for Water Resources Management | |
| **Purpose:**<br>➢ To adequately finance management activities in an equitable manner. | |
| **Goal:**<br>➢ Establish funding sources to finance water resources management activities | |
| **Finance Policies** | |
| ***Policy 11.1:*** | The City shall identify and implement available funding sources for water resources management. |
| ***Policy 11.2:*** | The City will actively pursue grants, donations, and in-kind contributions to help fund water resources management. |
| ***Policy 11.3:*** | The City shall assist citizens and businesses in their efforts to improve water quality, decrease water quantity and/or upgrade wetlands. |
| ***Policy 11.4***: | The City shall encourage the WMOs to finance inter-community issues and projects. |
| ***Policy 11.5:*** | The City shall support the establishment of Lake Improvement Districts formed by petition in cases where inter-community funding is necessary and WMO funding is not available. |
| ***Policy 11.6:*** | Project cost allocation shall be determined on a project by project basis and may consider contributing area, tax value, percent of runoff, total pollutant loading or other units of measure as a basis for determining cost splits. |
| ***Policy 11.7:*** | Private development will generally be responsible for funding all on-site facilities design for on-site runoff and/or pollutant loading, and may contribute for construction, expansion and/or maintenance of off-site conveyance or ponding systems. |

**Table 40 - Finance Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Budget |
|---|---|---|---|---|
| 1. Prepare study comparing planned expenditures to available financing and implement financing strategies of water resource management activities | • Implementation Plan (this report)<br>• Current City budget process and assessment policy<br>• Availability of funding sources<br>• Bench-marking with other communities<br>• City staff<br>• Finance study<br>• Public Involvement Plan | • Completed study<br>• Identification of specific financing strategy<br>• Annual Budgeting and plan implementation<br>• 5-Year CIP | 2002<br><br>Annual | NA<br><br>NA |
| 2. React to requests for the formation of Lake Improvement Districts with Lake Associations | • City Attorney<br>• Dakota County<br>• Lake Associations | • Formation of Lake Improvement Districts | Ongoing | NA |
| 3. Explore options to provide financial incentives for commercial/industrial property owners using good storm water practices. | • City Staff<br>• Lower MN WD<br>• Black Dog WMO<br>• Grants | • Established program<br>• Implement program | 2003<br><br>Ongoing | NA<br><br>NA |

## GOAL 12: LAND USE MANAGEMENT

*M.R.8410.0100, Subp. 2. If a (WMO) plan notes the existence of certain land uses that could adversely affect the organization's ability to achieve its water quality goals, and these uses cannot be properly managed or regulated with existing controls, the uses constitute a public nuisance according to Minnesota Statues, section 609.74. In those cases, the (WMO) plan must provide for the adoption of local controls to define and abate the nuisances. For the purpose of this chapter, public nuisances may include any action, failure to act, or land use practice that would impair water quality if allowed to continue.*

**Goal: Recognize the relationship between land use and water resources management.**

### Sustainable Development

One of the recent trends in planning for future growth is the concept of sustainable development. Sustainable development involves communities finding ways to meet their residents' needs for such things as good jobs, schools and housing without wasting or degrading the natural resources upon which future prosperity depends (Minnesota Planning, 1995). Although "growth" and "development" are often used interchangeably, they imply very different things for a community. "Growth" suggests bigger while "development" can mean getting better or achieving potential. By following the path towards sustainable development, communities can:

- Save money on infrastructure costs, such as roads, sewers, schools and police and fire protection, by avoiding duplication and anticipating future needs.
- Help ensure that the public costs of supporting new growth do not outweigh the benefits.
- Preserve natural assets and minimize pollution by giving community residents a way to clearly describe what kind of development they want, and where.
- Spur environmentally sustainable economic development by providing current and prospective businesses with information about areas' future.

To be truly sustainable over the long term, the development activity must include, but not be limited to, the following:

- Use the land - a finite resource that has no substitute - in ways that meet peoples diverse needs, conserve financial and natural resources, and preserve the land's ability to meet future needs.
- Create no more pollution and waste than the environment can recycle or render harmless.
- Include recreational and drinking water quality.

### Land Development Density

Only a small percentage of Burnsville remains to be developed. Smaller lot sizes and increased coverage run counter to what would normally be recommended on a watershed management basis. For areas tributary to trout streams as identified in the Black Dog Watershed Management Plan (Barr, 2000) any time the level of impervious cover exceeds the 12-15% level, the resource will be permanently degraded (Galli, 1991).

The shoreland zoning standard established by the Minnesota Department of Natural Resources limits impervious cover to 25 percent. However, outside the shoreland zone, much higher levels of cover are allowed via existing zoning. Even if less than 10 percent of the City remains to be developed, long-term water resource impact of redevelopment as well as current and near term development are concerns. There is a value based decision that must be made, based on the cost to develop in Burnsville, the cost of affordable housing and the cost of having to retrofit treatment facilities into the urban landscape to treat higher density produced runoff.

### Ordinance Revision

Based on discussion with City staff, the overriding philosophy behind the Water Resources Management Plan should be one of development/retrofit/treat versus limiting land cover to reduce pollutant loading. However, there are several methods to help the City achieve the balance between development and the environment.

### Low Impact Development Practices

Low Impact Development concepts include narrower streets, reduced parking and vertical construction, all geared towards reducing the overall impervious cover of the watershed unit, as well as volume and rate control practices to mimic pre-development hydrology.

The City currently has a standard for low volume residential streets. The intent of the standard is to provide a street as narrow as possible and still provide traffic and pedestrian safety. Use of alternative street widths should be considered in areas of sensitive environments or where there are existing runoff quantity and/or quality issues. Maintenance, parking and safety issues of narrower streets must be considered.

Peter Kratz, in his August 27, 1996, presentation to the APWA National Conference in Washington D.C. identified that typical city standards require too much parking, representing a financial cost, security problems and environmental problems (i.e., changes in water quality). Some sources include Off-Street Parking Requirements: A National Review of Standards (David Bergman, 1991) and Flexible Parking Requirements (Thomas P. Smith, 1983) through the American Planning Association.

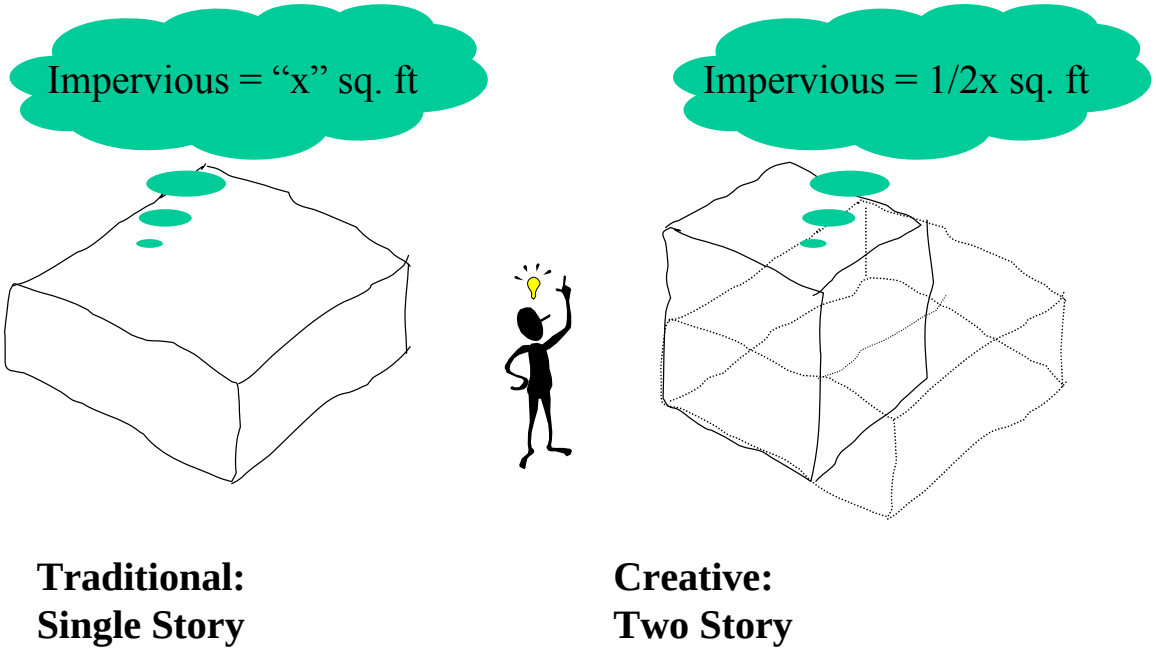
Encouraging the 45 degree parking space layouts will reduce percent impervious by eliminating one driving lane. Opening up the ordinance for porous pavement options

where practical will also help. Additionally, future ordinances could consider establishing parking area maximum levels rather minimum levels as they are currently listed. Encouraging joint parking facilities and promoting parking ramps that could include access for public transportation to large employee facilities could also be considered.

Parking costs must be a consideration. A traditional parking stall costs about $1,500 per space (2002 dollars). Covered parking (open, but under a building) can run up to $5,700 per space (2002 dollars). Fully enclosed parking ramp costs can run as high as $9,000 per space (2002 dollars). The economic cost must be weighed against the environmental benefit. These figures are based on reported costs in 1995 dollars adjusted for inflation of 3 percent annually.

In commercial and industrial zoning districts, establishing a minimum height of two stories will limit the office-show room/one-story style commercial and industrial development already prevalent in Burnsville. A move towards vertical construction, as illustrated in Figure 21, reduces infrastructure, the land area relative to the usable space, roofing and exterior building surfaces and increases green space while achieving planned densities. Vertical construction does increase the building footing design, vertical circulation within the site and parking densities and costs. The alternative is towards more green space and away from connected impervious surfaces.

**Figure 21 - Vertical Construction**



### Policies and Implementation

The City has developed policies and implementation activity steps to help meet the land use goals of this plan. These policies and activities are presented in Tables 41 and 42, respectively.

**Table 41 - Land Use Policies**

| | |
|---|---|
| **Subject:**<br>➢ Land Use Management | |
| **Purpose:**<br>➢ Revise ordinances and policies to promote sustainable growth. | |
| **Goal:**<br>➢ Recognize the relationship between land use and water resources management | |
| **Land Use Policies** | |
| ***Policy 12.1:*** | The City shall promote the use of Low Impact Development practices to replicate pre-development hydrology. |
| ***Policy 12.2*:** | The City will consider narrower street design, on a case by case basis, to increase green/open space and minimize impervious surface, in accordance with established City standards. |
| ***Policy 12.3:*** | Burnsville will encourage proof of parking and endorses shared-parking and green "show storage" areas to minimize impervious surfaces. |
| ***Policy 12.4:*** | On-site ponding and regional pond requirements will be reduced in proportion to reduction in runoff rates and/or volumes due to the use of Low Impact Development practices. |

**Table 42 - Land Use Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Develop a disconnected impervious policy which reduces the amount of impervious surface that can directly run off to the drainage system | • Current structural coverage<br>• Industry standards for pollutant loading relative to connected impervious<br>• Planning Staff<br>• Public Works Staff | • Completed policy<br>• Publicity-education campaign<br>• Included in ordinance | 2003<br><br>2004 | NA<br><br>NA |
| 2. Modify existing zoning to move impervious cover requirements to a separate development density standards section | • Existing Zoning<br>• Regulatory Responsibilities Strategy<br>• Planning Staff<br>• Public Works Staff | • Modified Zoning Ordinance | 2003 | NA |
| 3. Develop parking standards, variances and incentives that may encourage overall less area for parking | • Planning Staff<br>• Public Works Staff<br>• Available ordinances and standard references<br>• Developer Input | • Documented Standards | 2005 | NA |

## WATERSHED ASSESSMENT

Most of Burnsville lies within the larger Minnesota River Basin in east central Minnesota. The Minnesota River Basin includes several smaller watershed units including the Lower Minnesota and Black Dog (including the old Credit River watershed). About 6 percent of Burnsville is within the Vermillion River watershed, which is part of the Mississippi River basin. The extent and boundaries of these watersheds are illustrated in Figure 22.

The Vermillion River Watershed dominates Dakota County. The watershed stretches from Elko/New Market in the southwest to Lake Alimagnet in Burnsville in the northwest to Hastings in the east before discharging to the Mississippi River upstream of Red Wing.

The Black Dog Watershed covers parts of Burnsville, Lakeville, Apple Valley, Eagan and Savage. It includes the old Credit River watershed that covers southwest Burnsville. About 67 percent of Burnsville is within the Black Dog Watershed, comprising about 72 percent of the total watershed area. One of the primary goals of the watershed management organization (WMO) is to maintain or improve quality in the key ("strategic") water bodies in the watershed. Four lakes have been identified as strategic water bodies by the Black Dog WMO: Crystal Lake; Keller Lake; Lac Lavon; and Sunset Pond. The WMO will monitor these waterbodies, but leave direct management in the hands of the City. None the less, Burnsville's water quality goals for these waterbodies must meet or exceed the reasonably attainable water quality goals established by the Black Dog WMO. The WMO will also facilitate solutions to inter-community problems.

The remaining 27 percent of Burnsville lies within the Lower Minnesota River Watershed District (LMRWD). The LMRWD stretches along the Minnesota River valley from St. Paul to Chaska, mirroring the river both north and south. Significant resources that lie within both Burnsville and the Lower Minnesota River Watershed District include the Minnesota Valley National Wildlife Refuge, and Black Dog Lake.

### METHOD OF ANALYSIS

The watershed approach to completing this plan extends beyond the activities of preparing this document. The analysis included incorporation of existing studies, plans and models to develop a comprehensive watershed approach.

Examples of previous work that was utilized in plan development include:

- 1994 Comprehensive Storm Water Management Plan
- 1998 Comprehensive Wetland Protection and Management Plan
- 1999 Natural Resources Management Plan
- 1999 Comprehensive (Land Use) Plan
- Black Dog WMO Watershed Plan (2002)
- Lower Minnesota River Watershed Plan (1999)
- Vermillion River Watershed Plan (2005)

### Pond and Wetland Inventory

A detailed inventory was completed as part of the 2008 update to Comprehensive Wetland Protection and Management Plan.

Table 43 summarizes the number of basins and total acres for the four management classes of Burnsville's wetlands.

**Table 43 - Wetland Classification Summary**

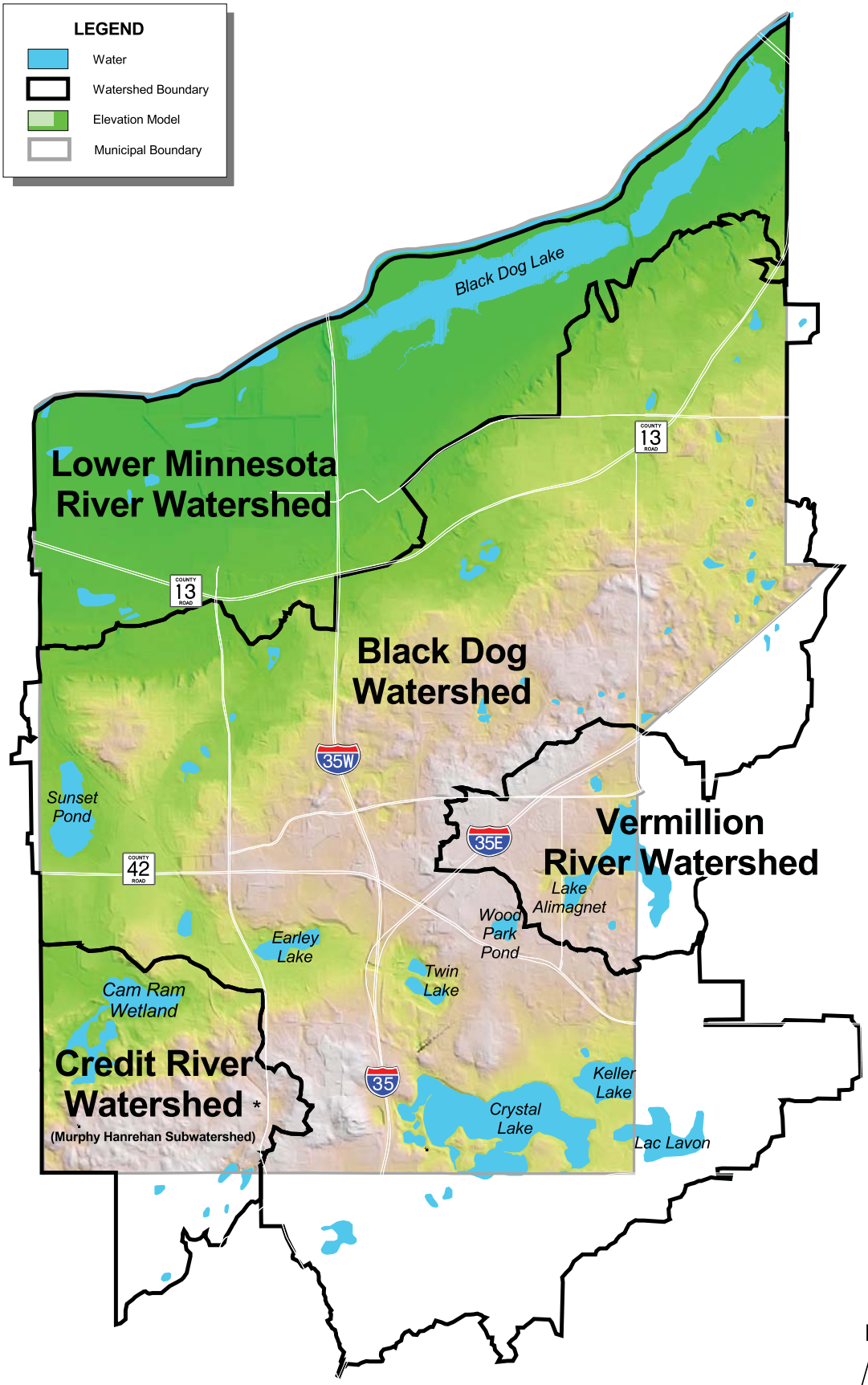
| Management Class | Percent of Basins in this Category | Total Acres |
|---|---|---|
| Protection | 77 | 1,375 |
| Improvement | 12 | 217 |
| Management | 9 | 171 |
| Management II | 2 | 31 |
| Total | 100 | 1,794 |

Source: City Wetland Inventory (2008)

### Map Revisions

One of the desired outcomes of the planning process was to have an updated map of the City's drainage system. The existing GIS includes 2-foot contour maps, parcel data and structure footprint. In addition, line work representing the in-place storm sewer system is also available.

To complement the existing information, the mapping produced as part of the 1994 plan was reviewed and revised. The nature of the revisions involved integrating recent detailed studies and comparing existing subwatershed boundaries to the in-place pipe system. The result is an accurate, over-all system map and associated GIS coverage for subwatershed and catchment.




* Under the Jurisdiction of Black Dog WMO

1" = 3500'

| | | | | |
|---|---|---|---|---|
| SEH | 9/20/02<br>burns.apr<br>naf | BURNSVILLE WATERSHEDS | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>22 | |

### Water Body Classification System

Considerable effort has been made towards updating the City's wetland classification system. Extensive efforts have also been made at the watershed level. As a result, specific lake goals have been established for all major lakes within the City. The City's classification system shown in Table 44 was taken from and is consistent with the Comprehensive Wetland Protection and Management Plan (2008). The City considered several classification systems in the original Plan development process in 2000 to 2002, including one very similar to the Black Dog WMO system described later in this Plan. As part of this update, the City no longer will have a separate classification system for City Lakes. Instead, the City will adopt the respective watershed's classification for the lakes.

**Table 44 - Burnsville Wetland Classification System**

| Classification | Description |
|---|---|
| Protection | Basins with Native Grades of A or B, sites with complete Community Structure, any sites supporting rare species, and any sites within or adjacent to significant natural communities as identified by the Dakota County Biological Survey. This is comparable to the Preserve Classification used in the MnRAM. |
| Improvement | Basins with 3 of 4 of the Community Structure criteria, sites greater than ten acres in size, Minnesota Department of Natural Resources Protected Waters and Wetlands (Public Waters), and basins within existing City parks that are not classified as Protection Areas. Although there is some overlap, this classification is similar to the Manage I and Manage II MnRAM classifications. |
| Management | Remaining wetlands, but generally of low quality and located outside of protected areas. Management wetlands are also likely to receive untreated storm water runoff, but have not been altered to enhance treatment capabilities. This classification is comparable to the Manage II and Manage III MnRAM classifications. |
| Management II | These basins include any of the water features that may have been historic wetlands, and would remain subject to the requirement of the Wetland Conservation Act. These basins will have minimal protection standards as they currently function primarily to provide storm water management. |

### Problem Identification Process

The planning process began with City staff identifying existing problems as well as expectations for the Water Resources Management Plan, including:

- Access for maintenance, identified on as-built drawings
- Identification of high water levels
- Accurate watershed map
- Terrace Oaks flooding
- Goals for urban stormwater management
- Standard for nuisance flooding
- Techniques for improving water quality
- Capacity of existing systems
- Frequency of maintenance activities
- Low Impact Development techniques
- Incompatibility between similar plans

### Land Use Driven Analysis

A relationship exists between land use practices and runoff impacts. The relationship is a function of both impervious cover and the extent and distribution of ponds and wetlands, as well as their *treatment capacity* and *treatment potential*. With a watershed impact/response relationship in place, the City can develop regulatory controls for allowable land use practices and require mitigation for sub-standard development. Currently the City deals with development standard issues primarily through the green space requirement and the Shoreland Ordinance.

### Wetland Utilization

The *treatment potential* in Burnsville is great within over 300 ponds and wetlands. However, the *treatment capacity* is not documented; in most cases only pond/wetland surface area data exists. No pond depth information is available. Additionally, the 1998 Wetland Inventory (SEH) brought the recognition that the City should not exploit the water quality *treatment potential* of all of its wetlands to improve the quality of the lakes and creeks, even if a particular wetland is providing treatment of runoff today. In fact, protection of the highest quality wetlands is warranted.

Utilizing wetlands as a key component to water quality improvements within the context of *treatment capacity* and *treatment potential*, raises several important value-based questions:

- Which are our most important resources?
- To what degree should they be protected, restored or maintained?
- How should the existing system be relied upon?

- What other measures should be taken?
- What are the tools necessary to maximize treatment potential?
- What additional treatment is necessary to achieve the plan goals?

*Treatment potential* begins to answer at least some of the questions above. *Treatment potential* represents the "best case scenario" for treatment based on the existing landscape and the City wetland classification. Treatment potential excludes wetlands classified as protection and those wetlands associated with high priority natural areas from consideration as water quality treatment facilities, even if they exhibit high or exceptional water quality attributes. Next, based on the area of the remaining ponds and wetlands, *treatment potential* is estimated by assuming that a volume of dead storage sufficient to achieve the level of pollutant removal achieved in the NURP study could be provided, regardless of whether or not it exists today. The treatment potential varies by wetland classification.

A methodology based on National Urban Runoff Program (NURP) and the P8 Urban Catchment Model Version 1.1 (IEP, 1990) defines the appropriate level of treatment for urban storm water. Using this approach, a recommended minimum pollutant removal efficiency for urban storm water treatment is determined. Based on this standard, the existing treatment capacity and treatment potential of each subwatershed can be estimated.

The P8 model was used to develop a relationship between pollutant loading based on the impervious fraction and the wet-pond surface area requirements, assuming optimum dead storage condition to approach pollutant removal efficiencies consistent with the results of the National Urban Runoff Program (NURP) study. The impervious fraction for each land use type used in the analysis is shown in Table 45.

**Table 45 - P8 Inputs by Land Use Type**

| Land Use Type | Impervious Fraction |
|---|---|
| Agriculture | 2% |
| Apartment/townhome | 65% |
| Commercial | 85% |
| Farm | 5% |
| Industrial | 72% |
| Multi-family | 65% |
| Park | 10% |
| Residential | 30% |
| Right of Way | 50% |
| Railroad | 85% |
| Vacant/undeveloped | 0 |
| Mobile Home | 38% |

Analysis of required pond size, expressed in terms of the impervious percentage of the contributing watershed, yields a relationship of pond area to impervious contributing area. The relationship is based on an 85 percent total suspended solids removal, and standard design-mode parameter of the P8 model.

An 85 percent total suspended solids (TSS) removal value was used in the analysis versus the 90 percent level achieved in the NURP study, recognizing that there may not be adequate detention time in many wetlands to achieve 90 percent removal as discussed by EPA (1983). Additionally, depending on the quality of the wetland, extended detention on a frequent basis, which would be the case for effective water quality treatment, may be detrimental to diverse vegetation and sensitive habitats.

MPCA's document Protecting Water Quality in Urban Areas (March 2000) presents a relationship between removal efficiencies and detention time. Table 46 illustrates the relationship. Although constructed storm water ponds may have appropriate detention time, they represent only a fraction of the City's treatment potential. From Table 46, it can be observed that, although the TSS removal goal of 90 percent can be met with detention times less than two days, the total phosphorus (TP) removal level of 65 percent requires detention times that begin to approach three days.

The City's drainage system relies heavily on wetlands for water quality treatment. Extended water level fluctuations and detention time can have a detrimental impact on wetland vegetation. A detention time of 36 hours was chosen, corresponding to an 85 percent TSS removal. The 36-hour detention time was chosen as a period short enough to minimize negative vegetative/habitat impacts. See Recreation, Fish and Wildlife Goal in the Goals and Policies section for additional discussion regarding water level fluctuations and habitat impacts. The results of the P8 analysis are illustrated in Figures 23 and 24.

**Table 46 - Pollutant Removal Versus Detention Time**

(MPCA, 1989)

| | **Detention Time (hours)** | | | | |
|---|---|---|---|---|---|
| **Parameter** | 24 | 36 | 41 | 48 | > 48 |
| Total Suspended Solids | 78% | 85% | 90%[1] | 93% | > 93% |
| Total Phosphorus | 50% | 56% | 57% | 58% | 65%[1] |

1 Meets levels reported/achieved in NURP study of 90% TSS or 65% TP.

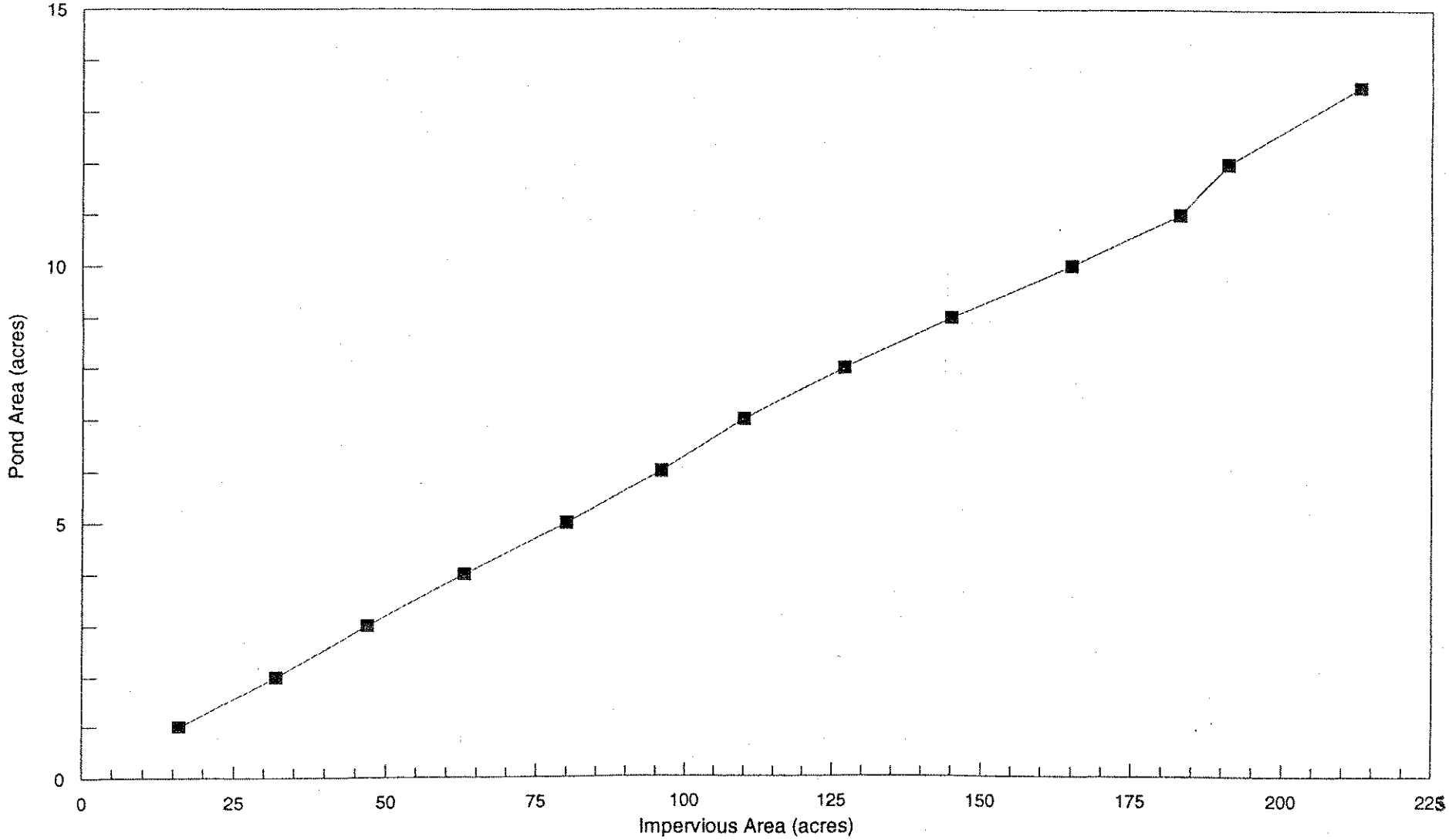
The following relationships were developed from Figures 23 and 24, to assess the treatment potential and the required treatment for each subwatershed. Analysis of required pond size expressed in terms of the impervious percentage of the contributing watershed yields the relationship of 1 acre of treatment pond is necessary for every 15.8 acres of impervious contributing area (or a ratio of 0.063). The relationship is based on an 85 percent TSS, and standard design-mode parameter of the P8 model (IEP). Based on this relationship, the following equations can be

developed, where I is Percent Impervious expressed in decimal form (i.e., for 10 percent impervious, use I = 0.10).

**EQ 1. Required Treatment Pond Size (Acre) = 0.063 x Acres of Impervious Surface**
**EQ 2. Total Suspended Solids (TSS) Loading (Lbs/Acre) = 613.79 x I**
**EQ 3. Total Phosphorus (TP) Loading (Lbs/Acre) = 0.186 x I**

*Note: The resulting relationships are not intended to be used as a detailed design tool – instead they are intended to make a comparative analysis of the treatment capacity and treatment potential within individual subwatersheds.*

FIGURE 23 Treatment Pond Area versus Impervious Area
(Based on P8 Model and 85 percent TSS Removal)



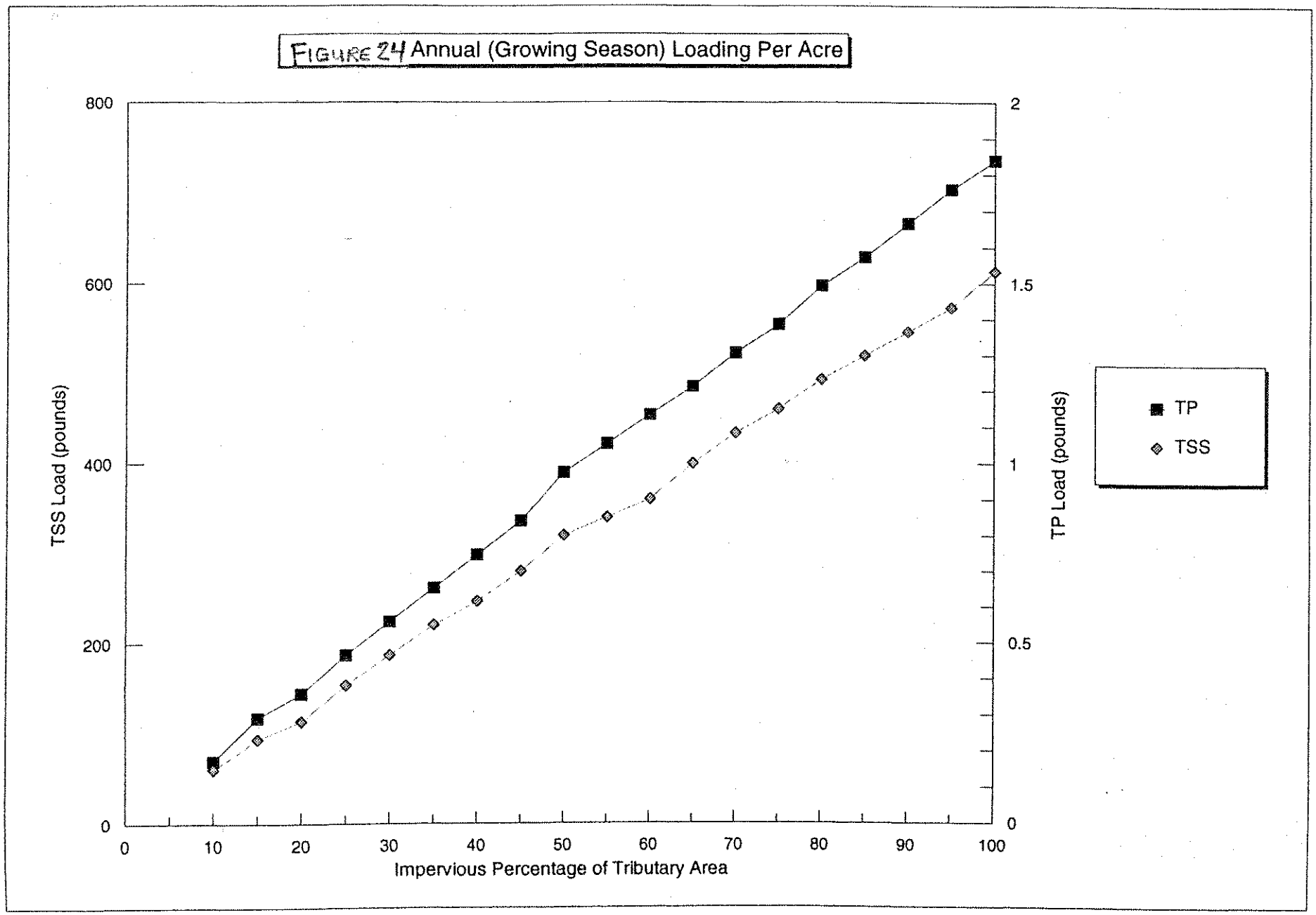


FIGURE 24 Annual (Growing Season) Loading Per Acre
TSS Load (pounds)
TP Load (pounds)
Impervious Percentage of Tributary Area
0
200
400
600
800
0
0.5
1
1.5
2
0
10
20
30
40
50
60
70
80
90
100
TP
TSS

### Prioritizing Future Watershed Management Activities

The foregoing discussion centers on a planning-level water quality analysis that determines excess or deficient treatment potential for each identified subwatershed. With subwatershed analysis complete, a method for prioritizing subwatersheds is required to develop the implementation plan. One example of a prioritization methodology for addressing future ponding needs is based on three factors:

1. The rank of the receiving water;
2. The degree of anticipated land use change in terms of change in impervious percentage; and
3. The current treatment deficiency.

Table 47 summarizes the three factors and their corresponding values.

**Table 47 - Prioritization Factors**

| **Receiving Lake Ranking** | **Value** |
|---|---|
| Protection (High Priority) | High |
| Improvement (Medium Priority) | Medium |
| Management (Low Priority) | Low |
| **Degree of Anticipated Land Use Change** | **Value** |
| High | High |
| Moderate | Medium |
| Minimal | Low |
| **Current Treatment Deficiency** | **Value** |
| Current Treatment Area < 50% of Required | High |
| Current Treatment Area > 50% and < 90% of Required | Medium |
| Current Treatment Area > 90% of Required | Low |

In the watershed/subwatershed descriptions in subsequent sections of this Plan, this methodology was used to help determine the priorities for each of the three categories in Table 48. Combining the subwatershed analysis in the Implementation Section of the Plan provides a tool for deciding where improvements should be made on a prioritized basis. The implementation plan includes a means for combining the three factors to establish a single priority system.

**Table 48 - Priority Categories**

| Subwatershed Priority | Values (from Table 47 ) |
|---|---|
| High | Minimum of one High and no Lows<br>or<br>High in both receiving water ranking and treatment deficiency |
| Medium | Neither High nor Low |
| Low | No Highs and two or more Lows |

### Hydrologic Model Update

The 1994 Comprehensive Storm Water Management Plan (OSM) included the development of a City wide flood-routing model using the HydroCAD™ model. The 1994 model was based a 1% chance (commonly referred to as the 100-year) event, assuming 5.9 inches of rain over a 24 hour period and an SCS/NRCS Type II storm distribution. The 1994 plan Policy 2 (page IV-2) indicates that a 6-inch rainfall over 24 hours is the 1% chance event in Burnsville. Therefore the overall model was updated using a 6 inch rainfall event. The model was also completed for the 4.2 inch (10-year, 24-hour) rainfall event. Recent modeling for FIRM map updates to various water bodies has been completed since 2002 using various models including XP-SWMM and HEC-RAS. These data are included in Appendix D.

In addition to adjusting the rainfall depth, the model was generally reviewed for inconsistencies that had risen since its initial development. In particular, the runoff curve numbers (CN), which are based on land use and soil conditions, were reviewed and modified as necessary. Information relating to lake and pond outlet conditions were also reviewed to ensure that the model reflects the asbuilt condition of the drainage system. Finally, recent modeling in the City of Lakeville was added to the Burnsville/Crystal Lake watershed to more accurately portray actual conditions.

A summary of the hydrologic modeling results for the 100-year storm event is provided in Appendix D. The information is presented in tabular format and includes data for most of Burnsville's subwatersheds. In general, the information should be considered approximate and should not be used for detailed, site-specific analysis for new development or redevelopment projects. Information for the specific water bodies in Burnsville that have designated flood elevations is also listed. Subwatershed identification numbers in the table correspond with the areas identified in Figure D-1 (Fold out map in Appendix D). Both new and old identification numbers are provided since the drainage area numbering system was updated as part of this 2008 Plan update.

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## VERMILLION RIVER WATERSHED

The Vermillion River drains 335 square miles in central Dakota County, including the urbanized east central part of Burnsville, to the Mississippi River at Red Wing. The Burnsville portion of the watershed is identified as being part of Planning Unit 1 in the Vermillion River Watershed Plan (2005). Runoff from this area contributes to North Creek, a tributary stream to the Vermillion River and the major lake in this watershed is Lake Alimagnet. Figure 25 illustrates the extent of the Vermillion River Watershed in Burnsville.

### WATERSHED JOINT POWERS ORGANIZATION

A 21-member Vermillion River Watershed Management Commission (VRWMC) previously governed the watershed. The legal basis for the commission was a Joint Powers Agreement (JPA), which was formulated on June 15, 1984. The purpose of the Commission was to preserve and use natural water storage and retention in the Vermillion River Watershed to meet Surface Water Management Act goals.

In accordance with the Metropolitan Surface Water Management Act, the WMO began to prepare a second generation plan for managing the water resources of the Vermillion River Watershed. A draft plan dated August 1999 was published and was in the process of review, but was not immediately adopted. Because a new joint powers agreement could not be established, the VRWMC was dissolved and management of the WMO reverted to Dakota and Scott Counties.

The Vermillion River Watershed located in Scott and Dakota Counties in Minnesota, is administered through a Joint Powers Agreement. The counties formed a Joint Powers Organization to exercise leadership in the development of policies, programs and projects that will protect and preserve the water resources in the Vermillion River Watershed. The VRWJPO is governed by a three-member Joint Powers Board (JPB) composed of two Dakota County Commissioners and one Scott County Commissioner. A nine-member citizen advisory Watershed Planning Commission supports the Joint Powers Organization.

Based on tax capacity, Dakota and Scott Counties jointly fund the administration and activities of the VRWJPO. The Counties established special taxing districts within their portions of the Watershed to provide a mechanism for funding VRWJPO costs. A nine-member Watershed Planning Commission (WPC), consisting of eight members from the Dakota County portion of the Watershed and one member from the Scott County portion, provides support to the JPB. The general duties of the WPC are to advise the JPB regarding its duties under the Joint Powers Agreement.

### Local Planning

The Commission requires preparation of local water management plans within two years after the VRWJPO plan is approved by the Minnesota Board of Water and Soil Resources (BWSR). Local plans must comply with Minnesota Rules 8410 and the specific plan requirements of VRWJPO. The VRWJPO completed and adopted their Plan on November 3, 2005.

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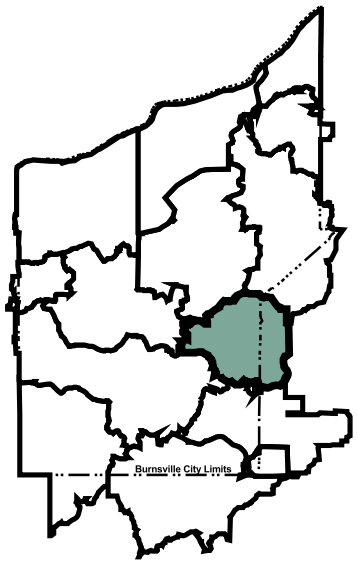
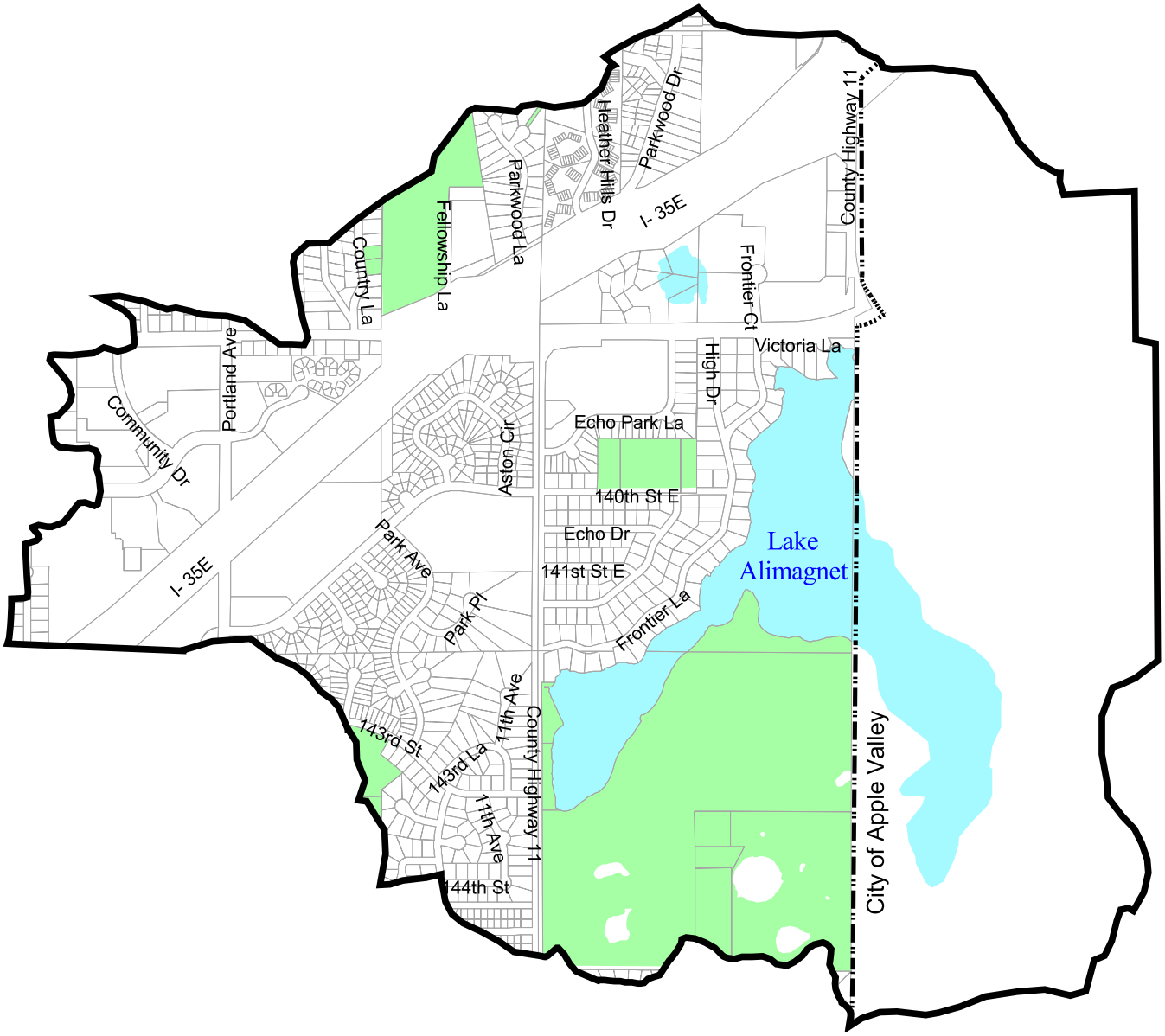



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 1392 Acres




| | | | |
|---|---|---|---|
| SEH | 6/11/02<br>subwtrshd.apr<br>bd | **Lake Alimagnet Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>25 |

## LAKE ALIMAGNET SUBWATERSHED

Lake Alimagnet is the sole subwatershed in Burnsville that is tributary to the Vermillion River. Lake Alimagnet is within the Vermillion River's 19,460 acre Watershed Planning Unit #1 as shown in Figure 25. The lake has a maximum depth of 9 feet, an average depth of only 5 feet and a surface area of approximately 109 acres. The watershed to lake area ratio is 12.8 to 1. The majority of the contributing area is in Apple Valley, as is the pumped-outlet. Table 49 summarizes lake quality statistics, water use restrictions, and fish population data for Lake Alimagnet.

In 1991, a diagnostic Feasibility study was prepared for the Lake. As part of that study, specific lake goals were established for the lake. The study found that the lake was impaired in terms of swimming, boating, recreational fishing and aesthetics. The impairment was based on a combination of low oxygen levels and high levels of algae in the lake.

The total phosphorus goal was set at 81μg/l. The lake is aging rapidly, with chronic occurrences of blue-green algae and a past history of fish kills. The data suggests that a reduction of external phosphorus loading was necessary to reduce the blue-green algae blooms. There are currently 12 storm sewer inlets to the lake within Burnsville and Apple Valley, three of which contribute 71 percent of the runoff. The 81μg/l goal was to be achieved after all identified watershed improvements were made.

The improvement slope for Lake Alimagnet from current, to diagnostic study goal to Grade B is steep at best. In it's current state, recreational uses (swimming, boating, fishing) are impaired. The 1999 mean summertime total phosphorus value was 122.2 μg/l. The diagnostic study found that removal of 440 lbs of phosphorus per year or a 30 percent reduction would make it possible to achieve the 81 μg/l goal. However, grade B levels would require considerably greater effort to reduce the total phosphorus concentrations to the 20 – 32 μg/l range suggested for grade B lakes by Metropolitan Council.

Based on the foregoing, it would seem practical to continue to work with Apple Valley and the Vermillion River WMO to implement all watershed related improvements to minimize phosphorus loading to the lake and to improve the sport fishery. However, the cost to achieve and maintain grade "B" level water clarity is considered cost-prohibitive. A water transparency goal of 1.2 meters is a more realistic long term goal. A detailed study of the watershed would be required to determine if it is feasible to achieve a higher lake clarity level and if a higher goal is warranted. The water clarity goal for Lake Alimagnet will be re-evaluated following completion of any future diagnostic studies. There are no critical water quantity issues.

**Table 49 - Lake Alimagnet Data**

| Lake Quality Statistics[1] | | |
|---|---|---|
| DNR Number | | 19-0021 |
| Total Suspended Solids - TSS | Mg/l | 8.0 |
| Total Phosphorus- TP | µg/l | 121.0 |
| Chlorophyll a | µg/l | 39.2 |
| Water Clarity – Secchi Disk | Meters | 0.9 |
| Carlson'sTrophic Status Index | TSI | 67.0 |
| Watershed Area | Acres | 1392 |
| Lake Area | Acres | 109 |
| Maximum Depth | Feet | 9.0 |
| Average Depth | Feet | 5.0 |
| Public Access | | West side of lake |
| WMO Classification | | N/A |
| City Classification | | Protection |
| Inlet/Outlet | | 12 inlets; pumped outlet in Apple Valley |
| **Fish Population** | | |
| Rainbow Trout | Not present | |
| Tiger Muskie | Not present | |
| Northern Pike | Very Good | 15.5 (2.67) |
| Bluegill Sunfish | Fair | 12.9 (11.67) |
| Largemouth Bass | Poor | 0.5 (0.5) |
| White Crappie | Not present | |
| Black Crappie | Very Good | 7.5 (2.67) |
| Yellow Perch | Very Good | 23.0 (8.0) |
| Walleye | Not present | |
| Channel Catfish | Stocked 9,000 in 2007 | |

1. Based on data from 1997 to 1999.
N/A = Not Available
Typical Ranges – North Central Hardwoods Ecoregion:

| | |
|---|---|
| TSI | 46-54 |
| Total Phosphorus | 23-50 µg/l |
| Water Clarity | 1.5-3.2 m |
| Chlorophyll a | 5-22 µg/l |

Fish numbers compared to state wide average (in parenthesis). Source: DNR, 2000.

### Water Use Summary for Lake Alimagnet

No local restrictions apply. (For a summary of state boating and other water use laws see http://www.dnr.state.mn.us/information_and_education/water_safety/boatingguide2001.pdf.)

### Action and Implementation Plans

Tables 50 and 51 present the City's Action Plan and Implementation Actions, respectively that have been developed to achieve the purpose and goals for Lake Alimagnet.

**Table 50 - Lake Alimagnet Action Plan**

| | |
|---|---|
| **Subject:**<br>➢ Lake Alimagnet Management Plan | |
| **Purpose:**<br>➢ Improve Lake Alimagent water quality and sport fishery | |
| **Goal:**<br>➢ Achieve an average water clarity of 1.2 meters | |
| **Intended Use:**<br>➢ Swimming, wildlife viewing and runoff management (flood control) | |
| **Problems** | ➢ **Solutions** |
| 1. External phosphorus loading is too high; internal loading is not considered a factor. | ➢ 1. Re-assess the structural recommendations of the 1991 Diagnostic Feasibility Study. |
| 2. Low dissolved oxygen conditions in the hypolimnion reduce the suitability for many sport fishery species and contribute to frequent winterkills. | ➢ 2. Continue to operate aeration system that has been in place since 1999. |
| 3. Treatment deficiencies in selected drainage areas, even with a number of existing treatment basins, could result in excessive pollutant loading to the lake. | ➢ 3. Prepare a study to identify options for enhancing treatment in contributing subwatersheds. |
| 4. Due to the mostly developed nature of the subwatershed, some of which lie outside the City, BMPs intended to reduce phosphorus loading may be difficult to implement. | ➢ 4. Prepare a study to discuss the desired level of treatment, treatment options, costs and impacts on riparian and non-riparian landowners. |
| 5. Twelve individual discharge points to the lake make it difficult to control the quality of the inflow at each location. | ➢ 5. The Diagnostic study identifies 70% of the load occurring from three inlets; develop end-of-pipe solutions for the three critical inlets. |

**Table 51 - Lake Alimagnet Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Complete re-evaluation of diagnostic study and implemented improvements | • VRWMC<br>• Apple Valley<br>• Public Works<br>• Lake Association<br>• DNR<br>• Available Monitoring | • Documentation of current and projected conditions of the lake.<br>• Document neighborhood and public issues and concerns | 2002 | $25,000<br>($50,000 total, also $25,000 Apple Valley) |
| 2. Work with Apple Valley to operate aeration system | • 1991 Diagnostic Feasibility<br>• Step 1 (above)<br>• DNR<br>• Neighborhood Input<br>• VRWMC<br>• City of Apple Valley | • Annual Operation | Annual | NA |
| 3. Implement water quality improvement projects | • Detailed Study<br>• City of Apple Valley<br>• VRWMC | • Feasibility Study<br>• Completed design and Construction | 2004<br><br>2005<br>2006 | $35,000<br><br>$140,000<br>$400,000 |
| 4. Implement a modular storm water treatment system (filters) at existing storm water inlets as pilot project | • Vendor Data<br>• Current user references<br>• Public Works Staff | • Completed design<br>• Installation<br>• Monitoring | 2004 | NA |

## BLACK DOG WATERSHED

The Black Dog Watershed is located in northwestern Dakota County and a portion of Scott County. Figure 26 illustrates the location of the watershed in relation to the seven county metropolitan area. When the Black Dog Watershed Management Organization (BDWMO) was formed in 1985, the watershed covered 12,900 acres (about 20.2 square miles). In 1999, the portion of the terminated Credit River watershed in Dakota County was incorporated into the Black Dog WMO, increasing the total watershed area by 3,700 acres (5.7 square miles). Figure 27 illustrates the Black Dog watershed and subwatersheds relative to Burnsville.

### WATERSHED MANAGEMENT ORGANIZATION

The legal basis for the BDWMO is a Joint Powers Agreement (JPA), which was formulated in June 1985 between the cities of Apple Valley, Burnsville, Eagan, Lakeville and Savage. The WMO was formed in response to the requirements of the State Metropolitan Surface Water Management Act of 1982. The BDWMO's first watershed plan was approved on November 22, 1989. BDWMO most recently updated their watershed plan in 2012.

In 1999, the Dakota County portion of the former Credit River watershed was added to the jurisdiction of the BDWMO. As a result, a revised and restated joint powers agreement was signed by the member communities. The BDWMO and Scott County signed a memorandum of understanding regarding the management of the Credit River watershed in Dakota County.

The BDWMO's general purposes include the following:

- Keep regulation at the local level;
- Assist member communities with inter-community issues;
- Monitor, classify and manage strategic water bodies (Crystal Lake, Keller Lake, Lac Lavon and Sunset Pond in Burnsville);
- Monitor, evaluate and/or model storm water runoff quality;
- Improve the quality of storm water runoff reaching the Minnesota River;
- Develop policies to be implemented by member cities to achieve the organization's goals; and
- Assess the performance of the BDWMO and the member cities in achieving the organization's goals.

### Local Planning

Each member City is responsible for preparing and implementing a local water resources management plan, as required in the WMO plan. One of the key requirements of the BDWMO Plan and the City's plan is that discharge rates leaving the BDWMO must be maintained at predevelopment rates (for developed watersheds) or existing rates (for fully developed wathersheds).

### BDWMO Lake Classification

The Black Dog Water Management uses four simple categories to describe its water bodies as shown in Table 52. The City of Burnsville's classification system is shown in Table 44 in the Watershed Assessment section of this Plan. The City's system uses three categories or levels including: Protection; Improvement and Management.

**Table 52 - Black Dog WMO Lake Classification**

**(Barr, 2012)**

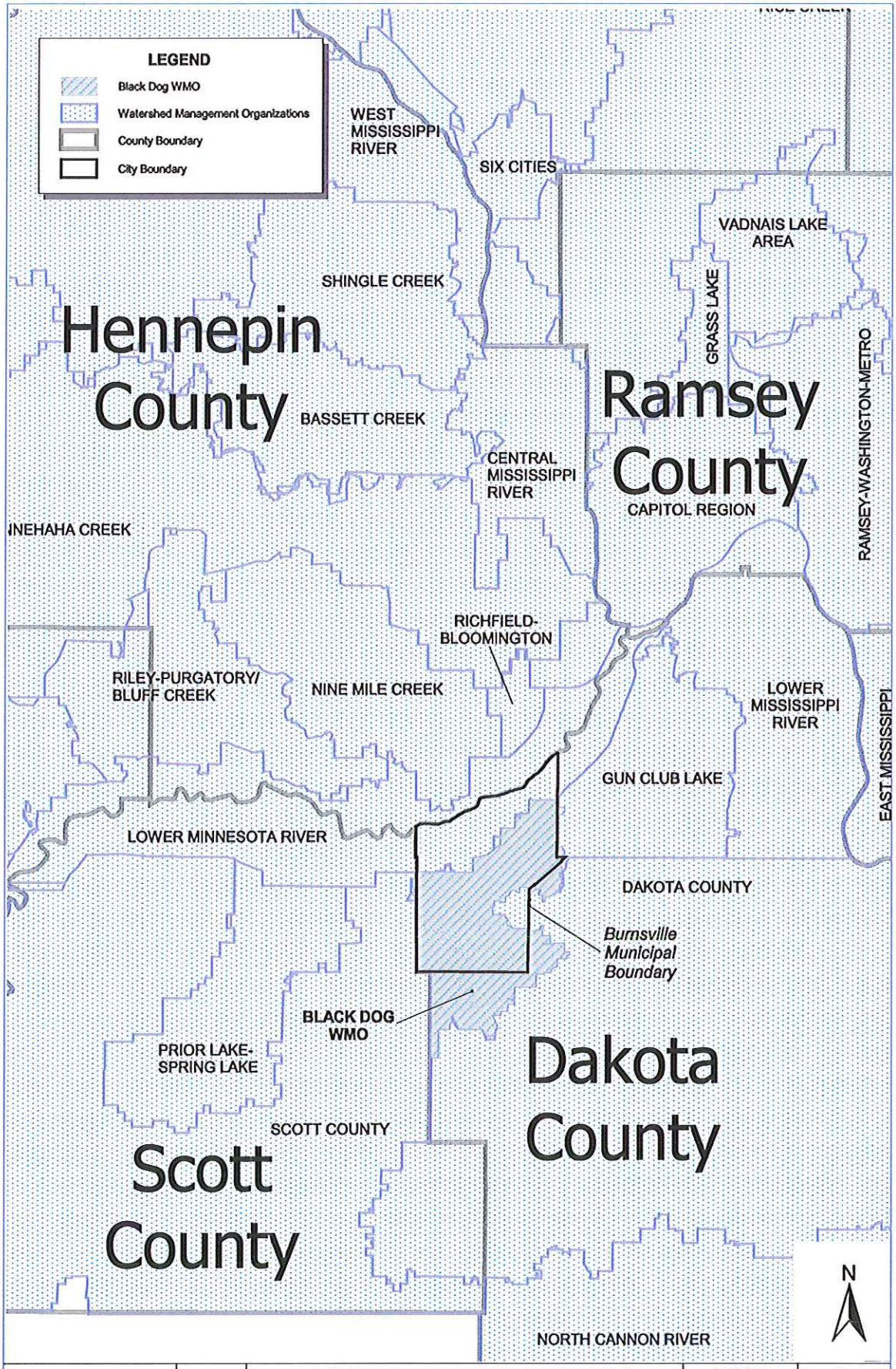
| Classification | Description |
|---|---|
| Category I | Highest water quality; supports swimming and other direct contact recreational activities such as water skiing, scuba diving and snorkeling. |
| Category II | Supports indirect recreational activities such as boating and fishing. |
| Category III | Provides wildlife habitat, aesthetic enjoyment and possibly warm water fishing. |
| Category IV | Typically water quality ponds used as nutrient and sediment traps. |

In addition to the classification system, the BDWMO has established action levels for four strategic water bodies in Burnsville: Crystal Lake; Lac Lavon; Keller Lake; and Sunset Pond. In some cases, the City's water clarity goal is somewhat higher than the WMOs action level for these lakes. The City recognizes that the higher goal(s) may be difficult to achieve, and is committed to working with the WMO to define the appropriate water clarity level for a selected lake. More detailed discussions would take place following completion of diagnostic studies for these strategic lakes.

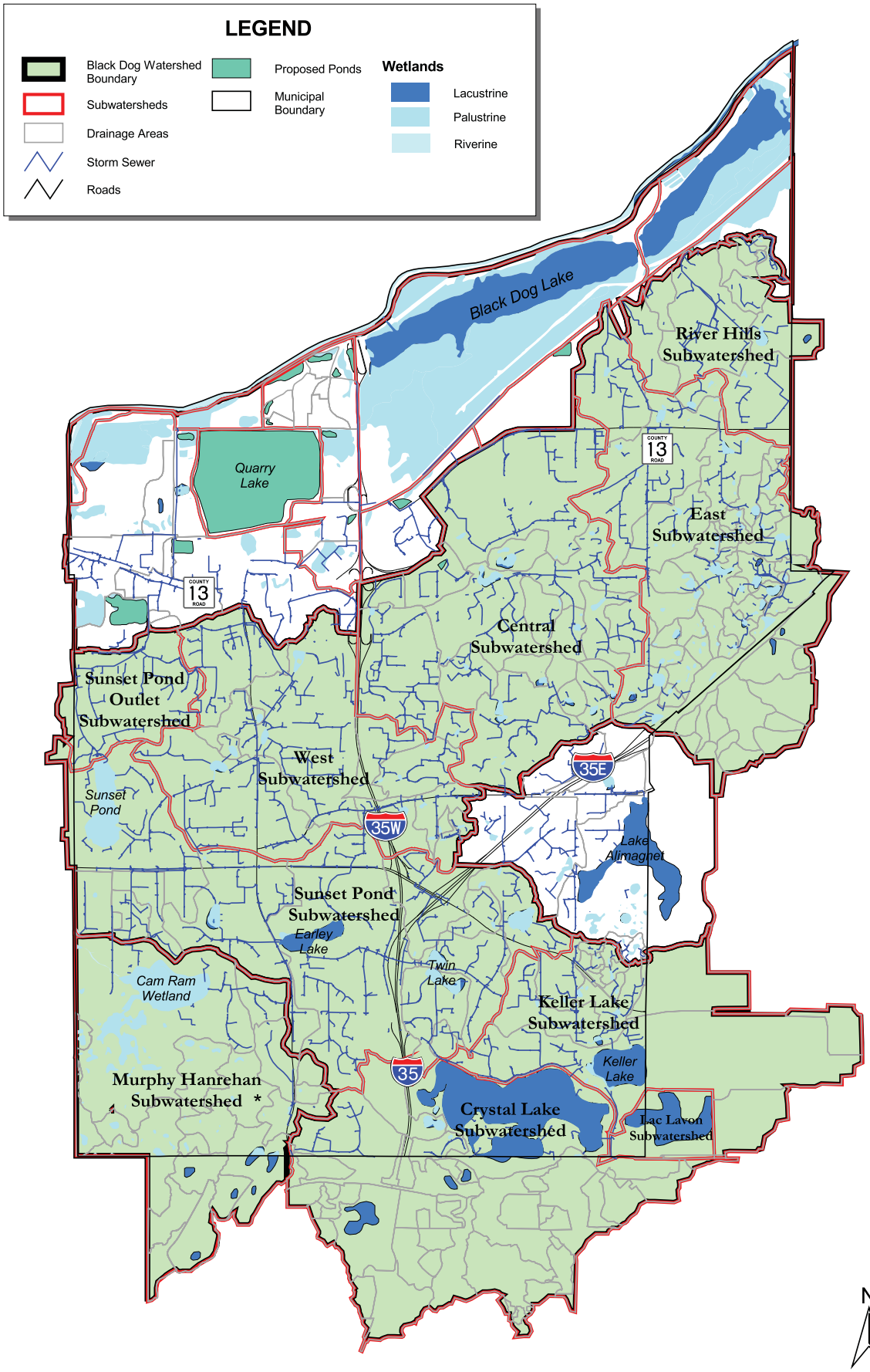
### Subwatersheds

There are 10 identified subwatersheds of the Black Dog Watershed that lie within the boundaries of Burnsville. Figure 27 illustrates the Black Dog WMO subwatersheds in Burnsville.

Each subwatershed has been further divided into smaller catchments or drainage areas that generally correspond to the City's 1994 Comprehensive Stormwater Management Plan. Some revisions and updates to subwateshed and catchment boundaries have been made as discussed previously in the Watershed Assessment Section of this Plan and are illustrated in the foldout map in Appendix D (see Figure D-1).



