CITY OF WHITE BEAR LAKE

WATER MANAGEMENT PLAN

NOVEMBER 1997

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CITY OF WHITE BEAR LAKE
WATER MANAGEMENT PLAN

ACKNOWLEDGEMENTS

Both the necessary data base and resources to support the development of this plan were available from each of the four watersheds bounding the City of White Bear Lake. Excerpts, whole and in part, were used in the preparations of this document to ensure conformance with WMO guidelines.

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CITY OF WHITE BEAR LAKE
WATER MANAGEMENT PLAN

TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY 1

SECTION 1 - INTRODUCTION
1.1 Authorization and Need 1-1
1.2 Background 1-1
1.3 Purposes of Water Management Programs 1-2
1.4 Plan Summary 1-3

SECTION 2 - PHYSICAL ENVIRONMENT
2.1 Geology and Topography 2-1
2.2 Soils 2-1
2.3 Precipitation 2-2
2.4 Surface Water Resources 2-4
2.4.1 Drainage Ditches 2-4
2.4.2 Lakes and Other Significant Water Bodies 2-5
2.5 Storm Drain System 2-7
2.6 Water Quality 2-8
2.7 Land Use 2-9
2.8 Utilities 2-9
2.9 Water Appropriation Permits 2-10
2.10 Ground Water Resource Data 2-10
2.11 Water-Based Recreation Areas 2-11
2.12 Unique Features and Scenic Areas 2-11
2.13 Pollutant Sources 2-11

SECTION 3 - OBJECTIVES AND POLICIES
3.1 General 3-1
3.2 Objectives 3-1
3.3 Policies 3-2
3.3.1 Water Resource Planning 3-2
3.3.2 Minimize Public Expenditures to Control Runoffs 3-2
3.3.3 Improve Water Quality 3-3
3.3.4 Prevent Erosion from Surface Flows 3-3
3.3.5 Control Flooding 3-4
3.3.6 Promote Groundwater Recharge 3-4
3.3.7 Protect and Enhance Fish and Wildlife Habitat and Water Recreation 3-4
3.3.8 Protect and Improve All Existing Native and Artificial Water Courses 3-4

SECTION 4 - MANAGEMENT STRATEGIES
4.1 General 4-1
4.2 Standards and Priorities 4-1
4.2.1 Stormwater Runoff 4-3
4.2.2 Hydrology and Hydraulic Design 4-4
4.2.3 Sub-Basin Hydrology 4-4
4.2.4 Wetlands 4-5
4.2.5 Groundwater 4-6
4.2.6 Shoreland Management 4-6
4.2.7 Floodplain Management 4-6
4.2.8 Soil Erosion and Sediment Control 4-7
4.2.9 Open Space, Recreation, and Wildlife Management 4-8
4.2.10 Education and Public Involvement 4-9
4.3 Assessment of Problems 4-9
4.4 Capital Improvements 4-9

SECTION 5 - PLAN IMPLEMENTATION 5-1
5.1 Process 5-1
5.2 Regulatory Action 5-1
5.2.1 Water Quantity 5-1
5.2.2 Water Quality 5-3
5.2.3 Wetlands 5-3
5.2.4 Groundwater 5-4
5.2.5 Shoreland Management 5-4
5.2.6 Floodplain Management 5-4
5.2.7 Soil Erosion and Sediment Control 5-4
5.2.8 Open Space, Recreation, and Wildlife Management 5-5
5.2.9 Education and Public Involvement 5-5
5.2.10 Maintenance and Inspection 5-5
5.2.11 Finance 5-6
5.3 Assessment of Problems 5-6
5.4 Capital Improvement Projects 5-6
5.5 Amendment Procedures 5-7

REFERENCES

GLOSSARY

TABLES

Number	Description	Page
1	Rainfall in Minneapolis-St. Paul Metropolitan Area	2-3
2	DNR Ecological/Management Classification of Protected Waters	2-5
3	Wetland Functions	2-6
4	Discharge Rates to Neighboring Communities	2-7
5	Flood Levels, Peak Discharges, Storage Volumes	2-8
6	Water Appropriation Permits	2-10
7	Pollutant Sources, Dumps, and Landfills	2-12

MAPS

Map	Description	Follows Page #
1	Location Map	1-2
2	Watershed Boundaries	1-2
3	General Geomorphic and Soil Areas	2-1
4	Lakes, Ponds, and Public Ditches	2-4
5	DNR Protected Waters and Wetlands	2-5
6	National Wetland Inventory	2-6
7A	Subwatershed Basins-VLAWMO	2-7
7B	Subwatershed Basins-RWMWD	2-7
7C	Subwatershed Basins-RCWD	2-7
7D	Subwatershed Basins-VB	2-7
8	Handlos Lake	2-7
9	Swamp 1	2-7
10	Swamp 2	2-7
11	Existing Land Use	2-9
12	Proposed Land Use	2-9
13	Recreational Facilities	2-11
14	Problem Areas	4-9

EXECUTIVE SUMMARY

CITY OF WHITE BEAR LAKE
WATER MANAGEMENT PLAN

EXECUTIVE SUMMARY

The City of White Bear Lake Water Management Plan has been prepared according to the 1990 Recodified State Statute 103B. The Plan is subdivided into five sections; an Introduction (1), Physical Environment (2), Objectives and Policies (3), Management Strategies (4), and Plan Implementation (5).

Although some reduced size maps are included in this document, zoning and storm sewer maps are on file at City Hall along with larger scale wetland mapping.

- Historically, White Bear Lake has had a commitment to Water Management issues. The City has made wetland preservation a high priority by establishing a Wetland District and a Wetland Ordinance. The City also has Shoreland and Floodplain Ordinances. Erosion and sediment control plans for any land disturbance greater than 100 cubic yards are required through the City's Land Alteration Permitting process.

- Since White Bear Lake is more than 90% developed, post-development rates of runoff will not vary substantially from the present rates. Therefore, in Section 2 of the Plan, only the rates that discharge to adjacent communities are reported. Most of the development in the City has incorporated natural drainage patterns and the use of detention basins. Flood levels, peak discharges and storage volumes of the basins which accommodate 100-year, 24 hour storm events are included in Section 2.

The Objectives and Policies were compiled from several sources, including Rice Creek Watershed District, Vadnais Lake Area Water Management Organization, Ramsey-Washington Metro Watershed District and Valley Branch Watershed District. This plan has been prepared in conformance with the criteria set forth in the plans of the aforementioned organizations. Copies of the water management plans of the watershed organizations are on file at City Hall. The watershed organizations shall continue to administer all water resource permitting responsibilities.

The Plan itself is described as having major divisions. Those divisions are coordination with other agencies, capital improvements, community education, and a maintenance plan. There are eight capital improvement projects recommended for the future. The City intends to construct those projects in the future as funding is available.

The Implementation section (Section 5) includes the Plan process divided into three major divisions. The process requires that the City take regulatory actions, begin implementation, and develop a capital improvement process.

The White Bear Lake Water Management Plan will be in effect after it has been approved by Rice Creek Watershed District, Vadnais Lake Area Water Management Organization, Valley Branch Watershed District, and Ramsey-Washington Metro Watershed District, submitted to the Board of Water and Soil Resources and approved, and then is adopted by the City Council of White Bear Lake. It is understood that White Bear Lake will continue its commitment to improving water management within the City and the management of water conveyed from the City to locations outside the corporate limits.

SECTION 1
INTRODUCTION

CITY OF WHITE BEAR LAKE
WATER MANAGEMENT PLAN

SECTION 1 - INTRODUCTION

1.1 AUTHORIZATION AND NEED

The Metropolitan Water Management Act was re-codified and enacted into State Statute 103B in 1990.

The 1984 statute required that the Watershed Districts prepare watershed management plans. Three watershed management districts and one watershed management organization exist within the boundaries of the City of White Bear Lake. Rice Creek Watershed District (RCWD) prepared a revised plan in 1986 which was revised, updated and approved by the Board of Water and Soils Resources (BWSR) in October 1990 and August 1994. Valley Branch Watershed District (VBWD) prepared a plan in 1994 which was approved by BWSR in 1995. Ramsey-Washington Metro Watershed District (RWMWD) prepared a plan in 1986 which is currently being revised. The Vadnais Lake Area Watershed Management Organization (VLAWMO) plan was approved in 1997. The City of White Bear Lake is required to submit a local municipal Water Management Plan to the Watershed Districts/Organization within two years of BWSR approval of the plans.

- The VLAWMO is a water management organization formed in 1983 through a joint powers agreement ratified by seven local units of government. White Bear Lake is one of the units which has entered in the joint powers agreement. The agreement was amended in 1997.

- Cities in the Metropolitan area are impacted by increased environmental concerns. Those concerns include loss of wetlands, wastewater treatment issues, construction erosion and sedimentation problems, shoreland development issues, groundwater protection and water quality degradation issues. The impact of these environmental concerns affects recreational opportunities and aesthetic considerations. It also affects ecological diversity and wildlife habitat.

- City Councils and staffs are under varied pressure from home owners, park and recreation users, land developers, real estate agents, and environmental groups in their communities. A general environmental consciousness impacts all these groups. The State Statutes and the political climate make water management planning an important issue. The City of White Bear Lake has already incorporated water management into ordinances and zoning codes. The City has also included water management projects in the annual budget in past years.

1.2 BACKGROUND

The City of White Bear Lake is located on the north, west, and south sides of White Bear Lake in Ramsey County with a small portion in Washington County. The City is bounded to the north by White Bear Township, to the west by Vadnais Heights and Gem Lake, to the south by Maplewood, and to the east by Birchwood and Mahtomedi. White Bear Lake is generally bounded

to the west by Interstate 35E, to the north by the Soo Line Railroad, to the south by Interstate 694, and to the east by East County Line Road. The City covers 10.06 square miles or about 6,450 acres. Map 1 illustrates the geographic location of White Bear Lake.

- White Bear Lake has several lakes and wetlands, providing recreational opportunities and environmental value. The largest of these, White Bear Lake, covers over 2,500 acres. There are four major watersheds with approximately 2,400 acres in VLAWMO, 2,075 acres in RWMWD, 1,725 acres in RCWD and 235 acres in VBWD. Map 2 illustrates the areas of the watersheds within the City.

Land in the City of White Bear Lake is more than 90% fully developed, with only a few undeveloped areas throughout the City. One undeveloped area is along the Interstate 35E corridor north and south of Trunk Highway 96. Commercial and light industrial development is anticipated for this area. Another area of potential development is along the Trunk Highway 61 corridor north of T.H. 96. Public and residential developments are expected. Another major area of future development is east of T.H. 61, south of County Road E, where residential and commercial development are anticipated. Existing and proposed land use maps are included in Section 2. The proposed land uses do not introduce significant changes that would affect rates and volumes of stormwater runoff.

Many of the waters and wetlands in the City of White Bear Lake are designated as State Protected Wetlands and Waters or are incorporated into the City's official zoning map and designated as City protected wetlands. Other wetlands are identified on the National Wetland Inventory maps which are under the jurisdiction of the U. S. Army Corps of Engineers (COE).

The White Bear Lake Conservation District completed a water quality report for the lake in 1990.

1.3 PURPOSES OF WATER MANAGEMENT PROGRAMS

The Metropolitan Water Management Program (Statute 103B.201 to 103B.255) is a re-codified version of Chapter 509 Watershed Plan. It was adopted by the Minnesota legislature in 1990. The purpose of the program and the objectives of the plan are reprinted below:

"103B.201 **METROPOLITAN WATER MANAGEMENT PROGRAM PURPOSE."**
The purposes of the water management programs required by sections 103B.205 to 103B.255 are to:

(1) protect, preserve and use natural surface and groundwater storage and retention systems;

(2) minimize public capital expenditures needed to correct flooding and water quality problems;

(3) identify and plan for means to effectively protect and improve surface and groundwater quality;

(4) establish more uniform local policies and official controls for surface and groundwater management;

(5) prevent erosion of soil into surface water systems;

(6) promote groundwater recharge;

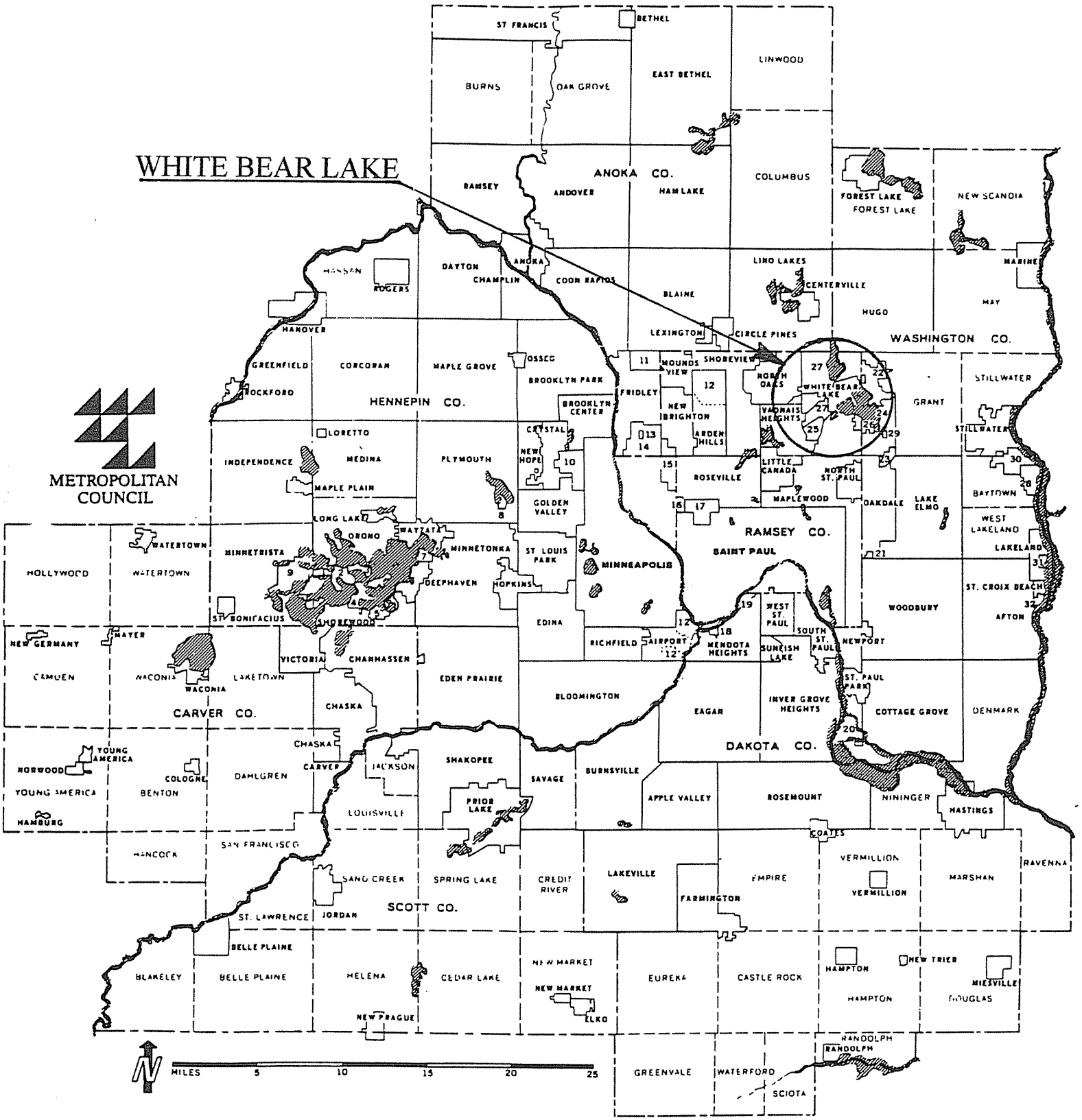
(7) protect and enhance fish and wildlife habitat and water recreational facilities; and