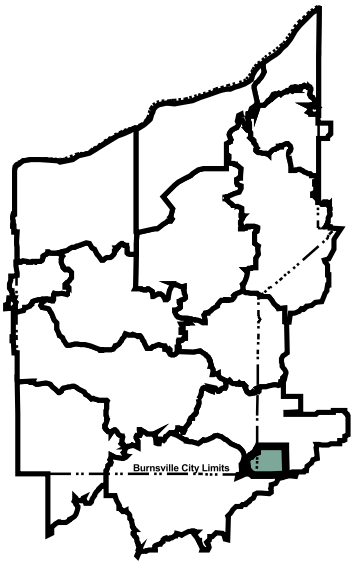

| | | | | |
|---|---|---|---|---|
| SEH | 6/11/02 watershed.apr naf | LOCATION OF BLACK DOG WATERSHED MANAGEMENT ORGANIZATION | FILE NO. ABURNS9904.00 FIG NO. 26 | |




* Under the Jurisdiction of Black Dog WMO

1" = 3500'

| | | | | |
|---|---|---|---|---|
| SEH | 9/20/02<br>watershed.apr<br>naf | BLACK DOG SUBWATERSHEDS IN BURNSVILLE | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>27 | |

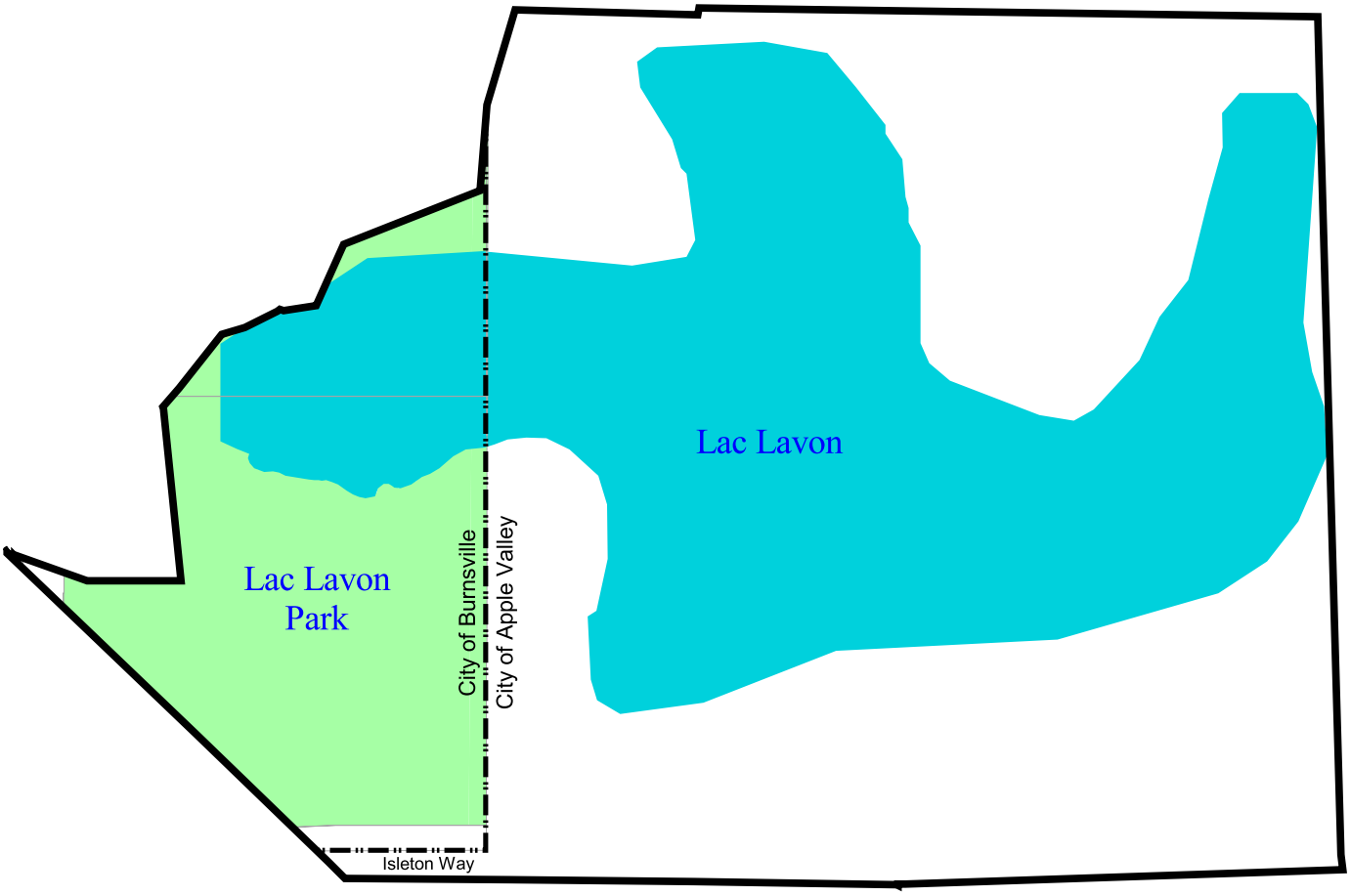



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- USGS DLG Lakes
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, Mn/DOT, and USGS.

Watershed Area = 184 Acres




| | | | | |
|---|---|---|---|---|
| SEH | 9/20/02 | **Lac Lavon Subwatershed Burnsville, MN** | FILE NO. ABURNS9904.00 | |
| | subwtrshd.apr bd | | FIG NO. 28 | |

## LAC LAVON SUBWATERSHED

Lac Lavon is a unique resource, not only in Burnsville, but also in the Metropolitan area. It is but one of a handful of metropolitan area lakes that rates an "A" in the literature values. Lac Lavon's quality is similar to that of lakes in northern Minnesota. One reason for Lac Lavon's quality is its relatively small watershed to lake area ratio of approximately 3.2:1. The lake has an average depth of less than 15 feet and a maximum depth of 32 feet. The 60-acre lake does not have a public access, nor does it have storm water inlets or outlets. The former gravel pit area turned lake exemplifies the benefits of limiting the influences of urbanization, setting a pattern the City hopes to repeat on future "Kraemer/Quarry" Lake (see discussion regarding the Northwest Burnsville subwatershed). The Lac Lavon subwatershed is shown in Figure 28.

Lac Lavon has been stocked in the 1990's with rainbow trout. Trout are a cold water species and their presence is considered an indicator of very good environmental quality. The Black Dog WMO draft plan does not anticipate any increase in total phosphorus loading to the lake. Therefore, maintaining Lac Lavon in its present form, while one of Burnsville's highest priorities, should not require costly management. Lake information, lake quality data and fish population data for Lac Lavon are summarized in Table 53.

The goal for Lac Lavon should be based on water clarity of 3.6 meters. There are no current water quality or quantity issues, although eurasian water milfoil currently exists in Lac Lavon. The City continues to administer an active aquatic vegetation control program. Future problems may exist related to runoff from the adjacent youth athletic complex.

### Policies and Implementation Plan

Tables 54 and 55 present the City's Action Plan and Implementation Actions, respectively that have been developed to achieve the purpose and goals for Lac Lavon.

**Table 53 - Lac Lavon Data**

| Lake Quality Statistics[1] | | |
|---|---|---|
| DNR Number | | 19-0446 |
| Total Suspended Solids – TSS | Mg/l | 39.0 |
| Total Phosphorus- TP | µg/l | 15.4 |
| Chlorophyll a | µg/l | 4.8 |
| Water Clarity – Secchi Disk | Meters | 3.7 |
| Carlson'sTrophic Status Index | TSI | 41.0 |
| Watershed Area | Acres | 184 |
| Lake Area | Acres | 60 |
| Maximum Depth | Feet | 32 |
| Average Depth | Feet | <15 |
| Public Access | | None |
| WMO Classification | | Category I |
| City Classification | | Protection |
| Inlet/Outlet | | None |
| **Fish Population** | | |
| Rainbow Trout | Fair | NA - Stocked by DNR |
| Tiger Muskie | Not present | |
| Northern Pike | Fair | 3.5 (2.67) |
| Bluegill Sunfish | Very Good | 62.2 (11.67) |
| Largemouth Bass | Poor | 0.5 (0.5) |
| White Crappie | Poor | 1.0 (0.71) |
| Black Crappie | Poor | 1.4 (2.67) |
| Yellow Perch | Not present | |
| Walleye | Not present | |
| Channel Catfish | Not present | |

1. Lake quality data from 1997-1999.
N/A = Not Available
Typical Ranges – North Central Hardwoods Ecoregion:

| | |
|---|---|
| TSI | 46-54 |
| Total Phosphorus | 23-50 µg/l |
| Water Clarity | 1.5-3.2 m |
| Chlorophyll a | 5-22 µg/l |

Fish numbers compared to state wide average (in parenthesis). Source: DNR, 2000.

### Water Use Summary for Lac Lavon

- Motorized vehicles, snowmobiles, and all terrain vehicles are prohibited.
- Electric motors allowed.
- No operation of watercraft from 10:00 p.m. to 5:00 a.m..
- No unnecessary, excessive noises associated with the operation or loading and unloading of any vehicle or motorboat.

Source: Burnsville Ordinance Chapter 8-9 and 6-5; and DNR website at:
http://www.dnr.state.mn.us/information and education/water_safety/surface_use.pdf
For a summary of state boating and other water use laws see also:
http://www.dnr.state.mn.us/information_and_education/water_safety/boatingguide2001.pdf.

## Table 54 - Lac Lavon Action Plan

**Subject:**

- Lac Lavon Management Plan

**Purpose:**

- Manage Lake consistent with its classification.

**Goal:**

- Maintain existing water quality clarity of 3.6 meters

**Lake Classification:**

- BDWMO: Strategic, Category I, Action Level = 3.6 meters

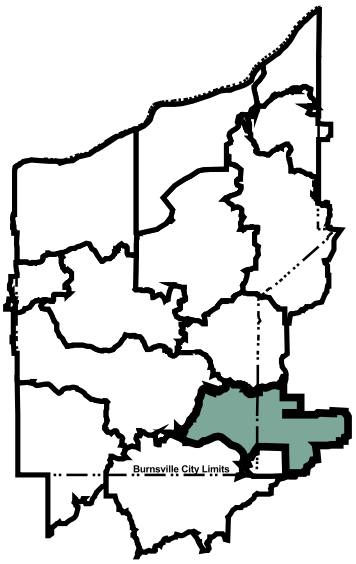
**Intended Use:**

- Full use – swimming, boating, fishing, aesthetics and runoff management (flood control); clarity fully supportive of swimming.

| Problems | Solutions |
|---|---|
| 1. Eurasian water milfoil threatens the recreational use of the lake. | 1. Continue to actively implement a control program in partnership with Apple Valley to minimize the spread of eurasian water milfoil. |
| 2. Runoff from the adjacent youth athletic complex may pose a threat to water quality. | 2. Complete an assessment of runoff patterns and water quality. |
| 3. Lack of information on fisheries because the Lake is not a DNR Protected Water and is not managed by the DNR Fisheries Program. | 3. Partner with Apple Valley to evaluate the fishery. |

## Table 55 - Lac Lavon Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Partner with Apple Valley to continue to actively implement a control program to minimize the spread of eurasian watermilfoil | • Recreation, Fish and Wildlife Goals<br>• Policies of this plan<br>• Experience of other communities<br>• Vendors | • Treatment (as needed) and annual assessment<br>• Annual habitat assessment | Annual<br><br>Annual | See Table 31 #1<br>NA |
| 2. Complete an assessment of runoff patterns and water quality at the youth athletic complex | • Park Plan (Youth Complex)<br>• Storm drainage facilities<br>• Contour mapping | • Completed study<br>• Implementation Program | 2007<br>2007 | $7,000<br>$100,000 |
| 3. Complete assessment of fish populations | • Fisheries staff<br>• Fisheries data<br>• Apple Valley<br>• Black Dog WMO | • Complete assessment of populations | 2004 | $8,000 |

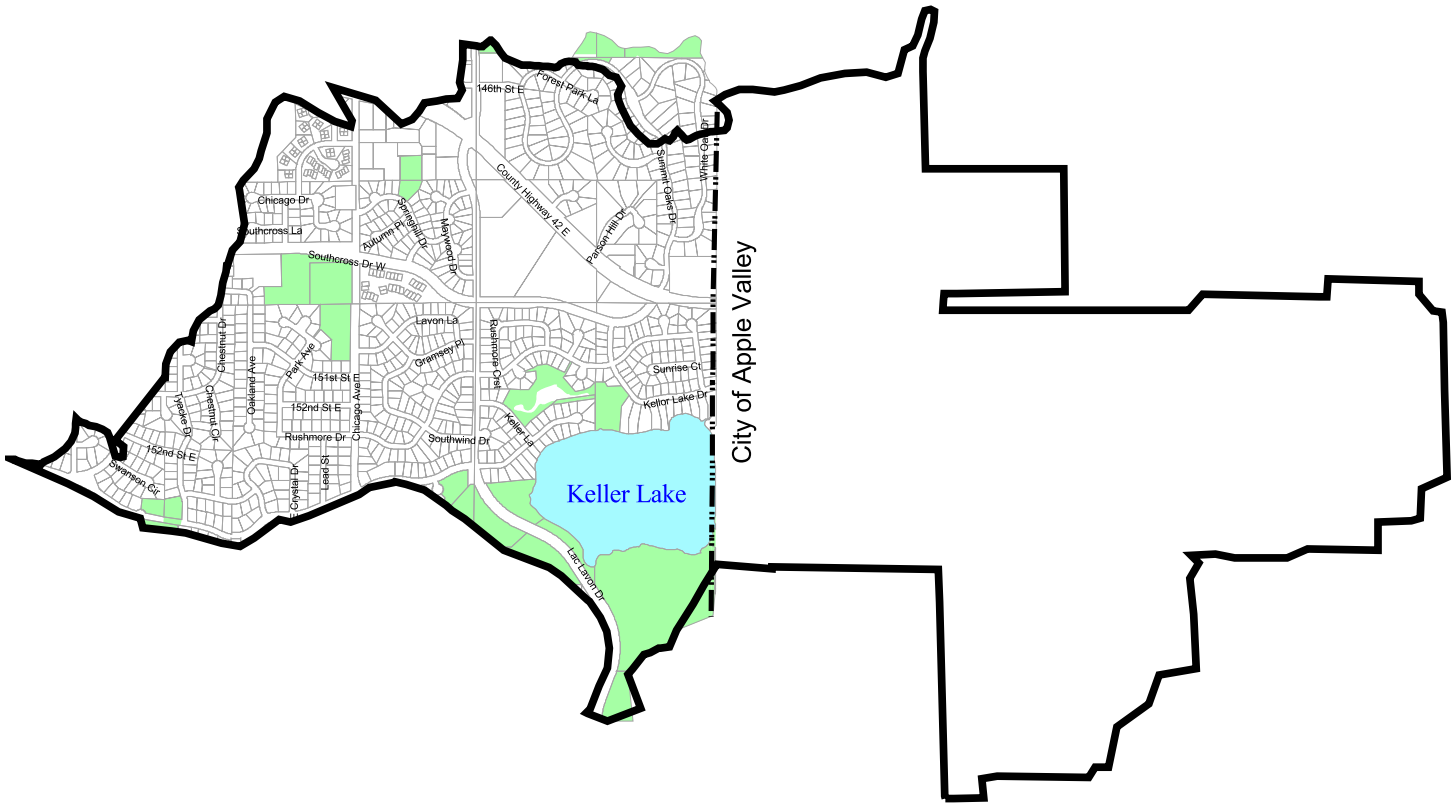



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 1,409 Acres




| | | | | |
|---|---|---|---|---|
| SEH | 9/10/02 | **Keller Lake Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00 | |
| | subwtrshd.apr<br>bd | | FIG NO.<br>29 | |

## KELLER LAKE SUBWATERSHED

Keller Lake has typically been rated by Metropolitan Council as having clarity less than 1 meter and high to severe levels of algae. The lake has an average depth of only 4.6 feet and a maximum depth of only 7 feet. The 63 acre lake has a watershed to surface area ration of 22 to 1 which helps to explain its current quality (as example, Lac Lavon has a ration of 3.2 to 1). Aside from 1998 when Keller's water quality improved significantly as a result of the Crystal Lake hypolimentic withdrawal system discharges, the lake has a very high phosphorus concentration. At the same time water quality improved, the lake experienced explosive plant growth. Based on current transparencies, the recreational suitability index would indicate very limited recreation uses based on citizen perception. The Keller Lake subwatershed is illustrated in Figure 29.

Keller Lake's predicted phosphorus load could increase by about 7 percent without additional treatment or BMPs. With BMPs implemented in the watershed, the BDWMO estimates that the phosphorus load would increase approximately 4 percent. The predicted future in-lake total phosphorus concentration is expected to change very little. There is minimal land use change expected in the contributing areas from Apple Valley. The Black Dog WMO should take the lead in developing solutions which also depend upon Apple Valley. Additional efforts should be undertaken to re-establish citizen expectations for intended uses.

In 1996, high water level complaints on Keller Lake prompted a study of options to increase discharges to Crystal Lake. It is advisable to hold off on any such improvements until one can gauge the impact of the capacity improvements recommended for Crystal Lake. The City's lake quality goal for Keller Lake is 1.8 meters of clarity. Quantity issues should be addressed by improvements to the Crystal Lake outlet (see Crystal Lake Special Study in Appendix A). At the time this Plan was completed, the BDWMO had not set an action level for Keller Lake. Upon completion of a diagnostic study on the Lake, the City and BDWMO will work cooperatively to evaluate the City's clarity goal and adjust it as needed based on the findings of the study. The BDWMO set an action level for Keller Lake at 0.7 meters of clarity.

Table 56 summarizes lake quality statistics, water use restrictions, and fish population data for Keller Lake.

### Policies and Implementation Plan

Tables 57 and 58 present the City's Action Plan and Implementation Actions, respectively that have been developed to achieve the purpose and goals for Keller Lake.

**Table 56 - Keller Lake Data**

| Lake Quality Statistics[1] | | |
|---|---|---|
| DNR Number | | 19-0025 |
| Total Suspended Solids - TSS | Mg/l | 62 |
| Total Phosphorus- TP | µg/l | 84.9 |
| Chlorophyll a | µg/l | 56.6 |
| Water Clarity – Secchi Disk | Meters | 1.3 |
| Carlson's Trophic Status Index | TSI | 60.5 |
| Watershed Area | Acres | 1409 |
| Lake Area | Acres | 63 |
| Maximum Depth | Feet | 7 |
| Average Depth | Feet | 4.6 |
| Public Access | | None |
| WMO Classification | | Category III |
| City Classification | | Protection |
| Inlet/Outlet | | Outlets to Crystal Lake |
| **Fish Population** | | |
| Rainbow Trout | Not present | |
| Tiger Muskie | Not present | |
| Northern Pike | Very Good | 80 (2.67) |
| Bluegill Sunfish | Very Good | 73.6 (11.67) |
| Largemouth Bass | Poor | 0.2 (0.5) |
| White Crappie | Not present | |
| Black Crappie | Poor | 2.4 (2.67) |
| Yellow Perch | Not present | |
| Walleye | Not present | |
| Channel Catfish | Not present | |

1. Lake quality data taken from 1998 to 1999 data. Clarity taken from 1970-1996 data or most recently available three year average.

N/A = Not Available

Typical Ranges – North Central Hardwoods Ecoregion:

| | |
|---|---|
| TSI | 46-54 |
| Total Phosphorus | 23-50 µg/l |
| Water Clarity | 1.5 - 3.2 m |
| Chlorophyll a | 5-22 µg/l |

Fish numbers compared to state wide average (in parenthesis). Source: DNR, 2000.

### Water Use Summary for Keller Lake

- Motorized vehicles, snowmobiles, and all terrain vehicles are prohibited.
- Electric motors allowed.
- No remote control internal combustion engines without City approval. No operation of watercraft with more than a 5 horsepower motor.
- No operation of watercraft between the hours of 10:00 p.m. to 5:00 a.m.

Source: Burnsville Ordinance Chapter 8-11; and DNR website at:
http://www.dnr.state.mn.us/information and education/water_safety/surface_use.pdf).
For a summary of state boating and other water use laws see also:
http://www.dnr.state.mn.us/information_and_education/water_safety/boatingguide2001.pdf.)

**Table 57 - Keller Lake Action Plan**

| | |
|---|---|
| **Subject:**<br>➢ Keller Lake Action Plan | |
| **Purpose:**<br>➢ Manage Keller Lake to be consistent with Category III standards (BDWMO). | |
| **Goal:**<br>➢ Monitor Keller Lake water quality and manage the contributing subwatershed to maintain water clarity to 1.8 meters | |
| **Lake Classification:**<br>➢ BDWMO: Strategic, Category III, Action Level not set | |
| **Intended Use:**<br>➢ Supports indirect recreational activities such as boating and fishing. Provides wildlife habitat. | |
| **Problems** | **Solutions** |
| 1. Recent increases in water clarity and overall water quality resulted from the discontinued Crystal Lake water quality treatment system. Improved clarity resulted in explosive aquatic plant growth. | ➢ 1. Re-establish citizen expectations for intended uses of Keller Lake based on pre-1996 quality, in cooperation with Apple Valley. |
| 2. Future development or redevelopment, even with treatment to NURP standards, could increase the pollutant loading to the lake. | ➢ 2. Pursue creative water resources management options to minimize development-related water quality impacts in partnership with Apple Valley. |
| 3. Due to the mostly developed nature of the subwatershed, some lying outside the City, BMPs intended to reduce phosphorus loading may be difficult to implement. | ➢ 3. Request the WMO complete a study to discuss the desired level of treatment, treatment options, costs and impacts on riparian and non-riparian landowners. |
| 4. Heavy aquatic vegetation severely limits active recreational use. | ➢ 4. Consider weed harvesting to enhance recreational opportunities. |
| 5. Past periods of high water levels on Keller Lake may dictate the need for increased discharge capacity to Crystal Lake. | ➢ 5. Evaluate downstream improvements impact on Keller Lake. |

**Table 58 - Keller Lake Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Develop a detailed study of the most important treatment facilities, their treatment capacity and their treatment potential | • Field inspections – pond depths<br>• Existing modeling<br>• As-built drawings<br>• Neighborhood Input<br>• BDWMO<br>• City of Apple Valley | • Detailed Study in conjunction with Crystal Lake study | 2004 | $10,000 |
| 2. Implement water quality improvement projects | • Detailed Study<br>• City of Apple Valley<br>• BDWMO | • Feasibility Study<br>• Completed design<br>• Completed Construction | 2008<br>2008<br><br>2009 | $5,000<br>$30,000<br><br>$400,000 |
| 3. Consider weed harvesting to enhance recreational opportunities | • Experience of other communities<br>• Vendors<br>• Recreation, fish and wildlife goals<br>• Policies of this WRMP | • Treatment (as needed) and annual assessment | Annual | See Table 31 #1 |
| 4. Re-evaluate the need for increased outlet capacity for Keller Lake | • Keller Lake Outlet Report (1996)<br>• DNR files<br>• Lake level records<br>• Crystal Lake outlet project | • Feasibility Study / Documentation of findings and recommendation | Future | Future |

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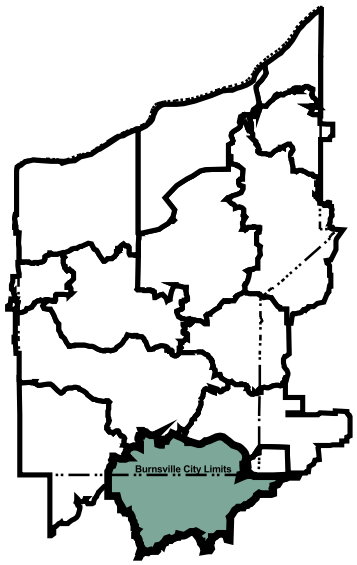
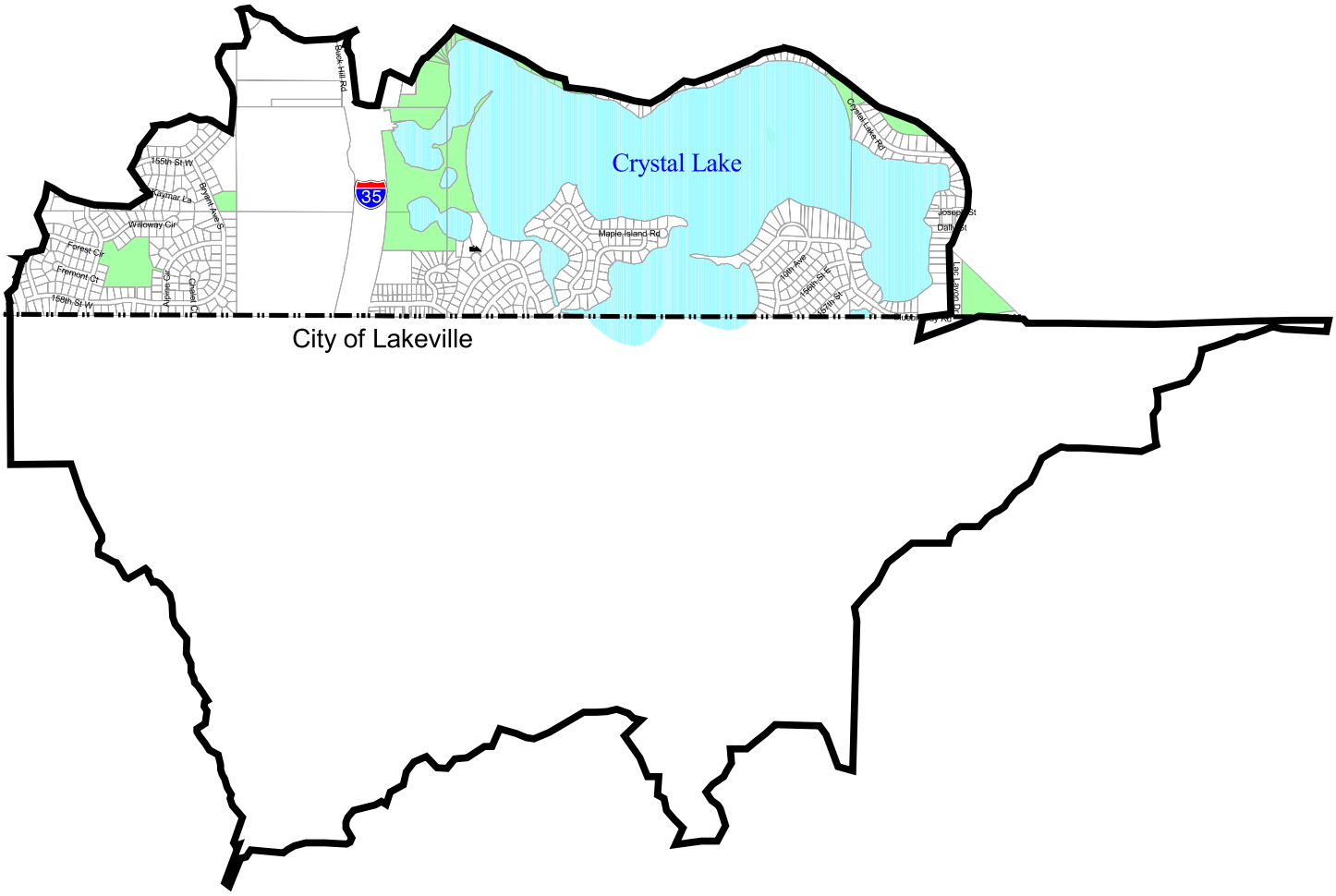



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 2,155 Acres




| | | | | |
|---|---|---|---|---|
| SEH | 9/10/02 | **Crystal Lake Subwatershed Burnsville, MN** | FILE NO. ABURNS9904.00 | |
| | subwtrshd.apr bd | | FIG NO. 30 | |

## CRYSTAL LAKE SUBWATERSHED

The Crystal-Keller basin in southeast Burnsville has a long history relative to drainage and water level fluctuations as referred to in the Executive Summary of this Plan. Ultimately, a deep gravity system was built. Significant downstream improvements were required including the construction of the dam that retains sunset pond and the box culvert system that discharges to the river. However, high water level problems have returned (see Special Study in Appendix A). The Crystal Lake subwatershed is illustrated in Figure 30.

In the 1990's, water quality concerns on Crystal Lake lead to the development of a hypolimnetic (bottom) withdrawal and chemical treatment system by the Black Dog WMO. The system was installed in 1995 and began operating in 1996. The plan was to remove water form the bottom of the Crystal Lake water column where phosphorus was present, mix in ferric chloride and allow the mixture to safely settle in Keller Lake before the water returned through the existing culvert connecting the two lakes.

From the beginning, the system was plagued with odor problems. Hydrogen sulfide that naturally occurs in the lower water column was being released when the water was withdrawn for treatment, resulting in citizen complaints. Use of the system was discontinued indefinitely in 1999. In reviewing the decision, the Black Dog WMO reasoned that there might be more cost effective means to accomplish water quality improvements on Crystal Lake. The system did not produce the desired improvements on Crystal Lake. An unexpected benefit was a significant, though short-term improvement in Keller Lake's water quality due to the injection of treated water.

### Crystal Lake Strategy

The 292-acre lake is highly valued for full contact recreational purposes. With a watershed to lake area ratio of approximately 7.4 to 1 (not including the Keller Lake watershed area), external storm water and phosphorus loading influence the lake.

On the Metropolitan Council system, Crystal Lake would only rate a "C" based on 1994 through 1999 data. On MPCA's citizen suitability scale, a 1.9-meter transparency would indicate a minor impact to swimming-impaired lake. The Black Dog WMO estimates that future land uses change could increase the phosphorus loading to the lake by over 25 percent without additional best management practices. The predicted in-lake total phosphorus concentration could increase by over 16 percent.

The City believes that the revised (2008) water clarity of 2.1 meters (from 2.6 in the 2002 Plan) is an appropriate long-term goal for Crystal Lake, compared to Crystal Lake's current 1.9 meters of water clarity. This revised goal is based on the findings of the Crystal and Keller Lake Use Attainability Analysis (2003). The City is committed to continuing work with the WMO to prioritize implementation projects under consideration in the watershed. As concluded by the Black Dog WMO (Barr,

2000), watershed loading reduction is among the most cost-effective approaches to improving Crystal Lake's water quality. Other cost effective options should also be explored. The Black Dog WMO is showing considerable land use change ahead for areas of Lakeville that are tributary to Crystal Lake. The City will work actively with the WMO to evaluate options for improving the water quality of Crystal Lake including phosphorus loading reduction strategies.

Two potential sites have been identified on a preliminary basis for pre-treatment of storm water. The first site is south of Keller Lake and west of Lac Lavon Drive. The second site is between Keller Lake and Crystal Lake east of Crystal Lake Road.

### Water Quantity Issues

Water quantity issues have also been noted at Crystal Lake. A special study was completed as part of this planning process and is described in Appendix A.

The current outlet structure is a box-weir that drops into a 36-inch diameter pipe, ultimately discharging to South Twin. The peak discharge rate from the system is 30 cfs for the 100-year, 24-hour event.

The special study showed that the box-weir is adequate. Therefore, any improvements would need to focus on the pipe connecting the weir-box to the downstream system. Ten alternatives were examined, focusing on replacing varying lengths of pipe immediately downstream of Crystal Lake and observing downstream impacts.

While no improvements are proposed at this time or funded in this Plan, the study recommended an alternative to implement at some time in the future. If and when this recommendation is pursued, the BDWMO will complete a cost allocation analysis to determine if other cities will contribute funding for the project. The BDWMO may also be involved in assigning costs to the parties involved.

The recommended (future) improvements include replacement of 986 feet of existing storm sewer immediately downstream of Crystal Lake, ending at Crystal Lake Road and Eileen Circle. The newly constructed 48 inch diameter outlet would replace the in-place 36 inch pipe and would lower the pipe elevation at Crystal Lake by one-foot. The results would (1) increase the peak discharge by nearly 100 percent; (2) decrease the 100 year peak by 0.75 feet and (3) reduce the duration of high water levels above 934 from an estimated 18 days to about 7 days.

Table 59 summarizes lake quality statistics, water use restrictions, and fish population data for Crystal Lake.

### Policies and Implementation Plan

Tables 60 and 61 present the City's Action Plan and Implementation Actions, respectively that have been developed to achieve the purpose and goals for Crystal Lake.

**Table 59 - Crystal Lake Data**

| Lake Quality Statistics[1] | | |
|---|---|---|
| DNR Number | | 19-0027 |
| Total Suspended Solids – TSS | mg/l | 51 |
| Total Phosphorus- TP | µg/l | 44.0 |
| Chlorophyll a | µg/l | 25.9 |
| Water Clarity – Secchi Disk | Meters | 1.7 |
| Carlson's Trophic Status Index | TSI | 58.0 |
| Watershed Area | Acres | 2155 |
| Lake Area | Acres | 292 |
| Maximum Depth | Feet | 37 |
| Average Depth | Feet | 10.0 |
| Public Access | | Beach, Boat Launch |
| WMO Classification | | Category I |
| City Classification | | Protection |
| Inlet/Outlet | | Inlet from Keller; outlet to South Twin |
| **Fish Population** | | |
| Rainbow Trout | Not present | |
| Tiger Muskie | Fair | 0.5 (0.17) |
| Northern Pike | Very Good | 12.3 (2.67) |
| Bluegill Sunfish | Very Good | 201.9 (11.67) |
| Largemouth Bass | Poor | 0.2 (0.5) |
| White Crappie | Not present | |
| Black Crappie | Fair | 3.6 (2.67) |
| Yellow Perch | Poor | 3.7 (8.0) |
| Walleye | Poor | 0.2 (0.5) |
| Channel Catfish | Poor | |

1. Taken from year 1998 and 1999 data. Clarity taken from 1970-1996 data or most recently available three year average.

N/A = Not Available

Typical Ranges – North Central Hardwoods Ecoregion:

| | |
|---|---|
| TSI | 46-54 |
| Total Phosphorus | 23-50 µg/l |
| Water Clarity | 1.5—3.2 m |
| Chlorophyll a | 5-22 µg/l |

Fish numbers compared to state wide average (in parenthesis). Source: DNR, 2000.

### Water Use Summary for Crystal Lake

- Slow-no wake zones: Maple Island Bay and Buck Hill Bay; within 150 feet from shore except not around Pik Nik Island; and when lake water elevation is 934 feet or greater.
- No water-skiing in a slow-no wake zone.
- All watercraft exceeding a slow-no wake speed must travel in a clockwise direction.
- Maximum speed limit from 9:00 a.m. to sunset is 40 mph.
- Maximum speed limit from sunset to 9:00 a.m. is 15 mph.

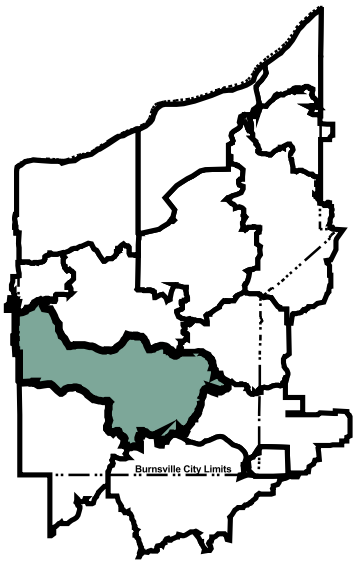
Source: Burnsville Ordinance Chapter 8-10; and DNR website at:
http://www.dnr.state.mn.us/information education/water_safety/surface_use.pdf).
For a summary of state boating and other water use laws see also:
http://www.dnr.state.mn.us/information_and_education/water_safety/boatingguide2001.pdf.)

**Table 60 - Crystal Lake Action Plan**

| | |
|---|---|
| **Subject:**<br>➢ Crystal Lake Management Plan | |
| **Purpose:**<br>➢ Protect and preserve Crystal Lake to be consistent with Category I standards | |
| **Goal:**<br>➢ Improve the quality and rate of runoff to Crystal Lake and work towards lake clarity of 2.1 meters | |
| **Lake Classification:**<br>➢ BDWMO: Strategic, Category I | |
| **Intended Use:**<br>➢ Supports swimming and other direct contact recreational activities such as water skiing, scuba diving and snorkeling. Provides wildlife habitat. | |
| **Problems** | **Solutions** |
| 1. Total chlorophyll a levels exceed ecoregion ranges and are the only parameter not meeting Category I standards. | ➢ 1. Prepare preliminary annual nutrient budget for the lake to identify target removal goals and to account for internal loading. |
| 2a. Treatment limitations: Future development, even with conventional treatment to NURP standards, could increase the pollutant loading to the lake. | ➢ 2a. Study treatment options: Pursue alternative integrated management practices to minimize development-related water quality impacts. |
| 2b. BMPs intended to reduce phosphorus loading may be difficult to implement in some areas of the watershed. | ➢ 2b. Determine the desired level of treatment, treatment options, costs and impacts on riparian and non-riparian landowners. |
| 2c. Treatment deficiencies in selected drainage areas could result in excessive pollutant loading to the lake. | ➢ 2c. Identify treatment options specific to subwatersheds. |
| 3. Future peak volumes will continue to cause shoreline erosion and diminish recreation use. | ➢ 3. Pursue water resources management options to minimize development-related water quantity impacts. |
| 4. Heavy aquatic vegetation severely limits active recreational use. | ➢ 4. Consider harvesting aquatic vegetation to enhance recreational opportunities. |

**Table 61 - Crystal Lake Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Complete diagnostic study of internal lake loading | • Public Works Staff<br>• BDWMO<br>• Available Monitoring Data | • Document water quality problems and solutions<br>• Implement solutions | 2002<br><br>2002 | NA<br><br>See Black Dog Plan |
| 2. Implement water quality improvement projects | • Vendor Data<br>• Current user references<br>• Public Works Staff<br>• Field inspections – pond depths<br>• Existing modeling<br>• As-built drawings<br>• Neighborhood Input<br>• BDWMO<br>• City of Lakeville<br>• Detailed Study | • Feasibility Study, completed design and construction | 2003<br><br>2004 | $175,000<br><br>$250,000 |
| 3. Implement a plan to decrease the duration of flooding on Crystal Lake, if needed, by increasing the discharge capacity at low head levels | • Special Study in WRMP<br>• Feasibility Study | • Completed design and construction | Future | Future ($1,600,000) |
| 4. Encourage homeowners to incorporate LID techniques, use of alternative landscape designs and promote infiltration | • Available information<br>• Example projects (Heart of the City – Black Dog Watershed) | • Implemented project | 2002 | $30,000<br><br>Matching funds from MEP Grant |
| 5. Actively implement a control program to minimize spread of E. watermilfoil | • Experience of other communities<br>• Vendors<br>• Recreation, fish and wildlife goals<br>• Policies of this WRMP | • Treatment (as needed) and annual assessment | Annual | See Table 31 #1 |

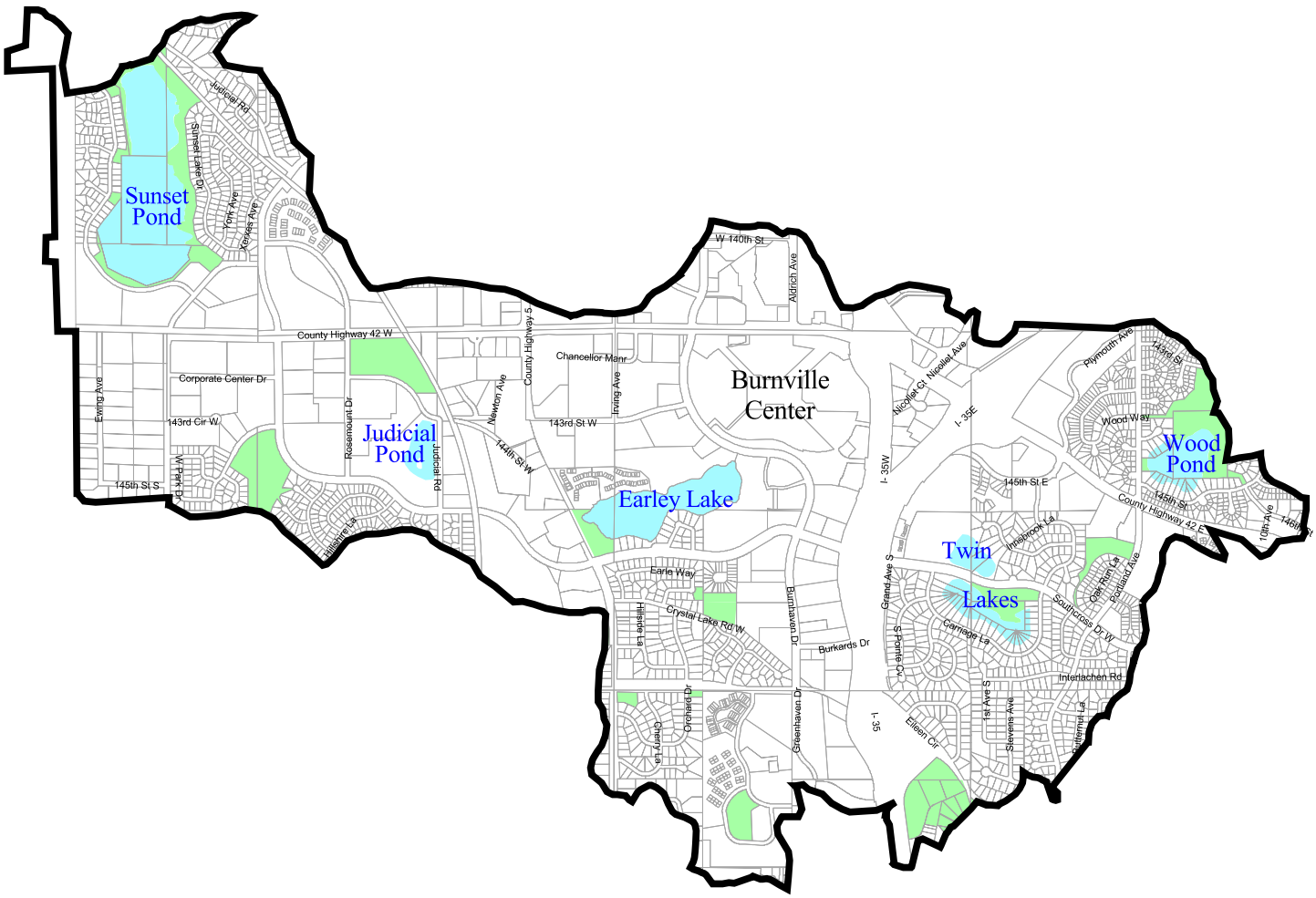



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 2,488 Acres




| | | | |
|---|---|---|---|
| SEH | 6/11/02<br>subwtrshd.apr<br>bd | **Sunset Pond Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>31 |

## SUNSET POND SUBWATERSHED

The Sunset Pond Subwatershed includes four catchments: Wood Park Pond; Twin Lakes; Earley Lake; and Sunset Pond. Except for Wood Park Pond, which drains into Earley Lake, the remaining water bodies comprise a major portion of Crystal Lake's outlet system. Figure 31 illustrates the Sunset Pond Subwatershed.

As described in the Watershed Assessment Section, historic high water levels on Crystal Lake resulted in the construction of a gravity outlet through Twin Lakes, to Earely Lake and ultimately to Sunset Pond. Sunset Pond creates significant peak flow reduction. The dam across the north end of the pond dampens the effect of large storms and reduces the size of the downstream conveyance system. Of the waterbodies within the Sunset Pond subwatershed, only Sunset Pond is considered to be a strategic water resource by the BDWMO. Each of these four catchments is discussed in more detail in the following pages.

### Wood Pond Catchment

Wood Pond lies "off-line" of the Crystal Lake outlet system. The pond is located northeast of Earley Lake and is positioned to receive runoff only from its' own direct contributing area. The 9-acre pond has a contributing area of 160 acres, or a watershed to lake area ratio of almost 18 to 1. The maximum depth of the pond is 15 feet. Wood Lake is used primarily for canoeing and fishing. There is no public beach or boat landing on the lake.

In the mid-1990's, a citizen-driven study was completed by the City. The study addressed water quality and water levels concerns. One major issue was that ponding easements did not exist over the properties adjacent to the pond. As a result, easement purchases were executed with the property owners.

In October 1997, the Lake was treated with aluminum sulfate (alum). From April 1996 to October 1997, pre-alum treatment sampling identified a mean total phosphorus value of 51.2 µg/l. Similar post-monitoring from April to October 1998 showed total phosphorus values of 30.8 µg/l. Over the same one–year period, chlorophyll a concentrations actually increased while overall transparency improved only slightly. The monitoring period also showed above average precipitation, which often produces an increased watershed loading and related poorer quality.

The 1998 summertime grade for the pond improved from less than 2 meters of clarity to over 2 meters of clarity, but the values returned to less than 2 meters level in 1999. Year 2000 monitoring (Metropolitan Council, 2001) shows nutrient and Secchi disc readings revert to pre-project levels in Wood Pond. Secchi disc transparency in 2000 averaged 1.3 meters while the goal for Wood Pond should be 1.7 meters. Quantity issues have been addressed through the purchase of easements. Table 62 summarizes lake quality statistics, water use restrictions, and fish population data for Wood Pond.

**Table 62 - Wood Pond Data**

| Lake Quality Statistics[1] | | |
|---|---|---|
| DNR Number | | 19-0024 |
| Total Suspended Solids - TSS | mg/l | 52 |
| Total Phosphorus- TP | µg/l | 39.8 |
| Chlorophyll a | µg/l | 14.5 |
| Water Clarity – Secchi Disk | Meters | 1.5 |
| Carlson's Trophic Status Index | TSI | 53.2 |
| Watershed Area | Acres | 160 |
| Lake Area | Acres | 9 |
| Maximum Depth | Feet | 15 |
| Average Depth | Feet | N/A |
| Public Access | | None |
| WMO Classification | | N/A |
| City Classification | | Improvement |
| Inlet/Outlet | | Outlets to Twin Lakes |
| **Fish Population** | | |
| Rainbow Trout | Not present | |
| Tiger Muskie | Not present | |
| Northern Pike | Not present | |
| Bluegill Sunfish | Fair | 10.3 (11.67) |
| Largemouth Bass | Not present | |
| White Crappie | Good | 8.3 (2.74) |
| Black Crappie | Very Good | 19.0 (2.67) |
| Yellow Perch | Not present | 12.0 (8.0) |
| Walleye | Stocked in 2005 | |
| Channel Catfish | Not present | |

1. Taken from year 1997-1999 data. Clarity data also taken from 1970-1996 data

N/A = Not Available

Typical Ranges – North Central Hardwoods Ecoregion:

TSI 46-54

Total Phosphorus 23-50 µg/l

Water Clarity 1.5—3.2 m

Chlorophyll a 5-22 µg/l

Fish numbers compared to state wide average (in parenthesis). Source: DNR, 2000.

### Water Use Summary for Wood Pond

- Motorized vehicles, snowmobiles, and all terrain vehicles are prohibited.
- Electric motors allowed.

Source: Burnsville Ordinance Chapter 8-12 and 6-5; and DNR website at:
http://www.dnr.state.mn.us/information education/water_safety/surface_use.pdf
For a summary of state boating and other water use laws see also:
http://www.dnr.state.mn.us/information_and_education/water_safety/boatingguide2001.pdf

### Twin Lake Catchment

Twin Lake, North Twin and South Twin, covers a total of about 18 acres. These basins are very shallow and have minimal available water quality data. South Twin Lake is the primary receiving water for Crystal Lake's discharge. The Special Study discussed in Appendix A describes a proposal to further increase the capacity of the Crystal Lake discharge. In addition to this proposed improvement, North Twin's outlet structure should also be modified to increase the weir length from 12 feet to 20 feet. Increasing the weir will prevent the Crystal Lake improvements from adversely affecting high water levels and duration on South and North Twin. The recommended improvements do not increase the flood potential for downstream waters including Earley Lake and Sunset Pond.

Any increase in Crystal Lake water quality should favorably effect the quality in Twin Lake. In general, Twin Lake would have very limited active recreational suitability. The 2002 WRMP stated that the water quality goal should be 0.9 meters based on conditions at the time. However, based on the desire for better quality and in consideration of proposed improvements in contributing drainage areas, the clarity goal was established at 1.7 meters.

Since that time the City has separated the management of Twin Lake into two parts and created unique goals for South Twin and North Twin. A goal of 1.7 meters has been retained on North Twin, while a goal of 1.4 meters has been established for South Twin.

The City has been experimenting with barely straw bundles at the inlet to South Twin. The chemical reaction between the water and the straw is hoped to control filamentous algae which is prevalent on South Twin.

Quantity issues will be addressed by the outlet improvements and similar improvements at Crystal Lake, Earley Lake and future controls from the "golden triangle" tributary northwest of North Twin. Table 63 summarizes lake quality statistics, water use restrictions, and fish population data for Twin Lake.

**Table 63 - North and South Twin Lake Data**

| Lake Quality Statistics[1] | | |
|---|---|---|
| DNR Number | | 19-0028 |
| Total Suspended Solids - TSS | mg/l | N/A |
| Total Phosphorus- TP | µg/l | 70 |
| Chlorophyll a | µg/l | 18.7 |
| Water Clarity – Secchi Disk | Meters | 1.7 |
| Carlson'sTrophic Status Index | TSI | 1.0 |
| Watershed Area | Acres | N/A |
| Lake Area | Acres | 18 |
| Maximum Depth | Feet | N/A |
| Average Depth | Feet | N/A |
| Public Access | | None |
| WMO Classification | | N/A |
| City Classification | | Improvement |
| Inlet/Outlet | | Inlet from Crystal and Wood; outlet to Earley |
| **Fish Population – Not Available** | | |
| Rainbow Trout | | |
| Tiger Muskie | | |
| Northern Pike | | |
| Bluegill Sunfish | | |
| Largemouth Bass | | |
| White Crappie | | |
| Black Crappie | | |
| Yellow Perch | | |
| Walleye | | |
| Channel Catfish | | |

1. 1999 data. Clarity data from most recently available three year average.

N/A = Not Available

Typical Ranges – North Central Hardwoods Ecoregion:

| | |
|---|---|
| TSI | 46-5 |
| Total Phosphorus | 23-50 µg/l |
| Water Clarity | 1.5-3.2 m |
| Chlorophyll a | 5-22 µg/l |

### Water Use Summary for Twin Lakes

- Motorized vehicles, snowmobiles, and all terrain vehicles are prohibited. Electric motors allowed.
- No operation of watercraft from 10:00 p.m. to 5:00 a.m.

Source: Burnsville Ordinance Chapter 8-12 and 6-5; and DNR website at:
http://www.dnr.state.mn.us/information
education/water_safety/surface_use.pdf
For a summary of state boating and other water use laws see also:
http://www.dnr.state.mn.us/information_and_education/water_safety/boatingguide2001.pdf.)

### Earley Lake Catchment

In the mid-to-late 90's, Earley Lake was rated as a clarity range of less than 1.5 meters on the Metropolitan Council's system. Due to its position in the watershed, Earley Lake receives a considerable inflow of urban runoff and pollutant loading. Current efforts are being investigated to divert low flow inlets through treatment devices before reaching the lake. Earley Lake discharges through a downstream pond before reaching Sunset Pond.

Recent development projects adjacent to Earley have been required to meet both rate control and pollutant removal standards for Total Phosphorus and Total Suspended Solids. Though properly mitigated to City standards, continued development in the urbanized watershed will continue to increase both the hydraulic and pollutant loading to the lake.

There has been considerable interest in Earley Lake as expressed by an active homeowners association. The Black Dog WMO Plan indicates that contact recreational activities like swimming are not supported by current lake quality due to excessive algae blooms in mid-to-late summer. The lake is not considered a strategic water resource by the WMO. More in-lake investigation should be undertaken to document lake depths (bathymetry) and the internal loading issues on the lake. A combination of active watershed controls and in-lake considerations may be necessary. Because so much of the contributing watershed is comprised of high value, commercial real estate, watershed controls may be very costly to implement. A goal of maintaining Earley Lake clarity at 1.7 meters is achievable and challenging at the same time. The duration of high water levels on Earley Lake has caused citizen complaints and the upstream drainage system improvements are not expected to increase the problem.

Extended periods of excessive high water levels on Earley Lake have created significant problems for residents. The 28-acre lake has an 878-acre direct contributing area, or a watershed-to-lake-area-ratio of 31:1. Following a flood event in July 2000, interest in developing an immediate solution to the Earley Lake problem was renewed as one of the top priorities for storm water management in the City.

Three major storm sewer outfalls contribute runoff to Earley Lake. These outfalls include the East Outfall, the South Outfall, and the West Outfall. The East outfall enters Earley Lake from Burnhaven Drive. This storm sewer system collects runoff from the northeastern portion of the Earley Lake direct watershed. The South Outfall enters Earley Lake from Southcross Drive. This storm sewer system collects runoff from the eastern and southern portions of the Earley Lake direct watershed system. It also serves as the outlet storm sewer system for North Twin Lake. The West Outfall enters Earley Lake from County Road No. 5. This storm sewer system collects runoff from the County Road No. 5 corridor. For the critical 1% or 100 year event, the Lake's flood level rises almost 9 feet above the normal water level of 905.5.

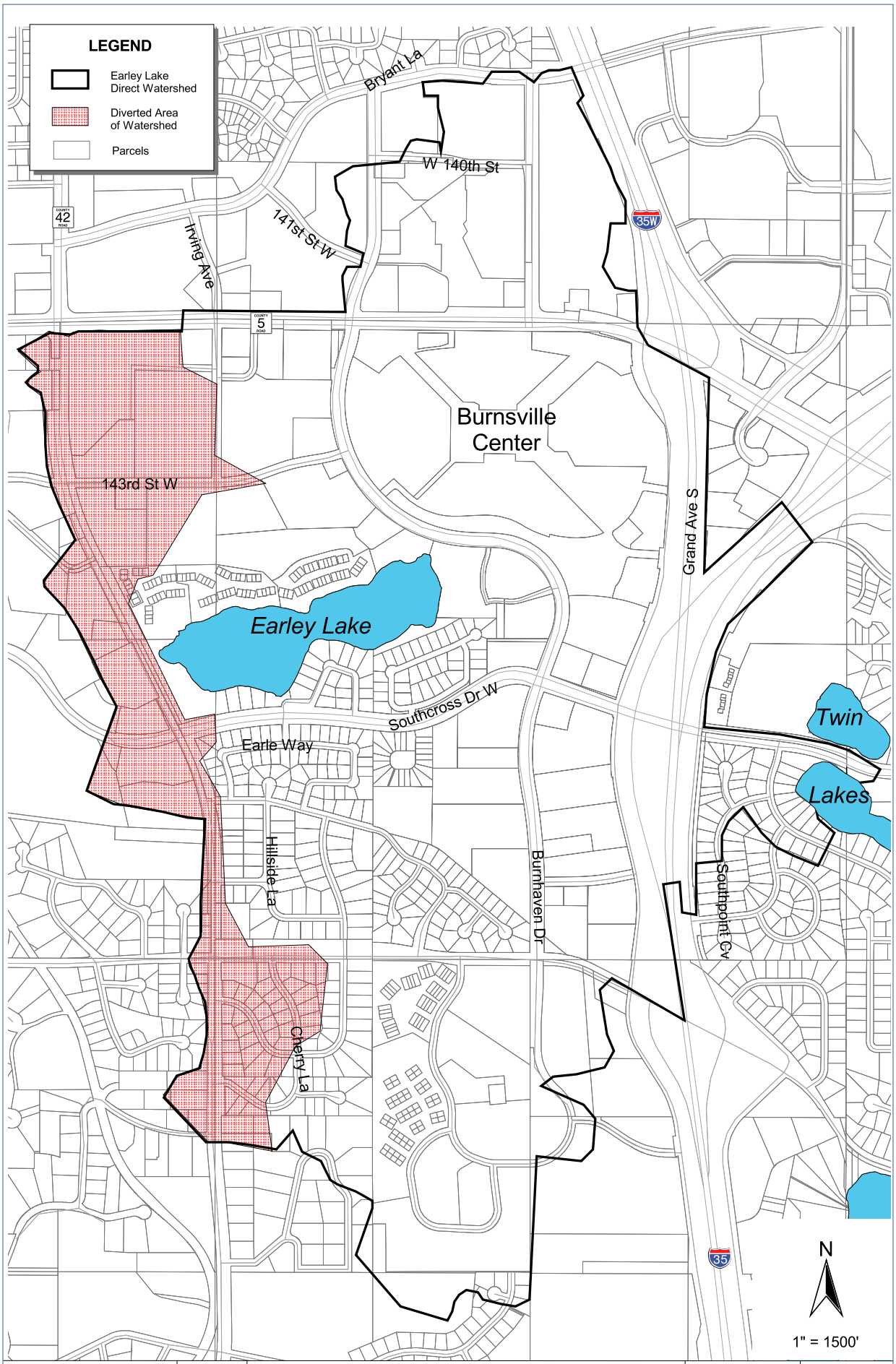
The outlet for Earley Lake is a concrete box structure with three 4 ft wide by 2 ft high openings. The outlet is located on the west side of Earley Lake. The outlet discharges into a 36" storm sewer that carries the water west, underneath County Road No. 5, eventually discharging into Judicial Pond.

In a Feasibility Study entitled Earley Lake Flood Control and Water Quality Improvements, May 29, 2001 (SEH), local storm water diversion to four potential downstream pond sites was evaluated, including new ponds at County Road 5 and east of Judicial Road. The strategy for Earley Lake involves a multi-faceted approach to addressing the issues including a partial diversion of the local subwatershed, an increase in the outlet capacity, and diversion of low flows through pre-treatment basins. Two alternatives from the report were selected by the City Council as capital improvement projects. Hydrologic/hydraulic modeling for Earley Lake assuming both improvements showed a significant reduction in the flood levels for a 100-year storm event. Construction began in the fall of 2001 and was completed in the spring of 2002.

Figure 32 illustrates the area that is diverted by the improvements and Table 64 illustrates the changes in hydrologic response at Earley Lake as a result of the improvements. Table 65 summarizes lake quality statistics, water use restrictions, and fish population data for Earley Lake.

**Table 64 - Changes in Hydrologic Response of Earley Lake**

| | **100-YEAR 24 HR EVENT** | | | **100-YEAR 10 DAY EVENT** | | |
|---|---|---|---|---|---|---|
| | **Peak Inflow** | **Peak Elevation (Feet)** | **Change in Elevation (Feet)** | **Peak Inflow** | **Peak Elevation (Feet)** | **Change in Elevation (Feet)** |
| **Existing Conditions** | 2145 cfs | 913.4 | - | 352 cfs | 914.4 | - |
| **May 29, 2001 Feasibility Study** | 1947 cfs | 911.8 | -1.6 | 308 cfs | 910.7 | -3.7 |
| **Final Recommended Improvements (SEH, July 25, 2001)** | 1947 | 912.3 | -1.1 | 308 cfs | 911.6 | -2.8 |




| | | | | |
|---|---|---|---|---|
| SEH | 6/11/02<br>watershed.apr<br>naf | EARLY LAKE FLOOD CONTROL AND DIVERTED DRAINAGE AREA | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>32 | |

**Table 65 - Earley Lake Data**

| Lake Quality Statistics[1] | | |
|---|---|---|
| DNR Number | | 19-0033 |
| Total Suspended Solids - TSS | mg/l | 57 |
| Total Phosphorus- TP | µg/l | 57 |
| Chlorophyll a | µg/l | 16.9 |
| Water Clarity – Secchi Disk | Meters | 1.7 |
| Carlson'sTrophic Status Index | TSI | 56.2 |
| Watershed Area | Acres | 878 |
| Lake Area | Acres | 28 |
| Maximum Depth | Feet | N/A |
| Average Depth | Feet | N/A |
| Public Access | | None |
| WMO Classification | | N/A |
| City Classification | | Improvement |
| Inlet/Outlet | | Inlet from Twin; outlet to Judicial, Sunset |
| **Fish Population – Not Available** | | |
| Rainbow Trout | | |
| Tiger Muskie | | |
| Northern Pike | | |
| Bluegill Sunfish | | |
| Largemouth Bass | | |
| White Crappie | | |
| Black Crappie | | |
| Yellow Perch | | |
| Walleye | | |
| Channel Catfish | | |

1. From year 1997-1999 data. Clarity data also taken from 1970-1996 data or most recently available three year average.
N/A = Not Available
Typical Ranges – North Central Hardwoods Ecoregion:
TSI 46-54
Total Phosphorus 23-50 µg/l
Water Clarity 1.5—3.2 m
Chlorophyll a 5-22 µg/l

### Water Use Summary for Earley Lake

- Motorized vehicles, snowmobiles, and all terrain vehicles are prohibited.
- Internal combustion engines are prohibited, electric motors are allowed.
- No operation of watercraft from 10:00 p.m. to 5:00 a.m.

Source: Burnsville Chapter 8-12 and 6-5; and DNR website at http://www.dnr.state.mn.us/information education/water_safety/surface_use.pdf).
For a summary of state boating and other water use laws see also http://www.dnr.state.mn.us/information_and_education/water_safety/boatingguide2001.pdf.)

### Judicial Pond Catchment

Judicial Pond lies west of Earley Lake, buffering upstream discharges before draining north to Sunset Pond (see Figure 31). Based on improvements to be made to the Earley Lake outlet system, Judicial Pond is expected to experience flood levels higher than experienced in the past. Table 66 illustrates the expected change in hydrologic response based upon the upstream improvements (fall 2001).

**Table 66 - Changes in Hydrologic Response at Judicial Pond**

| | 100-year 24 hr Event | | | 100-year 10 day Event | | |
|---|---|---|---|---|---|---|
| | **Peak Inflow** | **Peak Elevation (feet)** | **Change in Elevation (feet)** | **Peak Inflow** | **Peak Elevation (feet)** | **Change in Elevation (feet)** |
| **Existing Conditions** | 500 cfs | 897.0 | | 108 cfs | 897.1 | |
| **May 29, 2001 Feasibility Study** | 510 cfs (est) | 898.9 | +1.9 | 115 cfs (est) | 899.3 | +2.2 |
| **Final Recommended Improvements (SEH, July 25, 2001)** | 510 cfs (est) | 898.2 | +1.2 | 115 cfs (est) | 898.6 | +1.5 |

From a water quality perspective, Judicial Pond should be managed as a storm water detention facility. Its main function should continue to be to dampen the effect of upstream hydrologic and pollutant loading to minimize impacts to the downstream system.

Judicial Pond does not have a low natural overflow. The pond is served by a large storm sewer system on the north side. However, should the City receive an excessive rainfall event or if the outlet would become partially blocked, the pond would eventually rise to a level that would overtop Judicial Road to the east and could eventually threaten adjacent commercial properties. Existing development to the northeast is high enough in elevation where it would not be threatened in such a situation.

### Sunset Pond Catchment

Sunset Pond covers about 60 acres, with a 1,272-acre contributing watershed, or a watershed to lake area ration of 21:1. The pond has a maximum depth of about 9 feet; many areas have a depth of less than 4 feet. The outlet drains north through the Rudy L. Kraemer Nature Preserve and the Sue Fischer Memorial Youth Athletic Complex, where low flows are diverted into water quality ponds and wetland complexes.

The pond is considered to have clarity greater than 1.5 meters on the Metropolitan Council's system. The recreational suitability would indicate that activities like

swimming are considered to be impaired. The pond's history and purpose in the overall drainage system must be considered when developing a management strategy for the Pond. The Black Dog WMO estimates that the total Phosphorus loading is expected to increase by over 60 percent without additional treatment. The resulting in-lake total phosphorus concentration could increase by more than 16 percent.