(8) secure the other benefits associated with the proper management of surface and groundwater.

The intent of this Water Management Plan is to gather all essential information and planning data into a single document which describes the existing environment, establishes specific policy and management methods for protection and future enhancement of the City's water and wetland resources, while recognizing the need for proper land utilization and growth. The Plan has been prepared in conformance with the criteria set forth in the Vadnais Lake Area Water Management Organization (VLAWMO), Rice Creek Watershed District (RCWD), Ramsey-Washington Metro Watershed District (RWMWD), and Valley Branch Watershed District (VBWD) plans. The criteria, as a minimum, establish the degree of performance necessary to achieve improvement in water quantity and quality management. These criteria are not intended to dictate or preempt the design process, but rather provide guidelines to proper development.

1.4 PLAN SUMMARY

The White Bear Lake Water Management Plan includes the elements required by Statute 103B. The Plan includes identification of and recommendations for protection and maintenance of the existing hydrologic system, the goals and policies for water quality and quantity, erosion and sediment control, recreation, fish and wildlife enhancement, and an implementation program with a process for Plan amendment. The Plan supplements the watershed management organizations' Plans, creating a rational, efficient local management approach. By minimizing public capital expenditures and enhancing water quality, the City will best manage its important water resources.



MAP 1 LOCATION MAP

SECTION 2
PHYSICAL ENVIRONMENT

CITY OF WHITE BEAR LAKE
WATER MANAGEMENT PLAN

SECTION 2 - PHYSICAL ENVIRONMENT

2.1 GEOLOGY AND TOPOGRAPHY

Ramsey and Washington Counties are dominated by the Eastern St. Croix Moraine. This glacial and terminal moraine is characterized by steep hills interspersed with deep depressions. The depressions are occupied by small lakes or are filled with peat.

Along the northern part of Ramsey County and the northwestern part of Washington County, islands of glacial till protrude through the sandy deposits of the Anoka Sand Plain. This is a gently undulating outwash plain made up principally of fine sand. Depressions are commonly filled by peat deposits, marshes, or lakes. The City has diversified topographic relief.

Topographic maps are available from the U. S. Geologic Survey (USGS). Other geological information and maps are available from Ramsey and Washington Counties.