Intensive efforts to improve the pond are probably not warranted when one considers the fact that this is a created and not a natural water body, and that quality is "average". However, Sunset Pond should be monitored more closely to develop a more significant data set from which to develop future trend analysis. The City's water clarity goal areas established as 1.7 meters. Because the BDWMO action level for Sunset Pond of 1.4 meters is somewhat lower that the City's clarity goal, the City if committed to working with the WMO to determine if the 1.7 meter goal is appropriate. As part of the cooperative process for reaching an agreement on a clarity goal, the City and BDWMO with work together to prioritize implementation projects in the watershed.

The City's first comprehensive drainage plan (Barr, 1966) addressed extreme fluctuations in water level on Crystal Lake. The City ultimately decided to install a deep gravity storm sewer outlet. The next major hurdle was to construct a large lake/pond north of County Road 42 near the Savage City border. The "new" Sunset Pond would accepted the surface water from the homes and businesses in west central Burnsville and also the outflow of water from Crystal Lake. The development of Sunset Pond required a dam to be built to hold back the water. Shortly after completion of Sunset Pond the downstream pipes were installed and the Crystal Lake outlet was finally in-place. The dam represents a flooding hazard for downstream properties if not properly inspected and maintained.

Table 67 summarizes lake quality statistics, water use restrictions, and fish population data for Sunset Pond.

### Policies and Implementation Plan

Tables 68 and 69 present the City's Action Plan and Implementation Actions, respectively that have been developed to achieve the purpose and goals for the Sunset Pond Subwatershed.

**Table 67 - Sunset Pond Data**

| Lake Quality Statistics[1] | | |
|---|---|---|
| DNR Number | | N/A |
| Total Suspended Solids – TSS | mg/l | 52 |
| Total Phosphorus- TP | µg/l | 50.1 |
| Chlorophyll a | µg/l | 10.8 |
| Water Clarity – Secchi Disk | Meters | 2.4 |
| Carlson'sTrophic Status Index | TSI | 54.6 |
| Watershed Area | Acres | 1272 |
| Lake Area | Acres | 60 |
| Maximum Depth | Feet | N/A |
| Average Depth | Feet | N/A |
| Public Access | | None |
| WMO Classification | | Category II |
| City Classification | | Improvement |
| Inlet/Outlet | | Inlet from Twin; outlet to Judicial, Sunset |
| **Fish Population- Not Available** | | |
| Rainbow Trout | | |
| Tiger Muskie | | |
| Northern Pike | | |
| Bluegill Sunfish | | |
| Largemouth Bass | | |
| White Crappie | | |
| Black Crappie | | |
| Yellow Perch | | |
| Walleye | | |
| Channel Catfish | | |

1. Data taken from 1997-1999 data. Clarity taken from 1970-1996 data or most recently available three year average.
N/A = Not Available
Typical Ranges – North Central Hardwoods Ecoegion:
TSI 46-54
Total Phosphorus 23-50 µg/l
Water Clarity 1.5—3.2 m
Chlorophyll a 5-22 µg/l

### Water Use Summary for Sunset Pond

- Motorized vehicles, electric trolling motors, snowmobiles, and all terrain vehicles are prohibited.
- No boating on southern half as marked by buoys or signs (waterfowl nesting area).
- No operation of watercraft from 10:00 p.m. to 5:00 a.m..

Source: Burnsville Ordinance Chapter 8-12 and 6-5; and DNR website at:
http://www.dnr.state.mn.us/information and education/water_safety/surface_use.pdf).
For a summary of state boating and other water use laws see also:
http://www.dnr.state.mn.us/information_and_education/water_safety/boatingguide2001.pdf.).

## Table 68 - Sunset Pond Subwatershed Action Plan

**Subject:**

- Sunset Pond Subwatershed Management Plan. (Wood Park Pond, Twin Lakes, Earley Lake, Judicial Pond, Sunset Pond)

**Purpose:**

- Manage the water resources of the Sunset Pond Subwatershed consistent with their rankings.

**Goal:**

- Improve or maintain the quality and rates of runoff to support the intended uses. Water clarity goal for all lakes listed below is noted.

**Lake Classification and Specific Goals (City Wetland Classification, where noted):**

BDWMO: All non-strategic

Burnsville: Sunset Pond; Management, (Goal = 1.7 m)
Wood Park Pond; (Goal = 1.7 m)
Twin Lakes; (Goal = 1.7 m North Twin, 1.4 m South Twin)
Earley Lake; (Goal = 1.7 m)
Judicial Pond; Management, (Goal = 1.7 m)

**Intended Uses:**

- Supports indirect recreational activities such as boating and fishing. Provides wildlife habitat.

| Problems | Solutions |
|---|---|
| 1. High nutrient loading to Twin Lakes from contributing subwatersheds continue to cause deterioration in water quality. | ➢ 1. Prepare a nutrient loading study of Twin Lakes to identify the most cost effective means for minimizing loading to the lake consistent with it's classification. |
| 2. Increase runoff and pollutant loading into North Twin Lakes from planned developed to the northwest and from the "golden triangle" area may cause further quantity and quality problems. | ➢ 2. Develop conventional and Low Impact Development practices to minimize the rate, volume and quality impacts to North Twin Lakes. |
| 3. Existing storm water outfalls to Earley lake from Burnsville Center and other commercial areas do not allow for any rate, volume or water quality control, or containment of winter sand/salt applications. | ➢ 3. Work directly with commercial property owners, and specifically with Burnsville Center to develop Low Impact, on-site stormwater techniques targeted at reducing rate, volume and pollutant loading to Earley Lake. |
| 4. Extended duration of high water levels on Earley Lake created a potential for flood damages. | ➢ 4. Based on the completed Earley Lake feasibility study, improvements will be completed in 2002. |
| 5. Judicial Pond's high overland outlet may result in flooding of property east of Judicial Road in response to extreme rainfall events. | ➢ 5. Implement appropriate measures to establish first floor elevations and other appropriate flood proofing measures to protect properties east of Judicial Pond/Judicial Road. |
| 6. Sunset Pond dam poses a risk to downstream properties. | ➢ 6. Prepare a dam safety inspection and dam break analysis to minimize the downstream risks. |
| 7. For maintenance purposes the Sunset Pond outlet structure cannot be easily regulated to shut off downstream discharge due to the in place concrete skimmer. | ➢ 7. Design and construct improvements to the Sunset Pond outlet structure to enhance the ability to shut off downstream discharge for maintenance purposes. |

## Table 69 - Sunset Pond Catchment Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1 Prepare a nutrient loading study of Twin Ponds to identify the most cost effective means for minimizing loading to the lake consistent with it's classification | • Existing watershed and storm sewer maps<br>• Physical data of Twin Ponds<br>• P8 Urban Catchment model<br>• Lake Response mode<br>• Bathymetric information for Wood, Earley, North and South Twin | • Completed study and recommendations | 2006 | $30,000 |
| 2 Develop conventional and Low Impact Development practices to minimize the rate, volume and quality impacts to North Twin Lake. | • Future development agreements for area north and west of North Twin<br>• Soils and topographic data<br>• Appendix B of this plan<br>• Incentives | • Development Agreements<br>• Implemented Practices | Future (As required) | NA |
| 3 Work directly with commercial property owners, and specifically with Burnsville Center to develop Low Impact, on-site stormwater techniques targeted at reducing rate, volume and pollutant loading to Earley Lake. | • Future development agreements<br>• Soils and topographic data<br>• Storm sewer and utility maps<br>• Appendix B of this plan<br>• Incentives<br>• Explore grant opportunities | • Development Agreements<br>• Grant application(s)<br>• Implemented Practices | 2003<br>2004<br>2006 | NA<br>NA<br>$150,000 |
| 4. Implement appropriate measures to establish first floor elevations and other appropriate flood proofing measures to protect properties east of Judicial Pond/Judicial Road. | • Topographic maps<br>• Storm sewer base maps<br>• Site-surveys<br>• Proposed development plans<br>• Property acquisition | • Completed improvements | 2004 | See Table 13 #6 |
| 5. Prepare a dam safety inspection and dam break analysis to minimize the downstream risks. | • State dam Safety rules<br>• DAMBREAK model<br>• Construction Plans<br>• GIS- Downstream land use and flow path(s) | • Completed field investigation<br>• Completed modeling<br>• Completed report | 2005<br>2007<br>2007 | NA<br>$10,000<br>$8,000 |
| 6. Improvements to the Sunset Pond and Earley Lake outlet structure to shut off downstream discharge on a short term basis to conduct maintenance activities. | • Construction Plans<br>• Public Works Maintenance Staff<br>• Hydraulic model<br>• Dam break analysis | • Complete Plans<br>• Construct Improvements | 2004<br>2004 | $15,000<br>$75,000 |
| 7. Encourage future land owners / development to incorporate storm water treatment on adjacent parcels | • City staff | • Implemented treatment practices | Ongoing | NA |
| 8. Twin Lakes Outlet Improvements | • Construction plans<br>• Public works staff<br>• Hydrologic/hydraulic modeling | • Increased discharge capacity at low levels | 2003 | $250,000 |
| 9. Earley Lake Improvements | • Feasibility study (SEH 2001)<br>• Construction plans | • Reduction in flood levels and frequency | 2002 | $300,000 |

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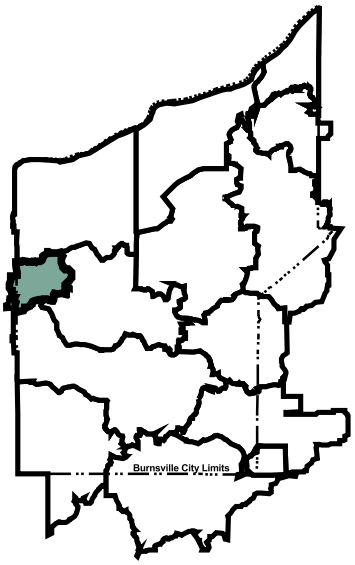
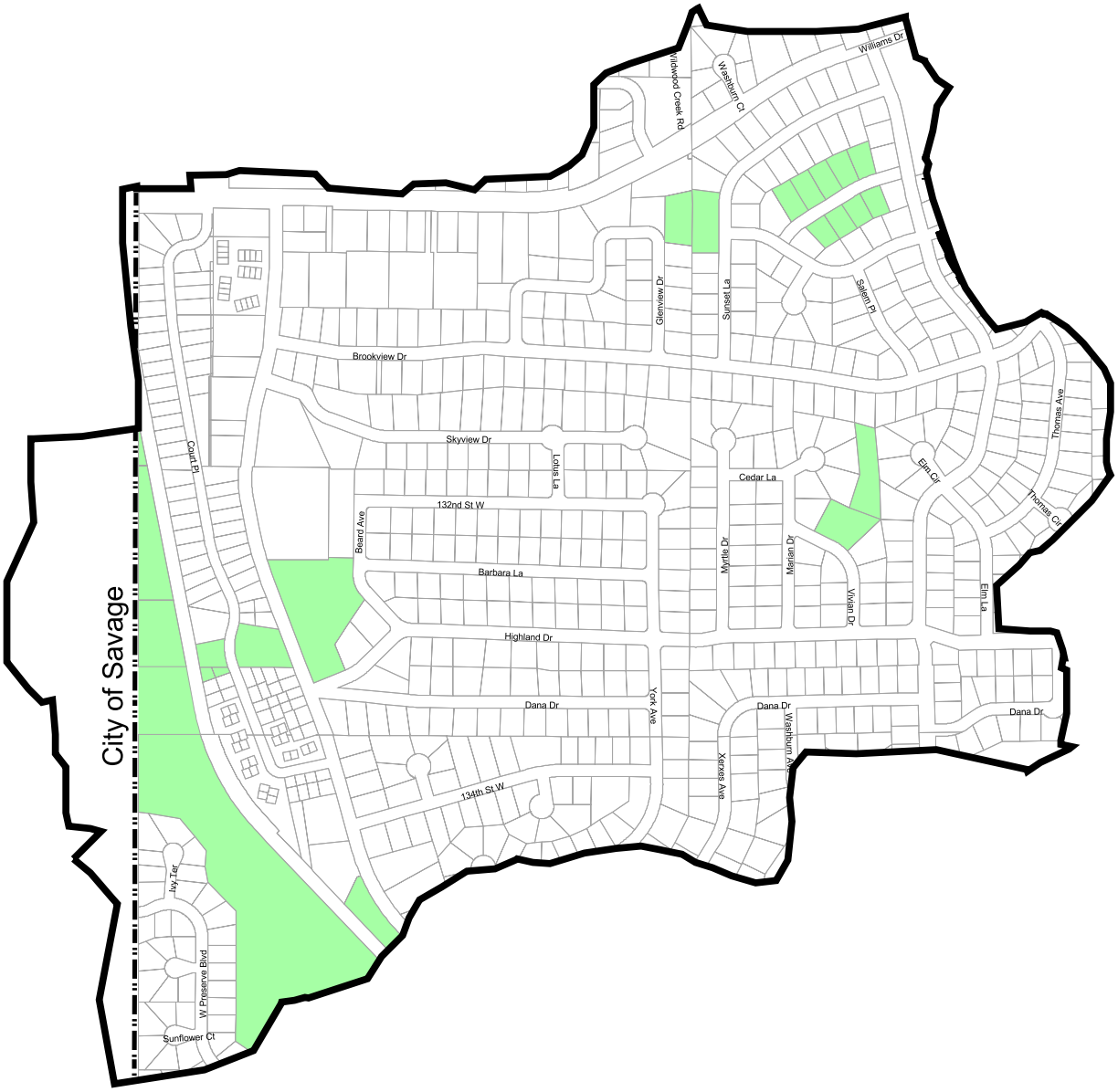



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

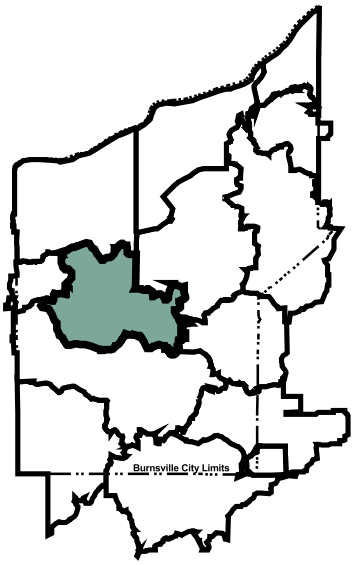
Watershed Area = 400 Acres




| | | | | |
|---|---|---|---|---|
| SEH | 6/11/02<br>subwtrshd.apr<br>bd | **Sunset Pond Outlet Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>33 | |

## SUNSET POND OUTLET SUBWATERSHED

The Sunset Pond Outlet Subwatershed lies directly north of and downstream of Sunset Pond. The entire subwatershed is tributary to the Nature Preserve Catchment within the Northwest Subwatershed in the Lower Minnesota River Watershed District. There are no significant water resources issues within this 400-acre subwatershed. Issues relative to the upstream dam that forms Sunset Pond are addressed in the Sunset Pond Implementation Plan. The Sunset Pond Outlet Subwatershed is illustrated in Figure 33.

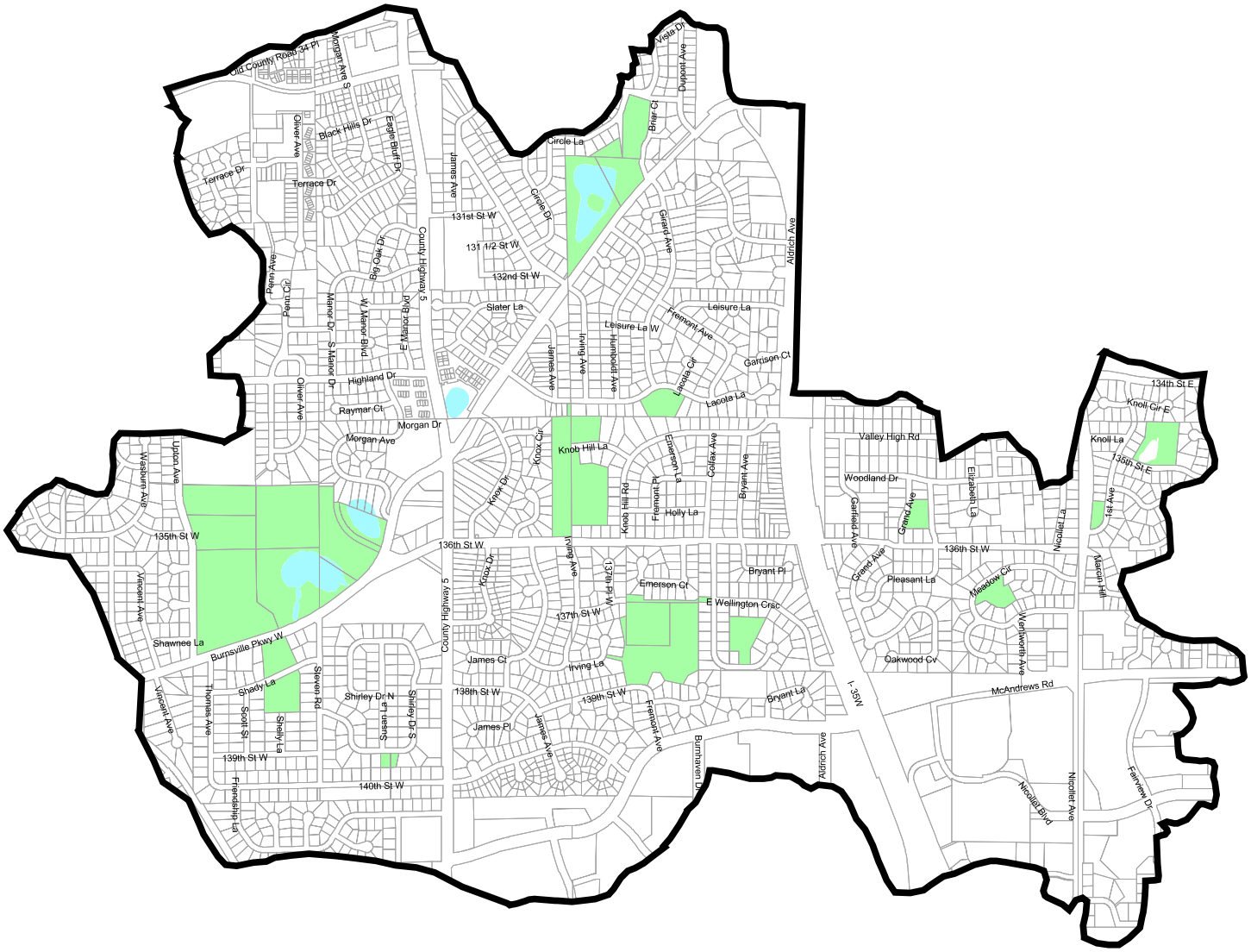



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 1,671 Acres

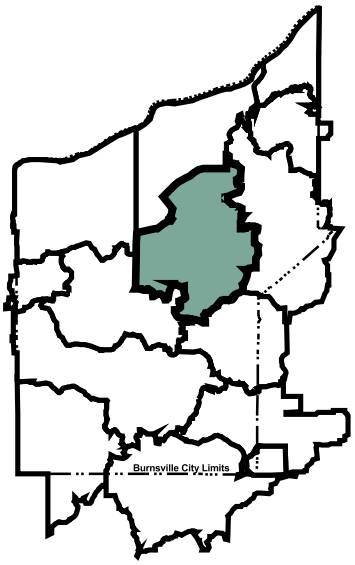



| | | | |
|---|---|---|---|
| SEH | 6/11/02<br>subwtrshd.apr<br>bd | **West Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>34 |

## WEST SUBWATERSHED

The West Subwatershed covers 1671 acres in the west central part of the Black Dog Watershed. The Subwatershed extends to Co. Rd. 42 to the south and to I35W in the east. There are several small catchments within the subwatershed, but there are no significant water resources. The area between I35W and I35E has several small storm water ponds. West of I35W, there are few ponding areas. The West Subwatershed is illustrated in Figure 34.

Runoff directed towards Co. Rd. 5 ultimately discharges into the Industrial Park Pond catchment in the Northwest subwatershed of the Lower Minnesota River watershed.

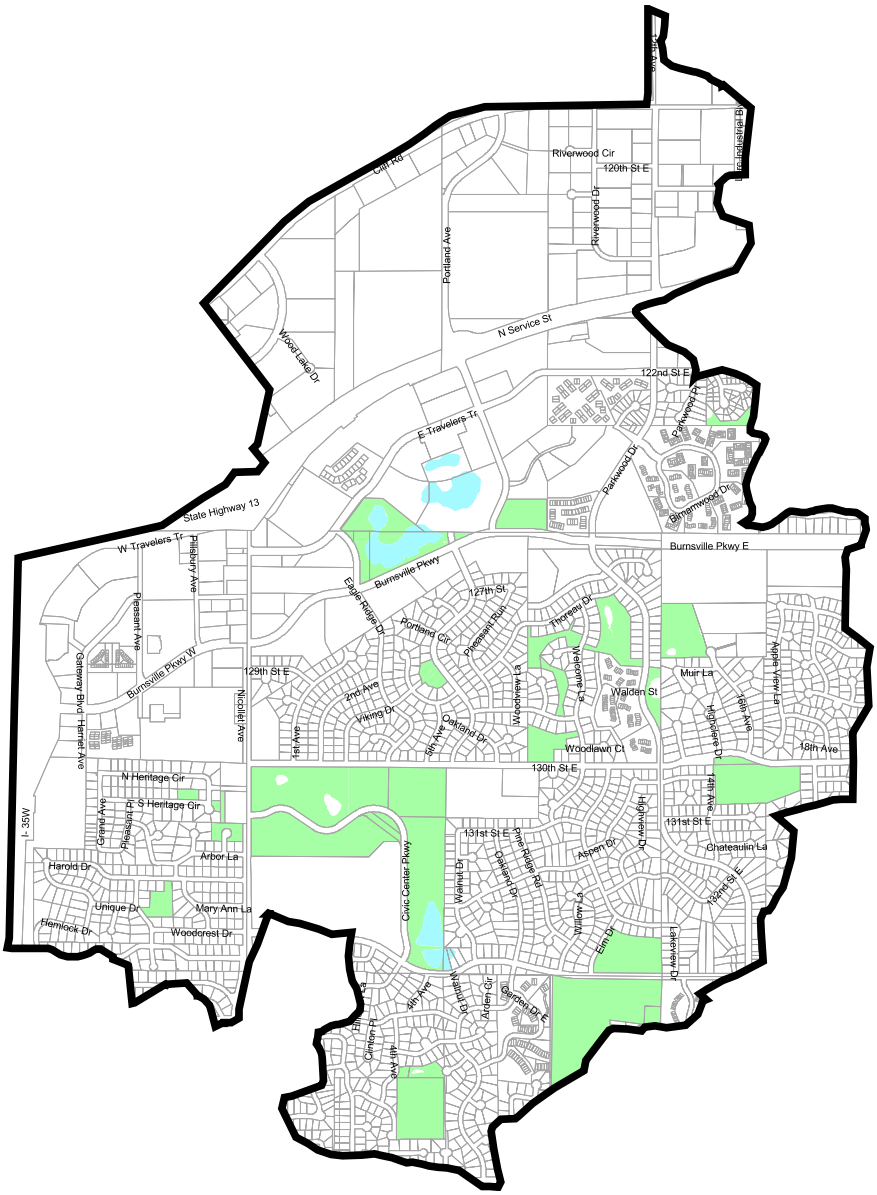



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 2,133 Acres




| | | | |
|---|---|---|---|
| SEH | 6/11/02 | **Central Subwatershed Burnsville, MN** | FILE NO. ABURNS9904.00 |
| | subwtrshd.apr bd | | FIG NO. 35 |

## CENTRAL SUBWATERSHED

The Central Subwatershed is generally centered about TH 13 and County Road 5. The Central Subwatershed drains into the Black Dog Fen Catchment of the Black Dog Lake Subwatershed in the Lower Minnesota River Watershed. The most recognizable downstream natural resource is Black Dog Lake lying within the Lower Minnesota River Watershed. The Black Dog Water Management Organization's draft Watershed Management Plan (2002) also identifies the Black Dog Fen as a downstream resource to be recognized and protected. The BDWMO Plan encourages cities to reduce discharge rates within trout stream and fen watersheds whenever possible, with the goal of reducing discharge rates to predevelopment levels or lower. The Central Subwatershed is illustrated in Figure 35.

### Heart of the City Catchment

The Heart of the City (HOC) Town Center lies within the City's Central Subwatershed, generally centered about TH 13 between County Road 11 and I35W.

The HOC Design Framework Manual (DSU) describes innovative storm water management techniques that are intended to minimize the reliance on conventional, centralized storm sewer collection systems and centralized detention pond treatment. As each individual block develops, site specific techniques that take full advantage of the high infiltration rates of the underlying soils will be employed. These "Low Impact Development" techniques will be required to mimic existing hydrology for the 1.5 inch rainfall events. The resulting goal will be to approach zero runoff for these frequent "water quality" storm events.

A separate document was prepared for the HOC area storm water management approach. The document Storm Water LID Guide Manual for the Heart of the City provided a summary of specific "Low Impact Development" (LID) techniques and a process for evaluating LID practices throughout the City. Techniques presented and discussed in the Manual are categorized according to the type of surface or area the practice may be used on (e.g., streets, boulevards, park are, roof tops). Developers can use the guide to select LID practices for a given project and a worksheet process was provided to help evaluate the level of runoff captured by the practices.

A conventional system of pipes and ponding will be available for the more infrequent, large volume/duration rainfall events (l00 year or 1-percent event). The conventional system will utilize in-place drainage system infrastructure and will also include the development of a regional detention basin at the TH 13 and Nicollet Avenue intersection. (See Figure 36.)

Table 70 summarizes the anticipated before and after conditions for the 40-acre Heart of the City Town Center development.

**Table 70 - Heart of the City Low Impact Development Hydrology Summary**

| | Pre-Development Conditions | Post-Development Conditions |
|---|---|---|
| Impervious Cover [1] | 70.5% | 92.5% |
| 100 Year Peak Discharge from 40 acre site [2,3] (CFS) | 194 | 214 |
| 100 Year Peak Discharge Leaving Site (CFS) | 329 | 87 |
| 1.5 inch Event Peak Discharge[4] (CFS) | 25 | 0 |
| **Pollutant Loading** | | |
| Total Phosphorus[5] | 4 | 90.4 |
| Total Suspended Solids[5] | 24.7 | 63.3 |

1. See EAW, 2001.
2. 100 year, 24 hour rainfall, 6.0", Type II Distribution.
3. Does not account for volume control due to low impact development techniques. Discharge into the regional pond.
4. Post development conditions require zero runoff for the 1.5 inch storm.
5. Units in % Removal Efficiency (i.e. for storm water carrying 100 ppm TSS, 90.4 ppm would be removed). Calculated after the 2nd cell of the regional ponding system at Nicollet/TH 13.

The 40-acre site previously did not have storm water ponding features. Runoff generally left the site in three ways on shown in Figure 36. The southern-most edge of the site drained south towards Burnsville Parkway. A storm sewer system in Burnsville Parkway collected runoff before discharging to the east into DNR Protected Wetland 114W. The wetland lies east of and outside of the Heart of the City Catchment.

The vast majority of the site drains to the north towards Highway 13. Existing storm drainage systems in Nicollet Avenue, 126th Street and Pillsbury Avenue collect local runoff in the southeast quadrant of the Highway 13/Nicollet Avenue intersection before discharging under Highway 13 and continuing north towards Cliff Road and the existing railroad grade. Excess runoff volumes at Nicollet and Highway 13 intersection will over-top an existing ditch block in the ditch on the south side of Highway 13, sending storm water east to the low point where it ultimately discharges north under Highway 13. Storm water ultimately discharges under the railroad grade approximately 2,000 feet east of the Cliff Road/Railroad intersection. Storm flows then meander through undeveloped lowlands before reaching Black Dog Lake. The Black Dog Fen Wetland Complex is generally located in this area. The exact location of the remnant Fen is not public information so that the resource can be protected. The Minnesota Department of Natural Resources can however confirm the existence and location of the remnant fen.

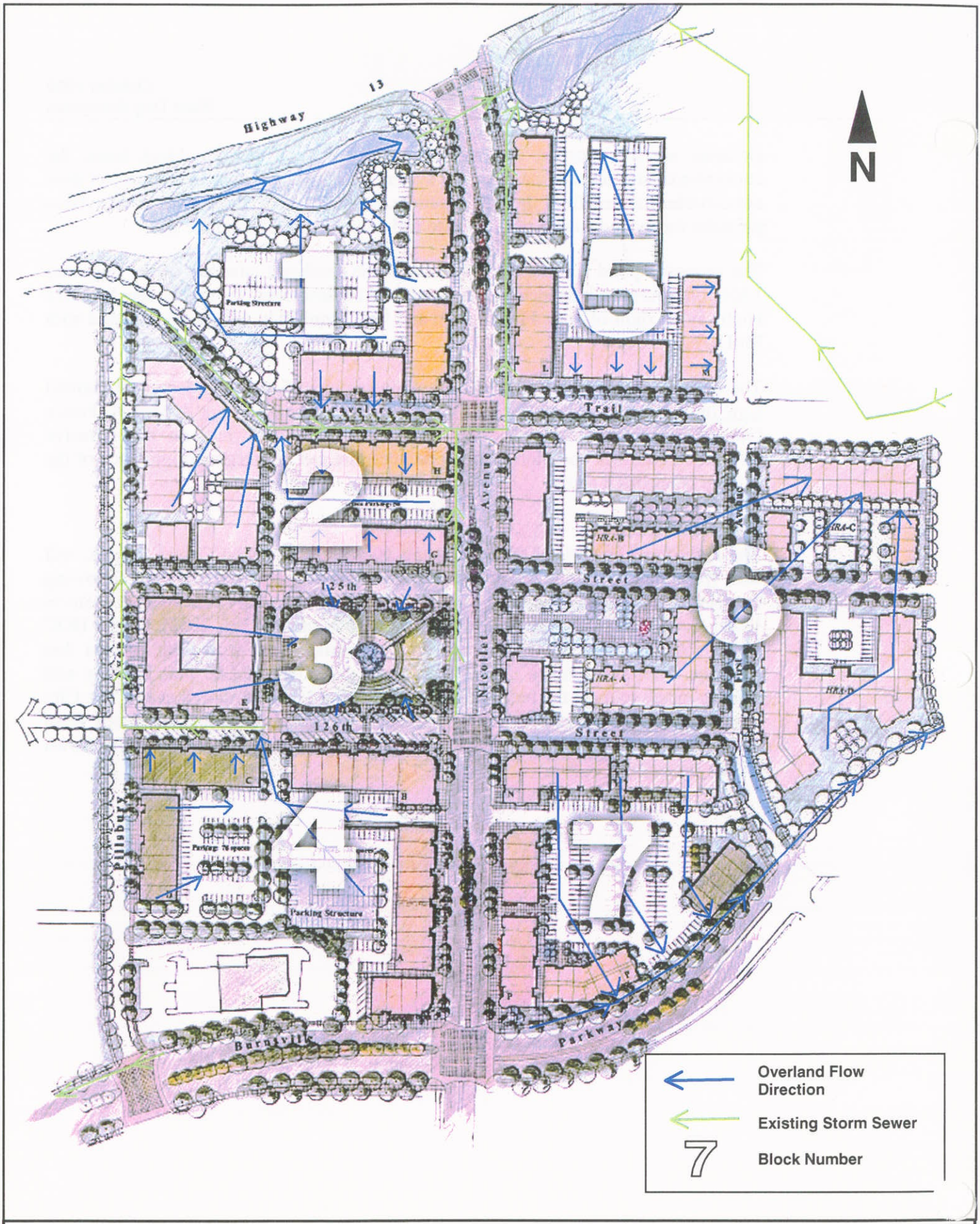
Through the use of LID techniques, reliance on the conventional centralized collection and treatment of storm water can be minimized. However, because the LID elements are site specific, and will be developed on a block-by-block basis, the

conventional storm water management system for the HOC Town Center project does not consider the benefit of the LID practices. In other words, the conventional system provides for redundancy in terms of rate and volume control from the site.

The proposed pond site for the project is in the southeast quadrant of the Highway 13/Nicollet Avenue intersection. The pond will be developed within existing MnDOT Highway 13 right-of-way. Final design and land acquisition will be coordinated with MnDOT.

The design approach will rely on methodologies identified in the document entitled Low Impact Development Design Strategies: *An Integrated design Approach* (Prince George's County, Maryland, June 1999). The techniques rely on non-intrusive infiltration facilities and bioretention practices that can be integrated into each of the surface types listed above.

The hydrologic conditions of the existing 40-acre HOC Town Center Project, will shift from approximately 70 percent impervious to 92 percent impervious following completion of the development and redevelopment. The City has created a *Storm Water Low-Impact Development Plan and Guide Manual* (SEH, 2002), for the HOC project. A key point of the plan and guide manual is the worksheet process that provides developers with a means to evaluate the extent of LID practice they will need to install to meet the required zero runoff for a 1.5 inch rainfall event. The City was also awarded Metro Environment Partnership (MEP) Grant funds from MCES that were used to help cost-share installation of LID practices in HOC Town Center projects.




Heart of the City, Conceptual Town Center Block Layout and Storm Water Routing Diagram.

**Figure 36**

### Action and Implementation Plans

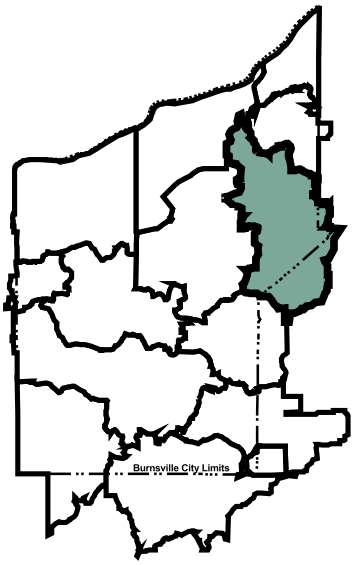
Tables 71 and 72 present the City's Action Plan and implementation actions, respectively, that have been developed to achieve the purpose and goals for the Central Subwatershed.

**Table 71 - Central Subwatershed Action Plan**

| | |
|---|---|
| **Subject:**<br>➢ Central Subwatershed Management Plan | |
| **Purpose:**<br>➢ Utilize innovative storm water management measures and Low Impact Development techniques to provide rate, volume and quality controls. | |
| **Goal:**<br>➢ Control the rate, volume and quality of storm water runoff to existing levels | |
| **Problems** | ➢ **Solutions** |
| 1. High level of development allows for minimal use of conventional storm water detention and treatment. | ➢ 1a. Implement Low Impact Development Techniques for re-developing areas including Heart of the City.<br>➢ 1b. Look for opportunities to provide storm water mitigative measures in the downstream Black Dog Fen Catchment. |

**Table 72 - Central Subwatershed Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Implement Low Impact Development Techniques for re-developing areas including Heart of the City | • Appendix B<br>• Available Incentives<br>• Heart of the City Stormwater Plan (SEH, 2001)<br>• Private developer plans | • Rate and volume control | 2002 (Ongoing) | $75,000<br><br>Also $75,000 matching MEP Grant |
| 2. Look for opportunities to provide storm water mitigative measures in the downstream Black Dog Fen Catchment | • Historic wetland area at Cliff Road and railroad Grade – Cliff Park | • Completed plans and construction<br>• Health of Fen | 2002<br><br>Ongoing | See Table 82 #1<br><br>NA |

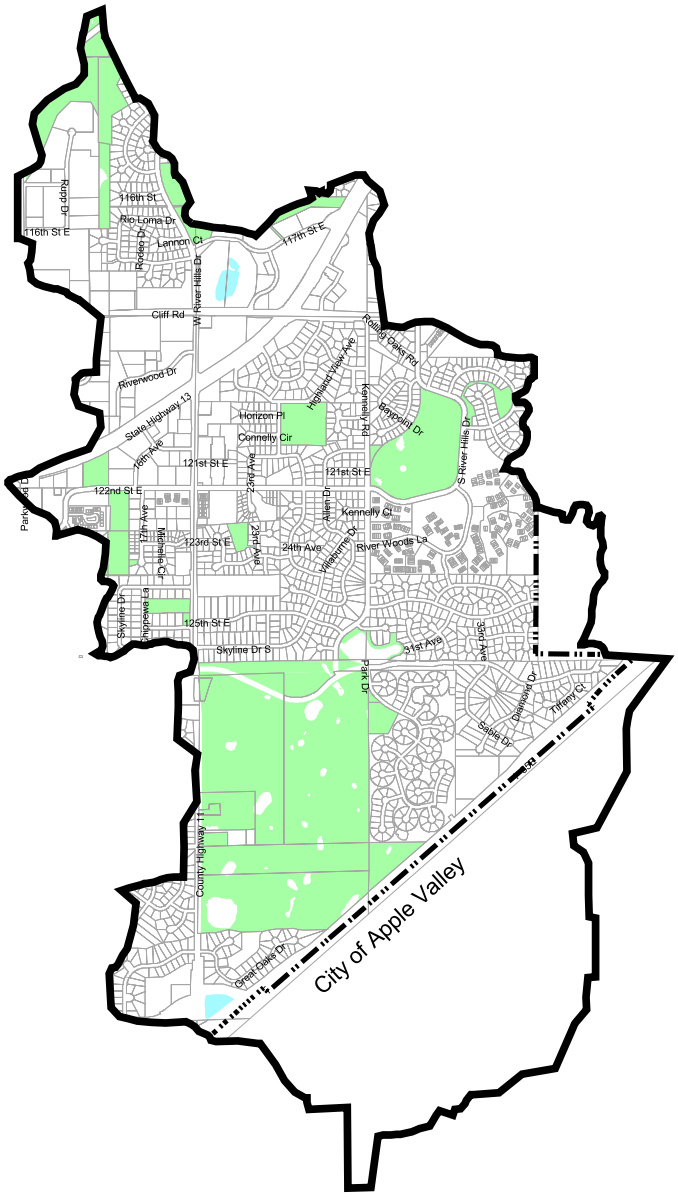



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 2,171 Acres




| | | | | |
|---|---|---|---|---|
| SEH | 6/11/02<br>subwtrshd.apr<br>bd | **East Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>37 | |

## EAST SUBWATERSHED

The southern portion of this subwatershed is peppered with numerous small natural depressions. Most of the area has a developed storm drainage system that ultimately discharges to the Minnesota River through the Minnesota River Valley National Wildlife Refuge. Portions of the area, like Terrace Oaks Park, are landlocked; that is, they have no outlet. The East Subwatershed is illustrated in Figure 37.

### Terrace Oaks Park Catchment

Terrace Oaks Park was the subject of a special study to determine the cause of and solution for problems resulting from high water levels in many of the parks land locked ponds. Extended water levels in the land-locked ponds in the southern most parts of the park had caused flooding, killing native vegetation and impacting the trail systems recreation value.

Terrace Oaks Park lies in the middle of a residential area. It remains an untouched natural area of woods, water and wetlands. Three ponds experience flooding – ponds 5, 6 and 7 illustrated on Figure 38.

Four alternatives to alleviate flooding were investigated, including increased storage, increased discharge, diversion of contributing areas and detention of upstream catchments. A critical elevation of 974 was used because it is the elevation; the three ponds will start to drain downstream into another series of ponds. It is also the elevation where water impacts to existing oaks will begin to occur.

Ultimately, the study recommended that two residential areas (about 58 acres) lying west of County Rd 11 be diverted to the south through a new storm sewer along County Road 11 into an existing pond in the northeast quadrant of I35E and County Rd 11. This pond, built by MnDOT, is also without an outlet. Storm water infiltrates in this location. City staff reports that there are no flooding problems associated with this pond. Additional study of pond levels as they vary with precipitation is needed to best understand the impact of the proposed diversion. A staff gauge should be installed and read on a regular basis.

After further monitoring of the conditions in Terrace Oaks Park, staff has determined major modifications to the drainage system are not necessary. Staff has conducted some short-term improvements and will continue to observe the effects of large rainfall events on the trails and vegetation within the Park.

### Down Stream Trout Streams

The Minnesota Department of Natural Resources has identified a potential trout stream segment (trout stream segment #7) that lies just downstream of the Central Subwatershed in the Lower Minnesota River Watershed (see Figure 10 in the Land and Water Resources Inventory.)

Trout streams require unique protection, not just from pollutants but also from water temperature. A cold water stream environment can be altered any time the hydrology of the contributing watershed exceeds the hydrology of a similar area with having less than 10% impervious cover, significantly below what would be considered "normal" urban development. Unfortunately, mitigating for thermal pollution is non-standard and still in the mostly experimental stage. Use of Low Impact Development techniques to reduce the rate and volume of runoff and increase infiltration is one of the best current tools (see Appendix B).

### Action and Implementation Plans

Tables 73 and 74 present the City's Action Plan and implementation actions, respectively, that have been developed to achieve the purpose and goals for the East Subwatershed.

### Table 73 - East Subwatershed Action Plan

| | |
|---|---|
| **Subject:**<br>➢ East Subwatershed Management Plan | |
| **Purpose:**<br>➢ Manage the water resources of the East Subwatershed to minimize the downstream impacts of increasing rates and volumes of runoff | |
| **Goal:**<br>➢ Maintain existing rate and volume of discharge from the East. Subwatershed | |
| **Problems** | ➢ **Solutions** |
| 1. Extended water levels in the land-locked ponds in the southern most parts of the park had caused flooding, killing native vegetation and impacting the trail systems recreation value. | ➢ 1. Divert two residential areas (about 58 acres) lying west of County Rd 11 be to the south through a new storm sewer along County Road 11 into an existing pond in the northeast quadrant of I35E and County Rd 11. |
| 2. MnDot pond at Co. Road 11 is does not have an outlet; the diversion could cause flooding of the underpass at I35E. | ➢ 2. Additional study of pond levels as they vary with precipitation is to best understand the impact of the proposed diversion A staff gauge should be installed and read on a regular basis. |

### Table 74 - East Subwatershed Implementation Plan

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Divert two residential areas (about 58 acres) lying west of County Rd 11 be to the south through a new storm sewer along County Road 11 into an existing pond in the northeast quadrant of I35E and County Rd 11 | • Dakota County<br>• Existing utilities | • Feasibility Study<br>• Completed plans and construction | 2005<br>2005<br>2006<br>2007 | $15,000<br>$345,000<br>$450,000<br>$150,000 |
| 2. Additional study of pond levels as they vary with precipitation is to best understand the impact of the proposed diversion A staff gauge should be installed and read on a regular basis | • City staff | • Staff Gauge installed<br>• Completion of level analysis | 2002<br>2002-2008 | NA<br>NA |
| 3. Rupp Drive storm treatment ponds | • Construction Plans<br>• City Staff | • Completed design and construction | 2010 | $750,000 |

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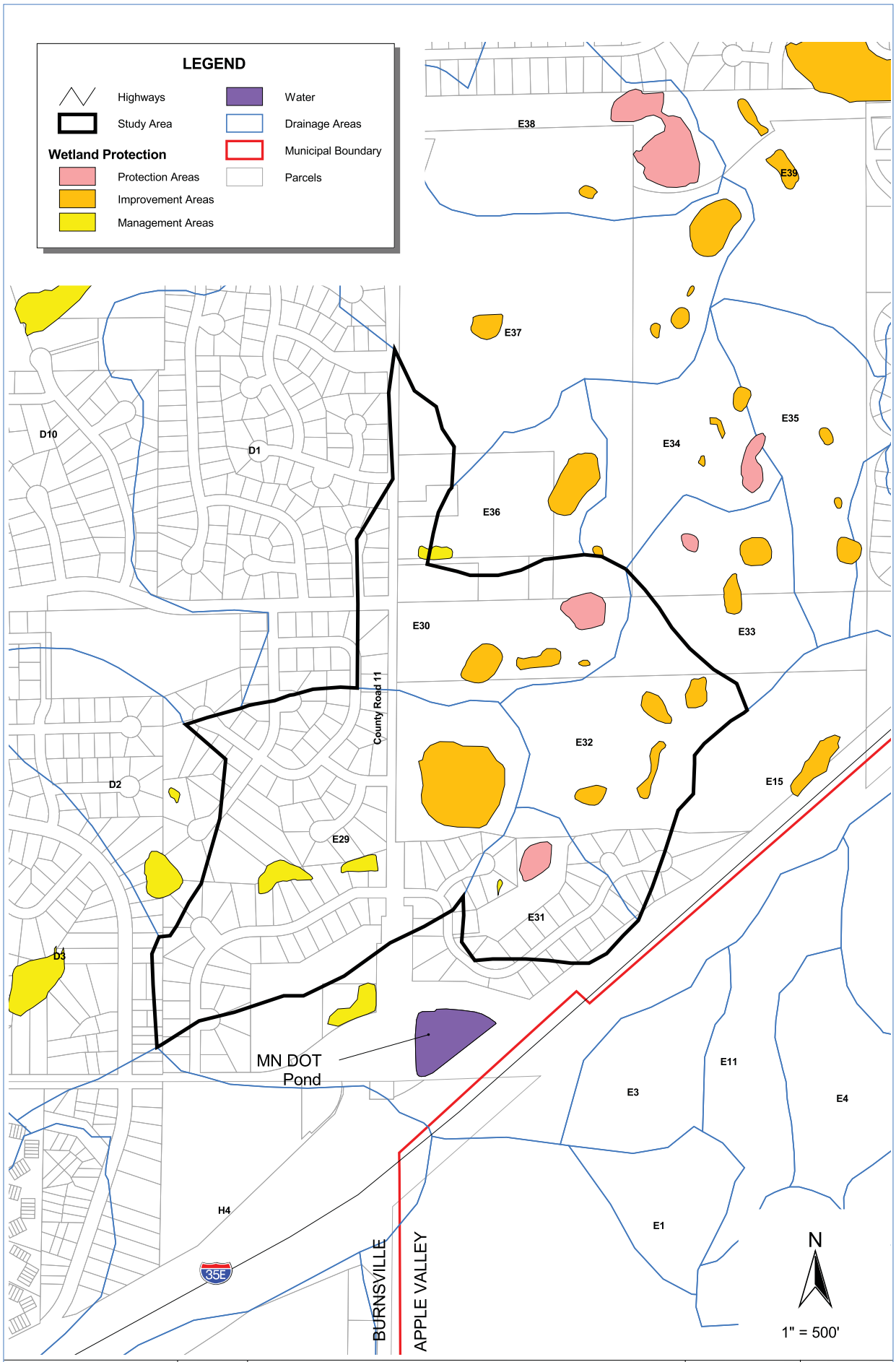


| | | | | |
|---|---|---|---|---|
| SEH | 6/11/02<br>watershed.apr<br>naf | TERRACE OAKS PARK<br>DRAINAGE AREA | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>38 | |

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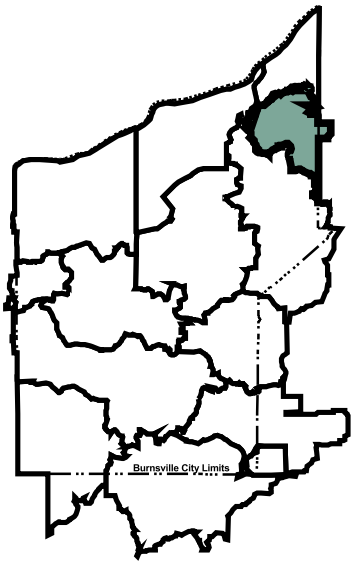
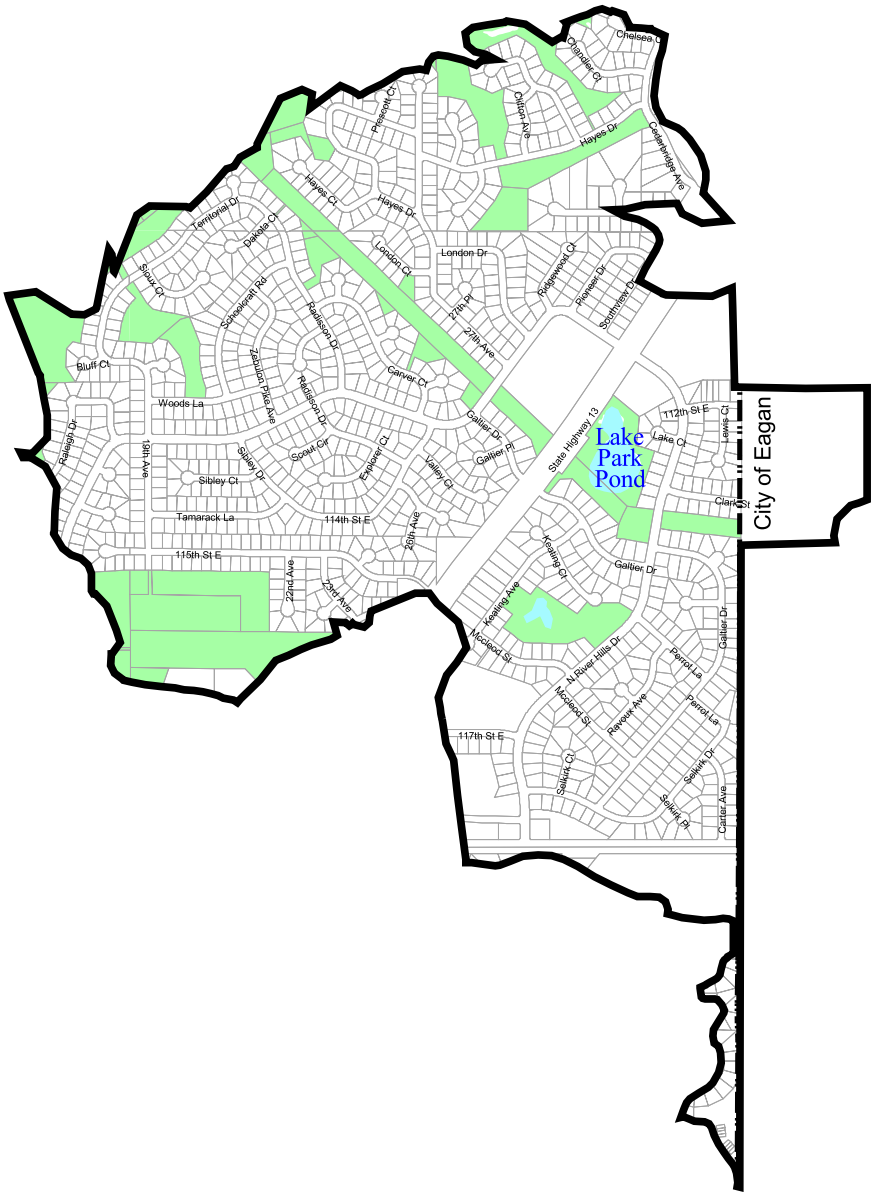



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 761 Acres




| | | | |
|---|---|---|---|
| SEH | 6/11/02<br>subwtrshd.apr<br>bd | **River Hills Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>39 |

## RIVER HILLS SUBWATERSHED

The Northeast Burnsville Subwatershed coincides with the Black Dog WMO's River Hills Subwatershed. The subdivisions lying southeast and northwest of TH13 ultimately drain through small constructed detention facilities before discharging down the buff into the Minnesota River Valley National Wildlife Refuge and on to the Minnesota River. Because future development related changes are expected to be minimal, the management strategy for this subwatershed should be one of pond maintenance and inspection of outfalls to the refuge. Storm water ponds are classified under the same system used for Burnsville lakes (see Watershed Assessment Section of this Plan). The City's Comprehensive Wetland Protection and Management Plan has established standards for these water bodies including provisions for water level fluctuations and pre-treatment. The River Hills subwatershed is illustrated is illustrated in Figure 39.

A detailed study entitled "*Northeast Burnsville Comprehensive Flood Study*" (SEH, 2001) of the existing storm sewer system in River Hills Subwatershed was completed following an excessive rainfall/runoff event in July 2000 that resulted in localized flooding problems. The area investigated is located north of Cliff Road (County Road 32) and east of Rupp Drive. Eastern and northwestern city limits define the other boundaries of the area. This area is predominantly residential but it also includes parks, schools, and a major highway (TH 13). Figure 40 illustrates study areas.

The main objectives of the field work included:

- Delineating the drainage boundaries;
- Determination of flow directions on all streets and at intersections;
- Identifying low points and high points along each street;
- Documenting the existing drainage system (not including field surveys);
- Document the condition of manholes, catch basins, and other structures of the storm sewer system; and
- Identifying residential areas that experienced significant flood damage during the storm of July 27, 2000, and/or during previous major flood events.

Based on topographic maps and field observations, the area was subdivided into "catchments" defined along major storm sewer systems. Under normal circumstances these catchments are hydraulically independent from each other. Thus, each catchment can be analyzed separately.

Each catchment was further subdivided into subcatchments and the contribution of each subcatchment to the storm sewer line was assessed. The area, slope, length, average width, and percentage of impervious surface have been determined for each subcatchment. Standard TR-55 procedures were carried out to determine the time of concentration for each subcatchment.

According to Dakota County Soil Survey, most of the soils in the area belong to hydrologic class B. Based on TR-55 manual; a curve number of 61 was used for pervious surface showing good grass cover. A conservative value of 40 percent impervious surface was used for residential areas. For parks and other types of open space 10 percent was considered impervious surface.

Storm sewer geometry was collected from City "as built" information. Documentation for a number of storm sewer pipes and structures, some of which are located in areas that experienced significant flood damage was not available.

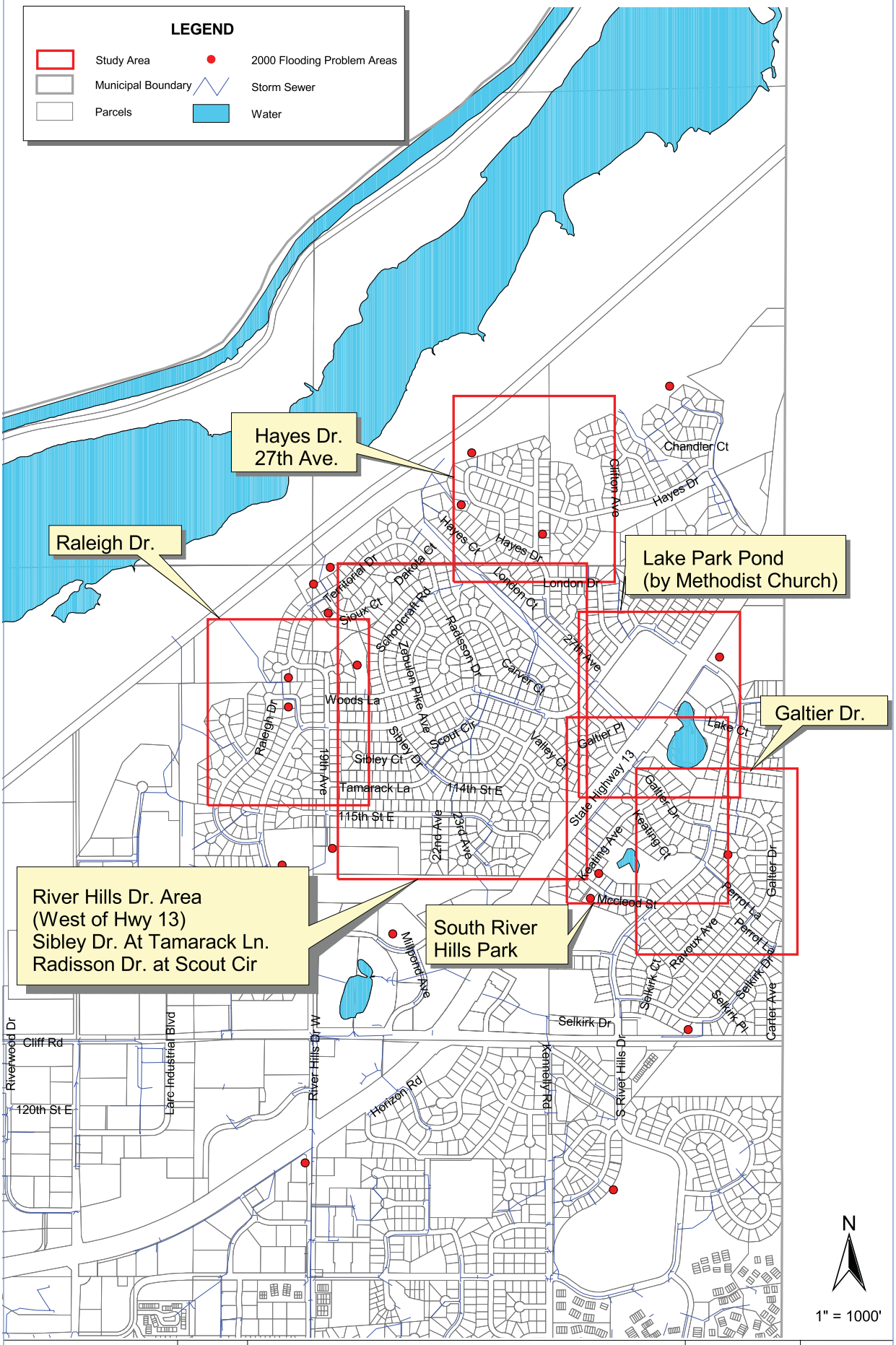
Most of the analysis was performed using XP-SWMM water engineering software. XP-SWMM is a complex modeling tool that incorporates hydrologic information and/or user defined inflow rates to produce an accurate routing of storm water through virtually any given network of pipes. HydroCAD was used for simulation of storm water routing through reservoirs such as ponds. HydroCAD was used. HydroCAD generated flow rates and volumes that were used as input in XP-SWMM.

The performance of the storm sewer systems was evaluated for three conditions:

- A 10-year 24 hour flood event (cumulative rainfall = 4.0");
- A 50-year 24-hour flood event (cumulative rainfall = 5.3"); and
- An event similar to the July 2000 storm(s) in northern Dakota County (over 8 inches in a three to five hour period).

While the majority of the storm sewer pipes and intake structures have adequate capacity, several portions of the storm drainage system appear to surcharge during extreme rainfall events. In some cases, surcharges occur for the 10-year event.

As a result of the study, plans and specifications were developed for a project in the Galtier Drive area. Other improvements in the River Hills Subwatershed will be completed along with planned street reconstruction in the area.




| | | | |
|---|---|---|---|
| SEH | 6/11/02<br>watershed.apr<br>naf | NORTHEAST BURNSVILLE DRAINAGE STUDY | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>40 |

### Down Stream Trout Streams

The Minnesota Department of Natural Resources has identified a potential trout stream segment (Trout Stream Segment # 4) that lies just downstream of the Central Subwatershed in the Lower Minnesota River Watershed (see Figure 10 in the Land and Water Resources Inventory)

Trout streams require unique protection, not just from pollutants but also from water temperature. A cold water stream environment can be altered any time the hydrology of the contributing watershed exceeds the hydrology of a similar area with having less than 10% impervious cover, significantly below what would be considered "normal" urban development. Unfortunately, mitigating for thermal pollution is non-standard and still in the mostly experimental stage. Use of Low Impact Development techniques to reduce the rate and volume of runoff and increase infiltration is one of the best current tools (see Appendix B).

### Action and Implementation Plans

Tables 75 and 76 present the City's Action Plan and implementation actions, respectively, that have been developed to achieve the purpose and goals for the River Hills Subwatershed.

**Table 75 - River Hills Action Plan**

| | |
|---|---|
| **Subject:**<br>➢ River Hills Subwatershed | |
| **Purpose:**<br>➢ Manage the rate and volume of runoff to minimize localized flooding and property damage and to protect sensitive downstream water resources. | |
| **Goal:**<br>➢ Improve storm sewer capacity and reduce downstream impacts to the National Wildlife Refuge and trout stream segment 4. | |
| **Problems** | ➢ **Solutions** |
| 1. Localized flooding occurred following heavy, intense rainfall events during July 2000. | ➢ 1. Implement improvements identified in the Northeast Burnsville Comprehensive Flood Study (SEH, 2001).<br>(a) River Hills Drive Catchment storm sewer improvements<br>(b) Raleigh Drive Catchment storm sewer improvements<br>(c) Lake Park Pond – Galtier Drive storm sewer improvements<br>(d) South River Hills Park storm sewer improvements<br>(e) Hayes Drive and 27th Avenue |
| 2. Storm water discharges below River Hills subwatershed cause erosion of the bluff and threaten sensitive resources in the Nation Wildlife Refuge and Trout Stream Segment # 4. | ➢ 2. Construct scour protection devices at the end of storm sewers discharging below the bluff, including sedimentation/infiltration ponding. |

**Table 76 - River Hills Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. River Hills Drive catchment storm sewer improvements - street reconstruction | • Northeast Burnsville Comprehensive Flood Study<br>• Neighborhood Input<br>• Existing Utilities | • Complete Plans<br>• Complete Construction | Future<br>Future | NA<br>Future ($375,000) |
| 2. Raleigh Drive catchment storm sewer improvements – street reconstruction | • Northeast Burnsville Comprehensive Flood Study<br>• Neighborhood Input<br>• Existing Utilities | • Complete Plans<br>• Complete Construction<br>• Additional improvements (if needed) | 2003<br>2004<br>Future | NA<br>$90,000<br>Future ($60,000) |
| 3. South River Hills Park storm sewer improvements - street reconstruction | • Northeast Burnsville Comprehensive Flood Study<br>• Neighborhood Input<br>• Existing Utilities | • Complete Plans<br>• Complete Construction | 2003<br>2003 | NA<br>See Table 10 # 2 |
| 4. Hayes Drive/27th Avenue storm sewer improvements - street reconstruction | • Northeast Burnsville Comprehensive Flood Study<br>• Neighborhood Input<br>• Existing Utilities<br>• Street Recon Program | • Complete Plans<br>• Complete Construction | 2002<br>2002 | NA<br>$545,000 |
| 5. Construct scour protection devices at the end of storm sewers discharging below the bluff | • Northeast Burnsville Comprehensive Flood Study<br>• Neighborhood Input<br>• Existing Utilities | • Complete Feasibility Study | 2002 | $5,000 |
| 6. Develop plans and install sedimentation/infiltration ponding below the bluff. | • Northeast Burnsville Comprehensive Flood Study | • Prepare plans and complete construction | 2008<br>2009 | $500,000<br>$250,000 |

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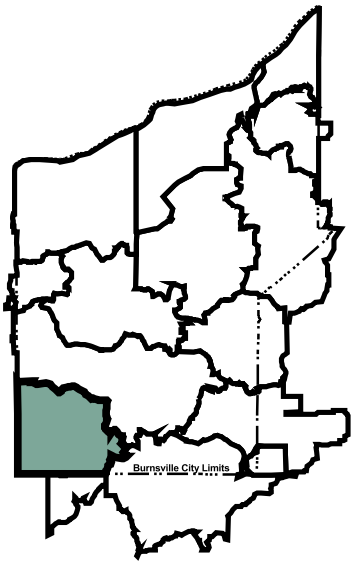
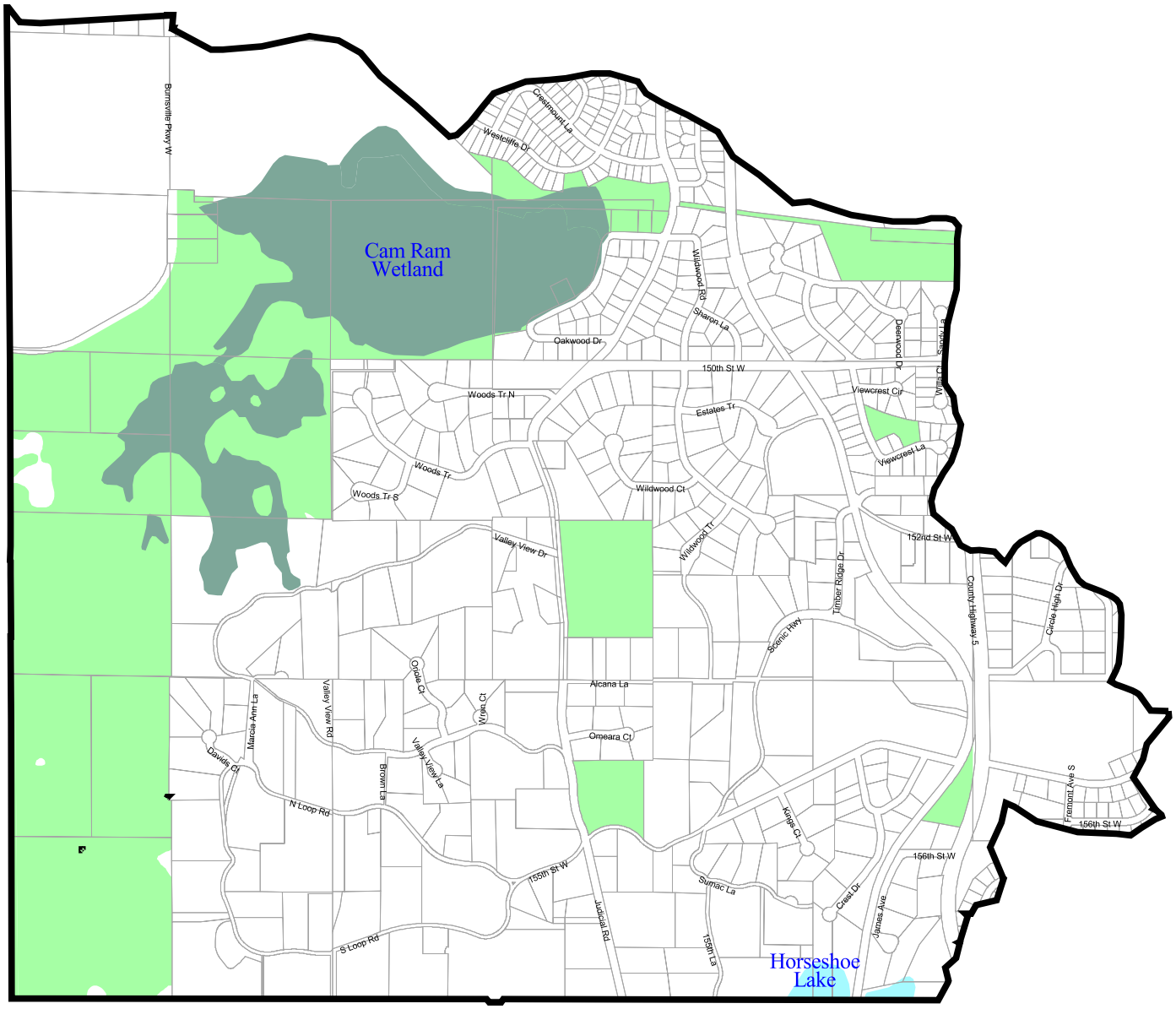



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- USFWS NWI
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, Mn/DOT, and USFWS.

Watershed Area = 1,392 Acres




| | | | |
|---|---|---|---|
| SEH | 6/11/02 | **Murphy Hanrehan Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00 |
| | subwtrshd.apr<br>bd | | FIG NO.<br>41 |

## MURPHY HANREHAN SUBWATERSHED

The Murphy Hanrehan Subwatershed is in southwest Burnsville, as illustrated in Figure 41. Horseshoe Lake is one of the identifiable waters, lying on the Burnsville/Lakeville border. Horseshoe Lake is approximately 10 acres in size, and is quite shallow (maximum depth about 4 feet). Limited physical and biological data is available for Horseshoe Lake. Further investigation and monitoring should be considered before establishing a management plan for Horseshoe Lake. A water quantity grade may be added in the future. There are no specific water quantity issues.

The lake discharges north through DNR protected Cam-Ram wetland (19-380), before turning to the northwest and into Savage. There is a general concern regarding the ultimate connection of the many land locked ponds and wetlands as shown in the Comprehensive Plan. However, there are no known current problems with water quantity in these areas. The City completed an update tot eh Flood Insurance Rate Maps in this area in 2005 and the data from this effort has been incorporated into Appendix D.

The area is zoned rural residential requiring one-acre lots when City sewer services are available and two-acre lots when City sewer is not available. There are many wetlands classified for protection and improvement in this area and there is likely opportunity for maintenance or improvement of the resources. Protection and improvement of wetlands in this area of the City will require public education efforts, as many of the wetlands are located on private land. The wetlands in southwest Burnsville are generally landlocked; that is, they do not have identifiable outlets. There is a need for more retention/infiltration in the watershed to prevent and reduce the likelihood of future problems.

As an update to the 1990 Comprehensive Plan, the City prepared a study report entitled Southwest Public Services Study. The study reviewed natural conditions and explored the means and methods for extending public utilities to the area.

The key policy decision that resulted from the study was that the City would adopt an official master plan for the future of this area and require all future subdivisions to be consistent with this plan. The resulting plan incorporates a design for the extension of public sanitary sewer, public water service and provision for storm water drainage improvements.

It is the intent to allow the area to remain unsewered for the foreseeable future. However, the City policy for future subdivisions requires that houses be located in such a way that the property can be further subdivided to a 1-acre minimum lot size when public sewer is available.

### Action and Implementation Plans

Tables 77 and 78 present the City's Action Plan and implementation actions, respectively, that have been developed to achieve the purpose and goals for the Murphy Hanrehan Subwatershed.

**Table 77 - Murphy Hanrehan Subwatershed Action Plan**

| | |
|---|---|
| **Subject:**<br>➢ Murphy Hanrehan Subwatershed | |
| **Purpose:**<br>➢ Manage the rate and volume of runoff to minimize localized flooding and property damage and to protect sensitive downstream water resources. | |
| **Goal:**<br>➢ Control rate and volume of runoff to existing (year 2000 levels) | |
| **Problems** | ➢ **Solutions** |
| 1. Many of the ponds and wetlands are landlocked, and without outlets. Therefore, increasing runoff will increase flooding and the potential for property damage. No problems currently exist. | ➢ 1. There is a need for more retention/infiltration in the subwatershed to prevent future problems. |
| 2. Future connection of ponds and wetlands could increase rates and volumes of runoff, threatening downstream resources. | ➢ 2. Require the use of Low Impact Development Techniques as the area ultimately develops. |
| 3. Much of the subwatershed is un-sewered. | ➢ 3. Enforce in place regulations regarding individual sewage treatment systems (ISTS). |
| 4. Increasing levels of impervious will increase the rate and volume of runoff. | ➢ 4. Utilize narrow street concepts as one tool to limit total impervious cover. |

**Table 78 - Murphy Hanrehan Subwatershed Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Evaluate the need for more retention / infiltration in the subwatershed to prevent future problems | • Low Impact Development Techniques (Appendix B)<br>• Black Dog WMO<br>• Lakeville | • Documented Policies<br>• Water level monitoring | 2003<br><br>2005-2016 | NA<br><br>NA |
| 2. Require the use of Low Impact Development Techniques as the area ultimately develops | • Low Impact Development Techniques (Appendix B)<br>• Comprehensive Plan<br>• Development Plans | • Development agreements<br>• Implemented improvement | On-going | See Table 13 #6 |
| 3. Enforce in place regulations regarding individual sanitary treatment systems (ISTS) | • ISTS regulations<br>• Inspection records<br>• Public Education | • Documentation of compliance | Annual | NA |
| 4. Use street design concepts and design standards | • Low Impact Development Techniques (Appendix B)<br>• City Maintenance and Public Safety | • Street re-construction plans | Annual | NA |

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## LOWER MINNESOTA RIVER WATERSHED

The Lower Minnesota River Watershed generally follows the Minnesota River Valley, encompassing the area that is directly tributary to the Minnesota River (that is, does not flow into other major streams first). The Watershed covers 64 square miles in Carver, Hennepin, Dakota, Scott and Ramsey counties. Within Burnsville, the watershed adjoins the boundary of the Black Dog Watershed to the south.

Figure 42 illustrates the subwatersheds and catchment areas within the Lower Minnesota River Watershed in Burnsville.

### WATERSHED MANAGEMENT ORGANIZATION

The Lower Minnesota River Watershed District is a watershed district created under Minnesota Statutes 103. The Minnesota Water Resources Board (now the Board of Water and Soil Resources) established the District on March 23, 1960. The District was originally established to be a legal entity for providing local participation to the U.S. Army Corps of Engineers (COE) to construct a navigation channel. The initial focus of the District was based on maintaining the 9-foot navigation channel on the Minnesota River.

The affairs of the District are managed by the Board of Managers. The Board is comprised of five county-appointed managers. The District's current purposes differ from its historical focus. The ongoing purposes include (Barr, 1999):

- Implementation of a data collection, assessment and planning program for District resources;
- Expand review role of development and local government projects;
- Expand project inspection program;
- Participate financially in projects that benefit the District; and
- Expand commercial navigation initiatives.

#### Local Planning

Each member City is responsible for preparing and implementing a local water resources management plan, as required in the Watershed District plan. Contents local plans are required to satisfy Minnesota Statutes 103B.235, Minnesota Rules 8410.

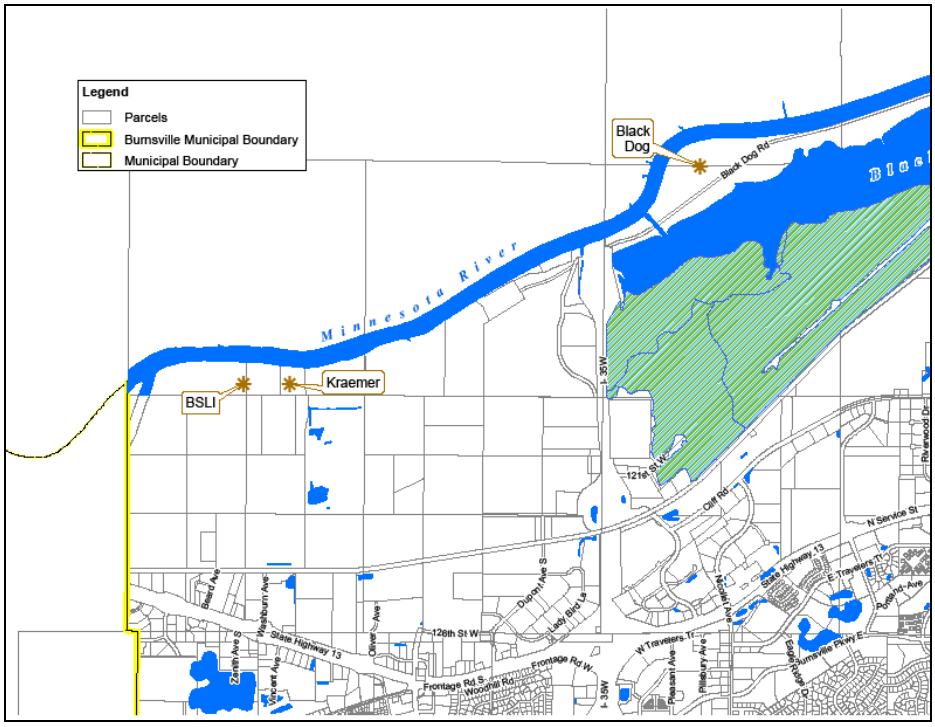
The District assumes that local government will continue to be the permitting authority for all land altering activity. The District requires that the local water management plan include a description of local permitting procedures including preliminary and final platting process. Appendix F of this Plan is intended to satisfy this requirement.

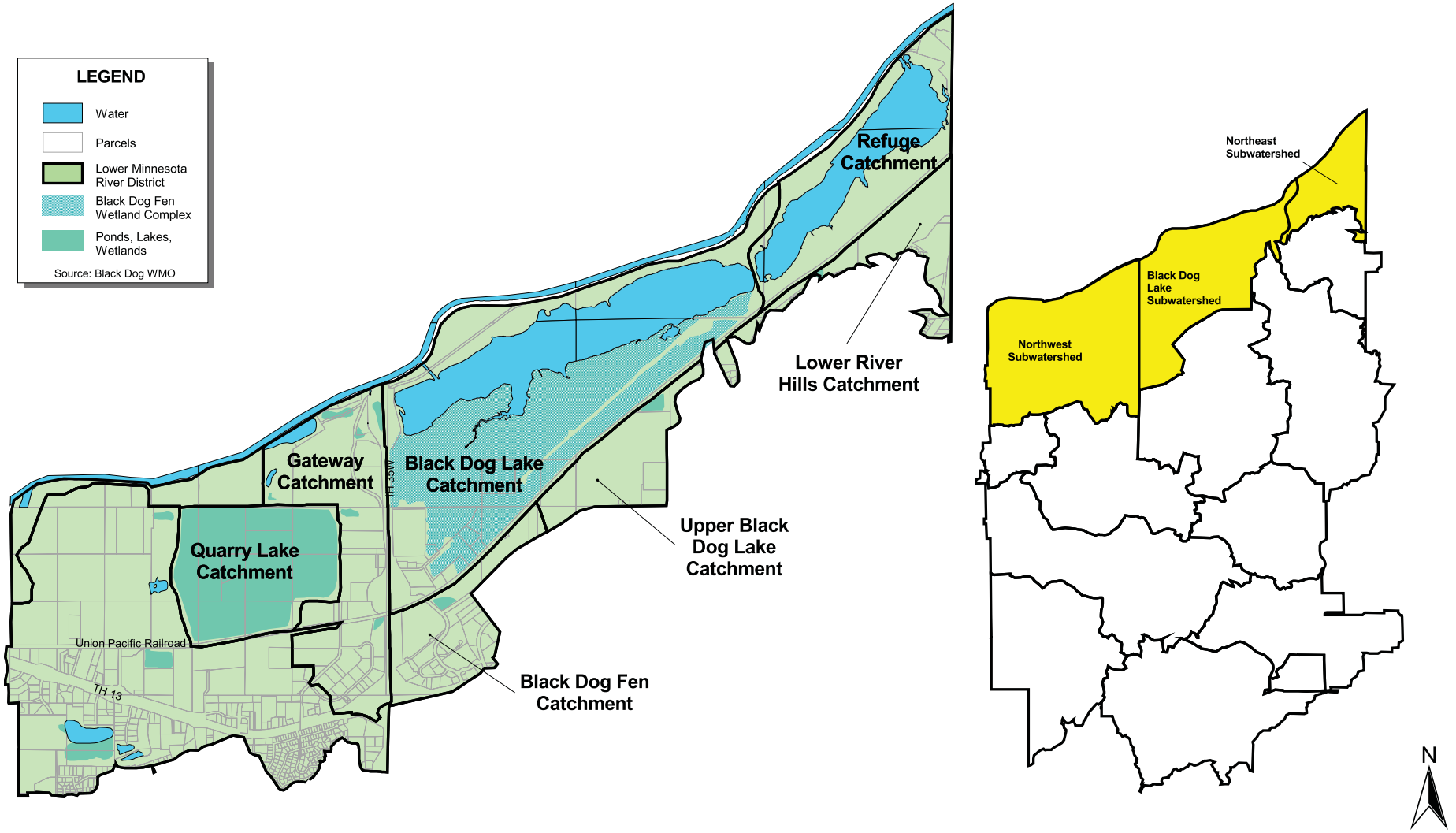
### Subwatersheds

There are 3 identified subwatersheds of the Lower Minnesota River Watershed within Burnsville as illustrated in Figure 42. Each subwatershed has been further divided into smaller catchments or drainage areas. The drainage areas are identified in the fold-out map in Appendix D (see Figure D-1).

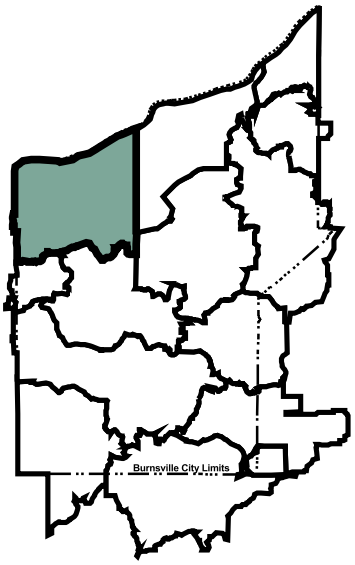
### Dredge Material Disposal Sites

Disposal of dredge spoil materials along the Minnesota River corridor is an ongoing effort by the US Army Corps of Engineers. The graphic below shows dredge storage sites as identified by the Lower Minnesota River Watershed District and the Corps of Engineers. The City will work with LMRWD and the Corps of Engineers to allow dredge material sites at the BSLI Landfill and Kraemer sites on a short-term, interim basis provided the sites are out of view of the Gateway Area. The City will discourage dredge spoil sites in other areas of the Minnesota River corridor.






| | | | |
|---|---|---|---|
| SEH | 9/20/02<br>watershed.apr<br>naf | LOWER MINNESOTA RIVER WATERSHEDS IN BURNSVILLE | FILE NO. ABURNS9904.00<br>FIG NO. 42 |

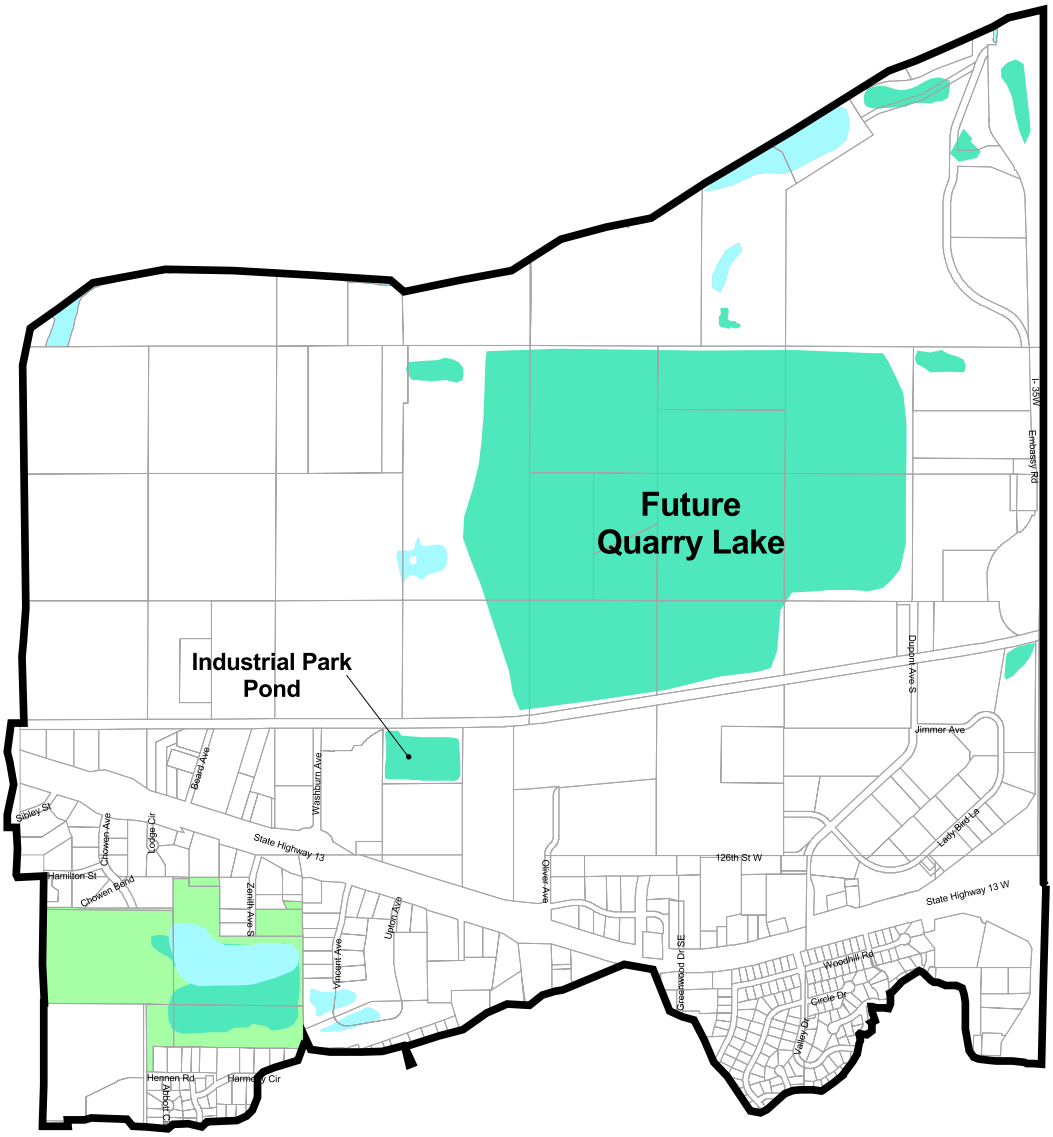



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space
- Future Ponds/Lakes/Wetlands

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 2,130 Acres




| | | | |
|---|---|---|---|
| SEH | 9/10/02 | **Northwest Subwatershed Burnsville, MN** | FILE NO. ABURNS9904.00 |
| | subwtrshd.apr bd | | FIG NO. 43 |

## NORTHWEST SUBWATERSHED

The Northwest Subwatershed is bounded to the north by the Minnesota River, to the east by Interstate 35W, to the west by the Savage City limits and generally to the south by Williams Drive. The Northwest Subwatershed is illustrated in Figure 43.

Historically, the Minnesota River has proved to be an amenity to the City by providing jobs and natural beauty. It also on many occasions proved to be an problematic when it flooded and forced the closing of I-35W and the old Cedar Avenue Bridge. Both of these major arteries were closed in 1965. In 1969 Cedar Ave was closed again while I-35W was protected by a dike, which left only one lane open in each direction. Many businesses also suffered severe damage and loss of revenue during those record floods. Examples would be the Embassy Club, Kraemer's Quarry operation and the Black Dog Power Plant.

The subwatershed includes the US Waste Landfill that has a self-contained drainage system that ultimately discharges to the Minnesota River. In addition to the landfill, there are several identifiable catchments within the subwatershed. The Nature Preserve Catchment that discharges to the Minnesota River via a 12-foot by 12-foot concrete box culvert. The box culvert also serves as the outlet for the Sunset Pond Outlet subwatershed in the Black Dog Watershed. The box culvert also handles contributions from Keller and Crystal Lake and the contributing catchments and subwatersheds in-between.

The Northwest Subwatershed also includes the Quarry Lake Catchment (currently an active quarry) and the Gateway Catchment. The Gateway Catchment includes the area west of and adjacent to I-35W including the proposed Black Dog amphitheater.

Based on the highly developed level of the subwatershed, there is generally too little pre-treatment of runoff. As further development and re-development occurs, a stronger emphasis on developing additional storm water treatment is needed. Since completion of the 2002 WRMP, the City has initiated a closer look at the redevelopment potential in this area and has named the area the Minnesota River Quadrant (MRQ).

Related to this WRMP update, a closer look was also taken at the storm water management needs and opportunities in the MRQ. This was completed in two stages. First, a look at the larger area was completed in February of 2006 that evaluated the needs based on a concept development scenario prepared by DSU. The second stage was to take a closer look at what opportunities for storm water management are available roughly between TH 13 and the rail road corridor. Both of these evaluations are provided in Appendix A of this WRMP.

### Quarry Lake Catchment

Much of the future development adjacent to the quarry is the subject of a planned unit development (PUD) agreement between Edward Kraemer and Sons, Inc. and the City (McCombs, et al., 1994). A levee system exists south of the river, extending from I-35W to the U.S. Waste Landfill in the northwestern most corner of the City. The levee was privately constructed in response to historic flooding problems and to protect the quarrying operation. Long term maintenance and ownership of the levee should be addressed in future revisions to the PUD.

The lessons learned from the former gravel-pit-turned "Grade A" Lake (Lac Lavon) will help the City to establish and maintain this resource of regional significance. Special efforts have been made to provide adequate storm water treatment and to divert direct storm water from the lake to help implement this vision. Already in-place are two trunk storm sewer systems, a 12 foot by 12 foot box culvert to the west side of the lake between the landfill and the quarry and a 72-inch storm sewer on the east side, directly west of I-35W. These trunk lines will carry runoff from the area and from the west and Sunset Pond Outlet Subwatersheds directly to the Minnesota River. Both outfalls require flood closure structures and the ability to bypass-pump when river levels are high and runoff is occurring in the upstream subwatersheds. Such a facility is already in-place at the box culvert outfall.

The discharge capacities generally coincide with the 10-year frequency rainfall event. When high river levels correspond with significant rainfall, minor flooding south of the levee systems could result. For that reason, all future structures south of the levee system should be built above elevation 720.0, or have adequate flood protection measures. The southeastern portion of the subwatershed coincides with the Black Dog WMO's West and Sunset Pond Outlet Subwatersheds. A series of small ponds in the upper/southern-most portions of the subwatershed currently discharge into the Northwest Burnsville Subwatershed along the County Road 5 alignment. Future regional storage/treatment facilities are planned to avoid direct discharge to Quarry Lake (see previous discussion).

Just as declining ground water levels due to quarrying have changed the surrounding landscape, future rising ground water levels in the quarry area will require careful evaluation and monitoring. Considerable infrastructure has been installed since the quarry operations began. The impact of nearer-the-surface local ground water levels could have some adverse impacts. This issue is beyond the scope of the Water Resources Management Plan update.

The floor of the Kraemer quarry to the south will be excavated to elevation 610, some 78 feet below the normal levels on the Minnesota River, according to the PUD document prepared by McCombs Frank Roos Associates, Inc. dated February 1994. At the Kraemer quarry, groundwater and surface water is collected in the quarry bottom and pumped up into a series of ponds before discharging through the flood plain forest wetland complex lying between the quarry and the Minnesota River. The

pumping operation is performed in accordance with a Minnesota Department of Natural Resources Water Appropriation Permit (Dewatering General Permit 97-0005). The quarry has been dewatered at the average rate of 6 million gallons per day (1995).

The Kraemer quarry is projected to remain in operation until 2017 according to the February 1994 PUD document (McCombs). Anticipated expansion of the quarry to the west has included investigation of the need for wetland permitting In 1997, the City found that a no-net-loss determination could be made for the future expansion.

When existing dewatering operations cease to function, the Kraemer quarry will fill with ground water. SEH, Inc. completed a ground water study in 2000 and 2001. The results of that study indicate that the Quarry Lake will likely rise to an elevation of 700 to 705 without an outlet and without any dewatering activity in the area. If the proposed Black Dog Amphitheater is built (see Gateway Catchment), dewatering at the rate of 2,500 gallons per minute (gpm) is anticipated. In this case the lake level could be maintained at elevation 695, assuming non-flood conditions on the river.

During a flood on the Minnesota River, additional pumping will be required to keep up with river water that will seep into the Quarry Lake through the fractured bedrock. During the 1997 flood, City and private efforts pumped water at the rate of 37,500 gallons per minute from the area adjacent to the quarry to the Minnesota River to minimize flood damage. The quarry dewatering pumps worked at the rate of 13 million gallons per day to keep the quarry bottom dry. River levels in 1997 rose to 714.3 (note: the Savage Gauge is approximately 0.7' higher than the City gauge at the box culvert). In 2001, the river exceeded 715.0; gauge records are incomplete since the Savage gauge was flooded out (see www.mvp.wc.usacearmy.mil/dcp/SAVM5.html).

The City plans to design and install a future pumping station at the Quarry Lake to minimize the extent to which the future lake will significantly exceed normal river levels and to control flooding of the future lake during a flood event on the Minnesota. The Minnesota Department of Natural Resources will be the permitting agent for future quarry dewatering/lake level control.

The quality goal for the future Quarry Lake is 3.6 meters clarity. Restricting direct discharge to the lake will minimize quality issues. The quantity issue for the lake will relate to control the lake's response to changing river levels.

### Nature Preserve Catchment

The Rudy L. Kraemer Nature Preserve is the centerpiece of the Nature Preserve Catchment. Built in 1996, the 75-acre complex includes restored wetlands that serve as wetland mitigation for expansion of the Burnsville Landfill (currently owned by U.S. Waste). The wetland complex receives storm water via a low flow diversion from the 66" trunk line that serves as the outlet for Sunset Pond and the Sunset Pond Outlet Subwatersheds

Two additional stormwater ponds were constructed directly to the east of the nature preserve in 2000. Lying southwest and adjacent to the Sue Fischer Memorial Park (Youth Athletic Complex), the two ponds also receive stormwater diverted from the 66-inch diameter trunk storm sewer that serves as the outlet for Sunset Pond and the Sunset Pond Outlet Subwatersheds. The northern-most pond is used to irrigate the adjacent athletic fields depending on available stormwater. Due to extensive pond weed growth, the irrigation system is operated in spring, early summer and late fall.

### Box Culvert Catchment

The box culvert catchment is the principal outlet for the majority of Burnsville. The 5,780 acres that are tributary to the upstream Sunset Pond discharge north through the Nature Preserve Catchment and finally into a 3,534 foot-long 12 foot by 12 foot pre-cast concrete box culvert that begins near Washburn Avenue and the US Waste Landfill. The box culvert follows a south-to-north path between the landfill and the quarry to an eventual discharge to the Minnesota River. Figure 44 illustrates the tributary drainage areas between Sunset Pond and the box culvert inlet.

The box culvert was designed to contain excess flows and/or Minnesota River flood waters when full discharge is restricted due to a flood. In 1997, numerous joints failed under flood pressure, resulting in flooding of private property and extensive pumping of flood waters to the Minnesota River. As a result, the existing flap gate and pump station connections discussed above were installed. In addition, an extensive external joint-repair program was undertaken in 1998. During the spring of 2001, flood waters again damaged several joints, causing the material adjacent to the box culvert to be washed-out. Once repaired, the joints, the flap gate and the pumping station will require regular maintenance and inspection to ensure that the entire system is in good working order prior to a flood event. Future construction may include a pump station and automated controls to replace the manual pump controls currently in place.

### Industrial Park Pond Catchment

The Industrial Park Pond area receives significant runoff from the West Subwatershed as well as from commercial and industrial properties along the TH 13 corridor. The tributary area extends as far south as County Rd. 42 and east of I-35W. A major trunk storm sewer in Co. Rd. 5 carries runoff north to an existing ditch that drains west along the south side of the railroad grade towards the box culvert (discussed above). Approximately 1,300 acres is tributary to the area.

The City prepared a draft feasibility study of a water quality pond in May 2001 (SEH). The project evaluated converting an 11-acre upland site just north of Cub Foods to a stormwater pond and wetland complex. The pond would divert low flows form the existing ditch and would discharge into the 12 foot by 12 foot box culvert to the northwest. The Industrial Park Pond project is no longer a specific project that the City has planned for the area. Instead, the information in Appendix A, relating to storm water management needs and options in the MRQ will be used a guide to future development and redevelopment.

Within the catchment, it has been proposed to extend Co. Rd. 5 to the north. As part of the roadway extension, additional stormwater ponding should be developed to provide additional upstream treatment.

### Gateway Catchment

The Gateway Catchment follows the eastern edge of the Northwest Burnsville Subwatershed, paralleling I-35W. The area is served by a large trunk storm sewer in Embassy Road. This is the site of the previously proposed Black Dog Amphitheater and the McGowan Landfill. The Amphitheater was the subject of an Environmental Assessment Worksheet (EAW) (DSU, 2000). The EAW addressed stormwater collection and treatment issues, future dewatering and proposed wetland mitigation. Figure 45 provides an aerial view of the area.

The existing levee in this area was previously evaluated (SEH, 1999). The elevation (which caused an increase in the upstream flood profile) and questionable construction methodology used ultimately resulted in the DNR and the City ordering that a portion of the levee be removed. The levee was lowered as a result in the spring of 2001 to ensure compliance with the National Flood Insurance Program.

A 72-inch storm sewer on the east side of the catchment, directly west of I-35W is the main drainage facility. This trunk line carries runoff directly to the Minnesota River. The outfalls require a flood closure structure and the ability to bypass-pump when river levels are high and runoff is occurring in the upstream area.

### Minnesota River Floodplain

Disposal of dredge spoil materials on the Minnesota River Corridor is an ongoing effort. Burnsville's Comprehensive Plan states that the City will work with Corps of Engineers and LMRWD to allow dredge material sites at the BSLI Landfill and Kraemer Sites on a short-term, interim basis provided the sites are out of view of the Gateway Area. The City will discourage dredge spoil sites in other areas of the Minnesota River Quadrant and east of I-35W.

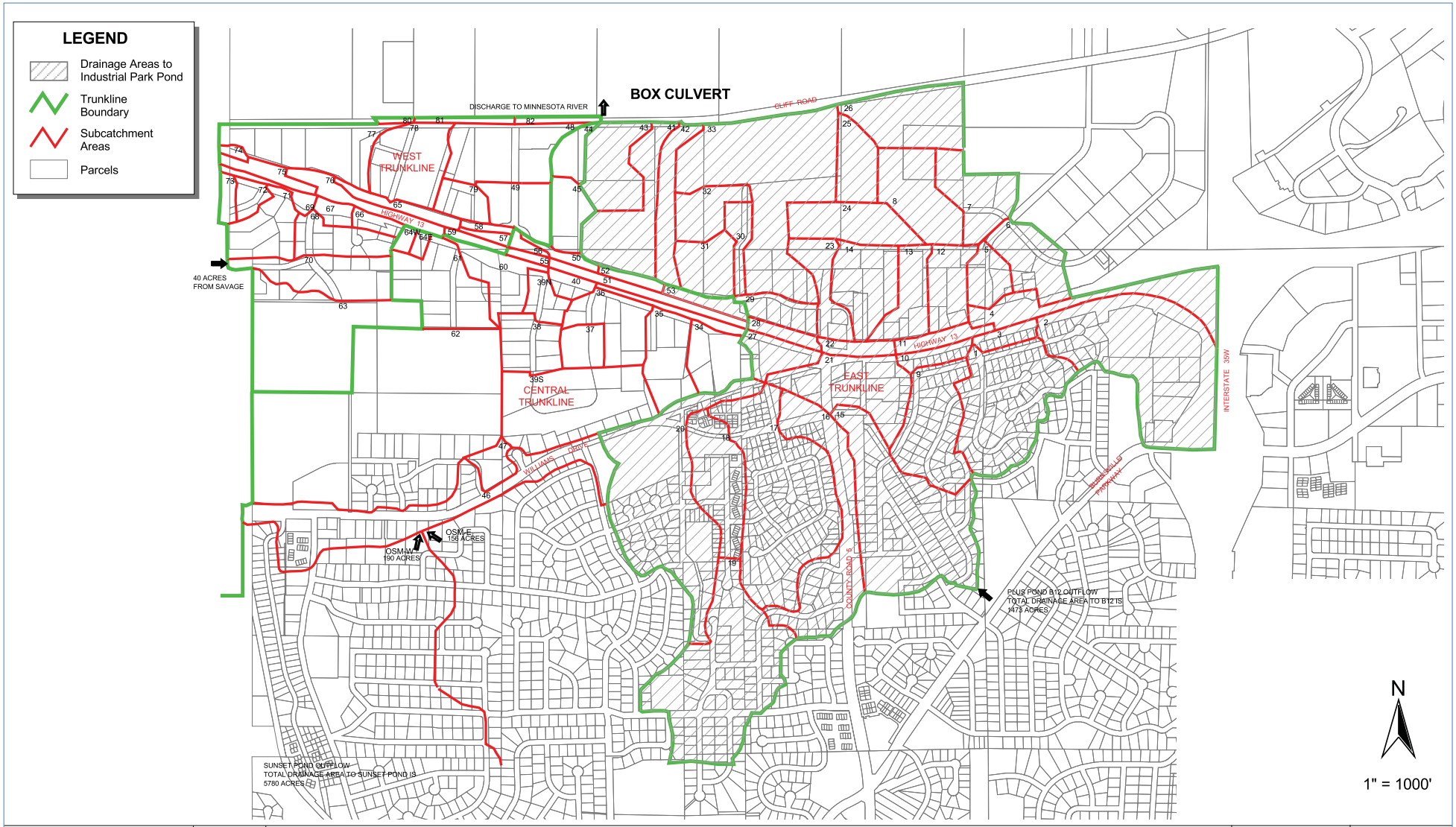
The District has secured easements to accommodate dredged materials. The dredge material has been used as daily cover at the Waste Management landfill in Northwest Burnsville. In 2001, the City approved a 10 to 15 year interim use permit for dredge disposal sites on Waste Management Property along the Minnesota River.

### Action and Implementation Plans

Tables 79 and 80 present the City's Action Plan and implementation actions, respectively, that have been developed to achieve the purpose and goals for the Northwest Subwatershed.

**Table 79 - Northwest Subwatershed Action Plan**

| | |
|---|---|
| **Subject:**<br>➢ Northwest Subwatershed | |
| **Purpose:**<br>➢ To manage the quality and quantity of stormwater discharges to the Minnesota River and to future Quarry Lake | |
| **Goal:**<br>➢ Maintain Quarry Lake's water clarity at 3.6 meters or greater; maintain federal/state/local standards for discharges to the Minnesota River. | |
| **City Classification:**<br>➢ Quarry Lake (Future); High Priority | |
| **Intended Use:**<br>➢ Future Quarry Lake: Supports swimming and other direct contact recreational activities such as water skiing, scuba diving and snorkeling. Provides wildlife habitat.<br>➢ Minnesota River: commercial and recreational boating, fishing. | |
| **Problems** | ➢ **Solutions** |
| 1. Direct discharges to Quarry Lake will decrease quality over time. | ➢ 1. Divert runoff around Quarry Lake; limit direct discharges from future development, and limit the watershed area to lake ratio to 1.1 to 1. |
| 2. Level of treatment in subwatershed is very limited. | ➢ 2a. Develop Industrial Park Pond and Wetland Complex to provide additional treatment.<br>2b. Complete a detailed water quality analysis including water quality of Sunset Pond discharge to identify effectiveness of existing treatment and opportunities for additional treatment and comply with federal/state/local standards. |
| 3. Embassy Road trunk storm sewer does not have a closure/by-pass pumping system for flood events. | ➢ 3. Construct flood closure and bypass pumping system for Embassy Road outfall. |
| 4. Future direct flooding of Quarry Lake (river water overtopping levee system) would severely threaten the water quality of the lake. Long-term maintenance and ownership of private levee at quarry is future concern. | ➢ 4. Maintain the existing private levee system between the Minnesota River and the Quarry Lake to provide direct separation between the lake and river water. Address long-term maintenance in Planned Unit Development Agreement. |
| 5. Indirect future flooding of Quarry Lake via groundwater, which will cause fluctuation in lake levels similar to the flood levels on the river, could cause flooding of properties adjacent to the lake at elevations below 720.0. | ➢ 5a Limit development of properties adjacent to future Quarry Lake to elevation 720.0 or higher.<br>5b. Prepare study for flood dewatering system to maintain Quarry Lake levels below flood stage on the river to reduce the risk of flooding adjacent properties. |




| | | | |
|---|---|---|---|
| SEH | 9/10/02<br>watershed.apr<br>naf | TRIBUTARY AREAS BETWEEN SUNSET POND AND BOX CULVERT INLET | FILE NO. ABURNS9904.00<br>FIG NO. 44 |

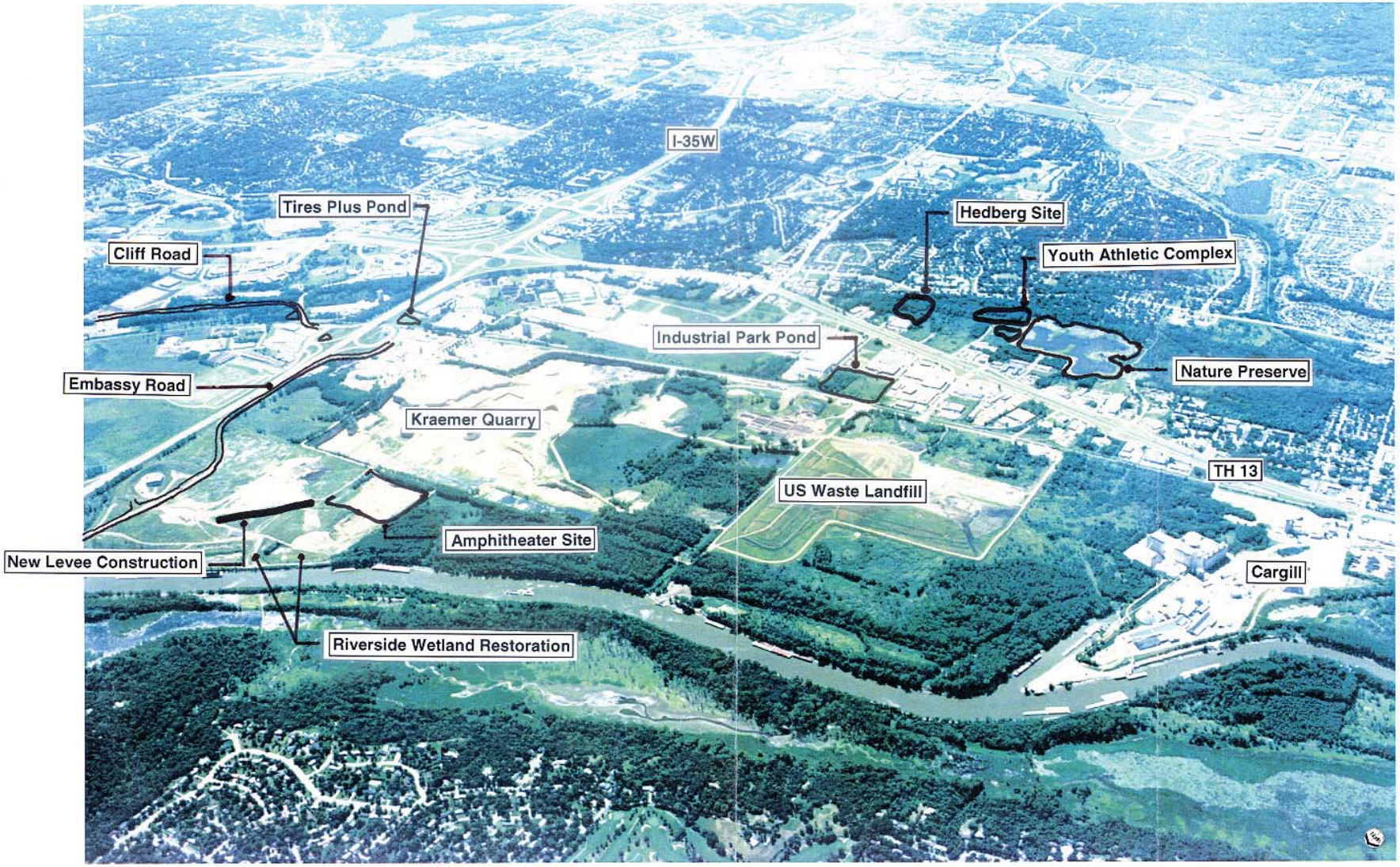
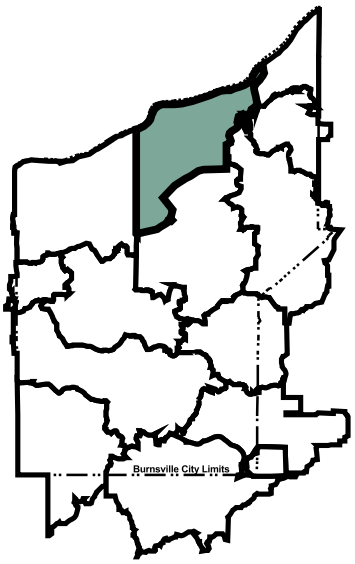



Figure 45
*Aerial Photograph - Looking South (Taken August 1996)*
***Existing Conditions - Burnsville Gateway Area***

**Table 80 - Northwest Subwatershed Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Divert runoff around Quarry Lake; limit direct discharges from future development | • Available trunk storm sewer capacity<br>• Regional detention and treatment<br>• Proposed development and incentives<br>• Development standards | • No direct discharges | Annual | NA |
| 2. Develop Industrial Park Pond and wetland complex to provide additional treatment | • Draft Feasibility Study<br>• CSAH 5 Extension EAW | • Acquire Property<br>• Complete Plans, Specifications, and Construction | 2003<br>2003<br>2004 | NA<br>$675,000<br>$175,000 |
| 3. Complete a diagnostic study of Sunset Pond and identify effectiveness of existing treatment and opportunities for additional treatment and comply with standards | • Subwatershed and Catchment Delineation<br>• Land use information<br>• Storm sewer as-builts<br>• Hydraulic and P8 modeling<br>• Available pond bathymetry (depths)<br>• Available monitoring data<br>• Willow Creek WOMP data | • Completed analysis and recommendations | 2009 | $30,000 |
| 4. Construct flood closure and bypass pumping system for Embassy Road outfall | • Existing physical conditions at the outfall<br>• Existing utilities<br>• Federal, state and local permitting | • Feasibility study<br>• Completed plans<br>• Completed construction | 2003<br>2003<br>2004 | $10,000<br>$10,000<br>$175,000 |
| 5. Maintain the existing private levee system between the Minnesota River and Quarry Lake to provide direct separation and address long-term maintenance in Planned Unit Development Agreement | • Existing ownership<br>• Available construction and inspection records<br>• Existing physical conditions | • Completed documentation in PUD<br>• Complete Inspection and report<br>• Future repairs | 2002<br>Future<br>Future | NA<br>Future ($35,000)<br>Future |
| 6. Strive to flood proof all properties adjacent to future Quarry Lake to elev. 720.0 | • Development plans | • Completed flood proofing | Future | Future |
| 7. Prepare study for flood dewatering system to maintain Quarry Lake levels below flood stage on river | • Existing ground water modeling (SEH)<br>• City Comprehensive (potable) Water Plan<br>• Kraemer Quarry operations<br>• DNR dewatering policy | • Completed study | Future | Future |
| 8. Continuing activities of the Kraemer Nature Preserve Master Plan | • Nature Preserve Master plan<br>• City Natural Resources Staff<br>• City Maintenance Staff | • Completed Master Plan activities (On-going maintenance) | 2002<br>2003<br>2004<br>2005<br>2006 | $52,000<br>$24,000<br>$19,000<br>$19,000<br>$10,000 |

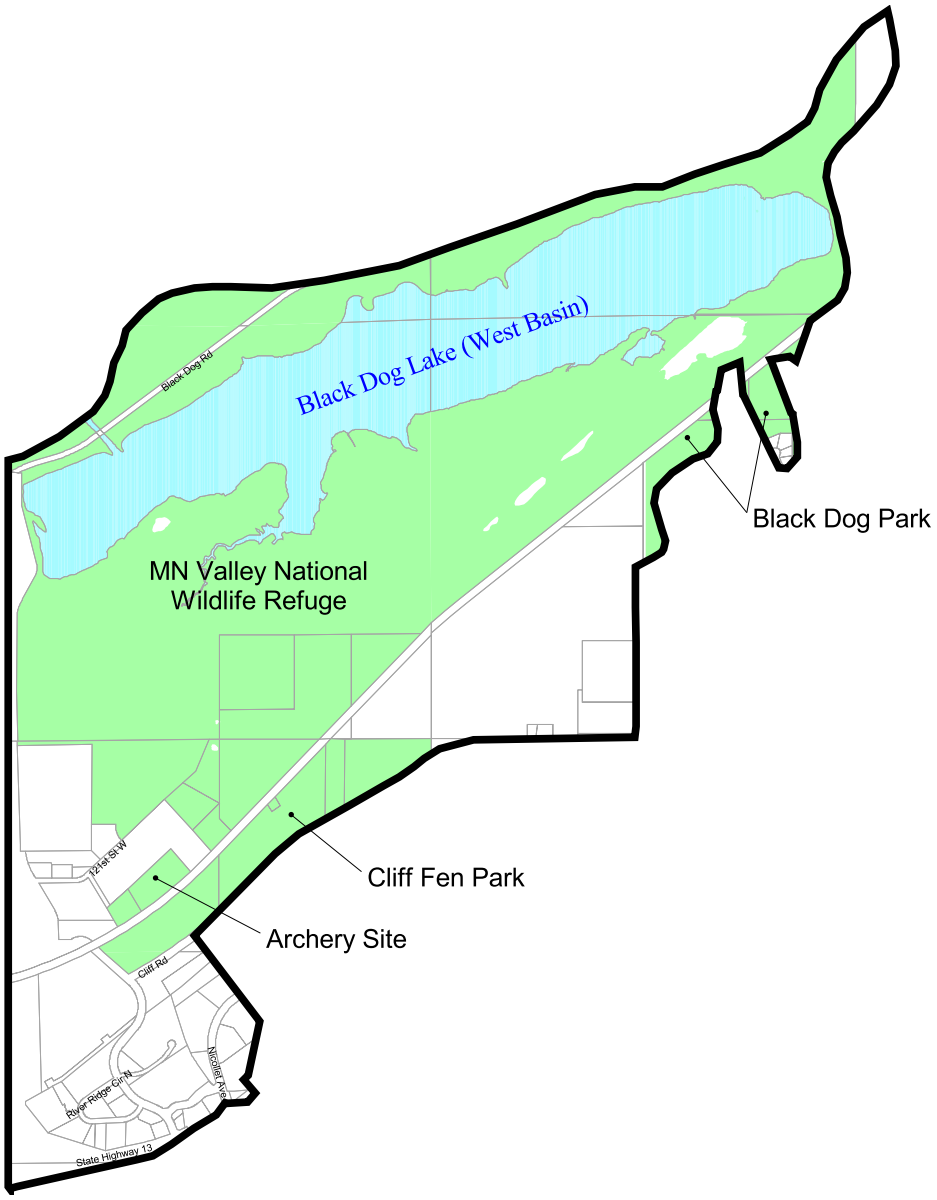



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 1,620 Acres




| | | | | |
|---|---|---|---|---|
| SEH | 9/10/02<br>subwtrshd.apr<br>bd | **Black Dog Lake Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>46 | |

## BLACK DOG LAKE SUBWATERSHED

There are three definable catchments within the Black Dog Lake Subwatershed; the Black Dog Fen Catchment to the southwest of Black Dog Lake, the Upper Black Dog Lake Catchment to the southeast of Black Dog Lake and the Black Dog Lake Catchment between the railroad and the Minnesota River. The Black Dog Lake Subwatershed is illustrated in Figure 46.

### Black Dog Fen Catchment

The Black Dog Fen Catchment includes the area east of I-35W and north of TH 13 and south of the railroad grade. With recent reconstruction of Cliff Road, additional ponds and wetland mitigation were constructed south of the railroad. The upstream subwatershed includes the Heart of the City catchment in the Central Subwatershed. The downstream area is tributary to the Black Dog Fen. There is a current opportunity to construct additional storm water treatment and wetland mitigation at the Cliff-Fen Park. The purpose of these ponds would be to provide additional storm water treatment and polishing before discharging under the railroad grade to the Black Dog Fen wetland complex. Because the fen is such a sensitive resource, every effort to minimize pollutants and large-duration large-volume discharges to the fen should be taken. In addition to the proposed ponds, a manually-operated control structure should be considered at the railroad crossing. This would give the City the ability to control the downstream migration of pollutants in the event of an upstream spill.

### Upper Black Dog Lake Catchment

The Upper Black Dog Lake Catchment lies east of the Black Dog Fen Catchment, between the railroad grade and the upstream east Subwatershed. This area generally lies below the developed bluff line. The area does not receive direct storm water discharge areas from upstream. Storm water is generally diverted to the west or east before reaching the catchment and the entire subwatershed is zoned general industrial use. The area ultimately discharges under the railroad grade where it is tributary to Unnamed Trout Stream #7. Therefore, precautions will need to be incorporated into any development plans to control the rate, volume and temperature of discharge to minimize adverse impacts to the downstream receiving waters.

### Black Dog Lake Catchment (West Basin)

The area lying between the railroad grade and the Minnesota River is part of the Black Dog Unit of the Minnesota Valley National Wildlife Refuge, under the authority of the U.S. Fish and Wildlife Service. The west basin of Black Dog Lake and the Black Dog Fen are the primary waterbodies within the catchment. The City understands that extensive data on Black Dog Lake may be available from Xcel Energy. The City intends to review the available data and work with Xcel to develop a future lake management plan.

The U.S. Fish and Wildlife Service has six objectives for protecting the Refuge from storm water, contaminants and spills.

1. Water entering the Refuge should meet Minnesota Class IIB Waters and National Urban Runoff Program Standards;
2. Refuge will not be the first line of defense for spills or upset conditions;
3. Minimize, maintain or improve existing transportation and utility corridors;
4. Effective treatment of stormwater in the watershed;
5. Clean Air; and
6. Minimize noise impacts.

Implementation of this subwatershed plan should satisfy several of the objectives listed above.

Unnamed Trout Stream #7

Unnamed Trout Stream Segment #7 is identified in both the Black Dog WMO and Lower Minnesota River Watershed District Plans (see Figure 10). The trout stream segment is one of several remnant trout streams identified by the DNR as part of its' Metro Trout Stream Watershed Protection Initiative.

Trout streams require unique protection, not just from pollutants but also from water temperature fluctuations. A cold water stream environment can be altered any time the contributing watershed exceeds approximately 10 percent impervious cover. This level of imperviousness is significantly below what would be considered "normal" urban development. Once the level of impervious cover exceeds 20-25 percent, nutrient loadings without BMPs in place will exceed background levels. When impervious surfaces exceed 40-50 percent, even with the most effective and reliable BMPs, nutrient loading will exceed background levels.

Unfortunately, mitigating for thermal pollution is non-standard and still in the mostly experimental stage. Use of Low Impact Development techniques to reduce the rate and volume of runoff and increase infiltration is one of the best current tools (see Appendix B).

The existence and viability of the existing stream are unknown at this time. Therefore, initial efforts should focus on habitat assessments including thermal stability of the stream flow monitoring, aquatic invertebrate surveys and chemical analysis.

### Action and Implementation Plans

Tables 81 and 82 present the City's Action Plan and implementation actions, respectively, that have been developed to achieve the purpose and goals for the Black Dog Lake Subwatershed.

## Table 81 - Black Dog Lake Subwatershed Action Plan

**Subject:**

- Black Dog Lake Subwatershed

**Purpose:**

- Control the rate, volume and quality of stormwater discharges and ground water levels to support natural resources including the Black Dog Fen, Unnamed Trout Stream #7 and the west basin of Black Dog Lake

**Goal:**

- Preserve existing conditions and improve long term conditions of the Black Dog Fen, Unnamed Trout Stream #7 and the west basin of Black Dog Lake.

**Water Body Classification:**

- Black Dog Fen; Protection, High Priority
- Unnamed Trout Stream #7: High Priority
- West Black Dog Lake: High Priority

**Intended Use:**

- Black Dog Fen: preservation and research
- Unnamed Trout Stream #7: protection and research
- Black Dog Lake: passive recreation, wildlife observation

| Problems | Solutions |
|---|---|
| 1. Development and redevelopment pressures in the Heart of the City Catchment (Black Dog Watershed, Central Subwatershed) threatens sensitive downstream resources. | 1. Construct additional storm water treatment and wetland mitigation at the Cliff-Fen Park. |
| 2. The existing discharge point from the Black Dog Fen Catchment under the railroad grade cannot be closed mechanical in the event of an upstream spill or release of pollutants. | 2. A manually-operated control structure should be considered at the Black Dog Fen outlet railroad crossing culvert. |
| 3. Storm water discharges from development above (south of) the bluff line threaten to cause excessive erosion at multiple discharge points below the bluff. | 3a. Precautions will need to be incorporated into any development plans to control the rate, volume and temperature of discharge to minimize adverse impacts to the downstream receiving waters.<br>3b. Construct a storm water basin/sediment-trapping device upstream (south of) the existing railroad grade culvert crossing. |
| 4. The suitability of Unnamed Trout Stream #7 is unknown, limiting the commitment to undertake full restoration efforts. | 4a. A Focus initial investigative efforts on habitat assessments including thermal stability of the stream, flow monitoring, aquatic invertebrate surveys and chemical analysis.<br>4b. A cooperative effort is needed between MnDOT, Lower Minnesota River Watershed District and the City to implement BMPs to minimize downstream impacts. |

**Table 82 - Black Dog Lake Subwatershed Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Construct additional storm water treatment, wetland mitigation and control structure at the Cliff-Fen Park | • Lower MN WD<br>• Hydrologic and pollutant loading models<br>• Heart of the City storm water plan (SEH, 2001)<br>• Available park lands | • Completed design and construction | 2002 | $670,000 |
| 2. Evaluate a manually-operated control structure at the Black Dog Fen outlet railroad crossing culvert | • Railroad<br>• Available property and access<br>• Hydraulic/hydrologic modeling<br>• Existing culvert conditions | • Completed design<br>• Completed Construction | 2006<br>2008 | NA<br>$100,000 |
| 3. Precautions will need to be incorporated into any development plans to control the rate, volume and temperature of discharge to minimize adverse impacts to the downstream receiving waters | • Development Agreements<br>• Low Impact development Techniques (see Appendix B)<br>• DNR Trout Unit<br>• Dakota Co. SWCD<br>• Lower Minnesota River Watershed District<br>• Financial Incentives | • Individual Development Plans<br>• Development Agreements | Ongoing | NA |
| 4. Construct a storm water basin/sediment-trapping device upstream (south of) the existing railroad grade culvert crossing | • Hydrologic and pollutant loading models<br>• Available property and access<br>• Upstream development plans<br>• Railroad coordination | • Completed design<br>• Completed Construction | 2007<br>2008 | $45,000<br>$400,000 |
| 5. Use existing data on west basin of Black Dog Lake as the basis to develop a future lake management plan | • Xcel data for Black Dog Lake<br>• US Fish and Wildlife Service<br>• Dakota County<br>• Metropolitan Council<br>• Lower Minnesota River Watershed District | • Completed management plan | 2005 | $15,000 |
| 6. Complete investigative efforts on Unnamed Trout Stream #7 including thermal stability of the stream, flow monitoring, aquatic invertebrate surveys and chemical analysis | • US Fish and Wildlife Service<br>• Dakota County<br>• Metropolitan Council<br>• DNR Trout Unit<br>• Lower Minnesota River Watershed District | • Installation of continuous monitoring thermal station<br>• Complete in-field habitat analysis | 2003<br>2003 | $10,000<br>$10,000 |

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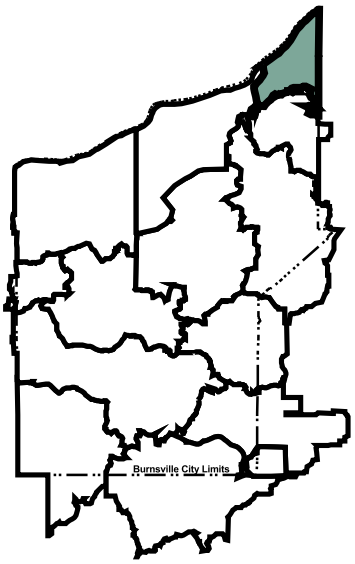
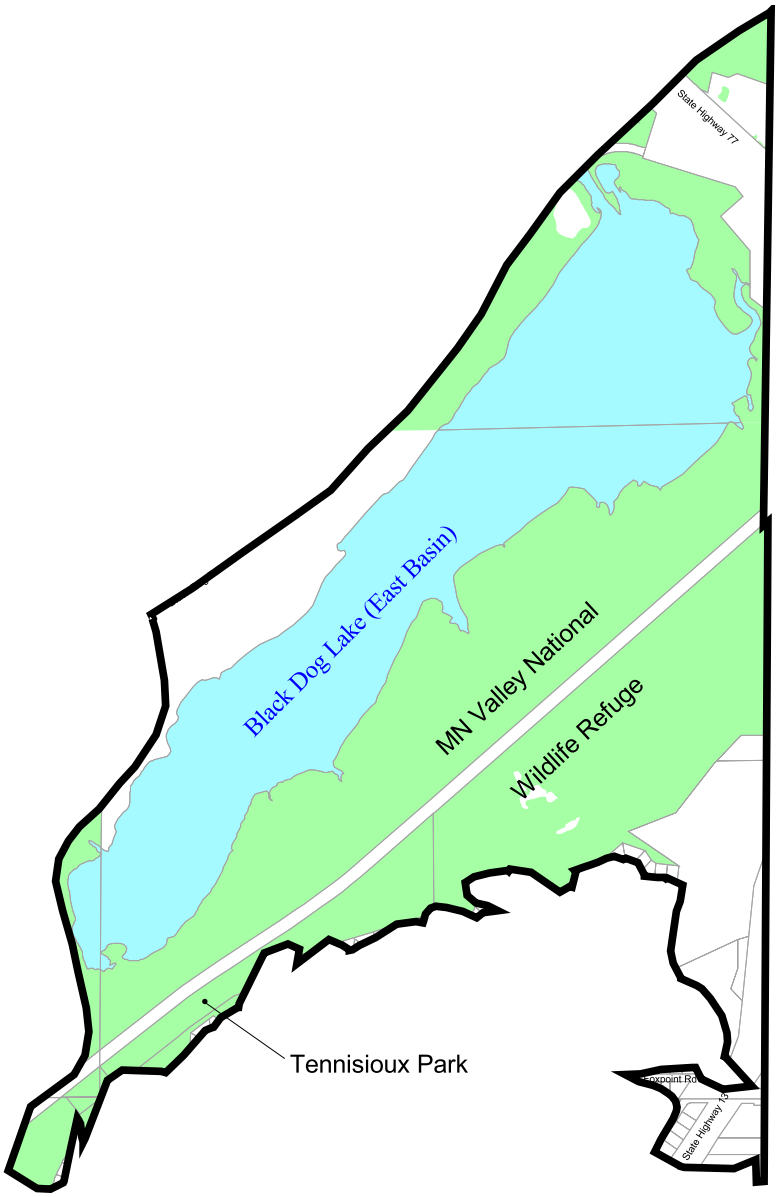



**Legend**

- Subwatershed Boundaries
- Parcel Boundaries
- Dakota County Water Bodies
- Burnsville Parks & Open Space

Source: City of Burnsville, Dakota County, and Mn/DOT.

Watershed Area = 600 Acres




| | | | | |
|---|---|---|---|---|
| SEH | 9/10/02<br>subwtrshd.apr<br>bd | **Northeast Subwatershed**<br>**Burnsville, MN** | FILE NO.<br>ABURNS9904.00<br>FIG NO.<br>47 | |

## NORTHEAST SUBWATERSHED

The Northeast Subwatershed is illustrated in Figure 47 and consists of two definable catchments: the Lower River Hills catchment; and the Refuge catchment.

### Lower River Hills Catchment

The Lower River Hills Catchment lies generally below the bluff line north of and adjacent to the upstream River Hills Subwatershed. The Subwatershed also includes a mostly-undeveloped area above (south of) the bluff line, north of TH 13 and west of the City limits. The catchment is bounded to the north by the existing railroad grade.

The City completed a comprehensive drainage study of the upstream River Hills Subwatershed in 2001 (see Black Dog Watershed section of this report). The drainage system improvements will include improving outfalls that discharge from the top of the bluff to the bottom and into the Lower River Hills Catchment. Each of the outfall points will require special erosion control and energy dissipation measures to prevent downstream erosion.

#### Unnamed Trout Streams #1 and #4

The undeveloped area above the bluff is directly tributary to the downstream Unnamed Trout Streams #1 and #4 (see Figure 10). A cooperative effort is needed between MnDOT, Eagan, the Lower Minnesota River Watershed District and the City to implement appropriate BMPs to minimize downstream impacts.