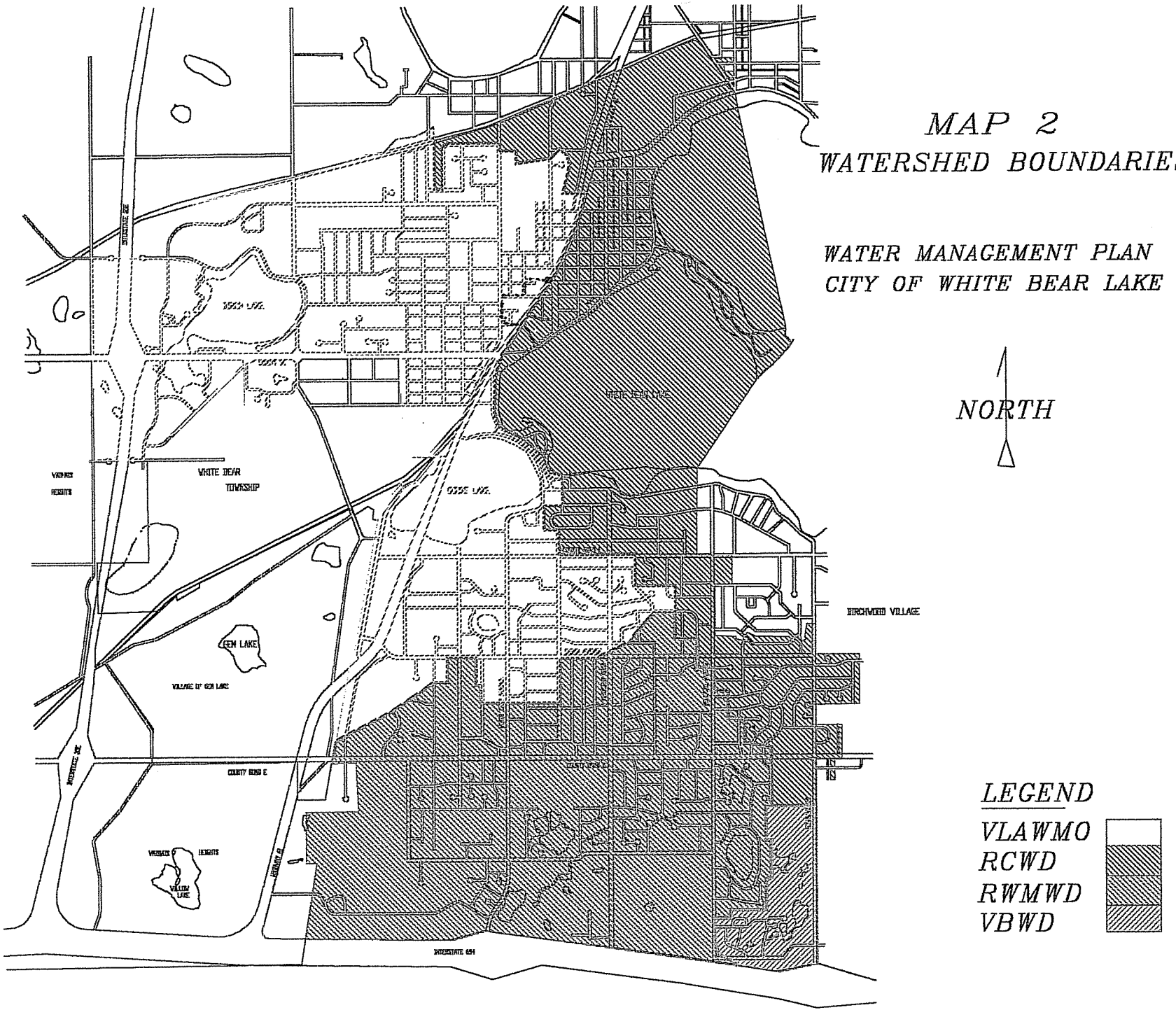
2.2 SOILS

The Ramsey County Soil and Water Conservation District prepared an inventory of existing soils found within the City of White Bear Lake. The main source of information for the inventory was the Ramsey County Soil Survey prepared by the Soil Conservation Service (SCS). The inventory depicted on Map 3 shows existing soils grouped numerically by area into five categories as follows:

Area 1: The soils are formed on nearly level to gently undulating sandy outwash and sandy lake plains with steep slopes occurring adjacent to drainageways and depressional areas. This area consists primarily of excessively drained, deep sandy soils. The infiltration rate and permeability of these soils is rapid, which tends to keep runoff at a minimum. The water table in this soil is typically below 6 feet. In some portions of area 1 there are depressional soils and wetland areas consisting of organic and poorly drained sandy soils. Water tables in these soils range from 0-2 feet.

Area 2: Loamy Grantsburg glacial till formed on moderately rolling or steep, irregular slopes intermingled with closed, poorly drained depressions. Soils are primarily grayish colored loamy till. The infiltration rate and permeability of the soils of this area are generally moderate. The water table is typically below 6 feet but may vary from 1 to 3 feet below the surface in some of the more level areas. Aside from the major lakes, many small lakes and organic-filled depressions are scattered throughout this area.

Area 6: Loamy Superior till formed on moderately rolling to steep, irregular slopes intermingled with closed, poorly drained depressions. Soils are primarily sandy loam or silt loam underlain by sandy loam till. The water table, except for depressional areas, is

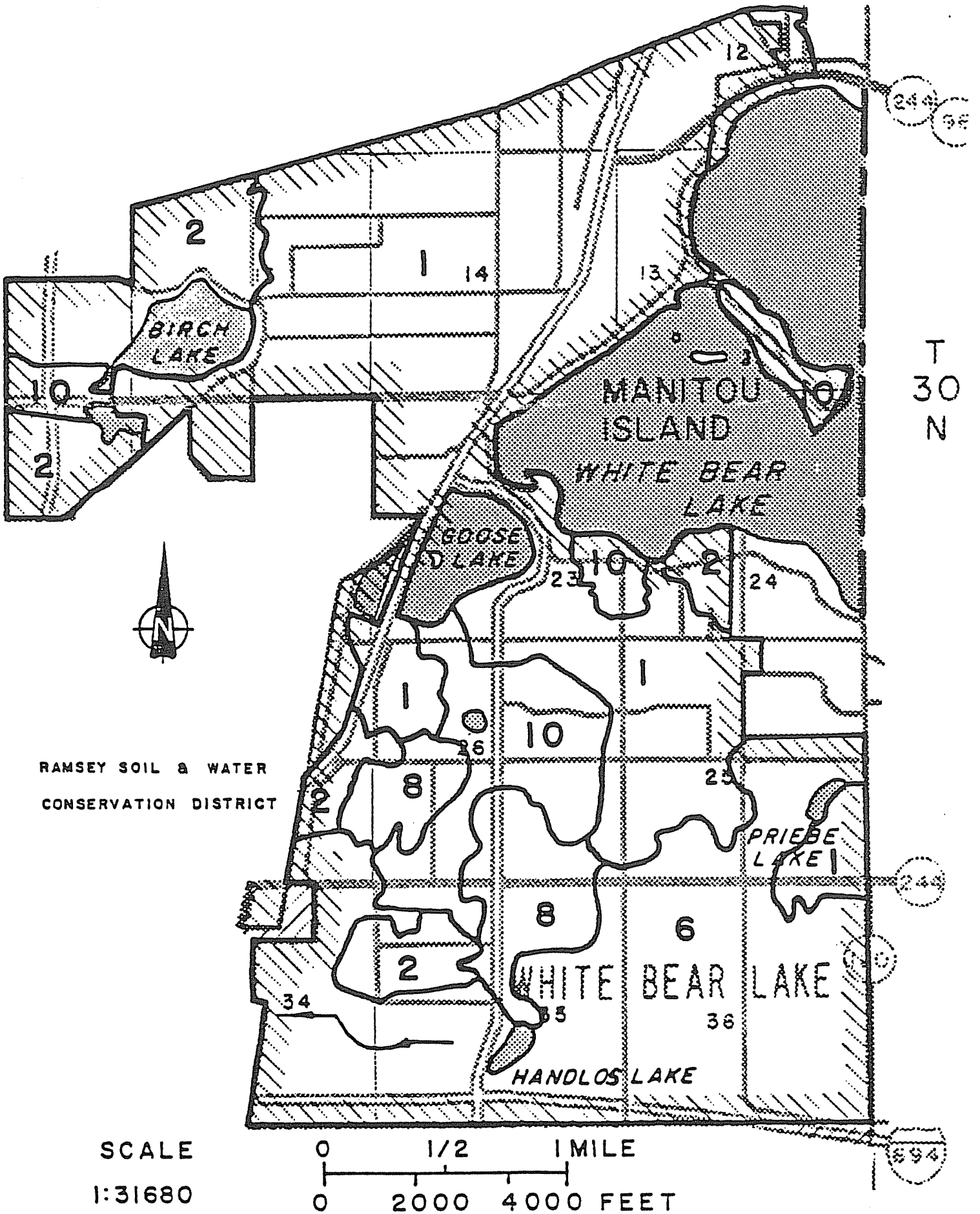


MAP 2
WATERSHED BOUNDARIES

WATER MANAGEMENT PLAN
CITY OF WHITE BEAR LAKE

NORTH

GENERAL GEOMORPHIC AND SOIL AREAS



MAP 3

generally below 6 feet. Small lakes and organic filled depressions are scattered throughout this area.

Area 8: Sandy soils formed in outwash deposited on steep to very steep terminal moraines of Superior and Grantsburg till. The soils are primarily brown and reddish brown moderately coarse-textured sand. The infiltration rate and permeability of these soils are rapid. Where till is exposed at the surface or underlies the sandy outwash, the soil is reddish or grayish loam. Permeability in the loam is moderately slow to moderate. Runoff is rapid on steep slopes. The water table in Area 8 is typically below 6 feet. Small depressions which may be wet or dry are scattered throughout this soil area.