Unnamed Trout Streams #1 and #4 are identified in both the Black Dog WMO and Lower Minnesota River Watershed District Plans. The trout stream segment is one of several remnant trout stream identified by the DNR as part of its' Metro Trout Stream watershed Protection Initiative.

Trout streams require unique protection, not just from pollutants but also from water temperature fluctuations. A cold water stream environment can be altered any time the contributing watershed exceeds approximately 10 percent impervious cover. This level of imperviousness is significantly below what would be considered "normal" urban development. Once the level of impervious cover exceeds 20-25 percent, nutrient loadings without BMPs in place will exceed background levels. When impervious surfaces exceed 40-50 percent, even with the most effective and reliable BMPs, nutrient loading will exceed background levels.

Unfortunately, mitigating for thermal pollution is non-standard and still in the mostly experimental stage. Use of Low Impact Development techniques to reduce the rate and volume of runoff and increase infiltration is one of the best current tools (see Appendix B).

The existence and viability of the existing stream are unknown at this time. Therefore, initial efforts should focus on habitat assessments including thermal

stability of the stream flow monitoring, aquatic invertebrate surveys and chemical analysis.

### Refuge Catchment

The area north of the railroad grade is part of the Black Dog Unit of the Minnesota Valley National Wildlife Refuge. The primary features of the catchment include Unnamed Trout Streams #1 and #4 and the east basin of Black Dog Lake. The lake receives cooling water discharge from Xcel Energy's Black Dog Power Plant. The City understands that extensive data on Black Dog Lake may be available from Xcel Energy. The City intends to review the available data and work with Xcel to develop a future lake management plan.

The U.S. Fish and Wildlife Service has six objectives for protecting the Refuge from storm water, contaminants and spills.

1. Water entering the Refuge should meet Minnesota Class IIB Waters and National Urban Runoff Program Standards;
2. Refuge will not be the first line of defense for spills or upset conditions;
3. Minimize, maintain or improve existing transportation and utility corridors;
4. Effective treatment of stormwater in the watershed;
5. Clean Air; and
6. Minimize noise impacts.

Implementation of this plan should satisfy several of the objectives listed above.

### Action and Implementation Plans

Tables 83 and 84 present the City's Action Plan and implementation actions, respectively, that have been developed to achieve the purpose and goals for the Northeast Subwatershed.

**Table 83 - Northeast Subwatershed Action Plan**

| | | |
|---|---|---|
| **Subject:**<br>➢ Northeast Subwatershed | | |
| **Purpose:**<br>➢ Control the rate, volume and quality of stormwater discharges and ground water levels to support natural resources including the Unnamed Trout Streams #1 and #4 and the east basin of Black Dog Lake | | |
| **Goal:**<br>➢ Preserve existing conditions and improve long term conditions of Unnamed Trout Streams #1 and #4 and the east basin of Black Dog Lake. | | |
| **City Classification:**<br>➢ Unnamed Trout Streams #1 and #4; High Priority<br>➢ East Black Dog Lake; High Priority | | |
| **Intended Use:**<br>➢ Unnamed Trout Streams #1 and #4 – protection and research<br>➢ Black Dog Lake – Passive recreation, wildlife observation | | |
| **Problems** | ➢ | **Solutions** |
| 1. The Lower River Hills Catchment is at risk of significant erosion from stormwater discharges form the upstream River Hills Subwatershed. | ➢ | 1. Each of the outfall points will require special erosion control and energy dissipation measures to prevent downstream erosion. |
| 2. The suitability of Unnamed Trout Streams #1 and #4 is unknown, limiting the commitment to undertake full restoration efforts. | ➢ | 2a A cooperative effort is needed between MnDOT, Eagan, the Lower Minnesota River Watershed District and the City to implement appropriate BMPs to minimize downstream impacts.<br>2b. A Focus initial investigative efforts on habitat assessments including thermal stability of the stream, flow monitoring, aquatic invertebrate surveys and chemical analysis. |

**Table 84 - Northeast Subwatershed Implementation Plan**

| Activity Steps | Resources | Measurement | Target Date | Est. Cost |
|---|---|---|---|---|
| 1. Use existing data on east basin of Black Dog Lake as the basis to develop a future management plan | • Xcel data for Black Dog Lake<br>• US Fish and Wildlife Service<br>• Dakota County<br>• Metropolitan Council<br>• Lower Minnesota River Watershed District | • Completed management plan | 2005 | $15,000 |
| 2. Outfall points will require special erosion control and energy dissipation measures to prevent downstream erosion | • Northeast Burnsville Comprehensive Storm Water Study (SEH 2001)<br>• City Street Reconstruction Program | • River Hills analysis and Construction | 2002 | See Table 76 #5 |
| 3. A cooperative effort is needed between MnDOT, Eagan, the Lower Minnesota River Watershed District and the City to implement appropriate BMPs to minimize downstream impacts to trout stream | • MnDOT<br>• Eagan<br>• Lower Minnesota River Watershed District<br>• Undeveloped property owner(s)<br>• Developers<br>• Low Impact Development Techniques (see Appendix B)<br>• DNR Trout Unit<br>• Financial Incentives | • Written MOA<br>• Development Agreement(s)<br>• Implemented Improvements | 2002<br>Ongoing<br>2004 | $5,000<br>NA<br>$45,000 |
| 4. Complete investigative efforts on Unnamed Trout Streams #1 and #4 including thermal stability of the stream, flow monitoring, aquatic invertebrate surveys and chemical analysis | • US Fish and Wildlife Service<br>• Dakota County<br>• Metropolitan Council<br>• DNR Trout Unit<br>• Lower Minnesota River Watershed District | • Installation of continuous monitoring thermal station<br>• Complete in-field habitat analysis | 2003<br>2003 | $10,000<br>$10,000 |
| 5. Complete study to investigate storm water quality and treatment | • Water Quality Action Plan<br>• Water Quality Action Plan | • Completed Study and Recommendations | 2004 | See Table 10 #5 |

## IMPLEMENTATION

The Implementation section is the final section of the Plan. It is intended to provide guidance in carrying out the Plan objectives. The implementation section summarizes capital improvement projects, studies and ongoing maintenance, inspection, monitoring and other management activities recommended for the years 2002 through 2016. Estimated costs of recommended actions and an implementation schedule are provided for each of the next fifteen years. Procedures for amending the Plan are also discussed.

The implementation plan is based on goal-driven action plans. The process of developing the action and implementation plans is based on four steps:

1. Development of goal statements consistent with Minnesota Rules Chapter 8410, the WMOs and Metropolitan Council;
2. Identification of issues or problems related to achieving the goals;
3. Identification of solutions corresponding to each of the issues; and
4. Development of specific action steps, including identification of resources, measurement, schedule and cost.

Based on the action plans from each Plan section, a process for accomplishing the goals of this WRMP is established.

### IMPLEMENTATION PRIORITIES AND COSTS

The implementation plan includes identification and prioritization of capital improvements, administration, maintenance and inspections, permitting, plan amendments, financing alternatives, public involvement and monitoring programs. Prioritization of improvements was based on a review of all recommended actions for the 24 individual action plans (one for each of the 12 Plan goals and, one for each lake or subwatershed unit).

The financial goal for this WRMP is to establish equitable funding sources to pay for water resources management activities. For the activities called out in this Plan, planning-level estimates of capital expenditures have been made. Following a detailed analysis and prioritization process for the recommended capital improvement projects and ongoing activities of this Plan a 10-year project and activity implementation schedule was presented to City committees prior to adoption of the 2002 Plan. The 10-year Plan had an estimated total cost over the 10-years of $24.6 million. While there was generally broad support for a 10-year implementation

plan from 3 of 4 committees, there were also concerns for the financial impact of the Plan on industrial and commercial property owners. The Economic Growth Committee recommended a 20-year schedule. Council subsequently approved the plan with a 15-year implementation schedule and an estimated cost over the next fifteen years of $27.3 million (in 2002 dollars). The additional costs of the 15-year schedule, as compared to the 10-year schedule, result from the additional 5 years of annual operating costs and anticipated ongoing project costs (e.g., storm sewer replacement program and pond clean out program). The anticipated annual cost estimates specific to storm water utility funds are summarized in Table 85.

Relative to historical levels, the storm water utility fund was increased in 2001 and 2002 to help address the increased commitment to water resources management. It was also recognized that future increases could be needed to meet the needs of the Implementation Plan. Table 86 summarizes the 2002 Estimated Expenditures, projects on an annual basis for years 2002 through 2016. Table 86 also includes the actual annual expenditures for the years 2002 through 2007 designated by an (A) following the value and revised (estimated) annual expenditures based on the 2008 WRMP Update designated by an (R) following the value.

**Table 85 - Implementation Plan Summary.**

| Year | 2002 WRMP Estimated Expenditures ($ Million) (1) | Actual (A) or Revised (R) Expenditures ($ Million) (2) |
|---|---|---|
| 2002 | 1.76 | 1.38 (A) |
| 2003 | 1.57 | 1.69 (A) |
| 2004 | 1.59 | 1.65 (A) |
| 2005 | 1.71 | 1.54 (A) |
| 2006 | 1.89 | 2.15 (A) |
| 2007 | 1.76 | 1.34 (A) |
| 2008 | 1.93 | 5.22 (R) |
| 2009 | 1.89 | 2.93 (R) |
| 2010 | 1.89 | 2.09 (R) |
| 2011 | 1.89 | 1.47 (R) |
| 2012 | 1.89 | 1.61 (R) |
| 2013 | 1.89 | 1.08 (R) |
| 2014 | 1.89 | 1.08 (R) |
| 2015 | 1.89 | 1.08 (R) |
| 2016 | 1.89 | 1.08 (R) |
| **Total** | **27.3** | **27.4 (R)** |

1. All values are in 2002 dollars.
2. Values are actual dollars through 2007 and estimated amounts for 2008-2016 in 2008 dollars.

There is strong consensus that the new costs should be apportioned based on overall property contributions to runoff and pollutant loading. This is the current philosophy behind the City's storm water utility. In addition, a renewed focus will be placed on securing grants, enlisting regional watershed funding, seeking local partnerships with adjacent communities and investigating other financing mechanisms like Lake Improvement Districts.

The Implementation Plan is not a hard and fast commitment to complete each and every activity in the time frame suggested. Rather, it is a suggested course of action that will accomplish the major goal of this plan, to accommodate growth in the community while protecting and improving Burnsville's water resources. The Implementation Plan should be reviewed on an annual basis. At that time, each proposed improvement is to be reconsidered, City budgets adjusted, and additional improvement projects or management activities added to or removed from the program.

## AMENDMENTS TO THE PLAN

### Amendment Procedures

The Water Resources Management Plan is intended to extend through the year 2016. For the plan to remain dynamic, an avenue must be available to implement new information, ideas, methods, standards, management practices, and any other changes which may affect the intent and/or results of the Plan. Amendment proposals can be requested any time by any person or persons either residing or having business within the City.

### Request for Amendments

Written requests for a plan amendment are submitted to the City staff. The request shall outline the need for the amendment as well as additional materials that the City will need to consider before making its decision.

### Staff Review

A decision is made as to the validity of the request. Three options exist;

- Reject the amendment;
- Accept the amendment as a minor issue, with minor issues collectively added to the plan at a later date; and
- Accept the amendment as a major issue, with major issues requiring an immediate amendment. In acting on an amendment request, staff shall recommend to the City council whether or not a public hearing is warranted.

### Council Consideration

The amendment and the need for a public hearing shall be considered at a regular or special Council meeting. Staff recommendations should also be considered before a decision(s) on an appropriate action(s) is made.

### Public Hearing and Council Approval

This step allows for public input based on public interest. Council shall determine when the public hearing should occur in the process. Based on the Public hearing, Council could approve of the amendments.

### WMO Approval

All proposed amendments must be reviewed and approved by the appropriate WMOs prior to final adoption of the amendments.

### Council Adoption

Final action on an amendment, following approval by the WMOs is Council adoption. However, prior to the adoption, an additional public hearing may be held to review the Plan changes and notify the appropriate stakeholders.

### Annual Report

A brief annual presentation will be completed by City staff summarizing water resource management activities that have been completed over the past year. Recommended changes to the Plan will not necessarily require individual amendments, but instead may be considered when the plan is brought up to date. The annual presentation should be completed by June 30th of each year to allow implementation items to be considered in the normal budget process. To the extent practicable and to avoid duplication of efforts, the annual presentation will be coordinated with the Phase II NPDES MS4 program annual report that must be submitted to MPCA by June 30$^{h}$ of each year. The annual update can also serve as an important public information tool and a summary will be presented annually to the Parks and Natural Resources Commission in a Public Hearing format. A notice of the meeting will be published in the City's newsletter at least 30 days prior to the meeting.

The Plan will remain in effect through 2016. The Plan should then be reviewed for consistency with current water resources management methods. At this time, all annual reports and past amendments can be added to the document. Depending on the significance of changes, a new printing of the plan may be appropriate.

Staff's intent is to revisit the goals, policies, tools and progress of the Plan on a three-year basis. The three-year average water quality results will be reviewed, the effectiveness of regulatory programs will be evaluated, and the success of public improvement projects will be assessed. Based on the three-year reviews, the WRMP will be updated to produce a truly dynamic plan.

# Table 86. Implementation Plan Summary

| Year | Table | Activity | Task | Goal | Watershed | Subwatershed | Lead Dept. (2) | Budgeted Cost (3) | Funding Source (4) | Comments | Project Status as of 2008 Update (or noted date) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2002** | | | | | | | | | | | |
| 2002 | 10 | 1 | 1 | Water Quantity | | | E | - | NA | Complete improvements to reduce flood levels and duration of flooding on Earley Lake | Completed |
| 2002 | 10 | 2 | 1 | Water Quantity | | | E | $15,000 | CIP #8 | Northeast Burnsville Drainage Feasibility Study | Completed |
| 2002 | 10 | 2 | 2 | Water Quantity | | | E | - | NA | Prepare construction contracts | Completed |
| 2002 | 10 | 4 | 1 | Water Quantity | | | E | - | NA | Identify known flooding and drainage problem areas using GIS mapping of problem area | Completed |
| 2002 | 10 | 4 | 2 | Water Quantity | | | E | $50,000 | CIP #10 | Implement local drainage improvements | Completed |
| 2002 | 13 | 1 | 1 | Water Quality | | | NR | - | NA | Continue citizen participation in measurement of lake quality/grade - CAMP | Completed/Ongoing |
| 2002 | 13 | 2 | 1 | Water Quality | | | NR | $13,000 | Oper | Implement City Goose Management Program | Completed - $13,000 / year SWM operating budget expense |
| 2002 | 13 | 6 | 1 | Water Quality | | | NR, E | $50,000 | CIP #7 | Construct storm water bioretention area (LID treatment) in Heart of the City Block #1 | Storm water pond constructed |
| 2002 | 13 | 7 | 1 | Water Quality | | | NR, E | Table 80-2 | NA | Provide treatment to address potential discharge of storm water to future Quarry Lake | Land acquisition for a pond planned for 2008 |
| 2002 | 13 | 8 | 1 | Water Quality | | | NR, E | Table 61-4 | NA | Encourage development to use LID techniques and alternative landscape practices | Ongoing |
| 2002 | 15 | 1 | 1 | Erosion Cont. | | | E | - | NA | Annual erosion control inspection process | Completed/Ongoing |
| 2002 | 15 | 3 | 1 | Erosion Cont. | | | E | $25,000 | Oper | Add half-time staff position to work on erosion control activities (1st year of staff position) | Added to Engineering Technician Responsibilities - General Fund Expense |
| 2002 | 18 | 1 | 1 | Wetlands | | | NR | - | NA | Continue citizen participation in stewardship of wetland resources - WHMP | Ongoing |
| 2002 | 18 | 2 | 1 | Wetlands | | | NR | - | NA | Prepare and mail newsletter for public education and information | Completed/Ongoing |
| 2002 | 18 | 4 | 1 | Wetlands | | | NR | - | NA | Assess opportunities for wetland restoration and banking in parks and vacant parcels | Completed |
| 2002 | 20 | 1 | 1 | Pub Info & Ed | | | NR | - | NA | Conduct public education program for understanding of goals and policies of Water Resources Management Plan | Completed/Ongoing |
| 2002 | 20 | 2 | 1 | Pub Info & Ed | | | NR | - | NA | Involve civic, neighborhood groups, business, industry and schools to promote water quality activities | Ongoing |
| 2002 | 20 | 3 | 1 | Pub Info & Ed | | | NR | - | NA | Expand the City's website related to the information in the Water Resources Management Plan | Completed |
| 2002 | 20 | 4 | 1 | Pub Info & Ed | | | NR | - | NA | Continue to publicize support for existing Parks and Natural resources Commission | Ongoing |
| 2002 | 20 | 5 | 1 | Pub Info & Ed | | | NR | - | NA | Pursue education related grants | Ongoing |
| 2002 | 20 | 6 | 1 | Pub Info & Ed | | | NR | - | NA | Continue citizen program to assist in wetland monitoring | Ongoing |
| 2002 | 20 | 7 | 1 | Pub Info & Ed | | | NR, E | - | NA | Involve stakeholders in making decisions about water resources | Ongoing |
| 2002 | 25 | 1 | 1 | Monitoring | | | NR | $25,000 | Oper | Implement monitoring plan to track water quality trends and monitor the effectiveness of programs. | Implemented - $25,000 increase to SWM Operating Budget |
| 2002 | 25 | 2 | 1 | Monitoring | | | NR | - | NA | Establish process for electronic access to GIS database monitoring data | Completed |
| 2002 | 27 | 1 | 2 | Maintenance | | | NR | $200,000 | CIP #11 | Implement Pond cleanout program | Completed |
| 2002 | 27 | 3 | 1 | Maintenance | | | NR, PW | - | NA | Develop written street sweeping program for areas contributing to protected class wetlands | Completed |
| 2002 | 27 | 3 | 2 | Maintenance | | | NR, PW | - | NA | Annual field review of street sweeping program | Completed/Ongoing |
| 2002 | 27 | 4 | 1 | Maintenance | | | PW | - | NA | Continue annual street sweeping program | Completed |
| 2002 | 27 | 5 | 1 | Maintenance | | | PW | - | NA | Study salt application alternatives for snow/ice control | Completed |
| 2002 | 27 | 6 | 1 | Maintenance | | | E | - | NA | Establish private maintenance and monitoring agreements | Completed |
| 2002 | 27 | 7 | 1 | Maintenance | | | E | Table 76-4-2 | NA | Storm sewer replacement program, new/upgraded storm sewer systems | Completed |
| 2002 | 31 | 1 | 1 | Rec, F & W | | | NR | $8,000 | CIP #7 | Manage E. Milfoil, Purple Loosestrife and other invasive plant and animal species - Identify areas | Completed |
| 2002 | 31 | 1 | 2 | Rec, F & W | | | NR | $2,000 | CIP #7 | Manage E. Milfoil, Purple Loosestrife and other invasive plant and animal species - Policy and Finance | Completed |
| 2002 | 31 | 1 | 4 | Rec, F & W | | | NR | Table 13-2 | Oper | Implement goose management program | Completed - see 13-2-1 |
| 2002 | 33 | 1 | 1 | Ground Water | | | E | - | NA | Prepare wellhead protection plan in accordance with MN Dept. of Health regulations | Completed |
| 2002 | 36 | 1 | 1 | Regulatory | | | E | - | NA | Prepare storm water management ordinance | Completed |
| 2002 | 36 | 2 | 1 | Regulatory | | | NR, P | - | NA | Finalize shoreland ordinance revisions | Completed |
| 2002 | 36 | 3 | 1 | Regulatory | | | E | - | NA | NPDES Phase II final rules received from MPCA | Completed |
| 2002 | 36 | 4 | 1 | Regulatory | | | NR, E | - | NA | Ongoing review of Low-impact development techniques for proposed development projects | Ongoing planning effort |
| 2002 | 40 | 1 | 1 | Finance | | | E, NR | - | NA | Complete study of planned expenditures compared to available financing | Completed |
| 2002 | 40 | 1 | 2 | Finance | | | E, NR | - | NA | Annual budgeting and plan implementation review | Completed |
| 2002 | 40 | 2 | 1 | Finance | | | NR | - | NA | React to requests for formation of Lake Improvement Districts | Ongoing |
| 2002 | 51 | 1 | 1 | | Vermillion R. | Lk. Alimagnet | NR | $25,000 | CIP #7 | Complete re-evaluation/diagnostic study of Lake Alimagnet ($50,000 total - Apple Valley also $25,000) | Completed |
| 2002 | 51 | 2 | 1 | | Vermillion R. | Lk. Alimagnet | NR | - | NA | Annual operation of aeration system with Apple Valley ($3,000 total - Apple Valley also $1,500) | Completed |
| 2002 | 55 | 1 | 1 | | Black Dog | Lac Lavon | NR | Table 31-1 | NA | Partner with Apple Valley to continue program to minimize spread of Eurasian watermilfoil - treatment as needed | Completed |
| 2002 | 55 | 1 | 2 | | Black Dog | Lac Lavon | NR | - | NA | Partner with Apple Valley-continue program to minimize spread of E. watermilfoil - annual habitat assessment | Completed |
| 2002 | 58 | 3 | 1 | | Black Dog | Keller Lake | NR | Table 31-1 | NA | Consider weed harvesting to enhance recreational activities - treatment as needed and annual assessment | Completed |
| 2002 | 61 | 1 | 1 | | Black Dog | Crystal Lake | | - | NA | Diagnostic study to document quality problems and solutions | Completed |
| 2002 | 61 | 1 | 2 | | Black Dog | Crystal Lake | | Black Dog Plan | NA | Implement solutions of diagnostic study | Completed |
| 2002 | 61 | 4 | 1 | | Black Dog | Crystal Lake | NR, E | $30,000 | CIP #7 | Approved development plans for LID, promote infiltration. Implement Projects. Matching MEP Grant funds. | Completed |
| 2002 | 61 | 5 | 1 | | Black Dog | Crystal Lake | NR | Table 31-1 | NA | Implement a program to minimize spread of Eurasian watermilfoil - treatment as needed, annual assessment | Completed |
| 2002 | 69 | 7 | 1 | | Black Dog | Sunset Pond | P, NR, E | - | NA | Ongoing: encourage future land owners/developers to incorporate storm water treatment on adjacent parcels | Ongoing planning effort |
| 2002 | 69 | 9 | 1 | | Black Dog | Sunset Pond | E | $300,000 | CIP #7 | Earley Lake Improvements - Diversion Structure and Earley Lake Estates Pond | Completed |
| 2002 | 72 | 1 | 1 | | Black Dog | Central | E, NR | $75,000 | CIP #7 | Implement LID techniques for re-developing areas including Heart of the City. Matching $75,000 MEP Grant funds. | Completed |
| 2002 | 72 | 2 | 1 | | Black Dog | Central | NR | Table 82-1 | NA | Design and Construct additional storm water treatment and wetland mitigation at the Cliff-Fen Park | Completed |
| 2002 | 74 | 2 | 1 | | Black Dog | East | E | - | NA | Install staff gauge on pond at I35E and Co. Rd. 11 | Project determined to be unnecessary |
| 2002 | 74 | 2 | 2 | | Black Dog | East | E | - | NA | Ongoing pond level analysis (staff gauge) | Project determined to be unnecessary |
| 2002 | 76 | 4 | 1 | | Black Dog | River Hills | E | - | NA | Complete plans for construction of Hayes Dr./27th Ave. street recon/storm sewer improvements | Completed |
| 2002 | 76 | 4 | 2 | | Black Dog | River Hills | E | $545,000 | CIP #8 | Complete construction of Hayes Dr./27th Ave. street recon/storm sewer improvements | Completed |
| 2002 | 76 | 5 | 1 | | Black Dog | River Hills | E | $5,000 | CIP #8 | Study scour protection devices and sedimentation/infiltration ponding at end of storm sewers below bluff | Completed |
| 2002 | 78 | 2 | 1 | | Black Dog | Murphy Han. | P, E, NR | Table 13-6 | NA | Development agreements requiring Low Impact Development Techniques in southwest Burnsville | Ongoing |
| 2002 | 78 | 3 | 1 | | Black Dog | Murphy Han. | I | - | NA | Enforce in place Individual Sewage Treatment System regulations | Ongoing |
| 2002 | 78 | 4 | 1 | | Black Dog | Murphy Han. | E | - | NA | Use street design concepts and design standards relating to LID techniques | Ongoing |
| 2002 | 80 | 1 | 1 | | Lower MN | Northwest | E | - | NA | Limit direct discharges from future development to future Quarry Lake | Ongoing planning effort |
| 2002 | 80 | 5 | 1 | | Lower MN | Northwest | E | - | NA | Maintain private levee between MN River and Quarry Lake. Complete documentation in PUD. | Ongoing planning effort |
| 2002 | 80 | 8 | 1 | | Lower MN | Northwest | NR | $52,000 | CIP #9 | Continuing activities of the Kraemer Nature Preserve Master Plan | Completed |
| 2002 | 82 | 1 | 1 | | Lower MN | Black Dog Lk | E, NR | $670,000 | CIP #4 | Design and Construct additional storm water treatment and wetland mitigation at the Cliff-Fen Park | Completed |
| 2002 | 82 | 3 | 1 | | Lower MN | Black Dog Lk | NR | - | NA | Ongoing: Incorporate precautions into development plans and agreements to minimize downstream impacts | Ongoing planning effort |
| 2002 | 84 | 2 | 1 | | Lower MN | Northeast | E, NR | Table 76-5 | NA | Analyze and construct storm sewer outfall protection to prevent downstream erosion | Completed |
| 2002 | 84 | 3 | 1 | | Lower MN | Northeast | NR | $5,000 | CIP #7 | Written MOA between MnDOT, Eagan, the Lower Minnesota River Watershed District | Determined unnecessary - pond system in place contains 100-year event without discharge |
| 2002 | 84 | 3 | 2 | | Lower MN | Northeast | NR | - | NA | Ongoing: Incorporate BMPs into development agreements to minimize impacts to trout stream | Ongoing planning effort |
| | | | | | | | **BUDGET** | $2,095,000 | | | |

| 2002 | SUMMARY | ACTUAL |
|---|---|---|
| Storm Water Utility - Capital Expenses | | $1,339,209 |
| Operating Expense Increases 2002 | | $38,000 |
| TOTAL | | $1,377,209 |

# Table 86. Implementation Plan Summary

| Year | Table | Activity | Task | Goal | Watershed | Subwatershed | Lead Dept. (2) | Budgeted Cost (3) | Funding Source (4) | Comments | Project Status as of 2008 Update (or noted date) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2003** | | | | | | | | | | | |
| 2003 | 10 | 2 | 3 | Water Quantity | | | E | $400,000 | CIP #2 | Construction of Northeast Burnsville Storm Sewer Improvements - South River Hill | Completed |
| 2003 | 10 | 3 | 1 | Water Quantity | | | E, NR | $35,000 | CIP #7 | Update models for Credit R., Black Dog Fen and trout stream tributaries to minimize peak flow. Tech memo | Completed |
| 2003 | 10 | 4 | 2 | Water Quantity | | | E | $50,000 | CIP #10 | Implement local drainage improvements | Completed |
| 2003 | 10 | 5 | 1 | Water Quantity | | | NR | Table 13-4 | NA | Develop model site to promote the use of alternative landscape features and innovative storm water practice | Completed |
| 2003 | 10 | 6 | 1 | Water Quantity | | | E | $110,000 | CIP #8 | Implement local drainage improvements - increase Oliver Court storm sewer capacit | Completed with 2001 Street Reconstruction Projec |
| 2003 | 13 | 3 | 1 | Water Quality | | | NR | Table 27-1-1 | NA | Develop/implement program to investigate nutrient characteristics of existing ponds on a prioritized basi | Ongoing |
| 2003 | 13 | 4 | 1 | Water Quality | | | NR | Table 61-4, 72-1 | NA | Ongoing work to develop model landscape/storm water practices (see Table 61-4 and 72-1 | Ongoing |
| 2003 | 15 | 2 | 1 | Erosion Cont. | | | E | $15,000 | CIP #7 | Develop an erosion and sediment control guidance manua | Utilized Existing Publications |
| 2003 | 27 | 1 | 2 | Maintenance | | | NR | $200,000 | CIP #11 | Implement Pond cleanout program | Completed |
| 2003 | 27 | 2 | 1 | Maintenance | | | E | $10,000 | Oper | Acquire/write/preserve easements for the purpose of maintenance | Completed utilizing existing staff - Ongoing projec |
| 2003 | 33 | 4 | 1 | Ground Water | | | NR | Table 13-4 | NA | Develop model site to promote and monitor the effectiveness of alternate landscape features - acquired site | Completed |
| 2003 | 36 | 3 | 2 | Regulatory | | | E | $70,000 | Other | NPDES Phase II permit application | Completed |
| 2003 | 40 | 3 | 1 | Finance | | | E, NR | - | NA | Establish financial incentives program for commercial and industrial property owners using good practice | Implemented in targeted areas such as the HOC |
| 2003 | 42 | 1 | 1 | Land Use | | | P, E, NR | - | NA | Develop and complete disconnected impervious policy | Postponed Indefinitely |
| 2003 | 42 | 2 | 1 | Land Use | | | P | - | NA | Modify existing zoning to move impervious cover requirements to a density standards sectio | Postponed Indefinitely |
| 2003 | 61 | 2 | 1 | | Black Dog | Crystal Lake | NR | $175,000 | CIP #7 | Implement water quality improvement projects | Completed |
| 2003 | 69 | 3 | 1 | | Black Dog | Sunset Pond | NR | - | NA | Development agreements with commercial property and Burnsville Center tributary to Earley Lak | Completed |
| 2003 | 69 | 8 | 1 | | Black Dog | Sunset Pond | E | $250,000 | CIP #5 | Twin Lake Outlet improvements | Completed |
| 2003 | 72 | 2 | 2 | | Black Dog | Central | NR | - | NA | Evaluate health of fen - Black Dog Fen Catchmen | Completed |
| 2003 | 76 | 2 | 1 | | Black Dog | River Hills | E | - | NA | Complete plans for Raleigh Drive storm sewer improvements - minimum measures of Feasibility Stud | Rescheduled for completion in 2008 LDM Project. |
| 2003 | 76 | 3 | 1 | | Black Dog | River Hills | E | - | NA | Complete plans for South River Hills storm sewer improvements | Completed with 2001 and 2004 Street Reconstruction Projects |
| 2003 | 76 | 3 | 2 | | Black Dog | River Hills | E | Table 10-2 | NA | Complete construction of South River Hills storm sewer improvements | Completed with 2001 and 2004 Street Reconstruction Projects |
| 2003 | 78 | 1 | 1 | | Black Dog | Murphy Han. | E, NR | - | NA | Document need for more retention/infiltration in Credit River Watershed to prevent future problems | Ongoing planning effort |
| 2003 | 80 | 2 | 2 | | Lower MN | Northwest | E, NR | $675,000 | CIP #1 | Industrial Park Pond - complete plans and specifications, construction (property acquisition by donatio | Re-scheduled for 2008-2012 |
| 2003 | 80 | 4 | 1 | | Lower MN | Northwest | E | $10,000 | CTS CIP | Completed feasibility for Embassy Road outfall flood closure and pump bypass structur | Project completed by MN DOT |
| 2003 | 80 | 4 | 2 | | Lower MN | Northwest | E | $10,000 | CTS CIP | Completed plans for Embassy Road outfall flood closure and pump bypass structur | Project completed by MN DOT |
| 2003 | 80 | 8 | 1 | | Lower MN | Northwest | NR | $24,000 | CIP #9 | Continuing activities of the Kraemer Nature Preserve Master Plan | Completed |
| 2003 | 82 | 6 | 1 | | Lower MN | Black Dog Lk | NR | $10,000 | CIP #7 | Installation of continuous monitoring thermal station on Trout Stream # | Monitored for 2 years |
| 2003 | 82 | 6 | 2 | | Lower MN | Black Dog Lk | NR | $10,000 | CIP #7 | Complete in-field habitat analysis of Trout Stream # 7 | Postponed indefinitely |
| 2003 | 84 | 4 | 1 | | Lower MN | Northeast | NR | $10,000 | CIP #7 | Installation of continuous monitoring thermal station on Trout Stream # | Monitored for 2 years |
| 2003 | 84 | 4 | 2 | | Lower MN | Northeast | NR | $10,000 | CIP #7 | Complete in-field habitat analysis of Trout Stream # 4 | Postponed indefinitely |
| | | | | | | | **BUDGET** | $2,074,000 | | | |

| 2003 | SUMMARY | ACTUAL |
|---|---|---|
| | Storm Water Utility - Capital Expenses | $1,656,162 |
| | Cumulative Operating Expense Increases | $38,000 |
| TOTAL | | $1,694,162 |

| **2004** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | 10 | 4 | 2 | Water Quantity | | | E | $50,000 | CIP #10 | Implement local drainage improvements | Completed |
| 2004 | 10 | 5 | 2 | Water Quantity | | | NR | Table 13-4 | NA | Monitoring data and report on model site - alternative landscape features and innovative storm water practice | Completed |
| 2004 | 13 | 5 | 1 | Water Quality | | | NR | $25,000 | CIP #7 | Develop specific water quality enhancement strategies for Burnsville Cente | Completed |
| 2004 | 20 | 8 | 1 | Pub Info & Ed | | | NR, E | - | NA | Explore an annual City Council recognition program for environmental projects completed in the Ci | Decided to utilize existing City recognition program |
| 2004 | 27 | 1 | 1 | Maintenance | | | NR | $40,000 | Oper | Develop and implement annual inspection program for documentation of the condition of ponds and drainage syste | Hired .5 FTE Natural Resources Technician - $30,000 increase to SWM operating Budge |
| 2004 | 27 | 1 | 2 | Maintenance | | | NR | $200,000 | CIP #11 | Implement Pond cleanout program | Completed |
| 2004 | 27 | 1 | 3 | Maintenance | | | PW | $50,000 | Oper | Maintenance and equipment acquisition based on annual inspections and work order | Completed - re-evaluated annually with budge |
| 2004 | 27 | 4 | 2 | Maintenance | | | PW | $60,000 | Oper | Staff to operate sweepers (hired 2003 - annual | Hired 1.0 FTE Street Maintenance Employee - $65,000 increase to SWM operating budge |
| 2004 | 27 | 4 | 3 | Maintenance | | | PW | $48,000 | Fleet CIP | Purchase street sweeping equipment - vacuum sweeper. Lease purchase agreement ($48,000/year - 5 years | Completed |
| 2004 | 27 | 5 | 2 | Maintenance | | | PW | - | Oper | Implement snow and ice control program to reduce sand use. Evaluation of street conditions and sand use | Completed |
| 2004 | 27 | 7 | 1 | Maintenance | | | E | $400,000 | CIP #8 | Annual storm sewer maintenance and replacement program | Completed |
| 2004 | 31 | 1 | 3 | Rec, F & W | | | NR | $25,000 | Oper | Manage E. Milfoil, Purple Loosestrife and other invasive plant and animal species - Control and Reductio | Implemented Aquatic Plant Mgmt Program - $45,000 increase to SWM operating budge |
| 2004 | 31 | 2 | 1 | Rec, F & W | | | NR | $10,000 | CIP #7 | Explore aquatic weed harvesting options - study and recommendation | Postponed to 2009 |
| 2004 | 33 | 2 | 1 | Ground Water | | | E | $10,000 | CIP #7 | Complete private well and ISTS data and update into GIS | Well data available from Dakota County. Staff to review ISTS data in 2008 |
| 2004 | 33 | 4 | 2 | Ground Water | | | NR | Table 13-4 | NA | Developed model site and monitoring (see 2003 #4-1) | Completed |
| 2004 | 33 | 5 | 1 | Ground Water | | | E | $25,000 | Water Util | Update Water Contingency and Conservation Plan | Water Emergency and Conservation Plan being completed by City staff in 2008 |
| 2004 | 33 | 6 | 1 | Ground Water | | | E, NR | - | NA | Evaluate policies and approaches to protect water resources near sand and gravel operations (active and inactive | Ongoing planning effort |
| 2004 | 36 | 3 | 3 | Regulatory | | | E | $25,000 | Other | NPDES Phase II storm water permit application (storm drainage system information) and comply with TMDL | Completed |
| 2004 | 40 | 3 | 2 | Finance | | | E, NR | - | NA | Implement financial incentives program for commercial and industrial property owners using good practice | Implemented in targeted areas such as the HOC |
| 2004 | 42 | 1 | 2 | Land Use | | | P, E, NR | - | NA | Publicize/educate on disconnected impervious policy, include policy in ordinanc | Postponed indefinitely |
| 2004 | 51 | 3 | 1 | | Vermillion R. | Lk. Alimagnet | NR | $35,000 | CIP #7 | Implement water quality improvement projects | Completed |
| 2004 | 51 | 4 | 1 | | Vermillion R. | Lk. Alimagnet | NR | - | NA | Implement modular treatment system(s) (filters) at existing storm water inlets as a pilot projec | Will be considered with Maintenance Ctr expansion |
| 2004 | 55 | 3 | 1 | | Black Dog | Lac Lavon | NR | $8,000 | CIP #7 | Completed assessment of fish populations by fisheries staf | Completed on targeted lakes |
| 2004 | 58 | 1 | 1 | | Black Dog | Keller Lake | NR | $10,000 | CIP #7 | Study treatment facilities, treatment capacity and treatment potential in conjunction with Crystal Lake stuc | Completed |
| 2004 | 61 | 2 | 1 | | Black Dog | Crystal Lake | NR | $250,000 | CIP #7 | Implement water quality improvement projects | Completed |
| 2004 | 69 | 3 | 2 | | Black Dog | Sunset Pond | NR | - | NA | Prepare grant applications for Burnsville Center LID practices to reduce pollutants to Earley Lak | Completed |
| 2004 | 69 | 4 | 1 | | Black Dog | Sunset Pond | E | Table 13-6 | NA | Compile flood proofing measures at Judicial Pond | Completed |
| 2004 | 69 | 6 | 1 | | Black Dog | Sunset Pond | E | $15,000 | CIP #8 | Design improvements to Sunset Pond and Early Lake outlet allow City to control downstream discharge | Postponed indefinitely |
| 2004 | 69 | 6 | 2 | | Black Dog | Sunset Pond | E | $75,000 | CIP #8 | Construct Sunset Pond and Early Lake outlet improvement to allow City to control discharge for maintenance activities | Postponed indefinitely |
| 2004 | 76 | 2 | 2 | | Black Dog | River Hills | E | $90,000 | CIP * | Raleigh Drive storm sewer improvements - minimum measures of Feasibility Study | Postponed to 2008 |
| 2004 | 80 | 2 | 2 | | Lower MN | Northwest | E, NR | $175,000 | CIP #1 | Industrial Park Pond - complete constructior | Re-scheduled for 2008 - 2012 |
| 2004 | 80 | 4 | 3 | | Lower MN | Northwest | E | $175,000 | CTS CIP | Completed construction for Embassy Road outfall flood closure and pump bypass structur | Project completed by MN DOT |
| 2004 | 80 | 8 | 1 | | Lower MN | Northwest | NR | $19,000 | CIP #9 | Continuing activities of the Kraemer Nature Preserve Master Plan | Completed |
| 2004 | 84 | 3 | 3 | | Lower MN | Northeast | NR | $45,000 | CIP #7 | Implemented developer improvements to minimize downstream impacts to trout strean | Ongoing |
| 2004 | 84 | 5 | 1 | | Lower MN | Northeast | NR | Table 10-5 | NA | Complete study of Northeast subwatershed to investigate water quality and treatmen | Postponed indefinitely |
| | | | | | | | **BUDGET** | $1,865,000 | | | |

| 2004 | SUMMARY | ACTUAL |
|---|---|---|
| | Storm Water Utility - Capital Expenses | $1,469,027 |
| | Cumulative Operating Expense Increases | $178,000 |
| TOTAL | | $1,647,027 |

# Table 86. Implementation Plan Summary

| Year | Table | Activity | Task | Goal | Watershed | Subwatershed | Lead Dept. (2) | Budgeted Cost (3) | Funding Source (4) | Comments | Project Status as of 2008 Update (or noted date) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2005** | | | | | | | | | | | |
| 2005 | 10 | 4 | 2 | Water Quantity | | | E | $50,000 | CIP #10 | Implement local drainage improvements | Completed |
| 2005 | 13 | 6 | 2 | Water Quality | | | NR, E | $200,000 | CIP #7 | Implement water quality improvement projects | Completed |
| 2005 | 27 | 1 | 1 | Maintenance | | | NR | - | Oper | Develop and implement annual inspection program for documentation of the condition of ponds and drainage system | Completed utilizing existing staff - ongoing program |
| 2005 | 27 | 1 | 2 | Maintenance | | | NR | $250,000 | CIP #11 | Implement Pond cleanout program | Completed |
| 2005 | 27 | 7 | 1 | Maintenance | | | E | $400,000 | CIP #8 | Annual storm sewer maintenance and replacement program | Completed |
| 2005 | 31 | 2 | 2 | Rec, F & W | | | NR | $100,000 | Fleet CIP | Purchase aquatic plant harvesting equipment | Postponed to 2009 |
| 2005 | 33 | 3 | 1 | Ground Water | | | NR, P | $10,000 | CIP #7 | Complete packet for developers on alternative landscape design guidelines | Completed |
| 2005 | 42 | 3 | 1 | Land Use | | | P | - | NA | Develop parking standards, incentives for less parking area | Parking standards updated to reduce parking area |
| 2005 | 51 | 3 | 2 | | Vermillion R. | Lk. Alimagnet | NR | $140,000 | CIP #7 | Implement water quality improvement projects | Completed |
| 2005 | 69 | 5 | 1 | | Black Dog | Sunset Pond | E | - | NA | Complete field investigation for dam safety analysis | Postponed to 2007 |
| 2005 | 74 | 1 | 1 | | Black Dog | East | E | $15,000 | CIP #8 | Feasibility study to divert two residential areas west of Co. Rd. 11 into existing pond at 35E and Co. Rd. 11 | Postponed to 2009 - see Terrace Oaks Project |
| 2005 | 74 | 1 | 2 | | Black Dog | East | E | $345,000 | CIP * | Prepare plans and commence construction to divert 58 acres from Terrace Oaks to pond at I35E and County Rd 11. | Postponed to 2009 - see Terrace Oaks Project |
| 2005 | 78 | 1 | 2 | | Black Dog | Murphy Han. | E, NR | - | NA | Water level monitoring to evaluate the need for more retention/infiltration in the watershed | Postponed indefinitely |
| 2005 | 80 | 8 | 1 | | Lower MN | Northwest | NR | $19,000 | CIP #9 | Continuing activities of the Kraemer Nature Preserve Master Plan | Completed |
| 2005 | 82 | 5 | 1 | | Lower MN | Black Dog Lk | NR | $15,000 | CIP #7 | Completed Management Plan for Black Dog Lake - west basin | Postponed indefinitely |
| 2005 | 84 | 1 | 1 | | Lower MN | Northeast | NR | $15,000 | CIP #7 | Completed Management Plan for Black Dog Lake - east basin | Postponed indefinitely |
| | | | | | | | **BUDGET** | $1,559,000 | | | |

| 2005 | SUMMARY | ACTUAL |
|---|---|---|
| Storm Water Utility - Capital Expenses | | $1,360,207 |
| Cumulative Operating Expense Increases | | $178,000 |
| TOTAL | | $1,538,207 |

| **2006** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006 | 10 | 4 | 2 | Water Quantity | | | E | $50,000 | CIP #10 | Implement local drainage improvements | Completed |
| 2006 | 27 | 1 | 2 | Maintenance | | | NR | $250,000 | CIP #11 | Implement Pond cleanout program | Completed |
| 2006 | 27 | 7 | 1 | Maintenance | | | E | $400,000 | CIP #8 | Annual storm sewer maintenance and replacement program | Completed |
| 2006 | 51 | 3 | 2 | | Vermillion R. | Lk. Alimagnet | NR | $400,000 | CIP #7 | Implement water quality improvement projects | Completed |
| 2006 | 69 | 1 | 1 | | Black Dog | Sunset Pond | NR | $30,000 | CIP #7 | Prepare a nutrient loading study of Twin Ponds | Completed |
| 2006 | 69 | 3 | 3 | | Black Dog | Sunset Pond | NR | $150,000 | CIP #7 | Develop Low Impact, on-site stormwater techniques in Earley Lake tributary area | Completed |
| 2006 | 74 | 1 | 2 | | Black Dog | East | E | $450,000 | CIP * | Continue construction to divert 58 acres from Terrace Oaks to pond at I35E and County Rd 11. | Postponed to 2009 |
| 2006 | 80 | 8 | 1 | | Lower MN | Northwest | NR | $10,000 | CIP #9 | Continuing activities of the Kraemer Nature Preserve Master Plan | Completed |
| 2006 | 69 | | | Water Quality | Black Dog | Earley Lake | NR | $1,000,000 | SWM/ASMT | Implement Earley Lake Study Projects - Burnsville Center Area Ponding Project (Construction in 2008) | Land Acquired for Pond at Southcross and Burnhaven |
| 2006 | 82 | 2 | 1 | | Lower MN | Black Dog Lk | E, NR | - | NA | Evaluate manually operated control structure at Black Dog Fen outlet railroad crossing culvert | Postponed to 2011 |
| | | | | | | | **BUDGET** | $2,740,000 | | | |

| 2006 | SUMMARY | ACTUAL |
|---|---|---|
| Storm Water Utility - Capital Expenses | | $1,973,502 |
| Cumulative Operating Expense Increases | | $178,000 |
| TOTAL | | $2,151,502 |

| **2007** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | 10 | 4 | 2 | Water Quantity | | | E | $155,000 | 02-SWM | Implement lateral drainage modifications program | Completed |
| 2007 | 13 | | | Water Quality | | | NR | $20,000 | 01-SWM | General water quality improvement projects | Completed |
| 2007 | 51 | | | Water Quality | Vermillion | Alimagnet | NR | $390,000 | 16-SWM | Implement Lake Alimagnet Study project - Pond 1A improvements | To be completed in 2008 |
| 2007 | 51 | | | Water Quality | Vermillion | Alimagnet | NR | $33,000 | 15-SWM | Implement Lake Alimagnet water quality improvement projects in partnership with Apple Valley (ongoing) | Completed |
| 2007 | 69 | | | Water Quality | Black Dog | Wood Pond | NR | $30,000 | 22-SWM | Complete Wood Pond Water Quality Study | To be completed in 2008 |
| 2007 | 69 | | | Water Quality | Black Dog | Twin Lakes | NR | $70,000 | 19-SWM | Implement Twin Lakes Study - Access Ramp & Alum Projects | Access ramp installed, Alum treatment to occur in 2008 |
| 2007 | 69 | | | Water Quality | Black Dog | Earley Lake | NR | $30,000 | 20-SWM | Implement Earley Lake Study Projects | Postponed to 2008 - see pond E-1B project |
| 2007 | 27 | 1 | 2 | Maintenance | | | E | $300,000 | 04-SWM | Implement Pond cleanout program / outfall improvements | Completed |
| 2007 | 74 | 1 | 2 | Water Quantity | Black Dog | East | PW | $605,000 | 03-SWM | Terrace Oaks Park Drainage Diversion Project | Postponed to 2009 |
| 2007 | 80 | 8 | 1 | | Lower MN | Northwest | NR | $53,000 | 15-SWM | Implement Kraemer Nature Preserve Master Plan | Postponed to 2008 |
| 2007 | | | | Planning | | | NR, E | $100,000 | 14-SWM | Update WRMP, Update NPDES Permit, Complete Non-degradation Study | To be completed in 2008 |
| 2007 | 25 | 2 | 2 | Monitoring | | | NR | $0 | | Adopted process (and annual maintenance of data acquisition model) | Will complete using in-house staff |
| 2007 | 27 | 7 | 1 | Maintenance | | | E | $375,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | Completed |
| 2007 | 55 | 2 | 2 | | Black Dog | Lac Lavon | NR | $40,000 | 18-SWM | Implement practices to reduce runoff and improve water quality in Lac Lavon | Postponed to 2008 |
| 2007 | 69 | 5 | 2 & 3 | | Black Dog | Sunset Pond | E | $18,000 | 11-SWM | Prepare a dam break model analysis and dam safety report for Sunset Pond - Complete in 2008 | To be completed in 2008 |
| 2007 | 82 | 4 | 1 | | Lower MN | Black Dog Lk | E, NR | $0 | | Design storm water basin/sediment-trapping device upstream existing railroad grade culvert | Project postponed indefinitely |
| | | | | | | | **BUDGET** | $2,219,000 | | | |

| 2007 | SUMMARY | ACTUAL |
|---|---|---|
| SW Utility - Capital Expenses | | $1,157,247 |
| Cumulative Operating Expense Increases | | $178,000 |
| TOTAL | | $1,335,247 |

# Table 86. Implementation Plan Summary

| Year | Table | Activity | Task | Goal | Watershed | Subwatershed | Lead Dept. (2) | Budgeted Cost (3) | Funding Source (4) | Comments | Project Status as of 2008 Update (or noted date) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2008** | | | | | | | | | | | |
| 2008 | 13 | | | Water Quality | | | NR | $20,000 | 01-SWM | General Water Quality Improvement Projects | |
| 2008 | 51 | | | Water Quality | Vermillion | Alimagnet | NR | $380,000 | 05-SWM | Implement Lake Alimagnet Study project - Pond 1A improvements | |
| 2008 | 27 | 7 | 1 | Maintenance | | | E | $200,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | |
| 2008 | 10 | 4 | 2 | Water Quantity | | | E | $170,000 | 08-301 SWM | Implement Lateral Drainage Modifications | |
| 2008 | 13 | 6 | 2 | Water Quality | | | E | $300,000 | 08-305 | Implement Pond Cleanout/Outfall Improvement Program | |
| 2008 | 76 | | | Water Quantity | Black Dog | River Hills | E | $350,000 | 08-307 | River Hills Storm Sewer Improvements | |
| 2008 | 69 | | | Water Quality | Black Dog | Wood Pond | NR | $50,000 | 11-SWM | Implement Wood Pond Water Quality Projects - Complete Study | |
| 2008 | 13 | | | Water Quality | Lower MN | | E | $0 | 14-SWM | Install Green Roof on Surface Water Treatment Plant | |
| 2008 | 69 | | | Water Quality | Black Dog | Earley Lake | NR | $2,000,000 | SWM | Implement Earley Lake Study Projects - Burnsville Center Area Ponding Project | |
| 2008 | 69 | | | Water Quality | Black Dog | Earley Lake | NR | -$1,050,000 | ASMT/Grant | Burnsville Center Area Ponding Project - Special Assessment & Grant Revenues | |
| 2008 | 69 | | | Water Quality | Black Dog | Earley lake | NR/E | $1,500,000 | SWM | Earley Lake Study Projects - E-1B Watershed Improvements. City expenses only -Total project cost estimated at $2.6 million. Project to be supported by other revenue sources. | |
| 2008 | 80 | 2 | 2 | | Lower MN | Northwest | E, NR | $1,000,000 | 12-SWM | Purchase Land for MN River Quadrant Ponds (Industrial Park Pond Project) | |
| 2008 | 69 | | | Water Quality | Black Dog | Twin Lakes | NR | $25,000 | 19-SWM | Implement Twin Lakes Study - Alum Treatment Project | Alum treatment project carried forward from 2007 |
| 2008 | 69 | 5 | 2 & 3 | | Black Dog | Sunset Pond | E | $13,000 | 11-SWM | Prepare a dam break model analysis and dam safety report for Sunset Pond - carried forward from 2007 | To be completed in 2008 |
| 2008 | | | | Planning | | | NR, E | $22,000 | 14-SWM | Update WRMP, Update NPDES Permit - carried forward from 2007 | To be completed in 2008 |
| 2008 | 76 | 6 | 1 | | Black Dog | Keller Lake | NR | | CIP #8 | Construct manually-operated control structure at Black Dog Fen outlet railroad culvert | Postponed to 2011 |
| 2008 | 69 | | | Water Quality | Black Dog | Twin Lakes | NR | $10,000 | Oper | Implement Twin Lakes Harvesting Program (ongoing) | |
| 2008 | 69 | | | Water Quality | Black Dog | Earley Lake | NR | $18,000 | Oper | Implement Earley Lake Harvesting Program (ongoing) | Postponed to 2008 - see pond E-1B project |
| 2008 | 51 | | | Water Quality | Vermillion | Alimagnet | NR | $34,000 | Oper | Implement Lake Alimagnet water quality improvement projects in partnership with Apple Valley (ongoin | |
| | | | | | | | | $5,042,000 | | | |

| 2008 | SUMMARY | BUDGET | ACTUAL |
|---|---|---|---|
| | Proposed Operating Expense Increase - 2008 | $62,000 | |
| | SW Utility - Capital Expenses | $4,980,000 | |
| **TOTAL** | | $5,042,000 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2009** | | | | | | | | | | | |
| 2009 | 13 | | | Water Quality | | | NR | $20,000 | 01-SWM | General Water Quality Improvement Projects | |
| 2009 | 27 | 7 | 1 | Maintenance | | | E | $400,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | |
| 2009 | 10 | 4 | 2 | Water Quantity | | | E | $70,000 | 08-301 SWM | Implement Lateral Drainage Modifications | |
| 2009 | 13 | 6 | 2 | Water Quality | | | E | $300,000 | 08-305 | Implement Pond Cleanout/Outfall Improvement Program | |
| 2008 | 80 | 8 | 1 | | Lower MN | Northwest | NR | $53,000 | 15-SWM | Implement Kraemer Nature Preserve Master Plan | Carried Forward from 2007 |
| 2009 | 69 | | | Water Quality | Black Dog | Wood Pond | NR | $230,000 | 11-SWM | Implement Wood Pond Water Quality Projects - Construct water quality pond in subwatershed WP-1 | |
| 2009 | 69 | | | Water Quality | Black Dog | Twin Lakes | NR | $1,250,000 | SWM | Implement Twin Lakes Study Projects - NT-1 Watershed Improvements. City expenses only -Total project cost estimated at $2.25 million. Project to be supported by other revenue sources | |
| 2009 | 74 | 1 | 2 | Water Quantity | Black Dog | East | NR/E | $200,000 | 03-SWM | Terrace Oaks Park Drainage Diversion Project - carried forward from earlier years | |
| 2009 | 31 | 2 | 2 | Rec, F & W | | | NR | $150,000 | 06-SWM | Purchase aquatic plant harvesting equipment | |
| 2009 | 31 | 2 | 2 | Rec, F & W | | | NR | $20,000 | Oper | Staff to Operate Harvester | |
| | | | | | | | | $2,693,000 | | | |

| 2009 | SUMMARY | BUDGET | ACTUAL |
|---|---|---|---|
| | Proposed Operating Expense Increase - 2009 | $20,000 | |
| | SW Utility - Capital Expenses | $2,673,000 | |
| **TOTAL** | | $2,693,000 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | | | | | | | | | | | |
| 2010 | 13 | | | Water Quality | | | NR | $25,000 | 01-SWM | General Water Quality Improvement Projects | |
| 2010 | 27 | 7 | 1 | Maintenance | | | E | $410,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | |
| 2010 | 10 | 4 | 2 | Water Quantity | | | E | $80,000 | 08-301 SWM | Implement Lateral Drainage Modifications | |
| 2010 | 13 | 6 | 2 | Water Quality | | | E | $300,000 | 08-305 | Implement Pond Cleanout/Outfall Improvement Program | |
| 2010 | 13 | | | Water Quality | | | NR | $100,000 | 10-SWM | Install Rain Gardens in Priority Watersheds | |
| 2010 | 69 | | | Water Quality | Black Dog | Wood Pond | NR | $110,000 | 11-SWM | Implement Wood Pond Water Quality Projects - Construct Rainwater Garden in subwatershed WP-3 | |
| 2010 | 27 | 1 | 2 | Maintenance | | | NR, E | $800,000 | 04-SWM | Rupp Drive stormwater treatment ponds | |
| | | | | | | | | $1,825,000 | | | |

| 2010 | SUMMARY | BUDGET | ACTUAL |
|---|---|---|---|
| | Proposed Operating Expense Increase - 2010 | $0 | |
| | SW Utility - Capital Expenses | $1,825,000 | |
| **TOTAL** | | $1,825,000 | |

# Table 86. Implementation Plan Summary

| Year | Table | Activity | Task | Goal | Watershed | Subwatershed | Lead Dept. (2) | Budgeted Cost (3) | Funding Source (4) | Comments | Project Status as of 2008 Update (or noted date) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2011** | | | | | | | | | | | |
| 2011 | 13 | | | Water Quality | | | NR | $25,000 | 01-SWM | General Water Quality Improvement Projects | |
| 2011 | 27 | 7 | 1 | Maintenance | | | E | $410,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | |
| 2011 | 10 | 4 | 2 | Water Quantity | | | E | $80,000 | 08-301 SWM | Implement Lateral Drainage Modifications | |
| 2011 | 13 | 6 | 2 | Water Quality | | | E | $300,000 | 08-305 | Implement Pond Cleanout/Outfall Improvement Program | |
| 2011 | 13 | | | Water Quality | | | NR | $50,000 | 10-SWM | Install Rain Gardens in Priority Watersheds | |
| 2011 | 69 | | | Water Quality | Black Dog | Wood Pond | NR | $115,000 | 11-SWM | Implement Wood Pond Water Quality Projects - Construct Subsurface Infiltration Basin in subwatershed WP-4 | |
| 2011 | 13 | | | Water Quality | Black Dog | Sunset Pond | NR | $50,000 | 13-SWM | Complete Sunset Pond Water Quality Study | |
| 2011 | 55 | 2 | 2 | Water Quality | Black Dog | Lac Lavon | NR | $80,000 | 07-SWM | Implement practices to reduce runoff and improve water quality in Lac Lavon (Carried forward from 2008) | |
| 2011 | 76 | 6 | 1 | | Black Dog | | NR | $100,000 | 03-SWM | Construct manually-operated control structure at Black Dog Fen outlet railroad culvert - carried forward form 2008 | |
| 2011 | 81 | | | | Lower MN | | NR | $500,000 | 12-SWM | Construct MN River Quadrant Ponds | |
| 2011 | 81 | | | | Lower MN | | NR | -$500,000 | ASMT | MN River Quadrant Ponds - Special Assessment Revenues | |
| | | | | | | | | $1,210,000 | | | |

| 2011 SUMMARY | BUDGET | ACTUAL |
|---|---|---|
| Proposed Operating Expense Increase - 2011 | $0 | |
| SW Utility - Capital Expenses | $1,210,000 | |
| **TOTAL** | $1,210,000 | |

| **2012** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | 13 | | | Water Quality | | | NR | $25,000 | 01-SWM | General Water Quality Improvement Projects | |
| 2012 | 27 | 7 | 1 | Maintenance | | | E | $410,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | |
| 2012 | 10 | 4 | 2 | Water Quantity | | | E | $80,000 | 08-301 SWM | Implement Lateral Drainage Modifications | |
| 2012 | 13 | 6 | 2 | Water Quality | | | E | $300,000 | 08-305 | Implement Pond Cleanout/Outfall Improvement Program | |
| 2012 | 13 | | | Water Quality | | | NR | $50,000 | 10-SWM | Install Rain Gardens in Priority Watersheds | |
| 2012 | 69 | | | Water Quality | Black Dog | Wood Pond | NR | $35,000 | 11-SWM | Implement Wood Pond Water Quality Projects - Alum Treatment | |
| 2012 | 13 | | | Water Quality | Black Dog | Sunset Pond | NR | $50,000 | 13-SWM | Implement Sunset Pond Water Quality Projects | |
| 2012 | 81 | | | | Lower MN | | NR | $500,000 | 12-SWM | Construct MN River Quadrant Ponds | |
| 2012 | 81 | | | | Lower MN | | NR | -$500,000 | ASMT | MN River Quadrant Ponds - Special Assessment Revenues | |
| 2012 | 82 | 4 | 2 | | Lower MN | Northeast | NR | $400,000 | 02-SWM | Construct Storm Water Basin/Sediment Trap Upstream of Existing Railroad Culvert (north of 27th & Hayes) | |
| | | | | | | | | $1,350,000 | | | |

| 2012 SUMMARY | BUDGET | ACTUAL |
|---|---|---|
| Proposed Operating Expense Increase - 2012 | $0 | |
| SW Utility - Capital Expenses | $1,350,000 | |
| **TOTAL** | $1,350,000 | |

| **2013** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013 | 13 | | | Water Quality | | | NR | $25,000 | 01-SWM | General Water Quality Improvement Projects | |
| 2013 | 27 | 7 | 1 | Maintenance | | | E | $410,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | |
| 2013 | 10 | 4 | 2 | Water Quantity | | | E | $80,000 | 08-301 SWM | Implement Lateral Drainage Modifications | |
| 2013 | 13 | 6 | 2 | Water Quality | | | E | $300,000 | 08-305 | Implement Pond Cleanout/Outfall Improvement Program | |
| | | | | | | | | $815,000 | | | |

| 2013 SUMMARY | BUDGET | ACTUAL |
|---|---|---|
| Proposed Operating Expense Increase - 2013 | $0 | |
| SW Utility - Capital Expenses | $815,000 | |
| **TOTAL** | $815,000 | |

| **2014** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | 13 | | | Water Quality | | | NR | $25,000 | 01-SWM | General Water Quality Improvement Projects | |
| 2014 | 27 | 7 | 1 | Maintenance | | | E | $410,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | |
| 2014 | 10 | 4 | 2 | Water Quantity | | | E | $80,000 | 08-301 SWM | Implement Lateral Drainage Modifications | |
| 2014 | 13 | 6 | 2 | Water Quality | | | E | $300,000 | 08-305 | Implement Pond Cleanout/Outfall Improvement Program | |
| | | | | | | | | $815,000 | | | |

| 2014 SUMMARY | BUDGET | ACTUAL |
|---|---|---|
| Proposed Operating Expense Increase - 2014 | $0 | |
| SW Utility - Capital Expenses | $815,000 | |
| **TOTAL** | $815,000 | |

| **2015** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2015 | 13 | | | Water Quality | | | NR | $25,000 | 01-SWM | General Water Quality Improvement Projects | |
| 2015 | 27 | 7 | 1 | Maintenance | | | E | $410,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | |
| 2015 | 10 | 4 | 2 | Water Quantity | | | E | $80,000 | 08-301 SWM | Implement Lateral Drainage Modifications | |
| 2015 | 13 | 6 | 2 | Water Quality | | | E | $300,000 | 08-305 | Implement Pond Cleanout/Outfall Improvement Program | |
| | | | | | | | | $815,000 | | | |

| 2015 SUMMARY | BUDGET | ACTUAL |
|---|---|---|
| Proposed Operating Expense Increase - 2015 | $0 | |
| SW Utility - Capital Expenses | $815,000 | |
| **TOTAL** | $815,000 | |

# Table 86. Implementation Plan Summary

| Year | Table | Activity | Task | Goal | Watershed | Subwatershed | Lead Dept. (2) | Budgeted Cost (3) | Funding Source (4) | Comments | Project Status as of 2008 Update (or noted date) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2016** | | | | | | | | | | | |
| 2016 | 13 | | | Water Quality | | | NR | $25,000 | 01-SWM | General Water Quality Improvement Projects | |
| 2016 | 27 | 7 | 1 | Maintenance | | | E | $410,000 | 01/02 Street | Annual storm sewer maintenance and replacement program (street rehabilitation & reconstruction) | |
| 2016 | 10 | 4 | 2 | Water Quantity | | | E | $80,000 | 08-301 SWM | Implement Lateral Drainage Modifications | |
| 2016 | 13 | 6 | 2 | Water Quality | | | E | $300,000 | 08-305 | Implement Pond Cleanout/Outfall Improvement Program | |
| | | | | | | | | $815,000 | | | |

| 2016 SUMMARY | BUDGET | ACTUAL |
|---|---|---|
| Proposed Operating Expense Increase - 2016 | $0 | |
| SW Utility - Capital Expenses | $815,000 | |
| **TOTAL** | $815,000 | |

| **Future: 2017 -** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Future | 58 | 4 | 1 | | Black Dog | Keller Lake | E | Future | | Feasibility Study to increase outlet capacity for Keller Lake ($20,000) | |
| Future | 61 | 3 | 1 | | Black Dog | Crystal Lake | E | Future | | Design and construction of increased discharge capacity system at Crystal Lake ($1,600,000) | |
| Future | 76 | 1 | 2 | | Black Dog | River Hills | E | Future | | Complete plans and construction of River Hills Drive Catchment storm sewer - street recon ($375,000) | |
| Future | 76 | 2 | 2 | Water Quantity | Black Dog | River Hills | E | Future | 08-306 | Raleigh Drive Storm Sewer Improvements - put into future projects during 2008 update (Estimated cost = $100,000) | |
| Future | 76 | 2 | 3 | | Black Dog | River Hills | E | Future | | Raleigh Drive Catchment - additional (optional) improvements if needed | |
| Future | 80 | 5 | 2 | | Lower MN | Northwest | E | Future | | Complete Inspection report of existing EKS levee ($35,000) | |
| Future | 80 | 5 | 3 | | Lower MN | Northwest | E | Future | | Future repairs to EKS levee | |
| Future | 80 | 6 | 1 | | Lower MN | Northwest | E | Future | | Completed flood proofing of properties adjacent to Quarry Lake | |
| Future | 80 | 7 | 1 | | Lower MN | Northwest | E | Future | | Prepare study for flood dewatering system to maintain Quarry Lake levels | |

## Financing Summary 2002 - 2016

| Year | Storm Water Utility (1) | Operating | TOTAL | Actual or Budgeted |
|---|---|---|---|---|
| 2002 | $1,339,209 | $38,000 | $1,377,209 | Actual |
| 2003 | $1,656,162 | $38,000 | $1,694,162 | Actual |
| 2004 | $1,469,027 | $178,000 | $1,647,027 | Actual |
| 2005 | $1,360,207 | $178,000 | $1,538,207 | Actual |
| 2006 | $1,973,502 | $178,000 | $2,151,502 | Actual |
| 2007 | $1,157,247 | $178,000 | $1,335,247 | Actual |
| 2008 | $4,980,000 | $240,000 | $5,220,000 | Budgeted |
| 2009 | $2,673,000 | $260,000 | $2,933,000 | Budgeted |
| 2010 | $1,825,000 | $260,000 | $2,085,000 | Budgeted |
| 2011 | $1,210,000 | $260,000 | $1,470,000 | Budgeted |
| 2012 | $1,350,000 | $260,000 | $1,610,000 | Budgeted |
| 2013 | $815,000 | $260,000 | $1,075,000 | Budgeted |
| 2014 | $815,000 | $260,000 | $1,075,000 | Budgeted |
| 2015 | $815,000 | $260,000 | $1,075,000 | Budgeted |
| 2016 | $815,000 | $260,000 | $1,075,000 | Budgeted |
| **Total** | **$24,253,354** | **$3,108,000** | **$27,361,354** | |

| Other Agency Contributions | Amount |
|---|---|
| West Buck Hill Park Infiltration Basin - Metropolitan Council Grant via BDWMO | $32,000 |
| HOC LID Program - Metropolitan Council Grant | $66,000 |
| Cliff Fen Park Wetland Restoration and Pond - Metropolitan Council Grant | $25,500 |
| Crystal Lake Rainwater Gardens Project -Metropolitan Council Grant | $117,000 |
| Burnsville Center Area Ponding Project - Dakota County CDA Grant (2008) | $250,000 |
| **TOTAL** | **$490,500** |

Notes:
1. Annual figure for years 2002 to 2007 are actual expenditures. Figures for 2008 to 2016 represent storm utility funds designated for projects and activities listed in the table in 2007 dollars.
2. Lead Department Codes: P=Planning, E=Engineering, NR=Natural Resources, PW=Public Works, I=Inspection
3. The total budgeted costs in the main table may not match the budget in the Annual Summary (at left). The total budget includes costs that may be covered by other funding sources.
4. NA = No new costs associated with this item. Costs are considered part of existing program as of 2001. New operating costs (OPER) are assigned a cost only in the first year of the "new" cost and are then considered NA.

## DEFINITIONS

**Ambient Monitoring:** Monitoring which focuses on baseline conditions and possible trends.

**Aquatic Bench:** A relatively flat sloped area or bench, generally having a width of 10- to 15-feet around the inside perimeter of a permanent pool that is approximately one-foot deep. Normally vegetated with emergent plants, the bench augments pollutant removal, provides habitat, conceals trash and water level drops, and enhances safety.

**Aquatic Macrophytes:** Rooted plants, either submerged, floating leafed, or emergent, and floating or floating leaf plants growing in public waters.

**Aquatic Nuisance:** The presence of leeches, snails that carry swimmer's itch, or any growth of aquatic vegetation or algae in such numbers or such abundance as to interfere with boating, swimming, or other aquatic recreation or beneficial water use.

**Base Flood Elevation (BFE)**: The elevation shown on the Flood Insurance Rate Map for Zones AE, AH, A1-A30, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, AR/AO, V1-V30, and VE that indicates the water surface elevation resulting from a flood that has a one percent chance of equaling or exceeding that level in any given year (also commonly referred to as the 100-year event). See also Flood (and related definitions).

**BMP (Best Management Practice):** A combination of land use, conservation practices, and management techniques, which when applied to a unit of land will result in the opportunity for a reasonable economic return with an acceptable level of water quality or water quantity improvements.

**Biodiversity:** The variety of interrelated plant and animal life forms that occur in a water body.

**Biological Monitoring:** Periodic surveys of aquatic biota as an indicator of the general health of a water body. Biological monitoring surveys can span the trophic spectrum, from macro-invertebrates to fish species.

**Bog:** A mat, either attached to or resting on the bottom or floating, that is normally made up of dead organic matter held together by various types of living plants.

**Buffer:** The use of land, topography, difference in elevation, space, fences, or landscape planting to screen or partially screen a use or property from the vision of another use or property, and thus reduce undesirable influences such as: sight, noise, dust, and other external effects.

**Buffer Strip:** An area of vegetated ground cover abutting a water body that is intended to filter sediment or other pollutants from runoff.

**Chlorophyll:** The green pigment of plants necessary for photosynthesis, the process by which plants produce energy from sunlight.

**Classification System:** See Water Body Classification System.

**Comprehensive Plan:** As defined in Minnesota Statutes 394.21, the policies, statements, goals and interrelated plans for private and public land and water use, transportation and community facilities that guide future development (and growth).

**Design Storm:** A rainfall event of specified size and return frequency that is used to calculate the peak discharge rate at selected locations in a storm water system.

**Detention:** The temporary storage of runoff from rainfall and snowmelt events to control peak discharge rates and provide an opportunity for physical, chemical and biological treatment to occur.

**Development:** The construction, installation or alteration of any structure, the extraction, clearing or other alteration of terrestrial or aquatic vegetation, land or the course, current or cross section of any water body or water course or division of land into two (2) or more parcels (source: Burnsville City Code 10-8-2 and 10-4-2). See also re-development and new development.

**De-Watering:** Process used in detention/retention facilities whereby water is completely discharged or drawn down to a pre-established pool elevation by way of a perforated pipe. De-watering allows the facility to recover its design storage capacity in a relatively short time after a storm event. Dewatering is also used to temporarily remove surface or ground water from a construction site in order to allow the construction to take place.

**Disturbed Area (or Disturbance)**: An area which is susceptible to erosion because the vegetative or non-vegetative cover has been temporarily or permanently removed or altered. This may be accompanied by mixing or removal of some soil horizons. For the purposes of this Plan and associated development standards, disturbed area includes all areas of the project site that are within the construction limits.

**Drawdown:** The gradual reduction in water level in a pond BMP due to the combined effects of outflow from an outlet structure, infiltration and evaporation.

**Draining:** The removal of surface water or ground water from the surface of the land or from within the soil profile.

**Dredging:** To enlarge or clean accumulated sediment out a water body, watercourse, or wetland.

**Drop Structure:** Placement of logs with a weir notch across an open channel. Water flowing through the weir creates a plunge pool downstream of the structure which dissipates energy and can also create beneficial fish habitat. A drop structures may also be a storm sewer manhole that has a drop of six to eight feet or more between the inlet pipe and outlet pipe invert elevations. Drop

structure manholes require a more detailed hydraulic analysis to evaluate the forces of flows in the structure and the potential reduction in flow capacity due to air entrainment.

**Easement:** A grant of one or more property rights by a property owner for use by the public, a corporation, or another person or entity.

**Ecologically Harmful Exotic Species**: Non-native aquatic plants or wild animals that can naturalize, have high propagation potential, are highly competitive for limiting factors, and cause displacement of, or otherwise threaten, native plants or native animals in their natural communities.

**Ecosystem:** A complex, interdependent system of humans, their built environments, other animals, plants and other organisms, and the natural physical and chemical environment upon which life depends.

**Emergent Plant:** An aquatic plant that is rooted in the sediment but whose leaves are at or above the water surface. Such wetland plants provide habitat for wildlife and waterfowl in addition to removing urban pollutants.

**End of Pipe Control:** Water quality control technologies suited for the control of existing urban storm water at the point of storm sewer discharge to a stream. Due to typical space constraints, these technologies are usually designed to provide water quality control rather than quantity control.

**Erosion:** The wearing away of land surface by the action of natural elements.

**Excessive Algae Bloom:** Some or all of the following conditions are present: algae population is dominated by glue-green algae; secchi disc reading is typically 2 feet or less; floating mats or scums of algae have accumulated on the downwind shore; or decomposition of accumulated algae has occurred releasing a blue-green pigment and causing an offensive odor.

**Exfiltration:** The downward movement of runoff through the bottom of an infiltration BMP into the subsoil.

**Exotic:** A species which is not native to Minnesota but has been introduced from other states or continents to Minnesota.

**Extended Detention:** A storm water design feature that provides for the gradual release of a volume of water over a period of 24 to 48 hours or more to increase settling of urban pollutants, and protect channels from high water levels and flooding.

**Extended Detention (ED) Ponds:** A conventional ED pond temporarily detains a portion of storm water runoff for up to 24 hours after a storm using a fixed orifice. Such extended detention allows urban pollutants to settle out. The ED ponds are normally "dry" between storm events and do not have any permanent standing water. An enhanced ED pond is designed to prevent clogging and resuspension. It provides greater flexibility in achieving target detention times. It may be equipped with plunge pools near the inlet, a micropool at the outlet, and utilize an adjustable reverse-sloped pipe at the ED control device.

**Fen:** A wetland featuring grasses and sedges, created when a high water table and a lack of runoff keep the ground continuously moist and deprived of oxygen. Plants that die in these conditions do not break down into the soil because there is not enough oxygen to support the microorganisms and bacteria that do this work. Dead plants build up and compress over thousands of years into thick, partially decayed mats of peat. Fen's are kept continuously wet and cool by the ground water supply.

**Filling:** The act of depositing any rock, soil, gravel, sand or other material so as to fill a water body, watercourse, or wetland.

**Flood (and related definitions):** A temporary rise in the water level of lake, pond or wetland, or in the stream flow or stage of an open channel that results in inundation of the areas adjacent to the main waterway or water body. Other commonly referred to flood-related terms include:

- Floodplain: Floodplains are lowland areas adjoining lakes, wetlands, and rivers that are susceptible to inundation of water during a flood and that are included on the City's Flood Insurance Rate Map. The mapped floodplain is the area covered by the 100-year flood and it is usually divided into districts called the floodway and flood fringe. Areas where floodway and flood fringe have not been determined are called approximate study areas or general floodplain areas. Any development within a floodplain area requires a permit from the City and/or FEMA.

    - General Floodplain Area: The general floodplain area is determined using the best available data, in lieu of performing a detailed engineering study. These data may be from soils mapping, experienced high water profiles, aerial photographs of previous floods, or other appropriate sources. There are no associated published 100-year flood elevations with general floodplain delineations, unlike detailed study areas. General floodplain area is synonymous with approximate study area and unnumbered A-Zone.

    - Flood Fringe: That portion of the 100-year floodplain outside of the floodway.

    - Floodway: The floodway is the channel of a river or other watercourse and the adjacent land areas which would actively convey the 100-year flood plus 0.50-foot.

- Flood Frequency: The average frequency, statistically determined, for which it is expected that a specific flood stage or discharge may be equaled or exceeded.

    - 1% Chance Flood: The flood having a one-percent (1%) chance of being equaled or exceeded in any given year. A one-percent (1%) chance flood is synonymous with Base Flood, Regional Flood, or 100-year flood. Any development within this area requires a permit from the City.

    - 100-Year Flood: The flood having a one-percent (1%) chance of being equaled or exceeded in any given year. A 100-year flood is synonymous with Base Flood, Regional or 1% Chance Flood. Any development within this area requires a permit from the City.

    - Regional Flood**:** A flood which is representative of large floods known to have occurred generally in Minnesota and reasonably characteristics of what can be expected to occur on an

average frequency in the magnitude of the 100-year recurrence interval. Regional flood is synonymous with the term “base flood" used in the Flood Insurance Study. Any development within this area requires a permit from the City.

- Flood Obstruction: Any dam, well, wharf, embankment, levee, dike, pile, abutment, projection, excavation, channel rectification, culvert, building, wire, fence, stockpile, refuse, fill, structure or matter in, along, across or projecting into any channel, watercourse or regulatory flood hazard area which may impede, retard or change the direction of the flow of water, either in itself or by catching or collecting debris carried by such water, or that is placed where the flow of water, either in itself or by catching or collecting debris carried by such water, or that is placed where the flow of water might carry the same downstream to the damage of life or property.

- Flood Proofing: A combination of structural provisions, changes or adjustments to properties and structures subject to flooding primarily for the reduction or elimination of flood damages to properties, water and sanitary facilities, structures and contents of buildings in a flood hazard area in accordance with the Minnesota State Building Code.

- Regulatory Flood Protection Elevation (RFPE)**:** The elevation established by local ordinance to which all new floodplain development must be protected against flood damage. In Burnsville, the required low building elevation may be higher than the RFPE for some water bodies.

**Forebay:** An extra storage area provided near an inlet of a pond or BMP to trap incoming sediments, reducing the amount that accumulates in a pond or BMP.

**Freeboard:** A factor of safety usually expressed in feet above a certain flood level. Freeboard compensates for the many unknown factors (e.g., waves, ice, debris, etc.) that may increase flood levels beyond the calculated level. The vertical distance between the regulatory high water level determined by hydrologic modeling and flood protection elevation (e.g., low floor or opening of a building, overflow elevation of a road).

**Herbicide:** A chemical which is designed to kill vascular plants; vascular plants are those which have internal systems for transporting nutrients, water and gases.

**Impervious Surface:** The portion of the buildable parcel which has a covering which does not permit water to percolate into the natural soil. Impervious surface shall include, but not be limited to, buildings, all driveways and parking areas (whether paved or not), sidewalks, patios, swimming pools, tennis and basketball courts, covered decks, porches, and other structures. Open, uncovered decks are not considered impervious for the purposes of this ordinance. The use of patio blocks, paver bricks or class 5 gravel material are considered impervious surfaces as a majority of water runs-off the surface rather than being absorbed into natural soils underneath.

**Infiltration Basin:** An impoundment where incoming storm water runoff is stored until it gradually infiltrates into and through the soil of the basin floor.

**Infiltration Trench:** A conventional infiltration trench is a shallow, excavated trench that has been backfilled with stone to create an underground reservoir. Storm water runoff diverted into the trench

gradually exfiltrates from the bottom of the trench into the subsoil and eventually into the water table. An enhanced infiltration trench has an extensive pretreatment system to remove sediment and oil. It requires an on-site geotechnical investigation to determine appropriate design and location.

**Infrastructure:** Public facilities and services, including transportation, water and sewer, telecommunications, recycling and solid waste disposal, parks and other public spaces, schools, police and fire protection, and health and welfare services.

**Integrated Management Practice (IMP):** A range of small-scale stormwater controls or practices distributed throughout a site and intended to maintain flow patterns, filter pollutants and re-create or maintain existing site hydrology.

**Lake Classification:** See Water Body Classification System.

**Littoral Area:** Any part of a body of water 15 feet deep or less.

**Lowest Floor:** The lowest floor of the lowest enclosed area (including a basement). An unfinished or flood-resistant enclosure, usable solely for parking of vehicles, building access, or storage in an area other than a basement area, is not considered a building's lowest floor provided that such enclosure is not built so as to render the structure in violation of requirements.

**Lowest Floor Elevation (LFE) or Low Building Elevation (LBE):** The elevation of a building's lowest allowable floor above the one percent chance flood elevation established in this plan or the BFE defined by FEMA.

**Low Impact Development (LID):** An approach to stormwater management intended to protect water resources, reduce storm sewer infrastructure costs and provide a more attractive storm water management system. LID practices include reduced impervious surface coverage, disconnected impervious areas, infiltration systems, bioretention areas, rain barrels, green roofs, porous pavements and a long list of additional innovative storm water treatment practices which are intended to mimic the natural hydrology of a site and minimize the resulting impacts to receiving waters.

**Monotypic:** A pure stand of one type of vegetation with few other aquatic plant species present.

**Native:** A plant or animal species that naturally occurs in Minnesota and has not been introduced from another state or continent.

**Natural Community:** A community developed over time through natural ecosystem processes. Some natural communities are climax and some are perpetually successional due to ever-changing environmental factors. An extreme example of the latter is a river or lake beach where persistent wave or flooding action restricts significant vegetation establishment and succession towards a climax community.

**Natural Resource Analysis:** A report in map and text form identifying the existing natural features of a parcel of land and the relationship of a proposed use to the existing natural conditions of the parcel. Used in the determination of appropriate means to preserve and manage areas unsuitable for development in their natural state due to physical constraints or special protection status.

**New Development:** Development of a property or portion thereof that is currently not developed.

**New Impervious Area**: The new impervious surface areas of a project site shall be those that are proposed or created after July 1, 2008. Where multiple projects are proposed on the same parcel or project site, the new impervious is the cumulative new impervious areas created after July 1, 2008.

**NURP:** Nationwide Urban Runoff Program, a study by the U.S. Environmental Protection Agency. A key component of this program was to assess the effectiveness of urban runoff detention/retention basins (e.g., wet ponds and other BMPs) in removing pollutants from storm water runoff. NURP ponds are generally accepted in the area as ponds which have a pollutant removal efficiency on the order of 60 % for total phosphorus and 90 % for total suspended solids.

**Nutrient Spiraling:** The cumulative effect of nutrient loading on water resources in moving from headwaters of watershed to the most down stream end.

**Off-Line BMP:** A water quality facility designed to treat a portion of storm water (for example: 0.5 to 1.0 inches per impervious acre) which has been diverted from a stream or storm drain.

**Off-Line Treatment:** A BMP system that is located outside of the stream channel or drainage path. A flow diverter is used to divert runoff from the channel and into the BMP for subsequent treatment.

**Ordinary High Water Level:** The boundary of public waters and wetlands, and shall be an elevation delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. For watercourses, the ordinary high water level is the elevation of the top of the bank of the channel. For reservoirs and flowage, the ordinary high water level is the operating elevation of the normal summer pool.

**Peat Sand Filter:** BMP, utilizing the natural adsorptive features of fabric or hemic peat, which consists of a vertical filter system with a grass cover crop, alternating layers of peat and sand and a sediment forebay feature. The peat sand filter is presently used for municipal waste treatment systems and is being adapted for use in storm water management.

**Permanent Pool:** A 4 to 10-foot deep pool in a storm water pond system between the bottom of the pond and the elevation of the outlet pipe or structure. The permanent pool provides removal of urban pollutants through settling and biological uptake. Also referred to as the dead storage component of a wet pond.

**Perennial:** A plant that persists from year to year and usually produces reproductive structures in two or more different years.

**Pondscaping:** A method of designing the plant structure of a storm water wetland or pond using inundation zones. The proposed wetland or pond system is divided into zones which differ in the level and frequency of inflow. For each zone, plant species are chosen based on their potential to thrive, given the inflow pattern of the zone.

**Porous Pavement:** An alternative to conventional pavement whereby runoff is diverted through a porous asphalt, concrete or paver block layer and into an underground stone reservoir. The stored runoff then gradually infiltrates into the subsoil.

**Potential Storm Water Hotspots (PSH).** Commercial, industrial, institutional, municipal and/or other operations that may produce or present a higher risk of spills, leaks or illicit discharges. PSH may include gas stations, petroleum wholesalers, vehicle maintenance and repair, auto recyclers, recycling centers, scrap yards, landfills/solid waste facilities, wastewater treatment plants, airports, railroad stations and highway maintenance facilities.

**Predevelopment:** Predevelopment is defined as the conditions on the project site prior to the proposed improvements.

**Public Waters:** Water basins assigned a shoreland management classification by the Commissioner under Sections 103F.201 to 103F.221, except wetlands less than eight (8) acres in size that are classified as natural environment lakes. Waters of the state that have been finally determined to be public waters or navigable waters by a court of competent jurisdiction. Meandered lakes, excluding lakes that have been legally drained. Water basins previously designated by the Commissioner for management for a specific purpose such as trout lakes and game lakes pursuant to applicable bylaws. Water basins designated as scientific and natural areas under Section 84.033. Water basins located within and totally surrounded by publicly owned lands.

Water basins where the State of Minnesota or the federal government holds title to any of the beds or shores, unless the owner declares that the water is not necessary for the purposes of the public ownership. Water basins where there is a publicly owned and controlled access that is intended to provide for public access to the water basin. Natural and altered water courses with a total drainage areas greater than two (2) square miles. Natural and altered water courses designated by the Commissioner as trout streams. Public waters wetlands, unless the statute expressly states otherwise.

**Reach:** A hydraulic engineering term to describe a longitudinal segment of a stream or river influenced by the natural or man-made obstruction. In an urban area, the segment of a stream or river between two (2) consecutive bridge crossings would most typically constitute a reach.

**Redevelopment:** Any development including but not limited to rebuilding, renovation, revision, remodel, reconstruction or redesign of or at an existing development.

**Retention:** The permanent storage of runoff from rainfall and snowmelt events with volume reduction coming from infiltration evaporation or emergency release.

**Retrofit:** The creation/modification of storm water management systems in developed areas through the construction of wet ponds, infiltration systems, wetland plantings, steam bank stabilization, and other BMP techniques for improving water quality and creating aquatic habitat. A retrofit can consist of the construction of a new BMP in the developed area, the enhancement of an older storm water management structure, or a combination of improvement and new construction.

**Riprap:** A combination of large stone, cobbles and boulders used to line channels, stabilize banks, reduce runoff velocities, or filter out sediment.

**Riser:** A vertical pipe extending from the bottom of a pond BMP that is used to control the discharge rate from a BMP for a specified design storm.

**Runoff (Storm Water):** The overland and near surface flow from storm water and snowmelt.

**Runoff Conveyance:** Methods for safely conveying runoff to a BMP to minimize disruption of the stream network, and promote infiltration or filtering of the runoff.

**Runoff Pretreatment:** Techniques to capture or trap coarse sediments before they enter a BMP to preserve storage volumes or prevent clogging within the BMP. Examples include forebays and micropools for pond BMPs, and plunge pools, grass filter strips and filter fabric for infiltration BMPs.

**Surface Area-to-Voids Ratio (SA/V):** The surface area to volume ratio is a useful measure of the capacity of storm water wetland to remove pollutants via sedimentation, adsorption, and microbial activity. The SA/V ratio can be increased by either increasing the surface area of a wetland or increasing the internal structural complexity within the wetland.

**Sand Filter:** A relatively new technique for treating storm water, whereby the first flush or runoff is diverted into a self-contained bed of sand. The runoff is then strained through the sand, collected in underground pipes and returned back to the stream or channel.

**Secchi Disc:** An 8-inch, white metal plate, attached to a calibrated rope use as a standard measure of water transparency.

**Sediment Forebay:** Storm water design feature that employs the use of a small settling basin to settle out incoming sediments before they are delivered to a storm water BMP. Particularly use full in tandem with infiltration devices, wet ponds or marshes. See also Forebay.

**Shoreland:** Land located within the following distances from public waters: one thousand feet (1,000') from the ordinary high water level of a lake, pond, or flowage; and three hundred feet (300') from a river or stream, or the landward extent of a floodplain designated by ordinance on a river or stream, whichever is greater. The limits of shoreland may be reduced whenever the waters involved are bounded by topographic divides which extend landward from the waters for lesser distances and when approved by the Commissioner of the DNR.

**Short Circuiting:** The passage of runoff through a BMP in less than the theoretical or design treatment time.

**Slope:** The degree of deviation of a surface from the horizontal, usually, expressed in percent or degrees.

**Storm Water Treatment:** Detention, retention, filtering or infiltration of a given volume of storm water to remove urban pollutants, reduce the runoff volume and/or reduce the potential for flooding.

**Stream Buffer:** A variable width strip of vegetated land adjacent to a stream that is preserved from development activity to protect water quality aquatic and terrestrial habitats. See also buffer and buffer strip.

**Structure:** Anything which is built, constructed or erected; an edifice or building of any kind; or any piece of work artificially built up and/or composed of parts joined together in some definite manner whether temporary or permanent in character. Among other things, structures including but not limited to buildings, gazebos, decks, retaining walls, walls, fences over six feet (6') in height, and swimming pools.

**Treatment Volume (Vt):** The volume of storm water runoff that is treated within a BMP. Typically expressed in terms of inches (i.e., depth) over the impervious area or inches over the contributing drainage area to a treatment system.

**Underdrain:** Plastic pipes with holes drilled through the top, installed on the bottom of an infiltration BMP, or sand filter, which are used to collect and remove excess runoff.

**Undeveloped Property:** Any property within the City on which no development (as defined in City Code 10-4-2) has occurred.

**Vacuum Sweeping:** Method of removing quantities of coarse-grained sediments from porous pavement in order to prevent clogging. Not effective in removing fine-grained pollutants.

**Vegetated Filter Strip:** A vegetated section of land designed to accept runoff as overland sheet flow from upstream development. It may adopt any natural vegetated form, from grassy meadow to small forest. The dense vegetative cover facilitates pollutant removal. A filter strip cannot treat high velocity flows; therefore, they have generally been recommended for use in agriculture and low-density development. A vegetated filter strip differs from a natural purpose of pollutant removal. A filter strip can also be an enhanced natural buffer, however, whereby the removal capability of the natural buffer is improved through engineering and maintenance activities such as land grading or the installation of a level spreader. A filter strip also differs from a grassed swale in that a swale is a concave vegetated conveyance system, whereas a filter strip has a fairly level surface.

**Vegetation, Native:** The pre-settlement group of plant species native to the North American continent that were not introduced as a result of European settlement.

**Vegetative Propagation:** Plant reproduction by means other than seeds, such as by fragments.

**Watershed:** The 81 major watershed units delineated by the State of Minnesota Watershed Boundaries 1979 map.

**Wetland:** Lands transitional between terrestrial and aquatics systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this definition, wetlands must have three (3) of the following attributes:

- A predominance of hydric soils.

- Inundation or saturation by surface or ground water at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions.
- Under normal circumstances, support a prevalence of such vegetation.

**Wetland Classification System:** The City of Burnsville's Wetland Protection and Management Plan classifies wetland basins according to the following system:

- *Protection Areas* - Basins with Native Grades of A or B, sites with complete Community Structure, any sites supporting rare species, and any sites within or adjacent to significant natural communities as identified by the Dakota County Biological Survey. This is comparable to the Preserve Classification used in the MnRAM.
- *Improvement Areas* - Basins with 3 of 4 of the Community Structure criteria, sites greater than ten acres in size, Minnesota Department of Natural Resources Protected Waters and Wetlands (Public Waters), and basins within existing City parks that are not classified as Protection Areas. Although there is some overlap, this classification is similar to the Manage I and Manage II MnRAM classifications.
- *Management Areas* - Remaining wetlands, but generally of low quality and located outside of protected areas. These wetlands are also likely to receive untreated storm water runoff, but have not been altered to enhance treatment capabilities. This classification is comparable to the Manage II and Manage III MnRAM classifications.
- *Management II Areas* – These basins include any of the water features that may have been historic wetlands, and would remain subject to the requirement of the Wetland Conservation Act. These basins will have minimal protection standards as they currently function primarily to provide storm water management.

**Wetland Mitigation:** Regulatory requirement to replace wetland areas destroyed or impacted by proposed land disturbances with artificially created wetland areas.

**Wet Pond:** A conventional wet pond has a permanent pool of water for treating incoming storm water runoff.

**Zoning District:** An area or areas of the City (as delineated on the Zoning Map) set aside for specific uses with specific regulations and provisions for use and development

**Zoning District Overlay:** A zoning district containing regulations superimposed upon other zoning district regulations and superseding the underlying zoning district use regulations.

## ACRONYMS

| | |
|---|---|
| **BMP** | Best Management Practices |
| **BWSR** | Minnesota Board of Water and Soil Resources |
| **DNR** | Department of Natural Resources |
| **EPA** | United States Environmental Protection Agency |
| **EPI** | Effective Percent Impervious |
| **EQB** | Environmental Quality Board |
| **EQC** | Environmental Quality Committee |
| **GIS** | Geographic Information System |
| **SWCD** | Soil and Water Conservation District |
| **IMP** | Integrated Management Practice |
| **LID** | Low Impact Development |
| **MPCA** | Minnesota Pollution Control Agency |
| **MS4** | Municipally Separate Storm Sewer System |
| **MUSA** | Metropolitan Urban Services Area |
| **NPDES** | National Pollutant Discharge Elimination System |
| **NURP** | Nationwide Urban Runoff Program |
| **ppb** | parts per billion |
| **SWPPP** | Storm Water Pollution Prevention Plan (or Program) |
| **TMDL** | Total Maximum Daily Load |
| **TP** | Total Phosphorus |
| **TSS** | Total Suspended Solids |
| **WD** | Watershed District |
| **WMO** | Water Management Organization |
| **WRMP** | Water Resources Management Plan |

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## Appendix A – Minnesota River Quadrant Analysis

**Appendix A previously contained:**

**SPECIAL STUDY: LAKE LEVEL MANAGEMENT**

Deleted in 2008 Update: Refer to October 2002 Plan

# MEMORANDUM

TO: City of Burnsville

FROM: Susan L Severa

DATE: July 18, 2006 (Revised – February 2008 - RBL)

RE: Minnesota River Quadrant
SEH No. A-BURNS0604.00

**Background**

The Minnesota River Quadrant (MRQ) is approximately 825 acres situated in the northwest corner of the City of Burnsville. Generally, the area is bounded on the south by TH 13, on the east by I-35W, on the north by the Minnesota River, and on the west by Lynn Avenue.

In January 2006, the City of Burnsville contracted with DSU to prepare a land use plan for the MRQ. Attached is the land use plan DSU proposed for the MRQ. The plan assumes full development of the MRQ area and details the future land use, road locations and conceptual pond sizes and locations.

It is important to note the inclusion of Quarry Lake in the MRQ. Future Quarry Lake is situated at the existing Kraemer Quarry location and is expected to serve as a surface water source for the City of Burnsville. Once current quarry activities have ceased groundwater will recharge the cavity and form Quarry Lake. Knowing future Quarry Lake will serve as a drinking water source for the City and should be treated as a sensitive resource, special attention must be paid to proposed development and the corresponding storm water management within the MRQ.

In addition, the land plan from DSU includes Industrial Park Pond (IPP) as a regional storm water facility. The City desires to optimize the IPP as a storm water management facility. IPP will provide both water quality and flood control for a substantial contributing area.

The entire area within the MRQ flows north into the Minnesota River. The Minnesota River is a protected resource, and all development activities within the corridor must conform to the City's most strict storm water management goals (as proposed). This means all development must not exceed existing 2, 10, and 100-year peak flow conditions and remove 90% Total Suspended Solids (TSS) and 60% Total Phosphorous (TP) from the storm water. Additionally, any development disturbing more than one acre must complete and obtain a Minnesota Pollution Control Agency (MPCA) National Pollutant Discharge Elimination System (NPDES) permit.

In order to protect the City's existing drinking water sources, the City has identified areas of high vulnerability for drinking water contamination and prohibited infiltration within these areas. The attached Figure of Prohibited Infiltration Areas shows the MRQ area is located within the designated boundary.

**Analysis**

The following hydrologic analysis was completed using the DSU land plan. The land plan was broken into smaller drainage areas, as shown in the attached exhibit. This analysis examined each drainage area to determine the approximate amount of dead storage volume required in order to meet the City's water quality guidelines set forth in the Water Resources Management Plan.

In order to better understand the storage requirements for each approximate ponding area, a HydroCAD model was generated. An estimated normal water level, bottom and top contour was assigned to each conceptual ponding area shown on the DSU land plan. Side slopes for the live and dead storage areas are estimated to be 3:1, and all ponds shall have a 10:1 bench below the normal water level. The ponds were hydraulically connected where feasible. See the attached exhibit for routing details. A 100-year (6.0-inch), 24-hour storm with a Type II Distribution was used to simulate high water levels within the approximate ponding areas.

This analysis did not specifically model rate control for each development within the MRQ. Rate control is accomplished by limiting the peak run-off rates for the 2, 10 and 100-year rainfall events to existing conditions. During final design, ponding areas can be designed to achieve rate control through the outlet size and live storage area. Detailed calculations for the time of concentrations for each subwatershed were not completed. Rather, a reasonable time of concentration was assigned based on contributing area and amount of impervious cover within each subwatershed. No existing utilities were investigated for potential conflicts in the proposed routing of ponds. No soils survey has been completed within the MRQ for use in this analysis. All soils were assumed to be Type B. The location of the bedrock will need to be determined prior to final design because very shallow bedrock has been found in a nearby project. Each development which disturbs more than one acre will be responsible for obtaining an NPDES permit from the MPCA.

Table 1 identifies the Curve Number (CN) assigned to a subwatershed based on the proposed land use.

**Table 1. Proposed Curve Number**

| Land Use | CN |
|---|---|
| Industrial | 88 |
| Commercial | 92 |
| Office Park | 92 |
| Medical Campus | 88 |
| Multi-Family | 85 |
| Park | 69 |
| Roadway | 98 |

The required dead storage volume for each drainage area was calculated based on 2.5-inches over the entire contributing drainage area. The resulting dead storage volume is a conservative

estimate of the volume which is required to meet the City's proposed 90% TSS and 60% Total Phosphorous TP removal rates. FEMA Flood Insurance Rate Maps for the MRQ area within Burnsville were also examined (see attached). Any development that may fall within a 100-year flood hazard boundary will need to follow all local, state and federal rules.

**Results**

Table 2 summarizes the drainage areas west of future Quarry Lake which will not receive treatment in Industrial Park Pond. In this analysis, all drainage areas listed within Table 2 shall have appropriate storm water management facilities constructed on-site as per the City's requirements.

In a Feasibility Report titled, "Industrial Park Pond at Hwy 13 and Washburn Ave," completed in April 2002, the City retained SEH to complete a study on the feasibility of constructing Industrial Park Pond through the use of property assessment funding. The report found Industrial Park Pond constructed to a 6-foot depth could provide approximately 64 ac-ft of dead storage. This design for the Industrial Park Pond would have treated approximately 552 acres of land to the City's previous treatment standards. Table 3 summarizes the drainage areas contributing to the IPP for this analysis.

Based on the DSU land plan, we estimated IPP with a depth of 10-feet below the normal water level. At a depth of 10-feet, the approximate dead storage volume available within IPP is 77 ac-ft. Approximating the dead storage volume from the conceptual ponding areas within the drainage areas listed in Table 3, these areas could provide approximately 27 ac-ft of volume prior to entering IPP. Subtracting the 27 ac-ft of available dead storage within the conceptual ponds from the required dead storage volume of 79 ac-ft, approximately 52 ac-ft of dead storage volume within the IPP will be used to treat the contributing drainage areas. The remaining 25 ac-ft of volume within IPP could be used to treat areas outside of the MRQ. Otherwise, the IPP could be constructed at a shallower depth if the City determined no need for excess volume within IPP.

It is not feasible to route the remaining drainage areas back to the IPP, so the storm water management will need to occur either on site or in a regional pond. Table 4 summarizes the areas east of Quarry Lake not treated within Industrial Park Pond.

Generally the area east of Quarry Lake outlined in Table 4, above, does not appear to have enough dead or live storage volume within the conceptual ponds shown on the land plan. The conceptual ponding areas will need to be bigger, or the City may choose to create a second regional storm water facility (similar to IPP) which would serve these drainage areas instead of multiple smaller ponding areas.

## Conclusions

Based on the results above, the following is a summary of conclusions for hydrologic analysis the MRQ:

1. Wetland impacts will need to be evaluated during final design. All wetland impacts shall be mitigated in accordance with local, state and federal laws.
2. Because of the MRQ's location within the City, all ponding areas must be lined to prevent storm water from entering the City's drinking water supply.
3. Infiltration is prohibited within the MRQ.
4. During final design proposed storm water treatment facilities may be reduced in size if the developer can show their proposed ponds meet the desired removal rates. P8, or an equivalent model accepted by the City, must be used to show these removal rates.
5. Filtration is encouraged and may be used in lieu of infiltration. Filtration may be modeled as infiltration, accordingly.
6. Rate control was not modeled in detail in this analysis and must be considered during final design.
7. The areas east of Quarry Lake which are not included in IPP do not show sufficient ponding areas within the conceptual land plan.
8. Regional ponding facilities are preferred over small ponds within each site. It may be beneficial to consider a regional pond within the areas east of Quarry Lake which are not included in IPP.
9. During final design, all ponds should be modeled to show proper management of the 100-year, 24-hour storm event (6.0-inch). Additionally, all ponds should be designed to meet the City's water quality requirements.
10. All ponds should include an extreme event overflow device, and routing of the extreme event should be considered during final design.
11. Any development occurring within FEMA's designated 100-year flood hazard boundary will need to follow all local, state and federal rules. No fill or development shall occur within the regulatory floodway.

**Table 2 Areas West Quarry Lake Not Treated in Industrial Park Pond**

| Drainage Area ID | Land Use | Area (acres) | Dead Storage Needed (ac-ft) (1) | Comments |
|---|---|---|---|---|
| 1 | Golf Course | 207.0 | 43.13 | Will be designed on top of existing landfill; assume design will include water hazards which will serve as storm water management facilities; may also utilize existing ponds constructed for landfill. |
| 4 | Industrial | 45.0 | 9.38 | 2 conceptual ponds shown on layout; ponds modeled together; conceptually the ponds meet dead and live storage requirements; ponds will serve Tract 4 only |
| 5 | Park | 22.0 | 4.58 | 1 conceptual pond shown on layout; conceptually the pond does not meet the dead storage requirement; pond will serve Tract 5 only |
| | **Total** | **274.0** | **57.1** | |

(1) Calculated based on 2.5-inches over the contributing drainage area. This is a conservative estimate of the storage volume needed.

**Table 3 Contributing Areas to Industrial Park Pond**

| Drainage Area ID | Land Use | Area (acres) | Dead Storage Needed (ac-ft) (1) | Comments |
|---|---|---|---|---|
| 2 | Existing | 62.0 | 12.92 | No conceptual ponds shown on layout; this area can be treated within IPP if it is feasible to construct storm sewer to avoid the existing box culvert along the eastern side of Tract 2 |
| 3 | Commercial | 27.0 | 5.63 | No conceptual ponds shown on layout; this area can be treated within IPP |
| 6 | Industrial | 57.0 | 11.88 | 2 conceptual ponds are shown on layout; ponds modeled together; routed to IPP; conceptually the ponds do not meet the dead storage requirement; remaining dead storage can be achieved in IPP |
| 7 | Office | 6.3 | 1.31 | 1 conceptual pond shown on layout; Pond 7 routed to Pond 6; conceptually the pond does not meet dead storage requirement; remaining dead storage can be achieved in IPP |
| 7a | Office | 9.0 | 1.88 | No conceptual pond shown on layout; routed to easterly Pond 10a; this area can be treated within IPP |
| 7b | Office | 10.5 | 2.19 | 1 conceptual linear pond shown on layout; Pond 7b routed to Pond 9; conceptually the pond does not meet dead storage requirement; remaining dead storage can be achieved in IPP |
| 7c | Office | 13.4 | 2.79 | No conceptual pond shown on layout; routed to Pond 9a; this area can be treated within IPP |
| 7d | Office | 19.1 | 3.98 | No conceptual pond shown on layout; routed to northern Pond 6; this area can be treated within IPP |
| 8 | Commercial | 19.0 | 3.96 | No conceptual pond shown on layout; routed to Pond 11; this area can be treated within IPP |
| 9 | Industrial | 10.0 | 2.08 | 2 conceptual ponds shown on layout; Tract 9 routed to Pond 9 (easterly); Pond 9 routed to Pond 9a (westerly); conceptually the ponds meet the dead and live storage requirement |
| 10 | Industrial | 26.0 | 5.42 | 2 conceptual ponds shown on layout; Tract 10 routed Pond 10 (westerly); Pond 10 routed to Pond 10a (easterly); Pond 10a routed to the Pond 7b; conceptually the ponds do not meet dead storage requirement; remaining dead storage can be achieved within IPP |
| 11 | Office | 29.0 | 6.04 | 1 conceptual pond shown on layout; Pond 11 routed to Pond 6; conceptually the pond does not meet dead storage requirement; remaining dead storage can be achieved within IPP |
| 12 | Medical Campus | 44.1 | 9.19 | 1 conceptual pond shown on layout; Pond 12 routed to Pond 7b; conceptually the pond does not meet dead storage requirement; remaining dead storage can be achieved within IPP |
| 12a | Medical Campus | 4.9 | 1.02 | 1 conceptual pond shown on layout; Pond 12a routed to Pond 12; conceptually the pond does not meet dead storage requirement; remaining dead storage can be achieved within IPP |
| 13 | Existing | 28.0 | 5.83 | No conceptual ponds shown on layout; this area can be treated within IPP if it is feasible to construct storm sewer along railroad and directly into IPP |
| 14 | CSAH 5 Roadway | 16.0 | 3.33 | No conceptual ponds shown on layout; this area can be routed to Pond 7; treatment can be achieved within IPP |
| | **Total** | **381.3** | **79.4** | |

(1) Calculated based on 2.5-inches over the contributing drainage area. This is a conservative estimate of the storage volume needed.

**Table 4 Areas East of Quarry Lake Not Treated Within Industrial Park Pond**

| Drainage Area ID | Land Use | Area (acres) | Dead Storage Needed (ac-ft) (1) | Comments |
|---|---|---|---|---|
| 15a | Office/Commercial | 29.7 | 6.19 | 1 conceptual pond shown on layout; Pond 15a routed to Pond 15e; conceptually the pond does not meet dead storage requirements |
| 15b | Office/Commercial | 3.3 | 0.69 | 1 conceptual pond shown on layout; Pond 15b routed to Pond 15e; conceptually the pond does not meet dead storage requirements |
| 15c | Office/Commercial | 2.5 | 0.52 | 1 conceptual pond shown on layout; Pond 15c routed to Pond 15b; conceptually the pond does not meet dead storage requirements |
| 15d | Office/Commercial | 15.4 | 3.21 | 1 conceptual pond shown on layout; Pond 15d routed to Pond 15e; conceptually the pond does not meet dead storage requirements |
| 15e | Office/Commercial | 23.1 | 4.81 | 2 conceptual ponds shown on layout; Pond 15e routed to Pond 15ea; conceptually the ponds does not meet dead storage requirements |
| 16 | Multi-Family | 15.0 | 3.13 | No conceptual pond shown on layout; Tract 16 routed to Pond 17b; no treatment is provided for this tract within the DSU layout |
| 17a | Office | 6.3 | 1.31 | 1 conceptual pond shown on layout; Pond 17a routed to Pond 17b; conceptually the pond does meet dead storage requirements |
| 17b | Office | 11.4 | 2.38 | 1 conceptual pond shown on layout; Pond 17b routed to Pond 17d; conceptually the pond does not meet dead storage requirements |
| 17c | Office | 9.1 | 1.90 | 1 conceptual pond shown on layout; Pond 17c routed to Pond 17d; conceptually the pond does not meet dead storage requirements |
| 17d | Office | 27.2 | 5.67 | 1 conceptual pond shown on layout; Pond 17d will discharge north to the Minnesota River; conceptually the pond does not meet dead storage requirements |
| 18 | Commercial | 24.0 | 5.00 | 1 conceptual pond shown on layout; Pond 18 will discharge north to the Minnesota River; conceptually the pond does not meet dead storage requirements |
| | **Total** | **167.0** | **34.8** | |

(1) Calculated based on 2.5-inches over the contributing drainage area. This is a conservative estimate of the storage volume needed.

sls
Attachment

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Office/ office showroom
Commercial/ mixed use
Industrial
Medical Technical Campus
Regional Riverfront Trail

APPROXIMATE SCALE

1000 0

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD BOUNDARY AND FLOODWAY MAP

CITY OF
BURNSVILLE
MINNESOTA
DAKOTA COUNTY

COMMUNITY-PANEL NUMBER
270102 0001

PAGE 1 OF 2
(SEE MAP INDEX FOR PAGES NOT PRINTED)

EFFECTIVE
SEPTEMBER 1, 1977

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

# MEMORANDUM

TO: Bud Osmundson – Director of Public Works/City Engineer
Terry Schultz – Director of Natural Resources
City of Burnsville

FROM: April Bielejeski
Ron Leaf
SEH

DATE: July 25, 2007

RE: Minnesota River Quadrant (MRQ) Pond Options
SEH No. A-BURNS0702.00

An analysis previously completed by SEH (Memorandum dated July 18, 2006) proposed pond locations and treatment options for the MRQ area. Since that time the original Industrial Park Pond location is no longer available. The City of Burnsville has therefore, requested alternate pond location options for the area. This analysis is focused on identifying treatment locations and quantifying the treatment capacity for these locations in the area west of I35-W, and between TH13 to the south and the rail road to the north. Additional areas north of the rail road and new CSAH 5 extension may also be available (e.g., a portion of the property between the CSAH 5 extension and Cliff Road).

According to the previous analysis and the City's proposed 90% Total Suspended Solids and 60% Phosphorous removal rates, the Industrial Park area within the MRQ will need a combination of ponds to obtain approximately 63.5 ac-ft of dead storage. This dead storage volume is based on 2.0 inches of depth over the contributing drainage area. The attached figure indicates the location of the existing ponds and potential future pond locations. Table 1 on page 2 of this memorandum summarizes the estimated pond dead storage volumes that could be obtained in each of the areas. The detailed design process will be able to refine the dead storage volume and resulting treatment efficiency that could be obtained at each location.

The sub-areas identified in Table 1 are approximate and intended to help group the ponding areas into the most likely routing directions based on the existing infrastructure. Some of the pond locations may be able to be routed to the east or central areas, such as ponds 3 and 7. As stated above, additional areas north of the proposed CSAH 5 extension and north of Pond EX-4 may also be available. For example, a portion of the parcel between the CSAH 5 extension and Cliff Road could be used for a pond about the size of pond 6 or 11.

The existing ponds were modeled using aerial photos and 2-ft contours. Each pond was assumed to have a 10:1 bench and 3:1 side slopes up to 10-ft below the Normal Water Level (NWL). The potential pond locations were assumed to consist of a pond having a 10:1 bench at the NWL, 3:1 side slopes to the top of pond (9-ft above the NWL), and 3:1 side slopes to the bottom of pond (11-ft below the NWL). The proposed locations were chosen based on the available open area indicated in the aerial photographs and contour elevations.

For information about how the required 63.5 ac-ft (rounded to 64 in the Table) of storage was obtained please refer to the July 18, 2006, memorandum.

If you have any questions about the proposed locations or the available storage please contact April at 320.229.4329 or Ron at 651.765.2998.

**Table 1. Summary of Existing and Potential Ponds in the Southern Portion of the MRQ.**

| **Sub-Area** (Note 2) | **Pond Location/ID** | **Existing Pond** (Yes/blank if no) | **Dead Storage** (acre-feet) | **Approximate Dead Storage Needed** |
|---|---|---|---|---|
| West | EX-1 (Menards) | Yes | 4.0 | 24 acre-feet |
| | EX-2 (AVR) | Yes | 2.0 | |
| | 12 | | 0.2 | |
| | 13 (Addition to EX-1) | | 27.3 | |
| | 14 | | 10.6 | |
| | 15 | | 5.3 | |
| | Subtotal | | 49.4 | |
| | | | | |
| Central | P1 (see note 1) | | 2.3 | 24 acre-feet |
| | P2 (see note 1) | | 0.8 | |
| | EX-3 (Dealership) | Yes | 0.7 | |
| | 1 | | 11.0 | |
| | 2 | | 9.0 | |
| | 7 | | 12.5 | |
| | 8 (Addition to EX-3) | | 11.0 | |
| | 9 | | 9.0 | |
| | 10 | | 5.3 | |
| | Subtotal | | 61.6 | |
| | | | | |
| East | EX-4 | Yes | 2.0 | 16 acre-feet |
| | 3 | | 3.0 | |
| | 4 | | 9.5 | |
| | 5 | | 10.8 | |
| | 6 | | 4.1 | |
| | 11 | | 5.4 | |
| | Subtotal | | 34.8 | |
| Totals | | | 145.8 | 64 acre-feet |

Notes:
1. P1 and P2 locations were proposed with the future road layout for the CSAH5-TH13 Interchange.
2. Sub-areas are approximate based on where the likely routing of storm water would go. The west and central areas would likely be routed to the box culvert. The east area would be routed to the east into the existing drainage system.

ab
Attachment

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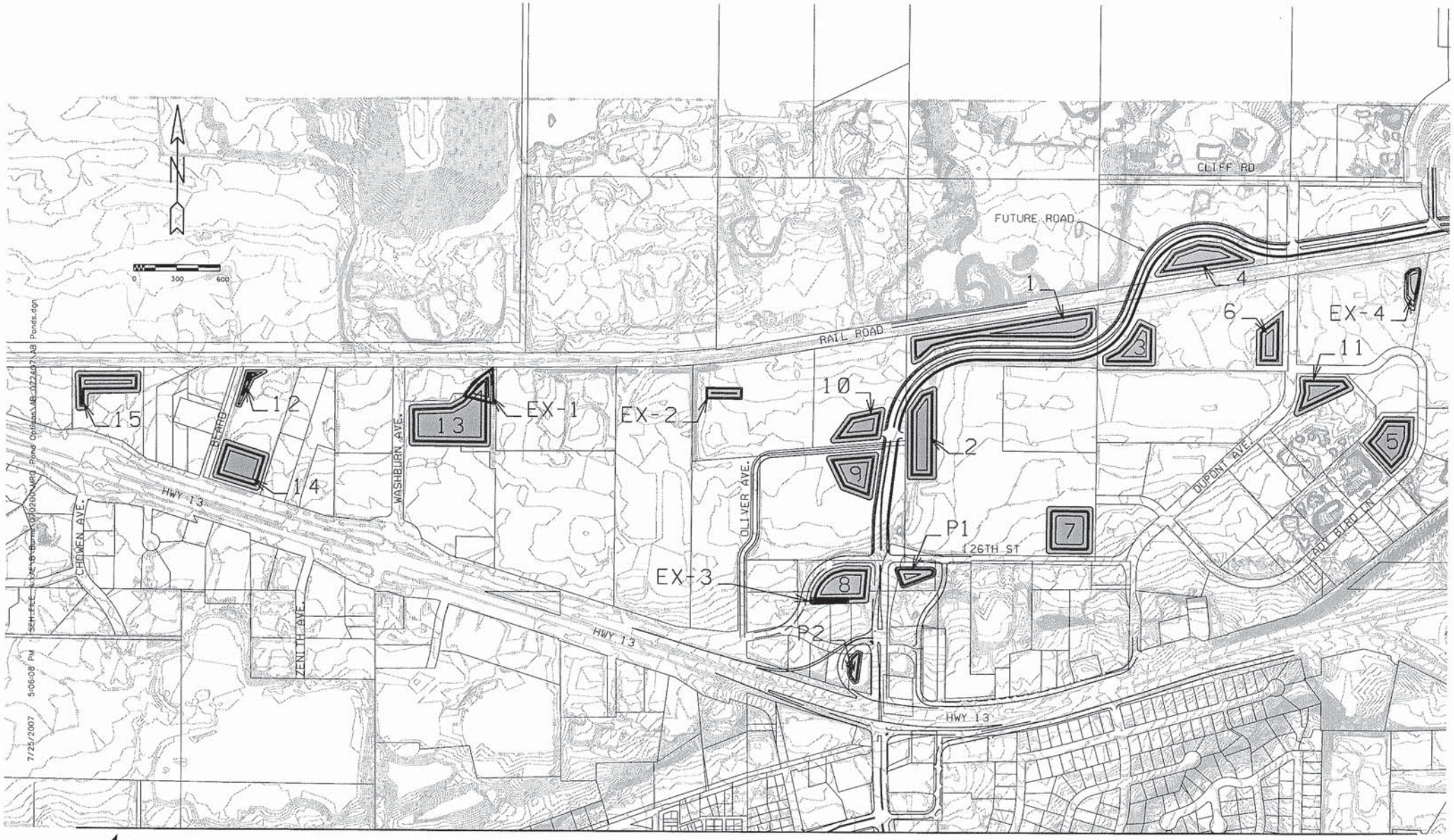



SEH

MINNESOTA RIVER QUADRANT
INDUSTRIAL PARK POND LOCATIONS
BURNSVILLE, MINNESOTA

FUTURE ROAD
RAIL ROAD
WASHBURN AVE
OLIVER AVE
DUPONT AVE
HWY 13
HWY 13
EX 3
EX 4
P1
1
2
3
4
5
6
7
8
9
13
SEH
MINNESOTA RIVER QUADRANT
INDUSTRIAL PARK POND LOCATIONS
BLOOMINGTON, MINNESOTA

## Appendix B - Volume Control / Infiltration Worksheet

This Appendix contains a worksheet and related information that can be used for evaluating conformance to the volume control and infiltration requirements for storm water practices and determining if proposed practices meet requirements specified in Appendix C.

The worksheet is used to evaluate if specific practices will meet the standards and how much volume or infiltration surface area may be needed for a specific project. The worksheet contains a step that accounts for non-infiltration practices where groundwater recharge will not directly occur, including rain barrels, cisterns, roof gardens and other "storage-type" practices.

The worksheet user should understand that soils information for the location of each infiltration practice is needed to complete the worksheet. The hydrologic information used to develop the runoff volumes for various soils is based on modeling the impervious surfaces and pervious surface of a site separately instead of using a composite curve number. In this way, a more realistic estimate of the runoff volume for smaller storms is achieved. The key hydrologic assumptions include using a 1.0-inch rainfall (Type II distribution with AMC 2) over an average 1-acre project site.

Step 1 requires the total site area in acres, the existing impervious area, the new impervious area, the redeveloping impervious area and the total impervious area after development. The new impervious area is the area where impervious surfaces will be created where there currently are not impervious surfaces. The redeveloped impervious surface includes, for example, building and parking lots that that will be demolished and rebuilt or where the subgrade soils will be exposed as part of the planned redevelopment work.

The total impervious area in acres is the total surface area of buildings, roads, sidewalks, parking lots and other impervious areas on the site upon completion of the project. The total site area is equivalent to the acreage of the entire tract or parcel.

Step 2 calculates the percent impervious for the proposed site plan.

In Step 3 the owner or developer determines the runoff volume per acre for the proposed site using the percent impervious from Step 2 by starting on the x-axis of the chart and drawing a line up vertically until it intersects the applicable soil group line. The relationship shown in Figure 1 is based on hydrologic model simulations using a Type II, 1.0-inch, 24-hour rainfall event for various levels of impervious coverage and soils ranging from Group A to Group D. The simulations modeled impervious and pervious portions of a site separately. Therefore, while there are some differences in runoff volume from a pervious surface between group A and group D soils, the soil type is not a significant factor in the runoff volume for the modeled 1-inch storm.

Step 4 calculates the total runoff volume that must be captured and treated in infiltration or filtration practices. The total volume is the total from new impervious areas and redevelopment areas. The volume from the new impervious areas is calculated by the full 1.0-inch runoff volume while the redevelopment area volume is calculated from a 0.5 inch runoff volume.

In Step 5 the portion of site runoff volume captured by filtration/storage-type (non-infiltration) practice, other than a traditional wet pond, will be accounted for. In general, this section will be used where infiltration is prohibited or site conditions are not suitable for infiltration. In some cases, a site may have a combination of filtration and infiltration BMPs.

For example, the volume captured by a rainwater garden with an under drain system is equal to the volume of rainfall that enters the planting soil plus the volume stored above the soil and below the outlet or overflow point. The volume captured in the soil is estimated as the volume of soil multiplied by the effective porosity of the soil. The effective porosity is estimated from the ranges of values presented in Applied Hydrology (Chow, et. al., 1988). For each non-infiltration practice to be used, the user should list the type, quantity and capacity of each practice in the chart provided below Table 1. If practices not listed are proposed, the user should enter a volume estimate in the chart and describe the method used to determine the volume. The result for Step 5 is the sum of the volumes captured by the different practice types.

In Step 6, users select a representative soil infiltration rate for the infiltration practices to be used at the site. If there are only filtration practices, then skip Steps 6 to 8 and go to Step 9 to determine if sufficient volume has been treated. Table 2 lists saturated infiltration rates for the four soil hydrologic soil groups and soil textures shown. If the user does not know the extent of soil conditions on the site or has not verified actual soil texture from field investigations, the most restrictive soil Group D should be used. If the user has verified on-site soil conditions and/or proposes to use the underlying soil with a permeability rate greater than those listed, data to support the infiltration rate must be submitted with the worksheet.

Step 7 is used to define the types and surface areas of specific practices to be used at the project site. Areas like a parking lot islands located above the elevation of the parking surface or boulevard grass sloping into the street curb and gutter system should not be considered as infiltration surface area in this section. Practices like infiltration trenches or basins, flat-sloped grassed swales, depressed parking lot islands and bio-retention areas can be included. The total surface area for infiltration practices is then calculated to obtain the Step 7 result.

Step 8 calculates the volume that can be infiltrated by practices in Step 7. In Step 8, the total surface area from Step 7 is multiplied by the infiltration rate from Step 6 (and a unit conversion factor) to obtain the volume infiltrated in cubic feet. The volume infiltrated represents a volume in a 48-hour period. This step assumes that the specific BMP design will provide for the entire excess runoff volume to be captured in the infiltration basin and that the BMP will drain fully within the 48-hour period. Note that the designer must also limit the maximum ponding depth in the practice to ensure it drains in 48 hours or less. For example, a Group C soil with a 0.2 in/hr infiltration rate will allow a maximum ponding depth of 0.8 feet, or about 9 inches.

Step 9 compares the total volume treated from both Step 5 and 8 to the volume need in Step 4. If the result for Step 9 shows that the volume control / infiltration requirements have not been met, the user should increase the storage capacity and/or infiltration surface area of the proposed practices in Steps 5 and 8, and recalculate the results through Step 9.

**Infiltration / Filtration System Evaluation**
**Burnsville, MN**
(page 1 of 3)

# Volume / Infiltration Practice Worksheet – Revised 2008

Owner / Developer Name: _____

Site Name/Block or Outlot ID:_____

**Step 1:** Determine the site areas for your project.

a. Total site area in acres. _____ acres

b. Existing impervious area in acres. _____ acres

c. New impervious area in acres. _____ acres

d. Redeveloped impervious area in acres _____ acres

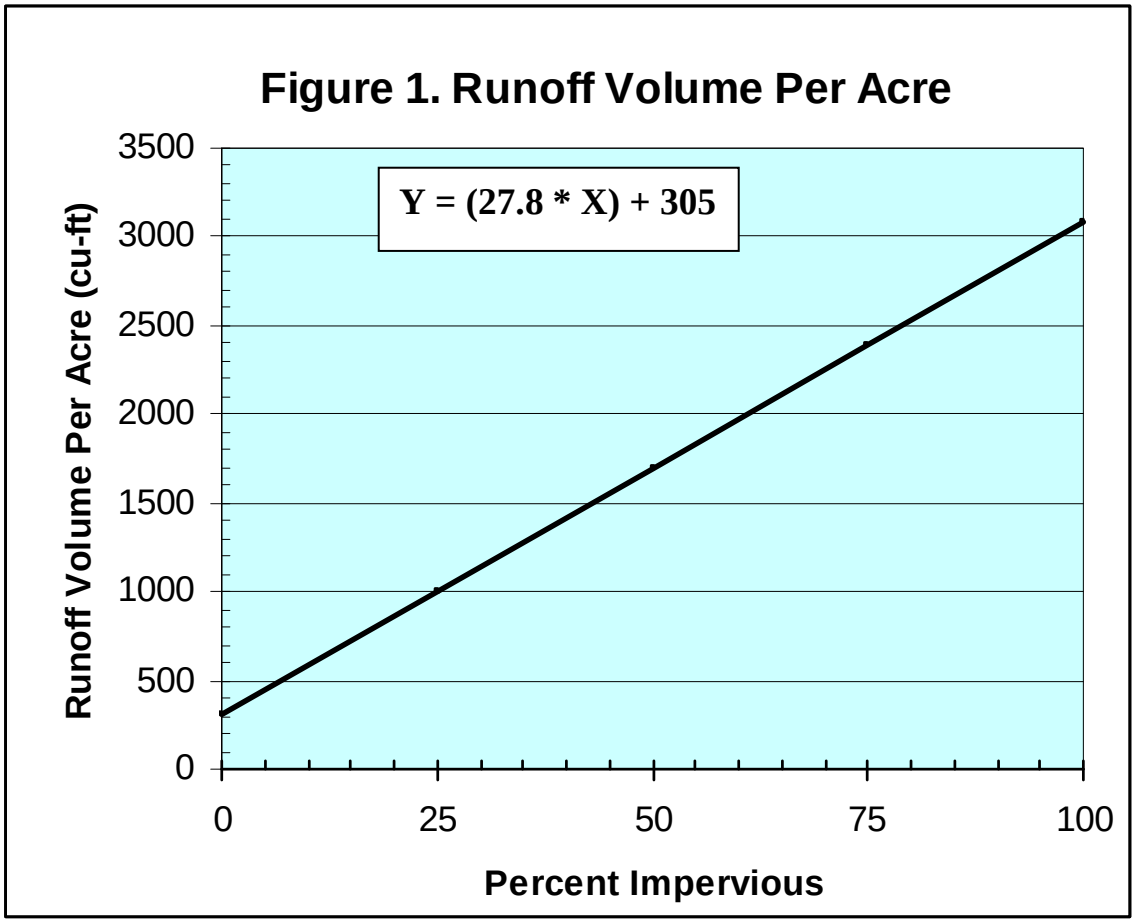
e. Total impervious area in acres. ( = 1b + 1c) _____ acres

**Step 2**: Determine the proposed percent impervious area for the site.

Site percent impervious = 100 x (Step 1.e. ÷ Step 1.a.) = 100 x (_____ ÷ _____ ) = _____ %

**Step 3:** Determine the post-development runoff per acre from Figure W-1.

Runoff per acre in cubic-feet = _____ cu. feet
(Obtained by drawing a line up from the percent impervious determined in Step 2 until it intersects the diagonal line, then drawing a line to left from that point to the total runoff per acre value. Or use the equation where X is the percent impervious)



**Step 4**. Calculate the site runoff volume required for infiltration/filtration.

Site runoff volume (cu. feet) = Runoff Per Acre (cubic-feet/acre) x Total Site Area (acres)

a. New Impervious Volume = Step 3 x (Step 1.c / Step 1.e) x Step 1.a.