Area 10: Well-drained, loamy Grantsburg till soils overlying loamy Superior till with the Superior material being exposed by urban construction activities. The area consists of undulating to steeply hilly soils on knolls and hillsides of glacial till moraines. Urban development has resulted in significant disturbance of these soils. The water table, except for depressional areas, is typically below 6 feet.

The SCS has established four general series of soil groups based on texture and slope as described below:

GROUP A - Low runoff potential, high infiltration
GROUP B - Moderate infiltration
GROUP C - Slow infiltration rate
GROUP D - Very slow infiltration rate, high runoff potential

The runoff potential of an area is determined using these general soil characteristics in combination with land use classifications, vegetation of the area and rainfall intensity determined from charts for the various design storms.

Soil characteristics are also considered when developing erosion control plans. Special procedures for erosion and sediment control should be incorporated into all construction projects. The erosion control handbook published by BWSR includes recommended management practices. The Minnesota Pollution Control Agency has also published a notebook titled Protecting Water Quality in Urban Areas, Best Management Practices for Minnesota (republished in December 1994), which may be used for reference. The City has adopted the Ramsey Soil Erosion and Sediment Control Handbook for erosion protection guidance.

2.3 PRECIPITATION

Rainfall data for predicting hydrology and designing hydraulic structures and facilities is presented in Table 1 on page 2-3. It shows rainfall for various return periods and durations for the Metropolitan area taken from the U.S. Department of Commerce, Weather Bureau Technical Paper No. TP-40.

TABLE 1

RAINFALL IN MINNEAPOLIS-ST. PAUL METROPOLITAN AREA

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

Source: U.S. Department of Commerce, Weather Bureau Technical Paper No. TP-40

Recently, the Metropolitan Council has assembled rainfall frequency data for the metropolitan area in "Precipitation Analysis for the Twin Cities Metropolitan Area, An Update". In this report, an analysis of 23 precipitation recording stations operated by the National Weather Service in the Metropolitan Area indicated that there is substantial variability in the rainfall patterns occurring within the region. The Ramsey Soil and Water Conservation District (RSWCD) has also been maintaining a database of rainfall information for Ramsey county since 1988. Some information in the database may be helpful in predicting rainfall for design of hydrologic structures in the City. The information contained in those reports may be used to predict local rainfall for design of hydrologic structures at various storm frequencies and durations.

2.4 SURFACE WATER RESOURCES

The individual water management organizations have developed or are planning to develop hydrologic data base and modeling classification systems. Those systems are adapted by reference by the City.

2.4.1 Drainage Ditches

In 1916, Ramsey County constructed Ditches No. 13 and No. 14 to drain surface waters to create more available cropland for cultivation. In 1927, the County board authorized the construction of a branch ditch system consisting of six laterals (No. 1 through No. 5 and No. 5A) connecting to the main Ditch No. 14. At present, the system is much as originally constructed. However, portions of the branches are no longer well defined due to subsidence of the ditch bottom or collapse of the side walls, especially in areas with poorly drained soils.

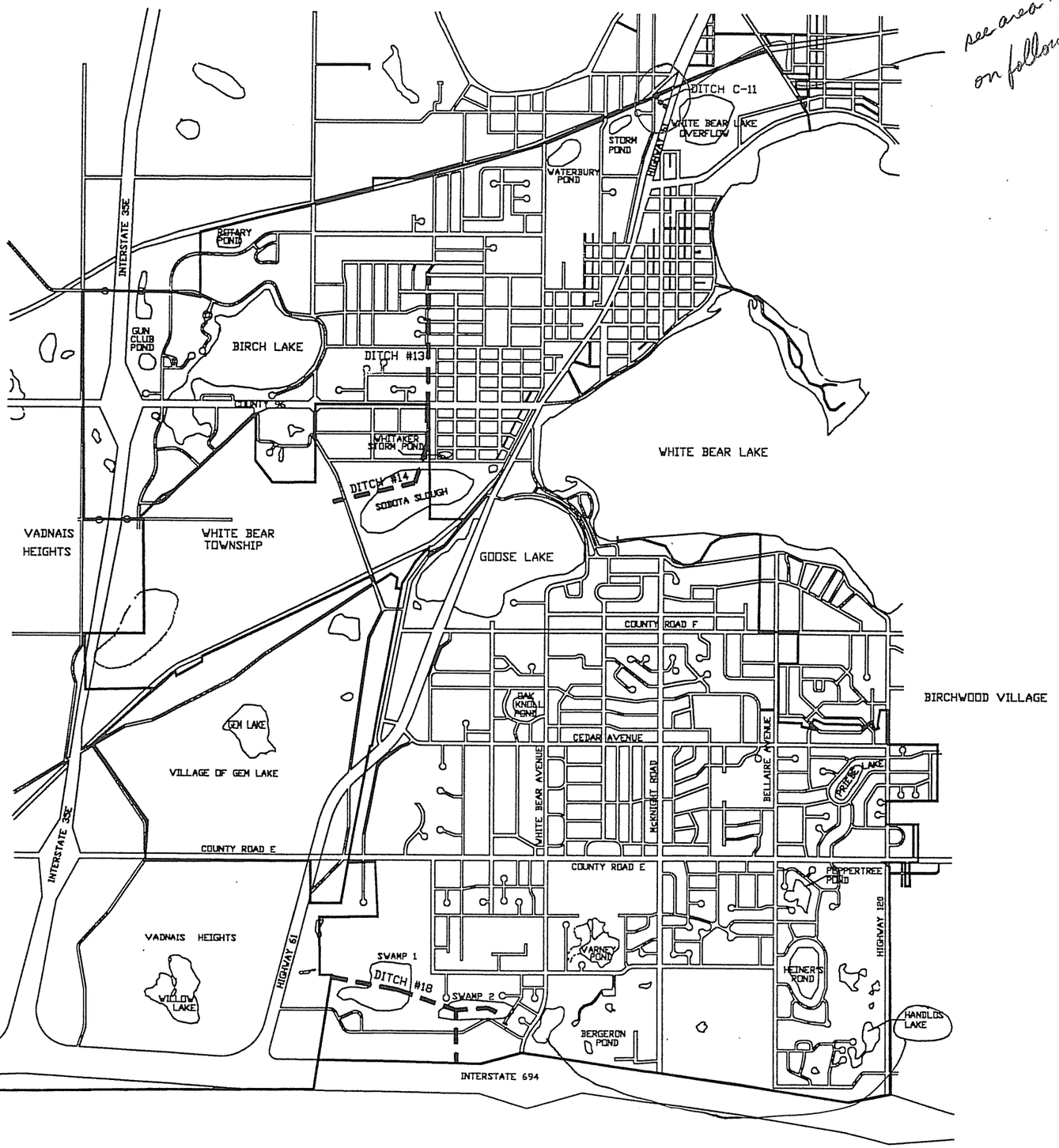
Land use surrounding the ditch system has changed to primarily urban residential with scattered agricultural use. The primary purpose of the ditch system has changed to a conveyance system for urban storm water runoff versus its original construction as a drain for standing lake waters to facilitate agriculture. As the volume of urban runoff increases, sustained peak flows in ditches have increased, causing a greater streambank saturation resulting in some side slope instability and a susceptibility to erosion.

County Ditch 11 is located in the north portion of White Bear Lake in the Rice Creek Watershed District. County Ditch 11 conveys surface water from the City of White Bear Lake and adjacent wetlands into Bald Eagle Lake in White Bear Township.

North County Ditch 18 is located in the south portion of White Bear Lake in the Kohlman Lake Subwatershed of the Ramsey-Washington Metro Watershed District. County Ditch 18 discharges to Kohlman Lake and the Phalen chain in Maplewood and St. Paul.

The locations of the County Ditches within the City of White Bear Lake are shown on Map 4.

see area map on following page



MAP 4

LAKES, PONDS and PUBLIC DITCHES

WATER MANAGEMENT PLAN
CITY OF WHITE BEAR LAKE

NORTH

LEGEND

CITY BOUNDARY ——

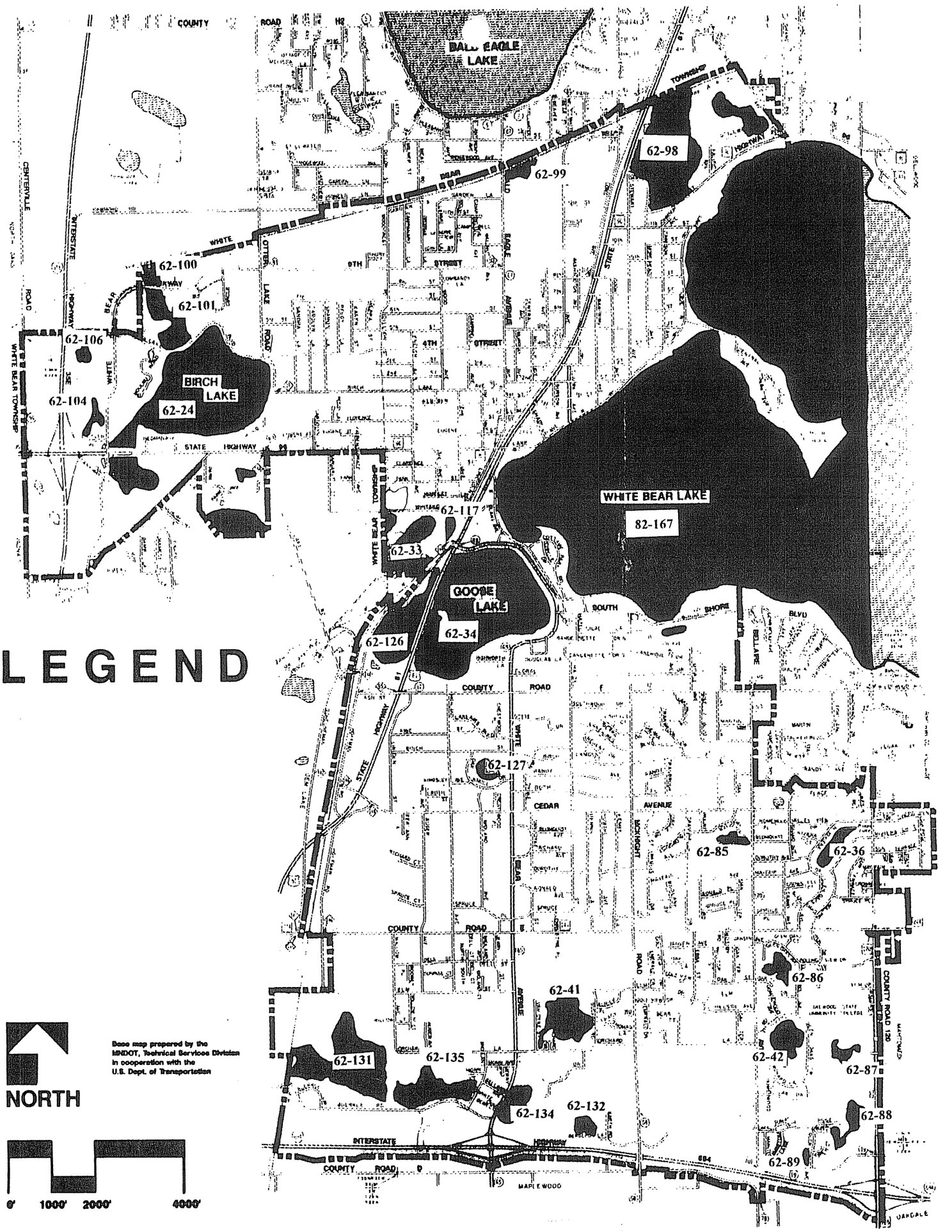
DITCHES - - -

2.4.2 Lakes and Other Significant Water Bodies

White Bear Lake borders the east section of the City and has much regional use. Several communities border the lakeshore. Other lakes in the City include Goose Lake, Birch Lake, Handlos Lake, and Priebe Lake. The lakes provide a recreation resource to the public in and near the City of White Bear Lake. The lakes and wetlands provide suitable environmental habitat for fish and wildlife within the City. These water bodies are natural assets which should be protected from degradation by pollution or contamination from surface water or groundwater sources. The City wetland and shoreland ordinances were developed to protect the waters. The lakes, wetlands and other significant water surfaces are located and numbered on Map 5, showing Department of Natural Resources (DNR) Protected Waters. The DNR ecological/management classifications of the protected waters within the City are shown on Table 2. These classifications are largely based on limnological characteristics.

TABLE 2
DNR ECOLOGICAL/MANAGEMENT
CLASSIFICATION OF PROTECTED WATERS

DNR Reference	No.	Ecological Classification	OHW	Management Classification
White Bear Lake	82-167	Walleye		LMB/BMG
Birch Lake	62-24	Waterfowl		Bullhead
Sobota Slough	62-33	Reg Winterkill		Waterfowl
Goose Lake	62-34	Reg Winterkill		Bullhead
Priebe Lake	62-36	Waterfowl		Waterfowl
Varney Pond	62-41	Waterfowl		Waterfowl
Heiner's Pond	62-42	Reg Winterkill		Bullhead
Unnamed Pond	62-85	Waterfowl		Waterfowl
Pepper Tree Pond	62-86	Waterfowl		Waterfowl
Unnamed Pond	62-87	Waterfowl		Waterfowl
Unnamed Pond	62-88	Waterfowl		Waterfowl
Unnamed Pond	62-89	Waterfowl		Waterfowl
Unnamed Pond	62-98	Waterfowl		Waterfowl
Waterbury Pond	62-99	Waterfowl		Waterfowl
Rotary Pond	62-100	Waterfowl		Waterfowl
Unnamed Pond	62-101	Waterfowl		Waterfowl
Neschville/Lande Pond	62-104	Waterfowl		Waterfowl
Unnamed Pond	62-106	Waterfowl		Waterfowl
Unnamed Pond	62-117	Waterfowl		Waterfowl
Unnamed Pond	62-126	No info. avail.		No info. avail.
Oak Knoll Pond	62-127	Waterfowl		Waterfowl
Swamp 2	62-131	Waterfowl		Waterfowl
Bergeron Pond	62-132	Waterfowl		Waterfowl
Handlos Lake	62-134	Reg Winterkill		Kids Fishing Pond
Swamp 1	62-135	Waterfowl		Waterfowl



LEGEND

DNR PROTECTED WETLANDS

MAP 5

The watershed organizations are each developing or have developed function and value-based classification systems for water bodies. The City of White Bear Lake adopts those classification systems for the geographic area of the individual watershed districts.