= _____ x _____ / _____ x _____ = _____ cu.-ft

b. Redevelopment Volume = Step 3 x (Step 1.d / Step 1.e) x Step 1.a. x 0.5

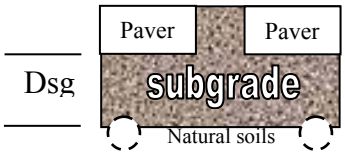
= _____ x _____ / _____ x _____ * 0.5 = _____ cu.-ft

c. Total Infiltration/Filtration Volume = Step 4.a + Step 4.b = _____ cu.-ft.

**Step 5**. Determine the runoff volume captured by filtration BMPs **(used where infiltration is prohibited)**

For each of the non-infiltration practices you will use, if any, enter the type and quantity/ID of each practice in the chart provided below. Select the volume calculation method from Table 1 that best fits the practice(s) or attach a separate sheet with calculations, calculate the volume-per-practice and a total volume for non-infiltration practices.

Table 1. Example Calculations for Volume Captured by Non-Infiltration BMPs.

| BMP Type | Volume Calculation (cubic-feet) | Notes |
|---|---|---|
| Green roofs – roof gardens<br><br>Rainwater Gardens or Bioretention areas<br>with an under drain | V = L x W x [(Ds x Pe) + Dt]<br> <br> | L = length of soil area (ft.)<br>W = width of soil area (ft.)<br>Ds = depth of soil (ft.)<br>Dt = depth of storage between soil surface and overflow of practice (ft.)<br>Pe = effective porosity of the soil = 0.4 (for this estimate).<br>Typical range, most soils = 0.3 - 0.5 |
| Porous Paver Systems – with an under drain<br><br>(may be accounted for here **or** in Step 8 – but **NOT** both.) | V = L x W x (Dsg x Pe)<br>  <br> | L = length of paved area (ft.)<br>W = width of paved area (ft.)<br>Dsg = depth of subgrade (ft.)<br>Pe = effective porosity of the subgrade = 0.32 |

List the type (by name and ID) of each practice to be used in the following chart. Calculate the total volume captured for the Step 5 result. Add additional sheets if more than 3 types of practices to be used.

| BMP Name / ID | Quantity | Vol.-per-practice (cubic-feet) | Total Practice Vol. = Quantity x vol.-per-practice (cubic-feet) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Volume Captured (add volumes in far-right column) = | | | |

**Step 6**. Select or Identify Soil Infiltration Rate. If not using infiltration, skip to Step 9.

For the detailed design stage, use the infiltration rate determined from site-specific soils investigation and lab testing. For planning purposes, the designer may select the infiltration rate from Table 2 that best reflects the soil type present at the site. If multiple soil-types are present, use the most restrictive soil hydrologic group when selecting an infiltration rate or complete Steps 6 to 8 for each of the different infiltration rate areas.

Infiltration Rate = _____ in/hr (circle soil hydrologic group(s) to be used in Table 2)

Table 2. Soil Infiltration Rates.

(Source: Infiltration rates taken from MPCA 2005 Minnesota Stormwater Manual, Version 1, Table 8.5.)

| Hydrologic Soil Group | Infiltration Rate (in/hr) | Soil Textures |
|---|---|---|
| A | 1.63 | Gravel, sandy gravel, silty gravel |
| | 0.80 | Sand, loamy sand, or sandy loam |
| B | 0.60 | Silt loam |
| | 0.30 | Loam |
| C | 0.20 | Sandy clay loam |
| D | < 0.20 | Clay loam, silty clay loam, sandy clay, silty clay, or clay |

**Step 7**. Identify infiltration practices and determine the total infiltration surface area.

For each of the practices you will use, enter the type and quantity of each in the chart provided below and calculate the surface area per-practice and a total horizontal surface area subject to prolonged wetting for infiltration practices.

| BMP Name / ID | Quantity | Area-per-practice (square-feet) | Total Practice Area = Quantity x area-per-practice (square-feet) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Infiltration LID Surface Area (add areas in far-right column) = | | | |

(*This is the Effective Pervious Area for practices to be used for infiltration. This number should only include areas available to accept runoff from impervious surfaces. Areas such as parking lot green islands located above the elevation of the parking surface should not be included here. This number should also not include the wetted area of permanent ponds.)

**Step 8**. Calculate the volume infiltrated by practices over 48-hours.

Volume Infiltrated = Step 7 x Step 6 x 48 x 1/12 = Step 6 x Step 7 x 4 =

= _____sq-ft. x _____in/hr. x 48 hrs x 1/12 ft/in = _____ cu.-ft

**Step 9**. Compare the excess runoff volume to the volume infiltrated by LID practices.

Verify that the total volume filtered in Step 5 and infiltrated in Step 8 is greater than the excess runoff volume calculated in Step 4. If the total of Steps 5 and 8 is greater than the amount from Step 4, sufficient practices have been planned to meet the City standards. The designer should refer to the City's design standards in Appendix C of the Water Resources Management Plan for more information of design requirements for infiltration practices. If the result for Step 4 is greater than the total form Steps 5 and 8, additional filtration and/or infiltration practices are needed.

Step 5 + Step 8 MUST BE GREATER THAN OR EQUAL TO Step 4

_____ MUST BE GREATER THAN OR EQUAL TO _____

## Appendix C – Development Standards

The City of Burnsville has developed specific requirements in this section that apply to development and redevelopment projects. These standards are intended to help achieve the water resource goals of the City's Water Resources Management Plan (WRMP) and help the City maintain compliance with the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit program and the related NPDES/SDS General Construction Stormwater Permit. This summary highlights important aspects of the requirements for storm water quality, discharge rate and volume control, wetland management and erosion control. This summary does not provide a complete listing of the requirements of this Plan or City Code. For a more detailed listing of requirements see the specific policies of the WRMP and the applicable City ordinances or consult with City staff on your specific project.

To accomplish these goals, it is important to the City to have consistent approaches to evaluating proposed development projects. Therefore, all hydrologic, hydraulic and water quality analyses must be prepared and submitted in a format that will allow for a timely and efficient review by City staff.

Project designers and/or developers are encouraged to schedule and complete a pre-design meeting with the City before any data will be accepted. The purpose of the meeting is to specifically address approvals and permits, pond requirements, trunk storm drain analysis, wetland impacts, water quality treatment, erosion control and discharge to lakes and sensitive wetland resources.

1) General

   a) Water quality treatment, volume control, water quantity and rate control requirements apply to any project which results in one-half acre or more of disturbed area or 5,000 square feet or more of new impervious area. For the purposes of these standards, the new impervious area shall be considered the cumulative new impervious area created after July 1, 2008.

   b) Projects conducting pavement reconstruction/rehabilitation only on existing impervious areas are exempt from rate, water quality, water quantity and volume control standards.

   c) Construction Site Erosion and Sediment Control standards apply to all projects.

   d) Additional requirements applicable to projects in Shoreland Areas are defined in City Code Section 10-8-10.

   e) Any project within a floodplain area requires a permit from the City and/or FEMA.

f) The owner shall submit the information listed in Section 10 of these Standards for review by the City.

g) Any project within the jurisdiction of the Vermillion River Watershed JPO that has obtained a variance from these standards by the City, must be reviewed and approved by the Vermillion River JPO.

2) Water Quality Treatment.

a) Infiltration / Volume Control Requirement:

1) For all new impervious portions of a project, a runoff volume of 1 inch must be treated in infiltration practices. The extent of infiltration / volume control practices required shall be determined using the worksheet in Appendix B.

2) For all redevelopment impervious portions of a project, a runoff volume of 0.5 inches must be treated in infiltration practices. The extent of infiltration / volume control practices required shall be determined using the worksheet in Appendix B.

3) For projects that have a combination of new and redevelopment, the treatment practices can be combined for the overall site, provided the overall combined treatment level meets or exceeds the levels above.

4) For projects in the Vermillion River Watershed, and that create one or more acre of new impervious surface, must control runoff volume for the 2-year, 24-hour storm event (2.75 inches) to the predevelopment volume.

b) Pollutant Removal Requirements. For projects that have met the infiltration/volume control requirements above, the pollutant removal requirements are considered to be met. For projects where infiltration is prohibited or restricted (see Items 3.a. and 3.b.), the following pollutant removal standards apply prior to reaching a downstream receiving water:

1) For new development portions of a site, provide treatment to remove 90% TSS and 60% TP as modeled on an annual basis.

2) For redevelopment portions of a site, provide treatment to remove 70% TSS and 30% TP as modeled on an annual basis.

3) For projects that have a combination of new and redevelopment, the treatment practices can be combined for the overall site, provided the overall combined treatment level meets or exceeds the levels above.

4) Design engineers and developers shall determine the pollutant removal efficiency of the BMP(s) incorporated into the site plan using the available industry standard models including P8 (and using a standard NURP particle size distribution for the analysis) or a comparable model approved by the City. As an alternative to preparing a site-specific

model, the development may provide a treatment volume (dead storage) of not less than 2.5 inches calculated over the contributing drainage area to the pond. For example, a 1-acre site that drains to a common treatment pond would be required to provide a dead storage volume of 0.21 acre-feet or 9,000 cubic feet.

3) Volume Control / Infiltration Practices.

a) Infiltration systems are prohibited:

1) Where industrial facilities are not authorized to infiltrate industrial stormwater under an NPDES/SDS Industrial Stormwater Permit issued by MPCA.

2) Where vehicle fueling and maintenance occur.

3) Where the bottom of the infiltration basin is less than 3 feet to bedrock or seasonally saturated soils.

4) Where high levels of contaminants in soil or groundwater will be mobilized by infiltration.

5) Within the areas designated as Very High Vulnerability and High Vulnerability within the Drinking Water Supply Management Area (DWSMA) identified in Figure C-1

b) The City restricts the use of infiltration systems in areas:

1) Low permeability soils (i.e., Hydrologic Soil Group D soils) or where a confining layer exists below the proposed basin.

2) Within 1,000 feet upgradient or 100 feet down gradient of active karst features.

3) Within the areas designated as: Moderate Vulnerability; and Low to Very Low Vulnerability within the Drinking Water Supply Management Area (DWSMA) identified in Figure C-1;

4) Where soil infiltration rates are more than 8.3 inches per hour.

;

c) For linear projects not meeting the exemption in Part 1.b., and where the lack of right-of-way precludes the installation of volume control practices that meet the requirements in Part 2 (Water Quality Treatment) and Part 3 (Volume Control/Infiltration Practices), the City may allow a lesser volume control on the construction site provided a reasonable attempt has been made to obtain right-of-way during the project planning process and:

1) The one or more of the prohibited or restricted site conditions listed above exists; and

2) The owner implements other practices (e.g., evapo-transpiration, reuse, conservation design, green roofs, etc.) on the construction site that may not fully meet the volume control requirements of Part 2 (Water Quality Treatment).

d) Infiltration practices must be designed to draw down to the bottom elevation of the practice within 48 hours. The maximum ponding depth shall be based on the soil infiltration rate determined from site-specific soils investigation data taken from the location of proposed

infiltration practices on the site. The soils investigation requirement may be waived for smaller residential property practices where the maximum ponding depth is one (1) foot or less.

e) Infiltration practices shall provide for pretreatment of the runoff. Examples of pretreatment include a mowed grass strip between a curb-cut and a small rain garden, a sump manhole or manufactured sediment trap prior to an infiltration basin and a sediment forebay as the first cell of a two-cell treatment system. Where the infiltration system captures only clean runoff (e.g., from a rooftop) pretreatment may not be required.

f) The design shall incorporate a diversion or other method to keep construction site sediment from entering the infiltration system prior to final stabilization of the entire contributing drainage area.

g) The design shall incorporate provisions that will prohibit construction equipment from compacting the soils where infiltration practices are proposed.

h) A plan for maintenance of the system must be submitted that identifies the maintenance activities and frequency of activities for each infiltration practice on the site.

4) Water Quantity / Flood Control.

a) The low building elevation shall be set to the higher of the following:

1) Where an effective Base Flood Elevation (BFE) has been established and is included in the City's FIRM, the low floor elevation adjacent to a surface water body shall be established in accordance with the City's Floodplain ordinance. The ordinance establishes the Regulatory Flood Protection Elevation (low floor elevation) at not less than one (1) foot above the BFE plus any increase due to encroachment of the floodway.

2) The low floor elevation shall be two (2) feet or more above the highest of the following:

(i) The 100-year/24-hour event as determined by a technical evaluation by a qualified engineer or hydrologist.

(ii) The 100-year/10-day runoff (snowmelt) event as determined by a technical evaluation by a qualified engineer or hydrologist.

b) An emergency overflow shall be incorporated into the site design at or above the BFE or modeled high water level to convey a 100-year discharge away from buildings to the next downstream water body. Existing, natural or man-made emergency overflows shall be analyzed as part of the design process. The lowest opening shall be at least 1.5 feet above the emergency overflow elevation of the adjacent water body, unless the analysis shows that adequate storage volume exists within the basin to provide a reasonable level of protection from potential flooding. Where a natural overflow does not exist, the designer shall consider the possibility of long duration events, such as multiple-year wet cycles and high runoff

volume events (e.g., snowmelt events that last for many weeks) when evaluating high water elevations and outlets from landlocked basins

c) Fill around a building or structure shall be above the BFE and extend a horizontal distance of at least 15 feet in all directions.

d) For underground parking structures with a low floor elevation below the high water level or emergency overflow elevation, the drainage system within the parking structure shall include anti-backflow devices and flood protected to minimize the impacts of high ground water levels during flood events.

e) Projects in the Vermillion River Watershed must not result in a net loss in floodplain storage.

f) For landlocked basins, where additional stormwater volume is proposed to be routed, consideration shall be given to the effects of increased flood levels on trees and vegetation and potential for erosion.

5) Rate Control.

a) Discharge rates leaving the site must not exceed the predevelopment rates for the 2, 10 and 100-year, critical duration (24-hour) storm events, using the updated Atlas 14 rainfall depths and antecedent moisture conditions 2 (AMC-2). The storm distribution shall be a NRCS Type II standard distribution until such time as the nested distribution for Atlas 14 based data becomes widely available in standard modeling software packages. Discharge rates leaving the site should be reduced from predevelopment rates where feasible. Predevelopment is defined as the conditions on the project site prior to the proposed improvements.

As an alternate to using the Type II storm distribution, designers may develop their own nested distribution using Atlas 14 data.

1) For projects in the Vermillion River Watershed, discharge rates leaving the site must not exceed the pre-development rates for the 1-year critical duration storm instead of, or in addition to, the 2-year event.

b) On-site rate controls may not be needed if downstream (regional) facilities can be shown to adequately detain/retain the runoff to existing conditions and in accordance with the rates established in Appendix D of this Plan. In this case, the developer or design engineer shall submit a technical evaluation completed by a qualified engineer or hydrologist which must be review and approved by the City Engineer.

c) Where a flow rate variance involves inter-community issues or significant water bodies, the regulatory jurisdiction shall have a review role. Any variances shall be reflected in subsequent plan submittals.

d) Project sites discharging directly to the Black Dog Fen must not increase the discharge rate from the site for the 1-year event.

e) For proposed outlets from landlocked basins, an analysis of the water quality and flooding impacts on intercommunity flows or any downstream strategic waterbodies shall be prior to construction of the outlet. If analyses indicate a potential adverse effect on water quality or increased flood potential, the city must notify the watershed organization prior to approving the outlet.

6) Special Waters and Wetlands.

a) Developments shall meet the requirements of the National Pollutant Discharge Elimination System (NPDES) permit program for all applicable requirements of the most recent permits including, but not limited to the following:

1) Sites discharging to Trout Stream #1, #4 or #7, must incorporate BMPs that address: runoff temperature requirements; maintain an undisturbed buffer zone of at least 100 feet between the project site and the trout stream; and cover exposed slopes that are steeper than 3:1 (H:V) within three days of the disturbance.

b) Horizontal vegetated buffer zones shall be established and/or maintained around existing wetlands and storm water treatment ponds. New development and redevelopment projects shall provide a buffer zone around wetlands in accordance with the requirements in the City's Wetland Protection and Management Plan. Storm water ponds with a permanent pool of water (i.e., wet ponds) shall have an average 20-foot buffer around the perimeter of the basin. The buffer shall extend form the normal water level to the top of the pond slope.

| Wetland Classification | Permanent Buffer Strip Average Width (feet) | Minimum Permanent Buffer Zone Width (feet) | Percentage Native Vegetation |
|---|---|---|---|
| Protection | 50 | 30 | Entire |
| Improvement | 35 | 25 | Entire |
| Management | 25 | 20 | Majority |
| Management II | 20 | 20 | Majority |

c) Water level fluctuations in wetlands shall be managed in accordance with the City's Comprehensive Wetland Protection and Management Plan. A rise (bounce) in elevation greater than 12 inches during a 10-year storm shall be avoided.

d) New discharge points to all wetlands and waters must include pretreatment. New direct discharges to Management II wetlands must have at least grit removal prior to discharge.

7) Design Computations.

a) All hydrologic data shall be completed using NRCS methodology; i.e. HydroCAD or TR20/TR55, XP-SWMM or a comparable, City approved method. Hydraulic calculations will be accepted in the rational method format or in commonly used software packages such as FHWA HY-8, Eagle Point or XP-SWMM or a compatible, City approved method. These computations shall be submitted to the City, upon request.

b) Rainfall amounts for hydrologic analysis shall be based on Atlas 14 data. Burnsville analyses shall use the values in the following table.

| **Rainfall Frequency** | **Rainfall (Inches)** |
|---|---|
| 2-Year / 24-Hour | 2.9 |
| 10-Year / 24-Hour | 4.3 |
| 100-Year / 24-Hour | 7.5 |

The City may require designers to run additional modeling scenarios with rainfall depths greater than the 100-year event listed above. For example, modeling a 10-inch event or back-to-back 100-year events will allow the designer to evaluate the sensitivity of the system response to larger events relative to detention/retention area high water levels and emergency overflow paths. Designers are encouraged to run extreme event scenarios as part fo the initial site evaluation and design process.

c) Local storm sewer systems shall be designed for the 10-year storm event. The Rational Method shall be the preferred methodology for the design of local systems. Culvert crossings or storm systems in County or State right-of-way may have a design frequency which differs from the City's 10-year design storm. The designer shall contact each agency/unit of government to determine the appropriate design frequency for hydrologically-connected systems.

d) For culvert outlet velocities less than or equal to 4 fps, check shear stress to determine if vegetation or riprap will be adequate. If vegetation is used, temporary erosion control during and immediately follow construction shall be used until vegetation becomes established. For velocities greater than 4 fps, energy dissipaters shall be designed in accordance with MnDOT Design Criteria.

e) High water elevations for landlocked areas (basins where no outlet exists) shall be established by first estimating the normal or initial water surface elevation at the beginning of a rainfall or runoff event using a documented water budget, evidence of mottled soil, and/or an established ordinary high water level. The high water level analysis shall be based on runoff volume resulting from a 100-year/10-day runoff (7.2 inches and saturated or frozen soil conditions [CN=100]) and/or the runoff resulting from a 100-year back-to-back event. The high water elevation shall be the higher of these two conditions.

8) <u>Additional Pond and Infiltration System Design Criteria</u>. Newly constructed or expanded/modified ponds and basins shall be designed and constructed to meet the following:

a) Any storm water pond constructed within the prohibited infiltration zone in Figure C-1, must meet the following criteria:

1) The basin bottom and side walls shall be constructed by compacting at least a 1-foot thickness of soils having at least 20 percent fines (at least 20% passing a #200 sieve). The

bottom must have at least a 3-foot vertical separation to the seasonally-high groundwater elevation and/or bedrock.

2) If a 3 foot separation to bedrock or the seasonally-high groundwater elevation cannot be obtained, the basin bottom and sidewalls shall be constructed of materials and methods that are approved by the City Engineer. Possible liner materials may include compacted cohesive soils, geosynthetic materials, plastic liner, soil additives or other materials.

3) The seasonally-high groundwater elevation shall be determined by assessing soil mottling or soil coloration that indicates temporary saturation of the soil.

b) All ponds or basins shall:

1) If the pond will have a permanent pool of water, have an aquatic bench having a 10:1 (H:V) slope for the first 10 feet from the normal water level into the basin.

2) Have a 3:1 maximum slope (above the NWL and below the 10:1 bench, if a wet pond);

3) Maximize the separation between inlet and outlet points to prevent short-circuiting of storm flows;

4) Be made accessible for maintenance and not be entirely surrounded by steep slopes or retaining walls which limit the type of equipment that can be used for maintenance. Vehicle access lane(s) of at least 10 feet shall be provided, at a slope less than 15 percent from the access point on the street or parking area to the pond, to accommodate maintenance vehicles. Maintenance agreements will be required when the pond is not located on City property.

5) Have a skimming device designed to remove oils and floatable materials up to a five-year frequency event. The skimmer shall be set a minimum of 12 inches below the normal surface water elevation shall control the discharge velocity to 0.5 feet per second.

b) For wet ponds, an average 4 feet of permanent pool depth (dead storage depth) shall be provided. This constraint may not be feasible for small ponds (less than about 3 acre-feet in volume or less). In such cases, depths of 3-4 feet may be used. To prevent development of thermal stratification, loss of oxygen, and nutrient recycling from bottom sediments, the maximum depth of the permanent pool should be less than or equal to 10 feet.

c) Structural BMPs proposed as a stand-alone device or as part of the overall treatment system, shall be designed in accordance with standard engineering principles and practices.

9) <u>Construction Site Erosion and Sediment Control</u>.

a) The City's Erosion Control Ordinances shall be followed for all projects, including those not regulated under the NPDES construction permit. Requirements of the City Code include, but are not limited to, Code Sections: 4-1-4, 4-1-6, 4-8-3-2, 7-3-4, 10-7-23, 10-8-6, 10-8-8, 10-9-2.

b) Prior to the start of any excavation or land disturbing activity for the site, the owner or contractor must have in place and functional an approved method of erosion control. The

contractor must have received authorization from the City prior to commencing construction activities.

c) Development projects shall meet the requirements of the National Pollutant Discharge Elimination System (NPDES) construction permit program, including the requirement to prepare and follow a storm water pollution prevention plan (SWPPP). The owner shall submit proof of receipt and approval by MPCA of the permit application prior to commencing construction. A copy of the SWPPP prepared in accordance with the NPDES permit requirements, shall be submitted to the City if requested by the City Engineer. Site plans shall include:

1) Best management practices (BMPs) to minimize erosion.
2) BMPs to minimize the discharge of sediment and other pollutants.
3) BMPs for dewatering activities.
4) Site inspections and keeping records of rainfall events.
5) Maintenance of BMPs during construction.
6) Management of solid and hazardous wastes.
7) Final stabilization of the site including the use of perennial vegetation and/or other methods on all exposed soils.
8) Computations and documentation regarding the sizing and location of temporary sediment basins.

10) Storm Water Plan Submittals.

a) Property lines and delineation of lands under ownership of the project proposer.

b) Delineation of the subwatersheds contributing runoff from off-site, and proposed and existing subwatersheds on-site.

c) Location, alignment and elevation of proposed and existing stormwater facilities.

d) Delineation of existing on-site wetlands, shoreland and/or floodplain areas. Removal or disturbance of stream bank and shoreland vegetation should be avoided. The plan shall address how unavoidable disturbances to this vegetation will be mitigated.

e) Existing and proposed high water level elevations, 10-year and 100-year water elevations on-site.

f) Existing and proposed site contour elevations related to NGVD, 1929 datum.

g) Construction plans and specifications of all proposed stormwater management facilities.

h) Stormwater runoff volume and rate analyses for existing and proposed conditions.

i) All hydrologic and hydraulic computations completed to design the proposed stormwater quality management facilities. Computations shall include a summary of existing and proposed impervious areas.

j) Provision of outlots or easements for maintenance access to detention basins, constructed wetlands and other stormwater management facilities.

k) Maintenance agreement between developer and city which addresses sweeping, pond inspection, sediment removal and disposal, etc.

l) Inlets to detention basins, wetlands, etc., shown at or below the outlet elevation.

m) Identification of receiving water bodies (lakes, streams, wetlands, etc).

n) Documentation indicating conformance with this Plan.

## Appendix D - Hydrologic System Information

The City of Burnsville developed this Water Resources Management Plan (WRMP) to analyze its water resources and to establish controls that help the City achieve their water resource management goals which are generally intended to reduce or minimize the future impacts of development on the City's natural and water resources and improve the quality of the City's resources.

Tabular data for the various water bodies and drainage areas in the City are provided in the tables which follow along with references to where more data may be available. Data is accompanied by Figure D-1 which illustrates the City's overall drainage system and the respective water resources. These data include results of modeling completed primarily in HydroCAD and XP-SWMM.

The following descriptions correspond to the information presented in the hydrologic summary table for the 100-Year Design Storm Data at the end of Appendix D. The 10-Year Design Storm Data is has similar information and also provided. However, data for the 10-Year Design Storm is less complete and have not been updated as part of this 2008 Plan update.

### Watershed and Subwatershed Name

Indicates area shown on the Subwatershed Map Figure D-1. these subheadings within the rows of the table distinguish between each major watershed unit and each subwatershed unit.

### New Drainage Area and Old Drainage Area ID

These columns identify the unique drainage area ID for each row within the table. The new ID refers to the new drainage area IDs used in Figure D-1. The old IDs refer to what these areas were labled as in the 2002 WRMP (these will generally correspond to the IDs in the 10-Year Design Storm Tables). These areas are generally distinct units that drain directly to a particular pond or major drainage way. The subwatershed boundaries were generally determined using available contour mapping. The boundaries should be considered approximate, due to the limited availability or accuracy of the contour mapping and the possibility of alteration by new construction or storm sewer projects.

### Water Body Common Name

The water body common name is listed for lakes and key water bodies.

### Subwatershed Drainage Area

Drainage area in acres of the listed drainage area.

### Surface Area at NWL

The water surface area at normal water level (in acres) is determined from contour mapping based on the elevation of the pond outlet structure, pump control elevation or a DNR established elevation.

### Ratio of Water Body Area to Subwatershed Area

Determined by dividing pond surface area at NWL by the subwatershed drainage area and multiplying by 100. This ratio gives an indication of the potential for the pond to provide treatment to improve water quality. A ratio greater than 1% indicates good stormwater treatment potential if the pond is managed properly.

### Outlet Description

The diameter of pipe or type of structure, if known, which provides an outlet for the pond or water body. This information should be used for planning purposes only and not for final design.

### NWL

The normal water level of the pond is the lowest controlling elevation. It is usually taken as the invert of the outlet structure or the pump control elevation and is the elevation that the pond will drain down to after a rainfall event. The NWL does not reflect the lowest elevation that may be attained naturally by infiltration, evaporation or transpiration. The elevation is listed in National Geodetic Vertical Datum (NGVD).

### Ordinary HWL

The OHWL listed represents the level reported in the DNR's Lake Finder database at www.dnr.state.mn.us for the water body listed in the comments column of the table. If noted by an *, the level is taken from the City's Planning Department database.

### 100-Year Event (6.0" Rainfall Event)

The 100-year event is also referred to as a rainfall event that has a 1% chance of occurrence in a given year. The information in this table was obtained from various hydrologic/hydraulic models that utilized the Soil Conservation Service TR20 Hydrograph Routing Procedure. The 100-year event assumed a 6.0 inch, Type II distribution, 24-hour duration rainfall event.

> Based on the 2013 updates to precipitation frequency data published in Atlas 14, the 100-year high water level data presented in these tables may require additional analysis by the City and/or owner prior to obtaining approvals. In general, the City will complete the updated modeling upon the initial contact with a project owner and provide the owner with updated high water level and low building elevation information.

<u>HWL</u>

The highest water level achieved in a pond as predicted by the above mentioned model for a 100-year event. The model assumes that the pond elevation is equal to the NWL at the beginning of the storm event. The HWL is affected by the accuracy of the data such as drainage area, storage capacity, outlet description and condition, and run-off factors. All of these factors should be reviewed when HWL is considered critical.

Regulatory BFE (FEMA)

The regulatory base flood elevation as defined in the most recent flood insurance study or flood insurance rate map. This number is only reported for water bodies that have a defined base flood elevation. The BFE may be more or less than the HWL listed in the previous column if more recent modeling was completed that has not yet been incorporated into an official map change by FEMA. These numbers will not change as a result of any additional analysis requested or required by the City to revaluate the effects of updated Atlas 14 precipitation data.

Bounce in Pond

The difference in elevation between the NWL and the HWL.

Storage

The volume of water stored in the pond between the NWL and the HWL.

Peak Outflow Rate

The maximum discharge rate from a pond through the outlet. This normally occurs when the pond is at the HWL and it assumes the full efficiency of the outlet structure.

### Model

The model used in determining the HWL and BFE reported in the table. In most areas the model used was HydroCAD or XP-SWMM model. A small stream section downstream of the CAM Ram Wetland Complex was modeled with HEC-RAS as part of the Flood Insurance Rate Map update for that area completed in 2006.

### Approximate Overflow Elevation

The elevation at which the pond would overland overflow if the storage capacity is exceeded. This approximate elevation was determined from contour mapping.

### Existing Low Building Elevation

This elevation was determined from the “House-Print” on the contour mapping and does not indicate low-floor or basement elevations. These elevations should be considered approximate due to possible inaccuracies in the mapping and buildings that have been constructed after the mapping was completed.

### Low Building Elevation

This elevation is determined based on the standards presented in Appendix C of this WRMP. This should be considered a planning level minimum elevation that is required by City standards. The developer should review the source and quality of data available and evaluate the low building elevation for each site directly to ensure a reasonable level of protection is provided.

### Freeboard (LBLDG – HWL)

The difference between the low building and 100-year high water level elevations. A negative number indicates that the HWL is higher than the LBLDG. This dimension along with the comments

column is intended to highlight areas in the City that could experience problems with flooding. Actual low building elevations, and other pertinent hydrologic data,, should be field verified to determine the extent of the problems.

It should be noted that LBLDG elevation may be different elevation than the low floor elevation per City Ordinance.

### Risk of Inundation

This column provides a relative risk of inundation of adjacent structures. The relative risk is not intended to take the place of detailed analyses to evaluate risk. Instead it is intended as an initial planning-level starting point. Almost any structure adjacent to a water body may have a risk of inundation during certain hydrologic events. The data is based on approximate overflow elevations and not on actual field conditions.

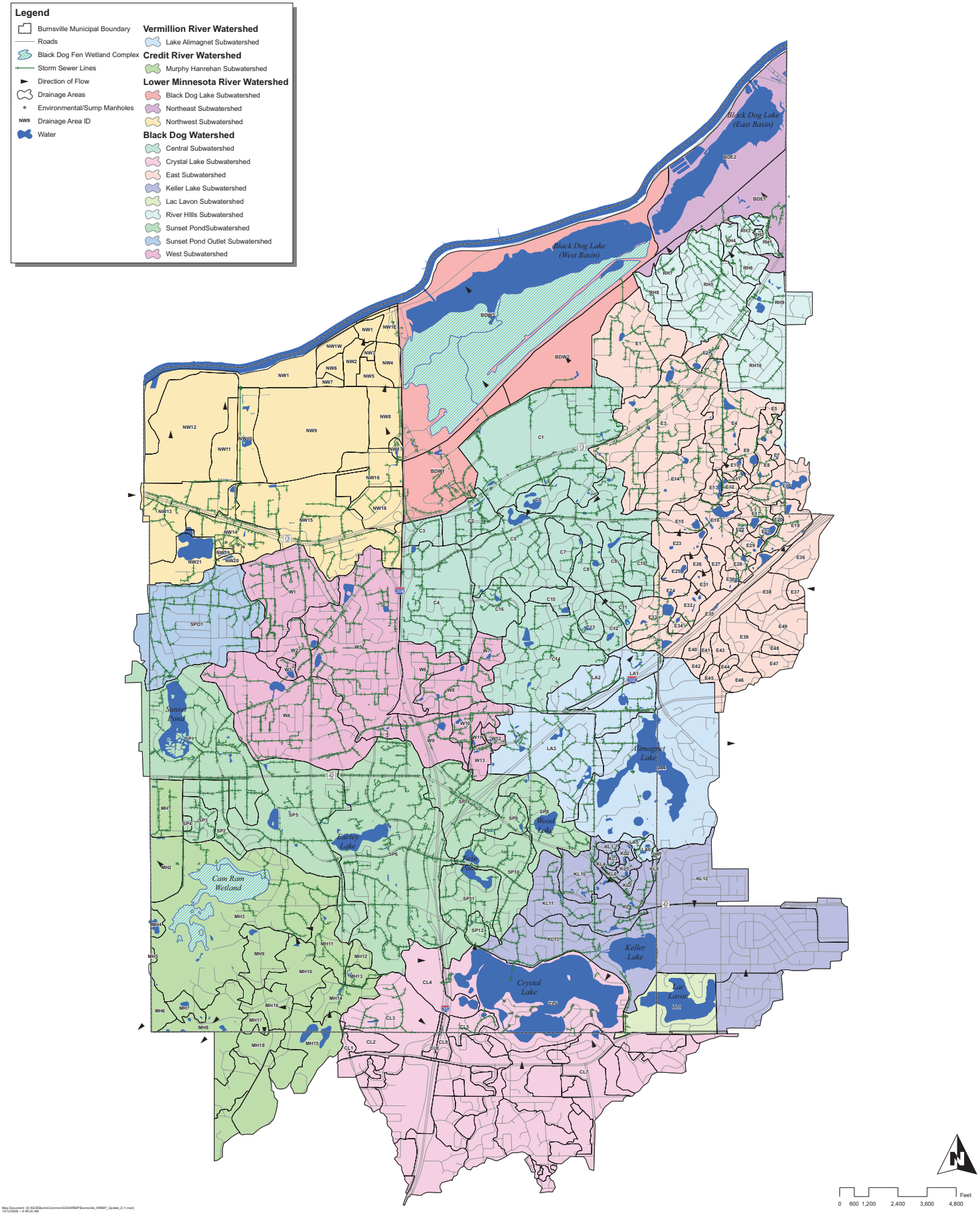
Relative Risk of Inundation

| **Distance Low Bldg. Elevation is Above the BFE or AOE (feet)** (1) | **Base Flood Elevation (BFE) or 100-Year HWL** | **Approximate Overflow (AOE)** | **Overall Risk** |
|---|---|---|---|
| ≤ 0 | HIGH | HIGH | HIGH |
| 0 to 1.5 | MODERATE | HIGH | HIGH |
| 1.5 to 2.0 | MODERATE | LOW | MODERATE |
| 2.0 or more | LOW | LOW | LOW |

1. A value of zero means the low building elevation is at the same elevation of the BFE or EOF. A negative number means the elevation is below the BFE or EOF.

### Notes

This column provides miscellaneous notes relating to the drainage area.




Map Document: (S:\AE\B\Burns\Common\GIS\WRMP\Burnsville_WRMP_Update_D-1.mxd)
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# Subwatershed and Drainage Areas

Burnsville, Minnesota

Figure

D-1

# Table D-1 Hydrologic Summary Data for the 100-Year Design Storm

| New Drainage Area ID | Old Drainage Area ID | Water Body Common Name | Subwatershed Drainage Area (Acres) | Surface Area at NWL (Acres) | Water Body to Watershed Ratio | Approx. Outlet Size (inches) | NWL (NGVD) | Ordinary HWL DNR | 100-Year Event (6.0" Rainfall Event) HWL (NGVD) | BFE (FEMA) | Bounce (ft) | Storage (acre/ft) | Peak Outflow Rate (cfs) | Model | Approximate Overflow Elevation | Approx. Existing Low Building Elevation (LBE) | Low / Minimum Building Elevation | Freeboard (LBE-HWL) (ft) | Risk of Inundation | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BLACK DOG WATERSHED** | | | | | | | | | | | | | | | | | | | | |
| **LAC LAVON SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| LL1 | A8 | Lac Lavon | 176.8 | 2.2 | 1.2 | no outlet | 929.6 | Not listed by DNR | | | | | | XP-SWMM | 948 | | | | | DNR #19044600-P. NO OUTLET |
| **KELLER LAKE SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| KL12 | A1 | | 183.1 | 1.4 | 0.8 | 30 | 944.5 | | 958.3 | | 13.8 | 23.0 | 56.0 | XP-SWMM | 958 | 958 | 960.3 | -0.3 | High | Apple Valley runoff tributary to Burnsville |
| KL 1 | A35 | | 8.5 | 0.5 | 5.9 | 12 | 1008.0 | | 1010.1 | | 2.1 | 1.4 | 3.1 | XP-SWMM | 1014 | 1015 | 1012.1 | 4.9 | High | Summit Oaks |
| KL 2 | A39 | | 10.3 | 0.4 | 3.9 | 12 | 994.0 | | 996.9 | | 2.9 | 1.3 | 5.1 | XP-SWMM | 1001 | 1006 | 998.9 | 9.1 | Low | |
| KL 3 | A36 | | 4.7 | 0.3 | 6.3 | 12 | 1000.0 | | 1003.9 | | 3.9 | 0.9 | 3.6 | XP-SWMM | 1008 | 1006 | 1005.9 | 2.1 | High | Summit Oaks |
| KL 4 | A37 | | 11.2 | | 0.0 | 12 | 997.0 | | 999.1 | | 2.1 | 1.7 | 8.9 | XP-SWMM | N/A | | 1001.1 | | | Summit Oaks |
| KL 5 | A40 | | 11.9 | 1.0 | 8.4 | 12 | 978.7 | | 980.1 | | 1.4 | 4.5 | 1.7 | XP-SWMM | 981 | 986 | 982.1 | 5.9 | Low | |
| KL 6 | A38 | | 4.5 | 0.1 | 2.2 | 12 | 990.0 | | 997.0 | | 7.0 | 1.5 | 9.8 | XP-SWMM | 1005 | 1016 | 999.0 | 19.0 | Low | Summit Oaks |
| KL 7 | A41 | | 10.5 | 0.5 | 4.8 | 12 | 972.7 | | 974.8 | | 2.1 | 1.8 | 3.3 | XP-SWMM | 976 | 988 | 976.8 | 13.2 | Low | |
| KL 8 | A4 | | 3.5 | 0.1 | 2.8 | 12 | 979.7 | | 982.2 | | 2.5 | 0.6 | 0.8 | XP-SWMM | 982 | | 984.2 | | | |
| KL 9 | A46 | | 62.4 | 1.0 | 1.6 | 18 | 954.0 | | 962.2 | | 8.2 | 14.0 | 28.5 | XP-SWMM | 963 | 988 | 964.2 | 25.8 | Low | |
| KL10 | A3 | | 74.8 | 0.5 | 0.7 | 30 | 972.0 | | 978.8 | | 6.8 | 8.0 | 72.7 | XP-SWMM | 980 | 976 | 980.8 | -2.8 | High | |
| KL11 | A6 | | 150.2 | 2.9 | 1.9 | 42 | 944.5 | | 950.7 | | 6.2 | 27.3 | 105.1 | XP-SWMM | 952 | 951 | 952.7 | 0.3 | High | |
| KL13 | A7 | Keller Lake | 725.9 | 28.1 | 3.9 | 72 | 934.1 | 934.5 | 938.7 | 936.0 | 4.6 | 302.1 | 69.3 | XP-SWMM | 940 | 938.5 | 940.7 | -0.2 | High | DNR #19002500-P. Includes inflow from Apple Valley. |
| KL14 | A2 | | 112.9 | 2.7 | 2.4 | 12 | 952.0 | | 958.0 | | 6.0 | 22.0 | 6.2 | XP-SWMM | 958 | | 960.0 | | | Apple Valley runoff tributary to Burnsville |
| **CRYSTAL LAKE SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| CL3 | A13 | | 180.7 | 2.0 | 1.1 | 30 | 983.1 | | 985.8 | | 2.7 | 12.4 | 37.8 | XP-SWMM | 986.8 | | 987.8 | | | |
| CL4 | A22 | | 105.3 | 7.3 | 6.9 | 10' weir | 936.7 | | 938.4 | | 1.7 | 9.3 | 55.7 | XP-SWMM | 940 | 1004 | 940.4 | 65.6 | Low | Portion west of I-35 drains to directly to Buck Hill Bay |
| CL5 | A23 | | 27.6 | 1.6 | 5.8 | 15 | 938.0 | | 940.8 | | 2.8 | 3.6 | 8.1 | XP-SWMM | 944 | 950 | 942.8 | 9.2 | Low | |
| CL6 | A24 | Crystal Lake | 549.5 | 298.6 | 54.3 | 36 | 933.4 | 934.5 | 935.0 | 936.0 | 1.6 | 392.7 | 61.1 | XP-SWMM | 938 | 940 | 937.0 | 5.0 | Low | DNR #19002700-P |
| **SUNSET POND SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| SPO1 | NW1 | | 402.6 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad nodes: 9106, 9107, 9110 - Sunset Pond Outlet. Includes a portion of Savage. |
| SP 1 | A33 | Sunset Pond | 441.7 | 57.6 | 13.0 | 48 | 854.7 | Not listed by DNR | 856.5 | | 1.8 | 229.3 | 44.9 | XP-SWMM | 860 | 860 | 858.5 | 3.5 | High | Includes Sunset Pond. Includes a portion of Savage. |
| SP 2 | A47 | | 71.7 | 0.2 | 0.3 | drop structure | 863.5 | | 876.6 | | 13.1 | 0.8 | 230.8 | | 880 | 880 | 878.6 | 3.4 | High | TIF Development; Special drop structure outlet |
| SP 3 | A48 | | 46.5 | 0.2 | 0.4 | 12 | 880.0 | | 888.2 | | 8.2 | 4.9 | 45.6 | | 885 | 884 | 890.2 | -4.2 | High | TIF Development |
| SP 4 | A49 | | 5.0 | 0.1 | 2.0 | 12 | 885.0 | | 886.1 | | 1.1 | 0.4 | 4.0 | | 888 | 890 | 888.1 | 3.9 | Low | TIF Development |
| SP 5 | A32 | Judicial Pond | 372.9 | 5.3 | 1.4 | 48 | 892.0 | | 898.7 | | 6.7 | 52.3 | 86.2 | XP-SWMM | 900 | 920 | 900.7 | 21.3 | Low | |
| SP 6 | A31 | Earley Lake | 764.2 | 28.6 | 3.7 | 36 | 902.0 | 906.7 | 911.9 | 911.9 | 9.9 | 324.5 | 53.1 | XP-SWMM | 916 | 914 | 913.9 | 2.1 | High | DNR #19003300-P |
| SP 7 | A27 | | 180.2 | 0.7 | 0.4 | 10' weir | 921.0 | | 923.9 | | 2.9 | 26.8 | 316.5 | XP-SWMM | 928 | | 925.9 | | | |
| SP 8 | A28 | Wood Park Pond | 145.0 | 14.2 | 9.8 | 18 | 1001.0 | 998.8 | 1003.4 | | 2.4 | 37.2 | 6.6 | XP-SWMM | 1012 | 1010 | 1005.4 | 6.6 | High | DNR #19002400-W |
| SP 9 | A29 | | 53.4 | 2.9 | 5.4 | 12 | 1009.0 | | 1010.6 | | 1.6 | 13.7 | 4.0 | XP-SWMM | 1011 | 1018 | 1012.6 | 7.4 | Low | |
| SP10 | A30 | North Twin | 159.8 | 4.7 | 2.9 | 36 | 914.5 | | 923.8 | 923.8 | 9.3 | 141.7 | 79.9 | XP-SWMM | 926 | 930 | 925.8 | 6.2 | Low | DNR #19002800-W |
| SP11 | A26 | South Twin | 151.1 | 8.7 | 5.8 | 36 | 917.0 | | 923.5 | 923.5 | 6.5 | 141.7 | 79.9 | XP-SWMM | 926 | 926 | 925.5 | 2.5 | High | DNR #19002800-W |
| SP12 | A25 | | 23.5 | 0.3 | 1.3 | 27 | 932.7 | | 941.0 | | 8.3 | 3.5 | 61.4 | XP-SWMM | 936 | 946 | 943.0 | 5.0 | Low | |
| **WEST SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| W 2 | B11 | | 67.7 | 1.4 | 2.1 | 36 | 867.7 | | 875.1 | | 7.4 | 7.0 | 68.1 | HydroCAD | 877 | 878 | 877.1 | 2.9 | High | |
| W 3 | B9 | | 13.6 | 2.2 | 16.2 | 21 | 882.0 | | 892.0 | | 10.0 | 97.9 | 22.0 | HydroCAD | 890 | 891 | 894.0 | -1.0 | High | Equalizes with Pond B10 |
| W 4 | B10 | | 438.5 | 4.9 | 1.1 | 21 | 882.0 | | 892.0 | | 10.0 | 97.9 | 22.0 | HydroCAD | 890 | | 894.0 | | | Equalizes with Pond B9 |
| W 5 | B12 | | 493.6 | 4.8 | 1.0 | 60 | 845.3 | | 858.2 | | 12.9 | 97.5 | 325.3 | HydroCAD | 855 | 854 | 860.2 | -4.2 | High | |
| W 6 | B2 | | 96.7 | 0.4 | 0.4 | 30" force main | 945.6 | | 952.3 | | 6.7 | 10.7 | 45.0 | HydroCAD | 954 | 958 | 954.3 | 5.7 | Low | |
| W 7 | B1 | | 37.6 | 0.7 | 1.9 | 12 | 979.5 | | 983.9 | | 4.4 | 6.3 | 6.4 | HydroCAD | 986 | 990 | 985.9 | 6.1 | Low | |
| W 8 | B3 | | 106.0 | 0.5 | 0.5 | 30" force main | 940.0 | | 956.3 | | 16.3 | 30.3 | 45.0 | HydroCAD | 954 | 960 | 958.3 | 3.7 | Low | |
| W 9 | B8 | | 92.9 | 2.0 | 2.2 | 30 | 948.0 | | 979.2 | | 31.2 | 34.0 | 79.3 | HydroCAD | 976 | 990 | 981.2 | 10.9 | Low | |
| W10 | B7 | | 63.2 | 0.8 | 1.3 | 21 | 969.0 | | 977.5 | | 8.5 | 11.7 | 29.9 | HydroCAD | 978 | 996 | 979.5 | 18.5 | Low | |
| W11 | B6 | | 7.3 | 0.5 | 6.8 | 30 | 1009.2 | | 1011.4 | | 2.2 | 1.9 | 21.3 | HydroCAD | 1012 | | 1013.4 | | | |
| W12 | B4 | | 14.2 | 0.5 | 3.5 | 18 | 1035.0 | | 1035.0 | | 0.0 | 0.5 | 14.3 | HydroCAD | 1042 | 1051 | 1037.0 | 16.0 | Low | |
| W13 | B5 | | 26.6 | 0.4 | 1.5 | 24 | 1017.0 | | 1021.1 | | 4.1 | 1.9 | 26.7 | HydroCAD | 1023 | 1046 | 1023.1 | 24.9 | Low | |
| **CENTRAL SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| C 1 | G1 | | 251.0 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | |
| C 2 | D13 | | 80.4 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | |
| C 3 | C2 | | 39.7 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | |
| C 4 | C1 | | 289.9 | 0.7 | 0.2 | 18 | 840.0 | | 858.9 | | 18.9 | 38.7 | 45.8 | HydroCAD | 859 | 864 | 860.9 | 5.1 | Low | |
| C 5 | D12 | | 374.7 | 6.7 | 1.8 | 48 | 865.0 | | 873.8 | | 8.8 | 98.3 | 84.5 | HydroCAD | 870 | 878 | 875.8 | 4.2 | Low | Equalizes with Pond D12 |
| C 6 | D11 | | 50.9 | 7.6 | 14.9 | | 869.8 | | | | | | | | 870 | 876 | | | | Equalizes with Pond D12 |
| C 7 | D8 | | 53.7 | 1.5 | 2.8 | 6 | 957.1 | | 962.6 | | 5.5 | 11.5 | 2.2 | HydroCAD | 961 | 971 | 964.6 | 8.4 | Low | |
| C 8 | D9 | | 45.1 | | 0.0 | no outlet | | | | | | | | | | | | | | NO OUTLET Proposed outlet to D10 |
| C 9 | D10 | | 71.8 | 2.0 | 2.8 | 15 | 970.0 | | 977.5 | | 7.5 | 24.2 | 15.4 | HydroCAD | 978 | 976 | 979.5 | -1.5 | High | |
| C10 | D1 | | 64.9 | 0.1 | 0.2 | 12 | 964.9 | | 1000.8 | | 35.9 | 7.9 | 20.1 | HydroCAD | 999 | 998 | 1002.8 | -2.8 | High | |
| C11 | D2 | | 27.5 | 1.9 | 6.9 | 24 | 1014.2 | | 1016.4 | | 2.2 | 3.4 | 16.6 | HydroCAD | 1028 | 1022 | 1018.4 | 5.6 | High | |
| C12 | D3 | | 42.9 | 2.7 | 6.3 | 18 | 1002.4 | | 1006.8 | | 4.4 | 8.3 | 16.2 | HydroCAD | 1017 | 1018 | 1008.8 | 11.2 | High | |
| C13 | D4 | | 24.2 | 1.0 | 4.1 | 12 | 989.0 | | 998.3 | | 9.3 | 14.1 | 8.4 | HydroCAD | 999 | 1000 | 1000.3 | 1.7 | High | |
| C14 | D6 | | 318.9 | 4.4 | 1.4 | 24 | 963.0 | | 974.0 | | 11.0 | 65.5 | 47.9 | HydroCAD | 974 | 972 | 976.0 | -2.0 | High | |
| C15 | D5 | | 31.0 | 1.4 | 4.5 | 12 | 968.0 | | 971.1 | | 3.1 | 3.6 | 23.1 | HydroCAD | 978 | 976 | 973.1 | 4.9 | High | |
| C16 | D7 | | 82.6 | 1.1 | 1.3 | 36 | 959.5 | | 965.0 | | 5.5 | 22.8 | 55.7 | HydroCAD | 961 | 962 | 967.0 | -3.0 | High | |

ATLAS 14 UPDATE - Based on updates to precipitation frequency data published in Atlas 14, the 100-year high water level data presented in these tables may require additional analysis by the City and/or owner prior to obtaining approvals. In general, the City will complete the updated modeling upon the initial contact with a project owner and provide the owner with updated high water level and low building elevation information.

# Table D-1 Hydrologic Summary Data for the 100-Year Design Storm

| New Drainage Area ID | Old Drainage Area ID | Water Body Common Name | Subwatershed Drainage Area (Acres) | Surface Area at NWL (Acres) | Water Body to Watershed Ratio | Approx. Outlet Size (inches) | NWL (NGVD) | Ordinary HWL DNR | 100-Year Event (6.0" Rainfall Event) HWL (NGVD) | BFE (FEMA) | Bounce (ft) | Storage (acre/ft) | Peak Outflow Rate (cfs) | Model | Approximate Overflow Elevation | Approx. Existing Low Building Elevation (LBE) | Low / Minimum Building Elevation | Freeboard (LBE-HWL) (ft) | Risk of Inundation | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BLACK DOG WATERSHED** | | | | | | | | | | | | | | | | | | | | |
| **EAST SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| E 1 | E48 | | 195.6 | 1.4 | 0.7 | 36 | 853.2 | | 865.1 | | 11.9 | 39.4 | 109.7 | | 867 | 863 | 867.1 | -2.1 | High | |
| E 2 | E46 | | 35.9 | 1.5 | 4.2 | 18 | 879.0 | | 897.5 | | 18.5 | 167.8 | 23.2 | HydroCAD | 903 | 901 | 899.5 | 3.5 | High | Equalizes with Pond E47 |
| E 3 | E47 | | 347.2 | 3.3 | 1.0 | 18 | 879.0 | | 897.5 | | 18.5 | 167.8 | 23.2 | HydroCAD | 903 | 901 | 899.5 | 3.5 | High | Equalizes with Pond E46 |
| E 4 | E44 | | 121.3 | 2.6 | 2.1 | 24 | 925.0 | | 932.5 | | 27.4 | 28.0 | 36.9 | | 933 | 932 | 934.5 | -0.5 | High | |
| E 5 | E25 | | 11.7 | 0.1 | 0.9 | 12 | 953.0 | | 957.5 | | 4.5 | 1.3 | 7.5 | HydroCAD | 962 | 968 | 959.5 | 10.5 | Low | |
| E 6 | E26 | | 23.6 | 1.1 | 4.7 | 12 | 953.0 | | 957.0 | | 4.0 | 5.3 | 7.1 | HydroCAD | 962 | 968 | 959.0 | 11.0 | Low | |
| E 7 | E28A | | 9.2 | 0.1 | 1.1 | 18 | 935.5 | | 942.0 | | 6.5 | 0.5 | 12.6 | HydroCAD | 968 | 970 | 944.0 | 28.0 | Low | |
| E 8 | E27 | | 24.3 | | 0.0 | no ponding | | | | | | | | | | | | | | |
| E 9 | E28 | | 30.9 | 2.1 | 6.8 | 18 | 958.0 | | 961.0 | | 3.0 | 65.6 | 18.2 | HydroCAD | 946 | 948 | 963.0 | -13.0 | Moderate | Equalizes with ponds E23 and E24 |
| E10 | E43 | | 15.0 | 1.3 | 8.7 | 15 | 935.5 | | 938.6 | | 3.0 | 7.0 | 9.1 | HydroCAD | 940 | 942 | 940.6 | 3.5 | Low | Equalizes with Pond E40, E41, and E42 |
| E11 | E42 | | 8.8 | 0.5 | 5.7 | 18 | 935.5 | | 938.5 | | 3.0 | 0.6 | 11.8 | HydroCAD | 940 | 944 | 940.5 | 5.5 | Low | Equalizes with Pond E40, E41, and E43 |
| E12 | E41 | | 10.4 | 0.6 | 5.8 | 21 | 935.8 | | 938.8 | | 3.0 | 4.8 | 10.6 | HydroCAD | 939.6 | 942 | 940.8 | 3.2 | Low | Equalizes with Pond E40, E42, and E43 |
| E13 | E40 | | 23.7 | 2.0 | 8.4 | 18 | 935.2 | | 938.5 | | 3.3 | 9.9 | 11.2 | | 938 | 948 | 940.5 | 9.5 | Low | Equalizes with Pond E41, E42, and E43 |
| E14 | E45 | | 138.3 | 1.2 | 0.9 | 21 | 924.4 | | 930.7 | | 6.3 | 21.8 | 18.0 | HydroCAD | 931 | 932 | 932.7 | 1.3 | High | |
| E15 | E38 | | 34.4 | 3.6 | 10.5 | | 957.1 | | 959.2 | | 2.1 | 7.0 | 4.4 | HydroCAD | 962 | 966 | 961.2 | 6.8 | Low | Equalizes with Pond E37 |
| E16 | E39 | | 67.2 | 5.1 | 7.6 | 18 | 944.0 | | 946.9 | | 2.9 | 15.4 | 12.4 | HydroCAD | 948 | 952 | 948.9 | 5.1 | Low | |
| E17 | E21 | | 32.5 | 2.3 | 7.1 | 36 | 935.0 | | 939.1 | | -4.1 | 2.5 | 54.9 | | 940 | 940 | 941.1 | 0.9 | High | 6" and 12" force mains |
| E18 | E24 | | 76.7 | 8.6 | 11.2 | 21 | 936.7 | | 940.3 | | 3.7 | | | | 962 | 944 | 942.3 | 3.7 | High | Equalizes with ponds E23 and E28 |
| E19 | E23 | | 56.4 | 1.7 | 3.0 | 42 | 938.5 | | 944.4 | | 5.9 | 6.4 | 57.4 | | 942 | 946 | 946.4 | 1.6 | Moderate | Equalizes with ponds E24 and E28 |
| E20 | E22 | | 3.2 | 0.8 | 24.8 | 42 | 946.0 | | 948.5 | | 2.5 | 3.3 | 40.3 | | 949 | | 950.5 | | | |
| E21 | E19 | | 12.5 | 3.1 | 24.8 | 12 | 933.0 | | 937.4 | | 4.4 | 6.5 | 4.5 | | 935 | 950 | 939.4 | 12.6 | Low | |
| E22 | E20 | | 12.9 | 1.0 | 7.8 | 12 | 935.0 | | 938.2 | | 3.2 | 1.6 | 6.2 | HydroCAD | 939 | 936 | 940.2 | -2.2 | High | |
| E23 | E37 | | 53.5 | 1.4 | 2.6 | | 957.1 | | 959.2 | | 2.1 | 7.0 | 4.4 | HydroCAD | 962 | | 961.2 | | | Equalizes with Pond E38 |
| E24 | E30 | | 31.5 | 1.5 | 4.8 | 12 | 988.0 | | 990.6 | | 2.6 | 7.0 | 4.2 | HydroCAD | 992 | 1014 | 992.6 | 23.4 | Low | |
| E25 | E36 | | 15.0 | | 0.0 | no outlet | | | 976.5 | | | 1.7 | 3.6 | HydroCAD | | | 978.5 | | | NO OUTLET; Proposed to outlet into E34 |
| E26 | E34 | | 18.3 | 0.8 | 4.4 | 12 | 968.0 | | 970.2 | | 2.2 | 2.9 | 4.0 | HydroCAD | 970 | | 972.2 | | | |
| E27 | E35 | | 21.9 | | 0.0 | no outlet | | | | | | | | | | | | | | NO OUTLET; Proposed to outlet into E34 |
| E28 | E17 | | 25.7 | 0.9 | 3.5 | 12 | 945.0 | | 949.3 | | 4.3 | 6.0 | 2.7 | | 948 | 950 | 951.3 | 0.7 | Moderate | |
| E29 | E18 | | 18.5 | 1.1 | 6.0 | 15 | 935.0 | | 937.5 | | 2.5 | 2.7 | 7.5 | HydroCAD | 938 | 942 | 939.5 | 4.5 | Low | |
| E30 | E16 | | 13.7 | 0.6 | 4.4 | 12 | 960.0 | | 961.2 | | 1.2 | 1.8 | 1.6 | HydroCAD | 962 | 966 | 963.2 | 4.8 | Low | |
| E31 | E33 | | 17.4 | 0.9 | 5.2 | 12 | 969.0 | | 970.8 | | 1.8 | 2.3 | 4.0 | HydroCAD | 976 | | 972.8 | | | |
| E32 | E32 | | 27.1 | 1.1 | 4.1 | 12 | 971.0 | | 973.3 | | 2.3 | 8.9 | 3.7 | HydroCAD | 976 | | 975.3 | | | |
| E33 | E29 | | 59.6 | 4.3 | 7.2 | 12 | 989.5 | | 992.1 | | 2.6 | 12.6 | 3.7 | | 1002 | 1006 | 994.1 | 13.9 | Low | |
| E34 | E31 | | 13.2 | 0.9 | 6.8 | 12 | 992.0 | | 992.7 | | 0.7 | 2.3 | 1.8 | HydroCAD | 996 | 1002 | 994.7 | 9.3 | Low | |
| E35 | E15 | | 114.8 | 3.0 | 2.6 | 24 | 943.1 | ..... | 946.1 | | 3.0 | 10.6 | 16.6 | HydroCAD | 950 | 952 | 948.1 | 5.9 | Low | Includes inflow from 35E/Apple Valley. |
| E36 | E14 | | 69.2 | 0.3 | 0.4 | 12 | 943.0 | | 963.8 | | 20.8 | 13.3 | 6.6 | | 958 | 958 | 965.8 | -5.8 | High | Watershed in Apple Valley -runoff tributary to Burnsville |
| E37 | E12 | | 10.4 | | 0.0 | | | | | | | | | | | | | | | Watershed in Apple Valley -runoff tributary to Burnsville |
| E38 | E13 | | 61.6 | 2.0 | 3.2 | 12 | 947.2 | | 950.7 | | 3.5 | 7.6 | 3.9 | | 956 | 956 | 952.7 | 5.3 | High | Watershed in Apple Valley -runoff tributary to Burnsville |
| E39 | E10 | | 73.1 | 8.4 | 11.5 | 12" force main | 968.0 | | 972.4 | | 4.4 | 33.2 | 7.0 | | 974 | 974 | 974.4 | 1.6 | High | Watershed in Apple Valley -runoff tributary to Burnsville |
| E40 | E3 | | 13.6 | 1.6 | 11.8 | 12" force main | 948.0 | | 958.9 | | 10.9 | 5.8 | 0.5 | | 958 | 956 | 960.9 | -2.9 | High | Watershed in Apple Valley -runoff tributary to Burnsville |
| E41 | E11 | | 18.6 | 0.8 | 4.3 | 12 | 965.9 | | 968.1 | | 2.2 | 24.5 | 3.5 | | 974 | 974 | 970.1 | 5.9 | High | Watershed in Apple Valley -runoff tributary to Burnsville |
| E42 | E1 | | 10.6 | 0.3 | 2.8 | 12 | 984.0 | | 986.0 | | 2.0 | 1.4 | 4.0 | | 990 | 988 | 988.0 | 2.0 | High | Watershed in Apple Valley -runoff tributary to Burnsville |
| E43 | E4 | | 17.0 | 4.3 | 25.2 | 12 | 967.0 | | 970.0 | | 3.0 | 2.7 | 4.6 | HydroCAD | 978 | 976 | 972.0 | 6.0 | High | Watershed in Apple Valley -runoff tributary to Burnsville |
| E44 | E8 | | 9.4 | 1.6 | 17.0 | 12 | 1008.0 | | 1012.7 | | 4.7 | 1.0 | 6.0 | | 1012 | 1014 | 1014.7 | 1.3 | Moderate | Watershed in Apple Valley -runoff tributary to Burnsville |
| E45 | E2 | | 22.2 | 5.2 | 23.4 | 12" force main | 1016.0 | | 1018.6 | | 2.6 | 5.5 | 0.5 | HydroCAD | 1022 | 1020 | 1020.6 | 1.4 | High | Watershed in Apple Valley -runoff tributary to Burnsville |
| E46 | E9 | | 26.7 | 1.1 | 4.1 | 12 | 1009.7 | | 1020.5 | | 10.8 | 4.9 | 2.7 | HydroCAD | 1022 | 1024 | 1022.5 | 3.5 | Low | Watershed in Apple Valley -runoff tributary to Burnsville |
| E47 | E5 | | 29.3 | 1.2 | 4.1 | 12 | 1005.5 | | 1012.4 | | 6.9 | 4.4 | 6.1 | | 1012 | 1014 | 1014.4 | 1.6 | Moderate | Watershed in Apple Valley -runoff tributary to Burnsville |
| E48 | E6 | | 16.8 | 13.2 | 78.4 | 12 | 1002.8 | | 1004.7 | | 1.9 | 4.9 | 6.1 | | 1006 | 1006 | 1006.7 | 1.3 | High | Watershed in Apple Valley -runoff tributary to Burnsville |
| E49 | E7 | | 67.6 | 2.3 | 3.4 | 18 | 996.5 | | 1003.8 | | 7.3 | 10.4 | 13.8 | | 1002 | 1004 | 1005.8 | 0.2 | Moderate | Watershed in Apple Valley -runoff tributary to Burnsville |
| **RIVER HILLS SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| RH 1 | L1 | | 24.8 | 0.5 | 2.0 | 18 | 797.6 | | 800.5 | | 2.9 | 0.1 | 12.1 | HydroCAD | 801.5 | 808 | 802.5 | 7.5 | Low | |
| RH 2 | L2 | | 3.3 | 0.1 | 3.0 | 12 | 797.0 | | 799.0 | | 2.0 | 0.2 | 4.6 | HydroCAD | 805 | 809 | 801.0 | 10.0 | Low | |
| RH 3 | L3 | | 17.5 | 0.4 | 2.3 | 12 | 748.0 | | 758.0 | | 10.0 | 10.0 | 11.7 | | 763 | 764 | 760.0 | 6.0 | High | |
| RH 4 | L5 | | 27.1 | 0.0 | 0.0 | 21 | 746.8 | | | | | | | | 755 | 793 | | | | |
| RH 5 | F3 | | 256.0 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | |
| RH 6 | L4 | | 38.6 | | 0.0 | 18 | 795.2 | | | | | | | | 812 | 818 | | | | |
| RH 7 | F4 | | 35.0 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | |
| RH 8 | F5 | | 91.0 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | |
| RH 9 | F2 | | 95.9 | 3.1 | 3.2 | 12 | 872.0 | | 873.8 | | 1.8 | 20.1 | 5.9 | XPSWMM | 877 | 880 | 875.8 | 6.2 | Low | Includes inflow form Eagan. |
| RH10 | F1 | | 171.0 | 2.9 | 1.7 | 18 | 892.0 | | 899.3 | | 7.3 | 30.2 | 22.8 | XPSWMM | 901 | 902 | 901.3 | 2.7 | High | |

ATLAS 14 UPDATE - Based on updates to precipitation frequency data published in Atlas 14, the 100-year high water level data presented in these tables may require additional analysis by the City and/or owner prior to obtaining approvals. In general, the City will complete the updated modeling upon the initial contact with a project owner and provide the owner with updated high water level and low building elevation information.