The National Wetland Inventory (NWI) map shows wetlands within the City of White Bear Lake as inventoried by the U.S. Fish and Wildlife Service. Areas shown on the DNR and NWI maps indicate the presence of wetlands, but show only the general location of wetlands. Site visits for delineation of wetland boundaries are required for permitting. The NWI map is included as Map 6 in this document. A copy of the map is on file at the White Bear Lake City Hall with other related maps.

All waters and wetlands over 1.5 acres in White Bear Lake are incorporated into the City's official wetland inventory map and are designated as City-protected wetlands. These City protected water bodies include those inventoried by RSWCD in 1980, the DNR Protected Waters and Wetlands, and the wetlands contained on the NWI map. White Bear Lake is committed to the protection and preservation of wetlands. The City requires that a land owner must obtain all required watershed, COE, and DNR permits for alteration of all identified wetlands regardless of size or inventory status according to WCA. Wetland functions are presented in Table 3.

TABLE 3
WETLAND FUNCTIONS

Floodwater Storage and Retention: Wetlands can reduce flooding by slowing down the force of floodwaters and by providing temporary storage of large amounts of storm water or snow melt water, thus reducing damages to roads, bridges, crop, etc.

Nutrient Assimilation: Wetland plants absorb nutrients during their growth and development. This removal means cleaner water leaving the wetland.

Sediment Entrapment: Wetlands can slow the flow of water moving through them This allows sediments and associated nutrients time to settle out before the water is released to other wetland, lakes or streams.

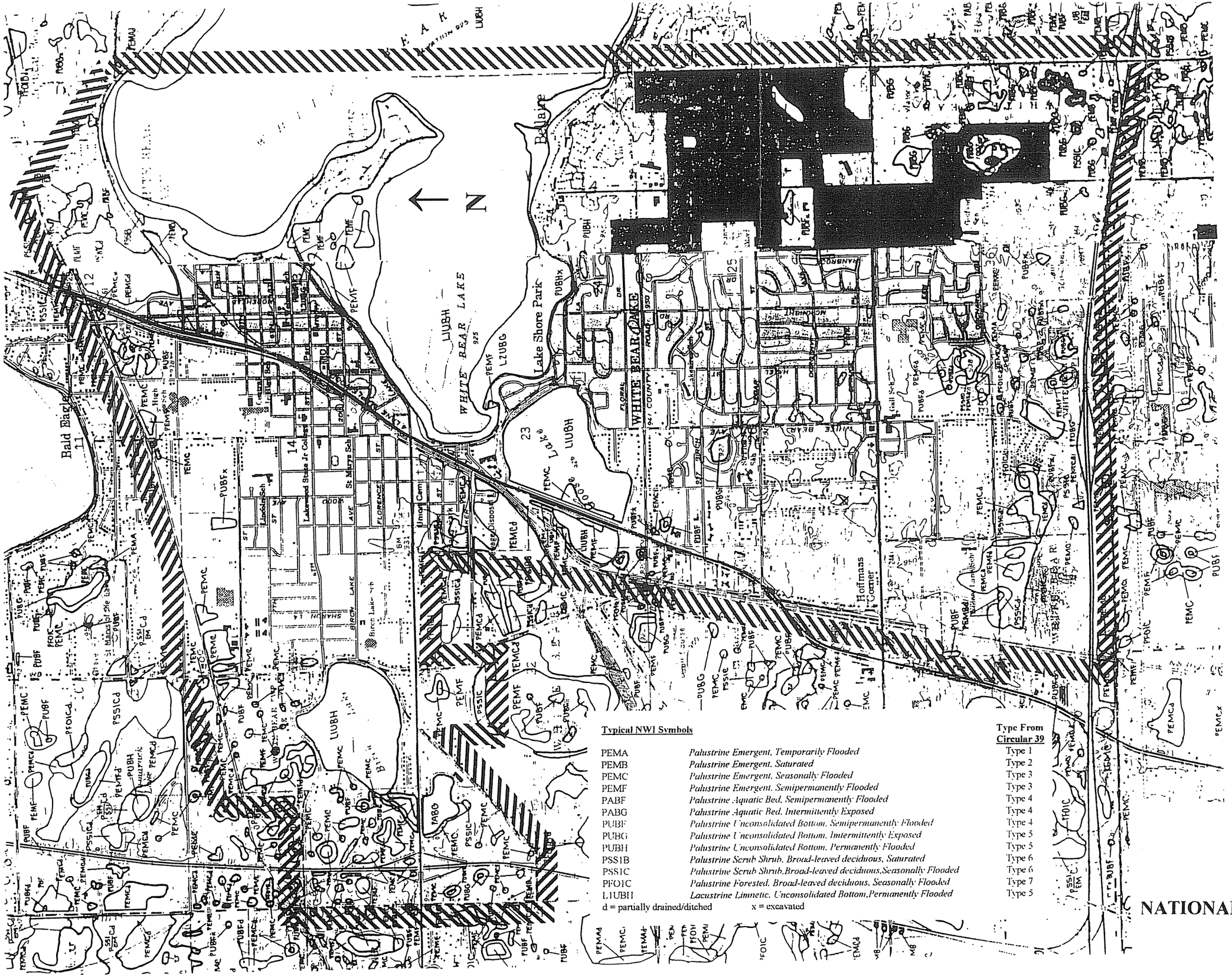
Ground Water Recharge: Some wetlands serve as a source of ground water recharge by collecting and retaining surface waters that would otherwise end up in distant lakes and rivers, helping assure long-term supplies of quality groundwater.

Low Flow Augmentation: Wetlands can augment low flows in streams through either retarding direct runoff or by contributing to groundwater based low flows reducing impacts of short term precipitation deficiencies in rivers and streams.

Aesthetics and Recreation: Wetlands are often beautiful areas to observe unique plant and animal species. They are an amenity to residential and commercial development in urban environments. Hunters and fishermen also frequent wetland areas.

Shoreland Anchoring and Erosion Control: Wetland vegetation can reduce erosion along lake and stream banks by reducing forces associated with wave action.

Wildlife Habitat: Many species of wildlife spend all or certain seasons of the year in wetland habitats for breeding, brood rearing, feeding or cover purposes.