# Table D-1 Hydrologic Summary Data for the 100-Year Design Storm

| New Drainage Area ID | Old Drainage Area ID | Water Body Common Name | Subwatershed Drainage Area (Acres) | Surface Area at NWL (Acres) | Water Body to Watershed Ratio | Approx. Outlet Size (inches) | NWL (NGVD) | Ordinary HWL DNR | 100-Year Event (6.0" Rainfall Event) HWL (NGVD) | BFE (FEMA) | Bounce (ft) | Storage (acre/ft) | Peak Outflow Rate (cfs) | Model | Approximate Overflow Elevation | Approx. Existing Low Building Elevation (LBE) | Low / Minimum Building Elevation | Freeboard (LBE-HWL) (ft) | Risk of Inundation | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CREDIT RIVER WATERSHED** | | | | | | | | | | | | | | | | | | | | |
| **MURPHY HANREHAN SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| MH 1 | J10 | | 72.7 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | |
| MH2 | J9 | | | | | channel | | | | | | | | XPSWMM | | | | | | Outflow to Savage. See LOMR Data |
| MH 3 | J8 | | 63.1 | 0.1 | 0.2 | grate | 915.3 | | | | | | | | 920 | 918 | | | | |
| MH 3 | J9 | Cam Ram Wetland | 706.7 | 70.1 | 9.9 | channel | 858.0 | | 864.8 | 865.0 | 6.8 | 38.3 | 2.9 | XPSWMM | N/A | | 866.8 | | | Cam Ram outlet to west into Scott County. See LOMR data. |
| MH 6 | K4 | | 31.5 | 1.0 | 3.2 | 12 | 998.0 | | 1001.0 | 1001.0 | 3.0 | 4.4 | 4.3 | | 1002 | | 1003.0 | | | Outflow to Scott Co. |
| MH 7 | J11 | | 28.4 | | 0.0 | no ponding | | | | | | | | | | | | | | |
| MH 8 | K3 | | 83.2 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | Outflow to Lakeville. |
| MH 9 | J7 | | 83.6 | | 0.0 | 12 | 942.0 | | 946.8 | | 4.8 | 1.5 | 3.7 | XPSWMM | 946 | 950 | 948.8 | 3.2 | Low | Wildwood Pond |
| MH10 | J6 | | 92.2 | 1.0 | 1.1 | 30 | 940.0 | | | | | | | | 950 | 958 | | | | |
| MH11 | J5 | | 74.9 | 0.3 | 0.4 | 42 | 950.0 | | 954.5 | | 4.5 | 14.6 | 8.1 | XPSWMM | 945 | 980 | 956.5 | 25.5 | Low | |
| MH12 | J4 | | 22.5 | 1.9 | 8.4 | 18 | 982.0 | | 998.8 | | 16.8 | 2.3 | 9.8 | XPSWMM | 998 | 1014 | 1000.8 | 15.2 | Low | |
| MH13 | J3 | | 15.9 | | 0.0 | | | | | | | | | | | | | | | |
| MH14 | J2 | | 58.6 | 0.6 | 1.0 | 12 | 1002.0 | | 1008.0 | | 6.0 | 7.9 | 6.3 | XPSWMM | 1004 | 1024 | 1010.0 | 16.0 | Low | |
| MH15 | J1 | Horseshoe Lake | 49.8 | 14.6 | 29.3 | 12 | 990.0 | 990.0* | 995.5 | | 5.5 | 14.3 | 1.2 | XPSWMM | 1016 | | 997.5 | | | Includes Horsehoe Lake - DNR #19003200-P. Proposed storm sewer to be constructed and routed to J2. |
| MH16 | K1 | | 53.0 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | |
| MH17 | K2 | | 15.5 | | 0.0 | no ponding | | | | | | | | | N/A | | | | | Outflow to Lakeville. |
| **LOWER MINNESOTA RIVER WATERSHED** | | | | | | | | | | | | | | | | | | | | |
| **NORTHWEST SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| NW 1 | NW16 | | 17.3 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node: 5016 |
| NW 2 | NW12 | | 29.9 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node: 5012 |
| NW 3 | NW14 | | 7.1 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node: 5014 |
| NW 4 | NW15 | | 36.3 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node:5015 |
| NW 5 | NW13 | | 25.6 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node:5013 |
| NW 6 | NW11 | | 18.5 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node:5011 |
| NW 7 | NW10 | | 10.7 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node: 5010 |
| NW 8 | NW5 | | 75.5 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node: 5005 |
| NW 9 | NW6 | | 363.3 | | 0.0 | No Data | | | | | | | | | | | | | | Future Quarry Lake subwatershed |
| NW10 | NW7 | | 78.1 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node:5007 - Outlets to NW Subwatershed of LMRWD |
| NW11 | NW8 | | 62.4 | | 0.0 | No Data | | | | | | | | | | | | | | Landfill |
| NW12 | NW9 | | 282.9 | | 0.0 | No Data | | | | | | | | | | | | | | Landfill - Outlets to NW Subwatershed of LMRWD |
| NW13 | NW2 | | 162.1 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node: 102. Inflow from Savage. |
| NW15 | NW3 | | 590.2 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad nodes:9124, 9126, 9127, 9128, 9129 |
| NW16 | NW4 | | 93.4 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node: 5001 |
| NW17 | NW5A | | 9.3 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node:5002 |
| NW18 | NW4A | | 76.6 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node:5000 |
| NW19 | NW1B | | 5.6 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node: 9101 |
| NW20 | NW1A | | 10.4 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node:9100 |
| NW21 | NW1C | | 95.9 | | 0.0 | No Data | | | | | | | | | | | | | | Hydrocad node:9105 |
| **BLACK DOG LAKE WEST SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| BDW1 | | | | | | No Data | | | | | | | | | | | | | | |
| BDW2 | | | | | | No Data | | | | | | | | | | | | | | |
| BDW3 | | | | | | No Data | | | | | | | | | | | | | | |
| **BLACK DOG LAKE EAST SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| BDE1 | | | | | | No Data | | | | | | | | | | | | | | |
| BDE2 | | | | | | No Data | | | | | | | | | | | | | | |
| **VERMILLION RIVER WATERSHED** | | | | | | | | | | | | | | | | | | | | |
| **LAKE ALIMAGNET SUBWATERSHED** | | | | | | | | | | | | | | | | | | | | |
| LA 1 | H4 | | 67.4 | | 0.0 | no ponding | | | | | | | | | | | | | | |
| LA 2 | H3 | | 177.2 | 3.2 | 1.8 | no ponding | | | | | | | | | | | | | | |
| LA3 | H2 | | 297.2 | 10.3 | 3.5 | 18 | 958.0 | | 962.8 | | 4.8 | 102.0 | 8.4 | | 960 | 972 | 964.8 | 9.2 | Low | Watershed drains to east through Apple Valley |
| LA4 | H1 | Lake Alimagnet | 701.1 | 112.0 | 16.0 | 30 | 954.5 | 954.8 | 957.1 | 959.0 | 2.6 | 217.5 | 75.2 | | 958 | 968 | 960.0 | 10.9 | Low | DNR # 19002100-P. Outflow to Apple Valley via lift station. |
| LA5 | A43 | | 9.3 | 0.2 | 2.2 | 12 | 1006.0 | | 1009.5 | | 3.5 | 1.6 | 7.0 | | 1015 | | 1011.5 | | | Lift station - Pumped to Lk Alimagnet Watershed |
| LA6 | A42 | | 14.3 | 1.6 | 11.2 | 15 | 1010.0 | | 1011.3 | | 1.3 | 2.3 | 5.7 | HydroCAD | 1018 | | 1013.3 | | | Drains to A43 then pumped to Lk Alimagnet watershed |
| LA7 | A45 | | 2.4 | 0.1 | 4.2 | 12 | 1003.0 | | 1008.5 | | 5.5 | 0.3 | 2.3 | HydroCAD | 981 | | 1010.5 | | | Drains to A42 to A43 then pumped to Lk Alimagnet wtrsd |

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# Table D-1. 10-Year Design Storm: Hydrologic Information for the City of Burnsville

| Subwatershed Name | Subwatershed Drainage Area (Acres) | Pond Surface Area at NWL (Acres) | Ratio of Pond Area to Subwatershed Area (%) | Ratio >1% | Outlet Description (inches) | NWL (NGVD) | Ordinary HWL (NGVD) | 10-Year Event (4.2" Rainfall Event) HWL (NGVD) | Bounce (ft) | Storage (acre/ft) | Peak Outflow Rate (cfs) | Approximate Overflow Elevation | Existing Low Building Elevation | Notes | Freeboard (LBLDG-HWL) (ft) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | 183.1 | 1.4 | 0.8 | NO | 30 | 944.5 | | 957.0 | 12.5 | 7.4 | 55.7 | 958 | 958 | Apple Valley runoff tributary to Burnsville | 1.0 | B G |
| A2 | 112.9 | 2.7 | 2.4 | YES | 12 | 952.0 | | 955.0 | 3.0 | 10.5 | 4.8 | 958 | | Apple Valley runoff tributary to Burnsville | | |
| A3 | 74.8 | 0.5 | 0.7 | NO | 30 | 972.0 | | 978.5 | 6.5 | 4.0 | 54.2 | 980 | 976 | | -2.5 | E G |
| A4 | 3.5 | 0.1 | 2.8 | YES | 12 | 979.7 | | 980.0 | 0.3 | 0.3 | 0.3 | 982 | | | | |
| A6 | 150.2 | 2.9 | 1.9 | YES | 42 | 944.5 | | 949.4 | 4.9 | 13.3 | 81.6 | 952 | 951 | | 1.6 | C F |
| A7 | 725.9 | 28.1 | 3.9 | YES | 72 | 934.3 | 934.5 | 937.2 | 2.9 | 181.7 | 28.4 | 940 | 939 | Includes Keller Lake - DNR #19002500-P. | 1.8 | B D G |
| A8 | 176.8 | 2.2 | 1.2 | YES | no outlet | | | | | | | 948 | | Includes Lac Lavon - DNR #19044600-P. NO OUTLET | | |
| A13 | 180.7 | 2.0 | 1.1 | NO | 30 | 983.1 | | 984.9 | 1.8 | 5.0 | 16.5 | 986.8 | | | | |
| A22 | 105.3 | 7.3 | | | 10' weir | 936.7 | | 937.6 | 0.9 | 4.4 | 36.8 | 940 | 1004 | Portion west of I-35 drains to directly to Buck Hill Bay | 66.4 | A F |
| A23 | 27.6 | 1.6 | 5.8 | YES | 15 | 938.0 | | 939.5 | 1.5 | 1.7 | 5.5 | 944 | 950 | | 10.5 | A D |
| A24 | 549.5 | 298.6 | 54.3 | YES | 36 | 933.4 | 934.5 | 934.3 | 0.9 | 239.1 | 38.2 | 938 | 940 | Includes Crystal Lake - DNR #19002700-P. | 5.7 | A D G |
| A25 | 23.5 | 0.3 | 1.3 | YES | 27 | 932.7 | | 937.9 | 5.2 | 2.2 | 38.2 | 936 | 946 | | 8.1 | A D |
| A26 | 151.1 | 8.7 | 5.8 | YES | 36 | 914.5 | | 919.0 | 4.5 | 71.5 | 59.2 | 926 | 926 | Includes Twin Lakes - DNR #19002800-W. Equalizes with Pond A30 | 7.0 | A D |
| A27 | 180.2 | 0.7 | 0.4 | NO | 10' weir | 921.0 | | 924.4 | 3.4 | 18.5 | 172.3 | 928 | | | | |
| A28 | 145.0 | 14.2 | 9.8 | YES | 18 | 1001.0 | 998.8 | 1002.5 | 1.5 | 21.6 | 3.6 | 1012 | 1010 | Includes Wood Park Pond - DNR #19002400-W. | 7.5 | A D |
| A29 | 53.4 | 2.9 | 5.4 | YES | 12 | 1009.0 | | 1010.5 | 1.5 | 7.4 | 3.8 | 1011 | 1018 | | 7.5 | A |
| A30 | 159.8 | 4.7 | 2.9 | YES | 36 | 914.5 | | 919.0 | 4.5 | 71.5 | 59.2 | 926 | 930 | Equalizes with Pond A26 | 11.0 | A D G |
| A31 | 764.2 | 28.6 | 3.7 | YES | 36 | 905.0 | 906.7 | 911.1 | 6.1 | 202.2 | 38.5 | 916 | 914 | Includes Earley Lake - DNR #19003300-P. | 2.9 | B G |
| A32 | 372.9 | 5.3 | 1.4 | YES | 48 | 893.0 | | 896.6 | 3.6 | 24.3 | 59.7 | 900 | 920 | | 23.4 | A |
| A33 | 441.7 | 57.6 | 13.0 | YES | 48 | 851.0 | 850.0* | 852.7 | 1.7 | 108.9 | 35.9 | 860 | 860 | Includes Sunset Pond | 7.3 | A D |
| A35 | 8.5 | 0.5 | 5.9 | YES | 12 | 1008.0 | | 1008.8 | 0.8 | 0.8 | 1.9 | 1014 | 1015 | Summit Oaks | 6.2 | A D |
| A36 | 4.7 | 0.3 | 6.3 | YES | 12 | 1000.0 | | 1001.1 | 1.1 | 0.4 | 2.4 | 1008 | 1006 | Summit Oaks | 4.9 | A D |
| A37 | 11.2 | | | | 12 | 997.0 | | 1000.0 | 3.0 | 1.0 | 6.2 | N/A | | Summit Oaks | | |
| A38 | 4.5 | 0.1 | 2.2 | YES | 12 | 990.0 | | 995.4 | 5.4 | 0.7 | 7.1 | 1005 | 1016 | Summit Oaks | 20.6 | A D |
| A39 | 10.3 | 0.4 | 3.9 | YES | 12 | 994.0 | | 995.5 | 1.5 | 0.6 | 3.8 | 1001 | 1006 | | 10.5 | A D |
| A40 | 11.9 | 1.0 | 8.4 | YES | 12 | 978.7 | | 979.9 | 1.2 | 2.1 | 1.7 | 981 | 986 | | 6.1 | A |
| A41 | 10.5 | 0.5 | 4.8 | YES | 12 | 972.7 | | 973.9 | 1.2 | 0.9 | 2.5 | 976 | 988 | | 14.1 | A |
| A42 | 14.3 | 1.6 | 11.2 | YES | 15 | 1010.0 | | 1010.8 | 0.8 | 1.2 | 13.7 | 1018 | | Drains to A43 then pumped to Lk Alimagnet watershed | | D |
| A43 | 9.3 | 0.2 | 2.2 | YES | 12 | 1006.0 | | 1007.7 | 1.7 | 0.7 | 4.2 | 1015 | | Lift station - Pumped to Lk Alimagnet Watershed | | D |
| A45 | 2.4 | 0.1 | 4.2 | YES | 12 | 979.9 | | 980.4 | 0.5 | 0.2 | 1.1 | 981 | | Drains to A42 to A43 then pumped to Lk Alimagnet wtrsd | | |
| A46 | 62.4 | 1.0 | 1.6 | YES | 18 | 954.0 | | 961.0 | 7.0 | 7.9 | 21.3 | 963 | 988 | | 27.0 | A |
| A47 | 71.7 | 0.2 | 0.3 | NO | drop structure | 863.5 | | 868.6 | 5.1 | 0.0 | 179.6 | 880 | 880 | TIF Development; Special drop structure outlet | 11.4 | A D |
| A48 | 46.5 | 0.2 | 0.4 | NO | 12 | 880.0 | | 884.1 | 4.1 | 2.2 | 40.2 | 885 | 884 | TIF Development | -0.1 | B G |
| A49 | 5.0 | 0.1 | 2.0 | YES | 12 | 885.0 | | 885.6 | 0.6 | 0.2 | 4.0 | 888 | 890 | TIF Development | 4.4 | A |
| | | | | | | | | | | | | | | | | |
| B1 | 37.6 | 0.7 | 1.9 | YES | 12 | 979.5 | | 981.8 | 2.3 | 3.2 | 4.3 | 986 | 990 | | 8.2 | A |
| B2 | 96.7 | 0.4 | 0.4 | NO | 30" force main | 945.6 | | 949.2 | 3.6 | 4.3 | 45.0 | 954 | 958 | | 8.8 | A |
| B3 | 106.0 | 0.5 | 0.5 | NO | 30" force main | 940.0 | | 952.8 | 12.8 | 14.7 | 45.0 | 954 | 960 | | 7.2 | A |
| B4 | 14.2 | 0.5 | 3.5 | YES | 18 | 1035.0 | | 1036.3 | 1.3 | 0.2 | 6.5 | 1042 | 1051 | | 14.7 | A D |
| B5 | 26.6 | 0.4 | 1.5 | NO | 24 | 1017.0 | | 1018.8 | 1.8 | 0.7 | 13.7 | 1023 | 1046 | | 27.2 | A |
| B6 | 7.3 | 0.5 | 6.8 | YES | 30 | 1009.2 | | 1010.4 | 1.2 | 0.9 | 7.6 | 1012 | | | | |
| B7 | 63.2 | 0.8 | 1.3 | YES | 21 | 969.0 | | 975.6 | 6.6 | 5.4 | 25.9 | 978 | 996 | | 20.4 | A |
| B8 | 92.9 | 2.0 | 2.2 | YES | 30 | 948.0 | | 956.9 | 8.9 | 24.1 | 65.2 | 976 | 990 | | 33.1 | A D |
| B9 | 13.6 | 2.2 | 16.2 | YES | 21 | 882.0 | | 887.8 | 5.8 | 49.7 | 16.1 | 890 | 891 | Equalizes with Pond B10 | 3.2 | C |
| B10 | 438.5 | 4.9 | 1.1 | YES | 21 | 882.0 | | 887.8 | 5.8 | 49.7 | 16.1 | 890 | | Equalizes with Pond B9 | | G |
| B11 | 67.7 | 1.4 | 2.1 | YES | 36 | 867.7 | | 871.0 | 3.3 | 3.5 | 46.0 | 877 | 878 | | 7.0 | C D F |
| B12 | 493.6 | 4.8 | 1.0 | YES | 60 | 845.3 | | 854.2 | 8.9 | 48.6 | 226.2 | 855 | 854 | | -0.2 | E F G |
| | | | | | | | | | | | | | | | | |
| C1 | 289.9 | 0.7 | 0.2 | NO | 18 | 840.0 | | 852.7 | 12.7 | 18.2 | 26.1 | 859 | 864 | | 11.3 | A F |
| C2 | 39.7 | | | | no ponding | | | | | | | N/A | | | | |
| | | | | | | | | | | | | | | | | |
| D1 | 64.9 | 0.1 | 0.2 | NO | 12 | 994.0 | | 998.8 | 4.8 | 3.5 | 19.8 | 999 | 998 | | -0.8 | E F G |
| D2 | 27.5 | 1.9 | 6.9 | YES | 24 | 1014.2 | | 1015.8 | 1.6 | 1.7 | 11.1 | 1028 | 1022 | | 6.2 | A D |
| D3 | 42.9 | 2.7 | 6.3 | YES | 18 | 1002.4 | | 1005.0 | 2.6 | 3.8 | 11.7 | 1017 | 1018 | | 13.0 | A D |
| D4 | 24.2 | 1.0 | 4.1 | YES | 12 | 989.0 | | 994.6 | 5.6 | 6.8 | 6.5 | 999 | 1000 | | 5.4 | B C F |
| D5 | 31.0 | 1.4 | 4.5 | YES | 12 | 968.5 | | 969.9 | 1.4 | 1.9 | 12.0 | 978 | 976 | | 6.1 | A D |
| D6 | 318.9 | 4.4 | 1.4 | YES | 24 | 963.0 | | 968.7 | 5.7 | 34.2 | 32.8 | 974 | 972 | | 3.3 | E |
| D7 | 82.6 | 1.1 | 1.3 | YES | 36 | 959.5 | | 963.3 | 3.8 | 16.1 | 36.1 | 961 | 962 | | -1.3 | C F |
| D8 | 53.7 | 1.5 | 2.8 | YES | 6 | 957.1 | | 961.2 | 4.1 | 5.6 | 1.8 | 961 | 971 | | 9.8 | A F |
| D9 | 45.1 | | | | no outlet | | | | | | | | | NO OUTLET Proposed outlet to D10 | | |

# Table D-1. 10-Year Design Storm: Hydrologic Information for the City of Burnsville

| Subwatershed Name | Subwatershed Drainage Area (Acres) | Pond Surface Area at NWL (Acres) | Ratio of Pond Area to Subwatershed Area (%) | Ratio >1% | Outlet Description (inches) | NWL (NGVD) | Ordinary HWL (NGVD) | 10-Year Event (4.2" Rainfall Event) HWL (NGVD) | Bounce (ft) | Storage (acre/ft) | Peak Outflow Rate (cfs) | Approximate Overflow Elevation | Existing Low Building Elevation | Notes | Freeboard (LBLDG-HWL) (ft) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D10 | 71.8 | 2.0 | 2.8 | YES | 15 | 970.0 | | 974.7 | 4.7 | 12.7 | 12.0 | 978 | 976 | | 1.3 | E |
| D11 | 50.9 | 7.6 | 14.9 | YES | | 869.8 | | | | | | 870 | 876 | Equalizes with Pond D12 | | F |
| D12 | 374.7 | 6.7 | 1.8 | YES | 48 | 865.0 | | 870.7 | 5.7 | 44.6 | 63.2 | 870 | 878 | Equalizes with Pond D12 | 7.3 | A F |
| D13 | 80.4 | | | | no ponding | | | | | | | N/A | | | | |
| | | | | | | | | | | | | | | | | |
| E1 | 10.6 | 0.3 | 2.8 | YES | 12 | 984.0 | | 985.3 | 1.3 | 0.7 | 3.4 | 990 | 988 | Watershed in Apple Valley -runoff tributary to Burnsville | 2.7 | B D |
| E2 | 22.2 | 5.2 | 23.4 | YES | 12" force main | 1016.0 | | 1017.4 | 1.4 | 2.8 | 0.5 | 1022 | 1020 | Watershed in Apple Valley -runoff tributary to Burnsville | 2.6 | B D |
| E3 | 13.6 | 1.6 | 11.8 | YES | 12" force main | 948.0 | | 954.4 | 6.4 | 3.0 | 0.5 | 958 | 956 | Watershed in Apple Valley -runoff tributary to Burnsville | 1.6 | E |
| E4 | 17.0 | 4.3 | 25.2 | YES | 12 | 967.0 | | 968.5 | 1.5 | 1.3 | 3.7 | 978 | 976 | Watershed in Apple Valley -runoff tributary to Burnsville | 7.5 | A D |
| E5 | 29.3 | 1.2 | 4.1 | YES | 12 | 1005.5 | | 1008.8 | 3.3 | 2.1 | 4.7 | 1012 | 1014 | Watershed in Apple Valley -runoff tributary to Burnsville | 5.2 | B |
| E6 | 16.8 | 13.2 | 78.4 | YES | 12 | 1002.8 | | 1004.1 | 1.3 | 3.4 | 3.9 | 1006 | 1006 | Watershed in Apple Valley -runoff tributary to Burnsville | 1.9 | B G |
| E7 | 67.6 | 2.3 | 3.4 | YES | 18 | 996.5 | | 999.1 | 2.6 | 4.6 | 11.4 | 1002 | 1004 | Watershed in Apple Valley -runoff tributary to Burnsville | 4.9 | B |
| E8 | 9.4 | 1.6 | 17.0 | YES | 12 | 1008.0 | | 1010.6 | 2.6 | 0.5 | 4.6 | 1012 | 1014 | Watershed in Apple Valley -runoff tributary to Burnsville | 3.4 | B |
| E9 | 26.7 | 1.1 | 4.1 | YES | 12 | 1009.7 | | 1015.9 | 6.2 | 2.5 | 2.1 | 1022 | 1024 | Watershed in Apple Valley -runoff tributary to Burnsville | 8.1 | A |
| E10 | 73.1 | 8.4 | 11.5 | YES | 12" force main | 968.0 | | 970.1 | 2.1 | 13.7 | 7.0 | 974 | 974 | Watershed in Apple Valley -runoff tributary to Burnsville | 3.9 | B |
| E11 | 18.6 | 0.8 | 4.3 | YES | 12 | 965.9 | | 967.6 | 1.7 | 21.0 | 3.4 | 974 | 974 | Watershed in Apple Valley -runoff tributary to Burnsville | 6.4 | A D |
| E12 | 10.4 | | | | | | | | | | | | | Watershed in Apple Valley -runoff tributary to Burnsville | | |
| E13 | 61.6 | 2.0 | 3.2 | YES | 12 | 947.2 | | 948.5 | 1.3 | 2.2 | 3.4 | 956 | 956 | Watershed in Apple Valley -runoff tributary to Burnsville | 7.5 | A D |
| E14 | 69.2 | 0.3 | 0.4 | NO | 12 | 943.0 | | 954.5 | 11.5 | 6.7 | 4.8 | 958 | 958 | Watershed in Apple Valley -runoff tributary to Burnsville | 3.5 | |
| E15 | 114.8 | 3.0 | 2.6 | YES | 24 | 943.1 | ….. | 944.6 | 1.5 | 5.2 | 5.7 | 950 | 952 | | 7.4 | C D |
| E16 | 13.7 | 0.6 | 4.4 | YES | 12 | 960.0 | | 960.8 | 0.8 | 0.9 | 0.8 | 962 | 966 | | 5.2 | A |
| E17 | 25.7 | 0.9 | 3.5 | YES | 12 | 945.0 | | 947.2 | 2.2 | 2.9 | 1.9 | 948 | 950 | | 2.8 | B |
| E18 | 18.5 | 1.1 | 6.0 | YES | 15 | 935.0 | | 936.6 | 1.6 | 1.3 | 5.7 | 938 | 942 | | 5.4 | A |
| E19 | 12.5 | 3.1 | 24.8 | YES | 12 | 933.0 | | 935.2 | 2.2 | 3.8 | 2.9 | 935 | 950 | | 14.8 | A |
| E20 | 12.9 | 1.0 | 7.8 | YES | 12 | 935.0 | | 937.3 | 2.3 | 0.8 | 5.1 | 939 | 936 | | -1.3 | E |
| E21 | 32.5 | 2.3 | 7.1 | YES | 36 | 935.0 | | 937.8 | -2.8 | 1.2 | 38.3 | 940 | 940 | 6" and 12" force mains | 2.2 | B D |
| E22 | 3.2 | 0.8 | 24.8 | YES | 42 | 946.0 | | 947.7 | 1.7 | 2.2 | 21.2 | 949 | | | | |
| E23 | 56.4 | 1.7 | 3.0 | YES | 42 | 938.7 | | 940.6 | 1.9 | 3.8 | 21.1 | 942 | 946 | Equalizes with ponds E24 and E28 | 5.4 | A |
| E24 | 76.7 | 8.6 | 11.2 | YES | 21 | 936.6 | | | | | | 962 | 944 | Equalizes with ponds E23 and E28 | | |
| E25 | 11.7 | 0.1 | 0.9 | NO | 12 | 953.0 | | 956.0 | 3.0 | 0.6 | 6.0 | 962 | 968 | | 12.0 | A D |
| E26 | 23.6 | 1.1 | 4.7 | YES | 12 | 953.0 | | 955.3 | 2.3 | 2.7 | 5.0 | 962 | 968 | | 12.7 | A D |
| E27 | 24.3 | | | | no ponding | | | | | | | | | | | |
| E28A | 9.2 | 0.1 | 1.1 | YES | 18 | 958.0 | | 959.8 | 1.8 | 0.2 | 8.9 | 968 | 970 | | 10.2 | A D |
| E28 | 30.9 | 2.1 | 6.8 | YES | 18 | 935.0 | | 939.0 | 4.0 | 30.6 | 12.4 | 946 | 948 | Equalizes with ponds E23 and E24 | 9.0 | A D G |
| E29 | 59.6 | 4.3 | 7.2 | YES | 12 | 989.5 | | 990.8 | 1.3 | 6.2 | 3.2 | 1002 | 1006 | | 15.2 | A D |
| E30 | 31.5 | 1.5 | 4.8 | YES | 12 | 988.0 | | 989.7 | 1.7 | 3.5 | 3.9 | 992 | 1014 | | 24.3 | A |
| E31 | 13.2 | 0.9 | 6.8 | YES | 12 | 992.0 | | 992.4 | 0.4 | 1.3 | 0.7 | 996 | 1002 | | 9.6 | A D |
| E32 | 27.1 | 1.1 | 4.1 | YES | 12 | 971.0 | | 972.4 | 1.4 | 4.6 | 3.4 | 976 | | | | G |
| E33 | 17.4 | 0.9 | 5.2 | YES | 12 | 969.0 | | 970.3 | 1.3 | 1.4 | 3.3 | 976 | | | | D G |
| E34 | 18.3 | 0.8 | 4.4 | YES | 12 | 968.0 | | 969.3 | 1.3 | 1.4 | 3.3 | 970 | | | | C F |
| E35 | 21.9 | | | | no outlet | | | | | | | | | NO OUTLET; Proposed to outlet into E34 | | |
| E36 | 15.0 | | | | no outlet | | | 975.8 | | 0.8 | 1.9 | | | NO OUTLET; Proposed to outlet into E34 | | |
| E37 | 53.5 | 1.4 | 2.6 | YES | | 957.1 | | 958.5 | 1.4 | 4.9 | 3.1 | 962 | | Equalizes with Pond E38 | | D |
| E38 | 34.4 | 3.6 | 10.5 | YES | | 957.1 | | 958.5 | 1.4 | 4.9 | 3.1 | 962 | 966 | Equalizes with Pond E37 | 7.5 | A |
| E39 | 67.2 | 5.1 | 7.6 | YES | 18 | 944.0 | | 945.5 | 1.5 | 8.7 | 7.6 | 948 | 952 | | 6.5 | A D C |
| E40 | 23.7 | 2.0 | 8.4 | YES | 18 | 935.2 | | 937.2 | 2.0 | 6.2 | 6.1 | 938 | 948 | Equalizes with Pond E41, E42, and E43 | 10.8 | A D |
| E41 | 10.4 | 0.6 | 5.8 | YES | 21 | 935.8 | | 937.5 | 1.7 | 2.5 | 6.0 | 939.6 | 942 | Equalizes with Pond E40, E42, and E43 | 4.5 | A D |
| E42 | 8.8 | 0.5 | 5.7 | YES | 18 | 935.5 | | 937.3 | 1.8 | 0.3 | 7.3 | 940 | 944 | Equalizes with Pond E40, E41, and E43 | 6.7 | A |
| E43 | 15.0 | 1.3 | 8.7 | YES | 15 | 935.5 | | 937.1 | 1.6 | 2.2 | 5.8 | 940 | 942 | Equalizes with Pond E40, E41, and E42 | 4.9 | A D G |
| E44 | 121.3 | 2.6 | 2.1 | YES | 24 | 925.0 | | 929.5 | 27.4 | 15.2 | 25.6 | 933 | 932 | | 2.5 | B D G |
| E45 | 138.3 | 1.2 | 0.9 | NO | 21 | 924.4 | | 928.7 | 4.3 | 9.7 | 17.5 | 931 | 932 | | 3.3 | B |
| E46 | 35.9 | 1.5 | 4.2 | YES | 18 | 879.0 | | 892.2 | 13.2 | 86.9 | 19.7 | 903 | 901 | Equalizes with Pond E47 | 8.8 | A D F |
| E47 | 347.2 | 3.3 | 1.0 | NO | 18 | 879.0 | | 892.2 | 13.2 | 86.9 | 19.7 | 903 | 901 | Equalizes with Pond E46 | 8.8 | A D G |
| E48 | 195.6 | 1.4 | 0.7 | NO | 36 | 853.2 | | 862.2 | 9.0 | 22.7 | 93.0 | 867 | 863 | | 0.8 | F F |
| | | | | | | | | | | | | | | | | |
| F1 | 171.0 | 2.9 | 1.7 | YES | 18 | 892.0 | | 896.7 | 4.7 | 15.1 | 16.8 | 901 | 902 | | 5.3 | B |
| F2 | 95.9 | 3.1 | 3.2 | YES | 12 | 873.0 | | 876.3 | 3.3 | 9.7 | 5.4 | 877 | 880 | | 3.7 | B D |
| F3 | 256.0 | | | | no ponding | | | | | | | N/A | | | | |
| F4 | 35.0 | | | | no ponding | | | | | | | N/A | | | | |
| F5 | 91.0 | | | | no ponding | | | | | | | N/A | | | | |
| | | | | | | | | | | | | | | | | |

# Table D-1. 10-Year Design Storm: Hydrologic Information for the City of Burnsville

| Subwatershed Name | Subwatershed Drainage Area (Acres) | Pond Surface Area at NWL (Acres) | Ratio of Pond Area to Subwatershed Area (%) | Ratio >1% | Outlet Description (inches) | NWL (NGVD) | Ordinary HWL (NGVD) | 10-Year Event (4.2" Rainfall Event) HWL (NGVD) | Bounce (ft) | Storage (acre/ft) | Peak Outflow Rate (cfs) | Approximate Overflow Elevation | Existing Low Building Elevation | Notes | Freeboard (LBLDG-HWL) (ft) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G1 | 251.0 | | | | no ponding | | | | | | | N/A | | | | |
| | | | | | | | | | | | | | | | | |
| H1 | 701.1 | 112.0 | 16.0 | YES | 30 | 954.5 | 954.8 | 956.0 | 1.5 | 117.0 | 72.0 | 958 | 968 | Includes Lake Alimagnet - DNR # 19002100-P. Additional drainage area from Apple Valley | 12.0 | A |
| H2 | 297.2 | 10.3 | 3.5 | YES | 18 | 958.0 | | 959.6 | 1.6 | 47.4 | 7.0 | 960 | 972 | Watershed drains to east through Apple Valley | 12.4 | A D |
| H3 | 177.2 | 3.2 | 1.8 | YES | no ponding | | | | | | | | | | | |
| H4 | 67.4 | | | | no ponding | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| J1 | 49.8 | 14.6 | 29.3 | YES | 12 | 988.0 | 990.0* | 988.3 | 0.3 | 8.5 | 0.5 | 990 | | Includes Horsehoe Lake - DNR #19003200-P. Proposed storm sewer to be constructed and routed to J2. | | D |
| J2 | 58.6 | 0.6 | 1.0 | NO | 12 | 981.0 | | 983.3 | 2.3 | 3.4 | 4.1 | 990 | 1024 | | 40.7 | A D |
| J3 | 15.9 | | | | | | | | | | | | | | | |
| J4 | 22.5 | 1.9 | 8.4 | YES | 18 | 910.0 | | 911.2 | 1.2 | 1.2 | 5.6 | 916 | 1014 | | 102.8 | A D |
| J5 | 74.9 | 0.3 | 0.4 | NO | 42 | 943.5 | | 943.5 | 0.0 | 10.5 | 0.0 | 945 | 980 | | 36.5 | A D |
| J6 | 92.2 | 1.0 | 1.1 | YES | 30 | 940.0 | | | | | | 950 | 958 | | | A |
| J7 | 83.6 | | | | 12 | 940.0 | | 940.7 | 0.7 | 0.7 | 1.6 | 946 | 950 | Wildwood Pond | 9.3 | A D |
| J8 | 63.1 | 0.1 | 0.2 | YES | grate | 915.3 | | | | | | 920 | 918 | | | B |
| J9 | 706.7 | 70.1 | 9.9 | YES | channel | 858.0 | | 858.2 | 0.2 | 15.3 | 1.2 | N/A | | Cam Ram outlet to west into Scott County | | |
| J10 | 72.7 | | | | no ponding | | | | | | | N/A | | | | |
| J11 | 28.4 | | | | no ponding | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| K1 | 53.0 | | | | no ponding | | | | | | | N/A | | | | |
| K2 | 15.5 | | | | no ponding | | | | | | | N/A | | | | |
| K3 | 83.2 | | | | no ponding | | | | | | | N/A | | | | |
| K4 | 31.5 | 1.0 | 3.2 | YES | 12 | 998.0 | | 999.9 | 1.9 | 1.9 | 4.0 | 1002 | | | | |
| | | | | | | | | | | | | | | | | |
| L1 | 24.8 | 0.5 | 2.0 | YES | 18 | 797.6 | | 799.0 | 1.4 | 0.0 | 6.9 | 801.5 | 808 | | 9.0 | A |
| L2 | 3.3 | 0.1 | 3.0 | YES | 12 | 797.0 | | 798.0 | 1.0 | 0.1 | 2.6 | 805 | 809 | | 11.0 | A D |
| L3 | 17.5 | 0.4 | 2.3 | NO | 12 | 748.0 | | 754.2 | 6.2 | 4.3 | 9.1 | 763 | 764 | | 9.8 | A D F |
| L4 | 38.6 | | | | 18 | 795.2 | | | | | | 812 | 818 | | | |
| L5 | 27.1 | 0.0 | 0.0 | NO | 21 | 746.8 | | | | | | 755 | 793 | | | |
| | | | | | | | | | | | | | | | | |
| NW1 | 402.6 | | | | No Data | | | | | | | | | Hydrocad nodes: 9106, 9107, 9110 | | |
| NW1A | 10.4 | | | | No Data | | | | | | | | | Hydrocad node:9100 | | |
| NW1B | 5.6 | | | | No Data | | | | | | | | | Hydrocad node: 9101 | | |
| NW1C | 95.9 | | | | No Data | | | | | | | | | Hydrocad node:9105 | | |
| NW2 | 162.1 | | | | No Data | | | | | | | | | Hydrocad node: 102 | | |
| NW3 | 590.2 | | | | No Data | | | | | | | | | Hydrocad nodes:9124, 9126, 9127, 9128, 9129 | | |
| NW4 | 93.4 | | | | No Data | | | | | | | | | Hydrocad node: 5001 | | |
| NW4A | 76.6 | | | | No Data | | | | | | | | | Hydrocad node:5000 | | |
| NW5 | 75.5 | | | | No Data | | | | | | | | | Hydrocad node: 5005 | | |
| NW5A | 9.3 | | | | No Data | | | | | | | | | Hydrocad node:5002 | | |
| NW6 | 363.3 | | | | No Data | | | | | | | | | Future Quarry Lake subwatershed | | |
| NW7 | 78.1 | | | | No Data | | | | | | | | | Hydrocad node:5007 - Outlets to NW Subwatershed of LMRWD | | |
| NW8 | 62.4 | | | | No Data | | | | | | | | | Landfill | | |
| NW9 | 282.9 | | | | No Data | | | | | | | | | Landfill - Outlets to NW Subwatershed of LMRWD | | |
| NW10 | 10.7 | | | | No Data | | | | | | | | | Hydrocad node: 5010 | | |
| NW11 | 18.5 | | | | No Data | | | | | | | | | Hydrocad node:5011 | | |
| NW12 | 29.9 | | | | No Data | | | | | | | | | Hydrocad node: 5012 | | |
| NW13 | 25.6 | | | | No Data | | | | | | | | | Hydrocad node:5013 | | |
| NW14 | 7.1 | | | | No Data | | | | | | | | | Hydrocad node: 5014 | | |
| NW15 | 36.3 | | | | No Data | | | | | | | | | Hydrocad node:5015 | | |
| NW16 | 17.3 | | | | No Data | | | | | | | | | Hydrocad node: 5016 | | |

## Appendix E – Water Resource Related Agreements

The City of Burnsville has entered into a number of water resource related agreements that govern in part how the City of Burnsville must manage its water resources. These agreements include joint powers agreements between the City and Watershed Management Organizations having jurisdiction within its boundaries, agreements between the City and adjoining communities, or agreements it may have with other governmental units or private parties. A description of the water resources related agreements which the City has entered into are described below.

1. Joint Powers Agreement with the Black Dog Watershed Management Organization.

2. Joint Powers Agreement with Credit River Watershed Management Organization.

3. Joint Powers Agreement with the Vermillion River Watershed Management Organization.

4. Joint Powers Agreement with the City of Savage, dated May 21, 1990 – City Project 90LD-3 – relates to billing and construction of Chowen Avenue storm sewer.

5. Joint Powers Agreement with the City of Savage, dated June 6, City Project Nos. 83LD-1A, B & C – relates to the Sunset Pond area.

6. Joint Powers Agreement with the City of Lakeville, dated March 17, 1980 – relates to Crystal Lake Overflow System

7. Joint Powers Agreement with the City of Lakeville, dated September 6, 1983 – relates to storm controls in an area adjacent to a common border between the cities of Lakeville and Burnsville in the vicinity of 35W North and 160$^{th}$ Street.

8. Joint Powers Agreement with the City of Apple Valley, dated March 15, 1982 – relates to City Project No. 81LD-7, and relates to Pond D, called out by Mn/DOT which is located in Burnsville in the SE Quarter of the NW Quarter of Section 16, Township 115, Range 20W.

9. Joint Powers agreement with the City of Apple Valley, dated December 18, 1978 – relates to Alimagnet Lake Lift Station to control lake level from stormwater runoff.

10. Joint Powers Agreement with the City of Eagan, dated March 15, 1992 – relates to land in Eagan in the SW ¼ of Section 31, Township 27, North Range 23, draining into the City of Burnsville.

11. Joint Powers Agreement with the City of Eagan, dated July 15, 1974 – relates to sanitary sewer, water lines and storm sewer improvements in River Hills 9$^{th}$ Addition, SW Quarter of the NW Quarter of Section 30, Township 27, North Range 23 West.

12. Joint Powers Agreement with the City of Savage, dated January 30, 1991 – relates to City Project 83LD-1A.

13. Joint Powers Agreement with the City of Savage, dated May 3, 1982 – relates to billing fees for properties in savage that are connected tot he Burnsville Water System.

14. Joint Powers Agreement with the City of Lakeville, dated January 3, 1992 – relates to three issues;
    a. Quarterly Potable Water Usage
    b. Maple Island Sanitary Sewer Lift Station Charges
    c. Payment for the Crystal Lake Outlet Construction.

15. Joint Powers Agreement with the City of Apple Valley, dated November 2, 1981 and amended March 7, 1983 – relates to Cobblestone Manor sewer Service Agreement.

16. Joint Powers Agreement with the City of Eagan, dated March 15, 1982 – relates to Subject 81LD-7 and Pond "E" Agreement further relates to Eagan reimbursing the City of Burnsville for appropriate trunk area storm sewer assessments when area is platted or building permits are issued.

17. Joint Powers Agreement with the City of Eagan, dated July 15, 1974. Agreement outlines Burnsville and Eagan responsibilities toward providing storm sewer, sanitary sewer and water service to properties in the River Hills 9th Addition.

## Example Storm Water Practice Maintenance

Following is an example Storm Water Pond Maintenance Agreement. The agreement can, and is intended to, be modified to apply to a wide range of storm water BMPs.

# EXAMPLE AGREEMENT

## REGARDING STORM WATER MANAGEMENT PRACTICES: WATER QUALITY TREATMENT POND

I. THIS AGREEMENT made this _____ day of _____, 200__ by and among the City of Burnsville, Minnesota (hereinafter referred to as the "City") and, _____, a _____ [corporation, individual] (hereinafter referred to as "_____") with reference to the following facts and circumstances:

A. (*)_____ is the fee owner of certain real property situated in the City of _____, legally described as follows:
(Legal)_____,
(*) CAPS_____(_____)
(hereinafter referred to as the "Subject Property").

B. As a condition of its approval of the development for the Subject Property, the City has required that the parties hereto enter into an agreement, which makes provision for the maintenance of the Storm Water Management Practice located within the boundaries of the Subject Property as the same is described and depicted in those certain construction plans drawn by _____, approved by the City and constructed by _____. The Storm Water Management Practice is located in the platted drainage and utility easement in_____.

C. The parties hereto desire to set forth their agreement with respect to the maintenance of the Storm Water Management Practice and the costs of such maintenance.

II. NOW THEREFORE, in consideration of the foregoing facts and circumstances, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto hereby agree as follows:

A. For the purposes of this Agreement, maintenance of the Storm Water Management Practice shall mean the annual inspection and certification by a qualified individual that the pond is functioning in accordance with the approved plans and, if necessary, the periodic dredging of the silt buildup in the Storm Water Management Practice as necessary to maintain function, as established for the Storm Water Management Practice in the construction plans and to maintain the proper operation of the treatment function of the Storm Water Management Practice.

B. (*)_____ shall be solely responsible for the maintenance of the Storm Water Management Practice, and shall bear all costs of such maintenance, until such time as _____ (hereinafter referred to as the "Association") is activated pursuant to Article _____, Section _____, of the Declaration of Covenants for _____, whereupon the Association shall bear the sole responsibility for such maintenance and shall bear all costs of such maintenance. If (*)_____, or after its incorporation,

the Association, does not undertake the necessary maintenance within 30 days of notification by the City, or within 30 days provide the City with a schedule for undertaking the necessary maintenance, the City may undertake such maintenance, and the costs reasonably incurred by the City for performing such maintenance shall be reimbursed to the City within 30 days by the party responsible for such maintenance and, if the responsible party does not timely reimburse the City, then the City may recover its costs by levying a special assessment against all single family house lots in the Subject Property, each lot to bear an equal share.

C. (*)_____, as present owner of the Subject Property, for itself and respective successors and assigns, hereby waives any statutory right which it may have to contest any such assessment by the City of its maintenance costs on the basis of the benefit to portions of the Subject Property.

D. Notwithstanding anything contained in this Agreement to the contrary, in the event the city shall establish a policy for maintenance by the City of Storm Water Management Practices located elsewhere in the City of Burnsville under which policy the costs of such maintenance are to be paid either out of general City revenues or by collection of utility or service fees or charges, then any owner of any portion of the Subject Property shall be entitled to petition the City for the inclusion of the Storm Water Management Practice under such maintenance program, and the City shall consent to such request and thereupon authorize the termination of this Agreement. The recording of a certified copy of the Resolution of the City Council of the City which sets forth the consent and authorization described in the foregoing sentence shall serve the terminate this Agreement, without further action on the part of any party hereto.

E. The terms and conditions of this Agreement shall be binding upon, and shall insure to the benefit of, the parties hereto and their respective successors and assigns.

III. IN WITNESS WHEREOF, the parties hereto have caused this document to be executed as of the day and year first above written.

_____ _____
Date

Title _____
for the City of Burnsville, Minnesota

_____ _____
[Corporation/individual] Date

THIS INSTRUMENT DRAFTED BY _____

## Appendix F – Local Permitting Process

The City's process for water resource related permitting is a significant aspect of the overall City development review and permitting program. The key steps in the permitting process are outlined below. In general, the process involves contacting the City Planning Department in the early stages of a proposed project. The Planning Department facilitates the review process with other City departments that may be involved in the project review process (e.g. Natural Resources Department, Engineering Department) prior to the project going before the Planning Commission and City Council. Following Council approval, the applicant submits a permit application and, if the required information has been submitted and reviewed to the satisfaction of the City, a permit is issued.

Step 1. **Initial City Contact.** Developer/applicant contacts the City Planning Department to initiate project review with City departments. Information from the Planning Department can be obtained by calling 952-895-4455 or by visiting the City's website at www.burnsville.org. The applicant will be given a list of the information that must be submitted to the City. The Planning Department will also arrange and facilitate initial meeting(s) and development review from other City departments having review responsibility for the project.

Step 2. **Staff Review Process.** City departments including the Natural Resources and Engineering Departments will begin discussions and preliminary review of the project and work with the applicant to address required elements. Staff will work through project details with the applicant to the point where an appearance before the Planning Commission can be scheduled. For storm water rate, volume, and water quality control/treatment requirements the developer should contact the Engineering Department at 952-895-4400 and refer to the information provided in Appendices C and D of this WRMP. For more information on wetland permitting and related requirements, the applicant should contact the Natural Resources Department at 952-895-4515.

Step 3. **Planning Commission Review.** The City Planning Commission reviews the project, typically resulting in one of the following two outcomes: 1. Recommendation to Council; or 2. Continuation of the project review so that additional information can be gathered, reviewed and presented. Review by the City's Park and Natural Resources Commission may be required on projects that have significant natural resource impacts.

Step 4. **Council Review.** Council reviews the project and considers any recommendations from the City Commissions and staff. Council may approve, not approve or continue the project so that additional information can be gathered, reviewed and presented. If Council approves the project, the applicant is required to satisfy all conditions of approval and modify plans/design accordingly prior to filing for a permit. pay any fees and satisfy and conditions needed to file for a permit.

Step 5. **Permit Application.** The developer/applicant applies to the Inspections Department for the City building permit and City staff complete final project reviews. No construction activities may commence on the site, and no permit will be issued until the applicant installs the required temporary erosion and sediment control BMPs at the site. This is the only site activity that is allowed prior to issuance of the permit.

Step 6. **Permit Issuance.** Following staff verification that the temporary erosion and sediment control BMPs are in place, the permit is issued approving commencement of construction activities. The permit and accompanying information describes project-specific requirements in more detail.

**City of Burnsville** Owner / Developer Name: _____

**Storm Water Checklist** Development Name/Parcel: _____

Date: _____ Existing Impervious (acres) _____

Reviewer: _____ New Impervious (acres) _____

Total Site Area (ac) _____ Redevelopment Impervious (acres) _____

Area Disturbed (ac) _____ Total Impervious (acres) _____

Downstream Receiving Water Name (e.g., wetland, Crystal Lake) _____

Receiving Water Type (Circle One) LAKE STREAM/RIVER WETLAND STORM POND

| | **Rate Control** | **Water Quality** | **Volume Control Standard** (3) | **Erosion & Sediment Control** |
|---|---|---|---|---|
| | No Increase from Existing Rates | Pollutant Removal Standard (3) | | |
| **New Development** (4) | | | | |
| | 2, 10 & 100-year | 90%TSS, 60%TP(1) | 1 inch | Yes |
| **Redevelopment** (4), (6) | | | | |
| New or Additional Impervious | 2, 10 & 100-year | 90%TSS, 60%TP(1) | 1 inch | Yes |
| Redevelopment Impervious areas | 2, 10 & 100-year | 70%TSS, 30%TP(2) | 0.5 inch | Yes |

(1) Annual pollutant removal efficiency as determined by a pollutant loading model approved by the City Engineer. This treatment level applies to the new development portions of a project. If the volume control standard is met through the worksheet in Appendix B, the pollutant removal standard is also considered to be met.

(2) Annual pollutant removal efficiency as determined by a pollutant loading model approved by the City Engineer. This treatment level applies to the redevelopment portions of a project. If the volume control standard is met through the worksheet in Appendix B, the pollutant removal standard is also considered to be met.

(3) The volume required is evaluated using the Worksheet in Appendix B of the Water Resources Management Plan. Restrictions to infiltration apply to hotspots, the area defined in Figure C-1, shallow bedrock or high water table.

(4) Rate control, water quality and infiltration standards apply to any project disturbing one-half acre or more of land or creating 5,000 square feet or more of new impervious area. Additional requirements (including impervious surface coverage limits) apply to any project in Shoreland.

(5) Disturbed area is defined as areas of where soil or the subgrade is exposed during the construction process and includes areas of both new development and redevelopment disturbances. Generally all area within construction limits.

(6) Projects conducting pavement reconstruction/rehabilitation only on existing impervious areas are exempt from rate, water quality and volume control standards. Erosion control standards still apply.

**City of Burnsville** Owner / Developer Name: _____

**Storm Water Checklist** Development Name/Parcel: _____

| **Summary of Required Submittals** (not a complete list of all data that may be needed to review a project) | | |
|---|---|---|
| **Standards Section / Category** | **Submitted** | **N/A** |
| **1. General** | | |
| ☒ Map showing overall site area, new and redevelopment impervious areas and construction limits/disturbed area | | |
| **2. Water Quality** | | |
| ☒ Infiltration Worksheet from Appendix B (if applicable) | | |
| ☒ Provide P8 (or equivalent) modeling showing annual removal of TSS and TP (if not meeting infiltration requirements) | | |
| ☒ Calculations and assumptions showing how total treatment volume is provided | | |
| **3. Volume Control / Infiltration Practices** | | |
| ☒ Soils investigation data from the location of each infiltration BMP on the site | | |
| ☒ Calculations showing the maximum drawdown time of 48 hours is met | | |
| ☒ Provide pretreatment system for each infiltration BMP on site | | |
| ☒ Plan for protecting infiltration BMPs from compaction and sedimentation during construction | | |
| ☒ Provide long-term maintenance/operation plan for infiltration BMPs | | |
| **4. Water Quantity/Flood Control** | | |
| ☒ Provide storm sewer and pond system plans and hydrologic/hydraulic calculations and/or models | | |
| ☒ Provide a site plan showing drainage areas and documentation of any floodplain impacts (if applicable) | | |
| ☒ Note low floor, low opening and high water elevations of adjacent water bodies on grading plans. | | |
| **5. Rate Control** | | |
| ☒ Provide calculations for the 2, 10 and 100-year rainfall event include routing map, modeling and computations. | | |
| ☒ In Vermillion River or direct discharges to Black Dog Fen, also provide 1-year rate calculations | | |
| **6. Special Waters and Wetlands** | | |
| ☒ If discharge is to Trout Stream #1, #4 or #7, additional BMPs required per NPDES Permit for erosion control, volume control, temperature control and maintaining a 100 buffer around stream. | | |
| ☒ Buffer establishment around wetlands and storm water ponds; | | |
| ☒ Buffer distance for wetlands per Wetland Mgmt. Plan | | |
| **7. Design Computations** | | |
| ☒ Calculations and/or modeling for storm system, ponds, downstream waters | | |
| **8. Pond and Infiltration Basin Design Items** | | |
| ☒ Pond construction plans and specifications for ponds in the zone shown in Figure C-1 | | |
| ☒ Pond design details showing average depth, maximum depth, 10:1 bench, maximum 3:1 slopes above and below the bench, vehicle access, maximum separation between inlet and outlet, outlet skimmer detail and calculations, soil boring information | | |
| **9. Erosion & Sediment Control** | | |
| ☒ Prepare NPDES Permit SWPPP for sites $\geq$1 acre disturbance – submit if requested by City Eng.. | | |
| ☒ Provide plans for erosion and sediment control BMP's for all projects | | |

## Definitions *(additional definitions in Definitions Section of the WRMP)*:

**Development:** The construction, installation or alteration of any structure, the extraction, clearing or other alteration of terrestrial or aquatic vegetation, land or the course, current or cross section of any water body or water course or division of land into two (2) or more parcels (source: Burnsville City Code 10-8-2 and 10-4-2). See also re-development and new development.

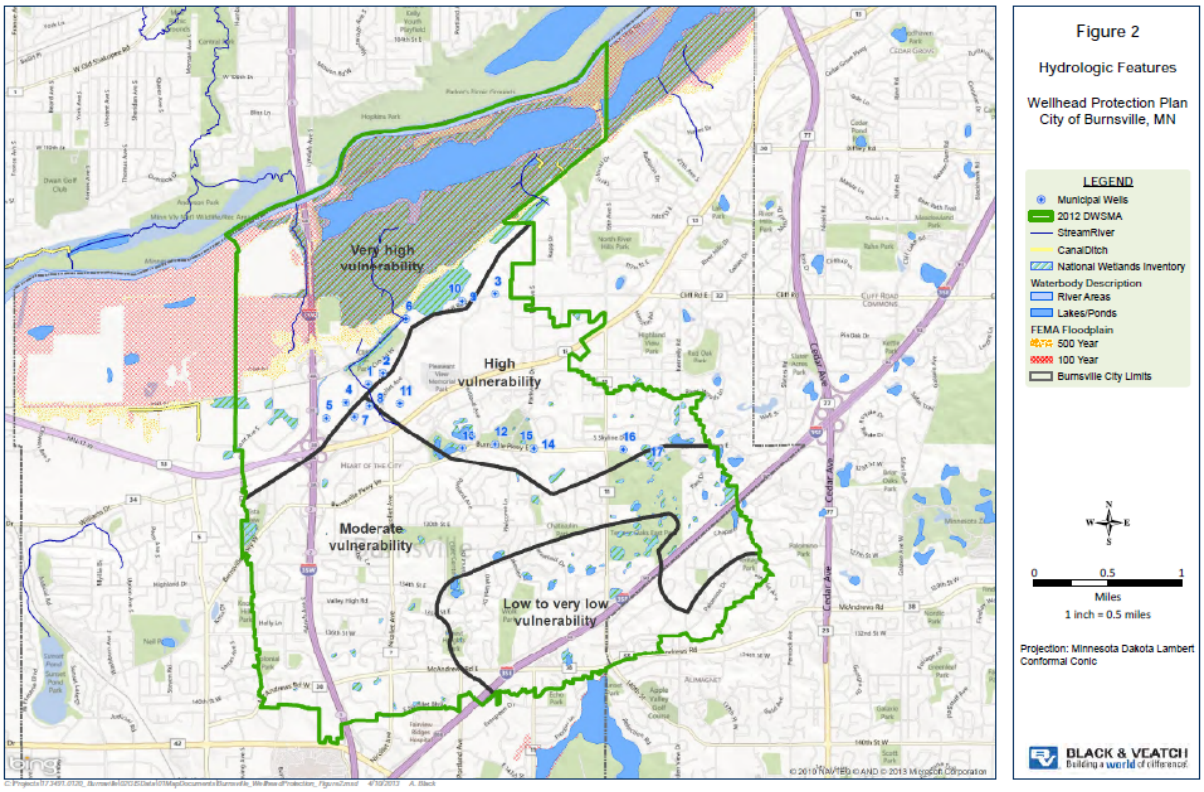
**New Development:** Development of a property or portion thereof that is currently not developed.

**Redevelopment:** Any development including but not limited to rebuilding, renovation, revision, remodel, reconstruction or redesign of or at an existing development.

**Shoreland:** Land located within the following distances from public waters: one thousand feet (1,000') from the ordinary high water level of a lake, pond, or flowage; and three hundred feet (300') from a river or stream, or the landward extent of a floodplain designated by ordinance on a river or stream, whichever is greater. The limits of shoreland may be reduced whenever the waters involved are bounded by topographic divides which extend landward from the waters for lesser distances and when approved by the Commissioner of the DNR.

**Undeveloped Property:** Any property within the City on which no development (as defined in City Code 10-4-2) has occurred.

**Figure C-1. Prohibited and Restricted Infiltration Zone.** Projects located Very High or High Vulnerability areas are prohibited from using infiltration practices. A combination of wet ponds and/or filtration BMPs can be used to meet the water quality treatment requirements specified in the Plan standards. Some restrictions may apply to areas designed as Moderate or Low to Very Low Vulnerability. Consult with City Engineering staff for more information.



| Applicant: |
|---|
| Case File No.: |

## APPLICATION CHECKLIST

| REQUIRED SUBMISSIONS | SUBMITTED | N/A |
|---|---|---|
| **Preliminary Plat**<br>☒ Provide items listed on Preliminary Plat handout. Development fees will be calculated based on the information shown on the preliminary plat. | | |
| **Final Plat**<br>☒ Provide items listed on Final Plat handout when requested by Engineering Department | | |
| **Site Survey**<br>☒ Provide all existing conditions on-site and surrounding the property including delineated wetlands | | |
| **Site Plan – Existing and Proposed**<br>☒ Provide legal boundaries of the property, easements, buildings, parking lot layout, size of parking stalls, driveway widths, parking lot lighting, curbing detail, setback lines, north arrow, Ordinary High Watermark of lakes, floodplains | | |
| **Area Calculations – Existing and Proposed**<br>☒ Provide SF of property and building, total impervious surface area, total % and SF of greenspace, % and SF of landscaping within the parking lot, and % of landscaping 4 feet in width around the perimeter of the building, number of parking stalls | | |
| **Grading/Erosion Control Plan - Existing & Proposed**<br>☒ Provide existing and proposed contours with building footprint and spot elevations, contours must extend at least 20 feet beyond lot line, location and details of erosion control fence | | |
| **Utility Plan – Existing and Proposed**<br>☒ Provide locations of all utilities, fire hydrants and storm sewer calculations, detail of proposed utilities | | |
| **Lighting Plan and Light Fixture Detail**<br>☒ Provide photometry plan and cut sheets of fixtures, location of fixtures on grounds & building exterior | | |
| **Signage Plan – Existing and Proposed**<br>☒ Provide SF of all signs including height of freestanding signs, location, colored sign drawings, and sign criteria for multi-tenant buildings | | |
| **Landscape Plan – Existing and Proposed**<br>☒ Provide existing vegetation, sodded areas, notation on irrigation, and a planting schedule that includes: size, type, root type | | |
| **Building Elevations/Floor Plan – Existing and Proposed**<br>☒ Provide front, sides and rear elevations with all building dimensions, materials and colors clearly labeled on all sides. Include rooftop screen measures, details of trash enclosure, sprinkler notation | | |
| **Tree Survey**<br>☒ Provide location of existing trees, list of trees to be saved and removed, woodland evaluation worksheet with the value, # and %'s to be removed and saved, reforestation plan if exceeding threshold | | |
| **Noise/Traffic Study**<br>☒ Contact Planning Department to determine if a noise or traffic study is needed prior to making application. A noise or traffic study may be required after you make application | | |
| **Environmental Review (EAW / EIS / AUAR)**<br>☒ Provide all documentation required per the MN Environmental Quality Board & State of MN Environmental Rules | | |
| **Completed Application Form (SF = Square Footage) (% = Percent)**<br>☒ Provide **15** complete **FOLDED** sets of all plans, filing fee, property owner's signature, signed Professional Fees Agreement, list of property owners within 350 feet from all property lines, and two typed sets of mailing labels | | |
| CD →Submit the following with Revised Plans, including Final Plat, if applicable.<br>☒ **Provide all plans, drawings, narratives, attachments, etc. 11 X 17 size on a CD (in PDF format).** | | |

OFFICE USE ONLY

**No. of P.H. Signs:** _____ **Complete Application:** ☐ **Yes** ☐ **No** **Date:** _____

**Mail Plans to:**

| | | |
|---|---|---|
| MnDot | ☐ Yes (3) | ☐ No |
| DNR | ☐ Yes (1) | ☐ No |
| County | ☐ Yes (1) | ☐ No |
| LMWD | ☐ Yes (1) | ☐ No |

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