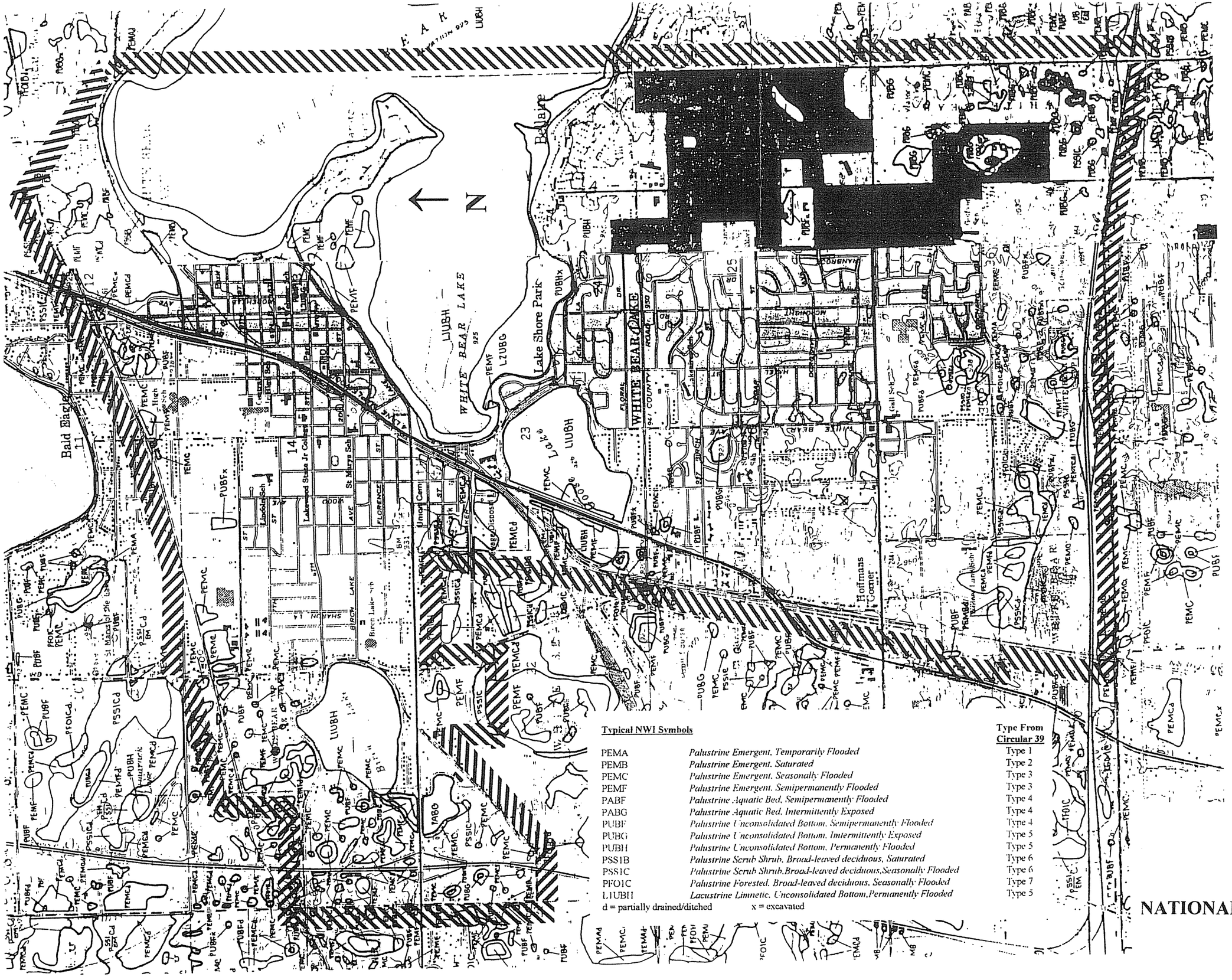
Typical NWI Symbols

		Type From Circular 39
PEMA	*Palustrine Emergent, Temporarily Flooded*	Type 1
PEMB	*Palustrine Emergent, Saturated*	Type 2
PEMC	*Palustrine Emergent, Seasonally Flooded*	Type 3
PEMF	*Palustrine Emergent, Semipermanently Flooded*	Type 3
PABF	*Palustrine Aquatic Bed, Semipermanently Flooded*	Type 4
PABG	*Palustrine Aquatic Bed, Intermittently Exposed*	Type 4
PUBF	*Palustrine Unconsolidated Bottom, Semipermanently Flooded*	Type 4
PUBG	*Palustrine Unconsolidated Bottom, Intermittently Exposed*	Type 5
PUBH	*Palustrine Unconsolidated Bottom, Permanently Flooded*	Type 5
PSS1B	*Palustrine Scrub Shrub, Broad-leaved deciduous, Saturated*	Type 6
PSS1C	*Palustrine Scrub Shrub,Broad-leaved deciduous,Seasonally Flooded*	Type 6
PFO1C	*Palustrine Forested, Broad-leaved deciduous, Seasonally Flooded*	Type 7
L1UBH	*Lacustrine Limnetic, Unconsolidated Bottom,Permanently Flooded*	Type 5

d = partially drained/ditched x = excavated

MAP 6

NATIONAL WETLAND INVENTORY



Typical NWI Symbols

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PEMA	*Palustrine Emergent, Temporarily Flooded*	Type 1
PEMB	*Palustrine Emergent, Saturated*	Type 2
PEMC	*Palustrine Emergent, Seasonally Flooded*	Type 3
PEMF	*Palustrine Emergent, Semipermanently Flooded*	Type 3
PABF	*Palustrine Aquatic Bed, Semipermanently Flooded*	Type 4
PABG	*Palustrine Aquatic Bed, Intermittently Exposed*	Type 4
PUBF	*Palustrine Unconsolidated Bottom, Semipermanently Flooded*	Type 4
PUBG	*Palustrine Unconsolidated Bottom, Intermittently Exposed*	Type 5
PUBH	*Palustrine Unconsolidated Bottom, Permanently Flooded*	Type 5
PSS1B	*Palustrine Scrub Shrub, Broad-leaved deciduous, Saturated*	Type 6
PSS1C	*Palustrine Scrub Shrub,Broad-leaved deciduous,Seasonally Flooded*	Type 6
PFO1C	*Palustrine Forested, Broad-leaved deciduous, Seasonally Flooded*	Type 7
L1UBH	*Lacustrine Limnetic, Unconsolidated Bottom,Permanently Flooded*	Type 5

d = partially drained/ditched x = excavated

MAP 6

NATIONAL WETLAND INVENTORY

2.5 STORM DRAIN SYSTEM

- White Bear Lake is divided into four major watershed basins. The major watershed boundaries coincide with the boundaries of the four watershed organizations that have jurisdiction in the City. About 2,400 acres drain to Vadnais Lake (VLAWMO, see Map 7-A), 2,075 acres drain to the Phalen Chain of Lakes (RWMWD, see Map 7-B), 1,725 acres drain to the Rice Creek (RCWD, see Map 7-C), and 235 acres drains to Silver Lake (VBWD, see Map 7-D). Peak discharge rates out of the City, as provided by watershed organizations, are listed below in Table 4.

TABLE 4
DISCHARGE RATES TO NEIGHBORING COMMUNITIES

Subwatershed Basin	Outlet Structure	Drainage Area (Acres)	Peak Runoff (cfs)	Reference
RC - 1 (Map 7-C)	2-18X28 RCP Arch	1725	25	RCWD-Clearwater Creek Basin
VLA - 3 (Map 7-A)	30" RCP	1889	27	VLAWKO-Black/Wilkinson Basin
VLA - 2 (Map 7-A)	96" RCP	511	131	VLAWMO-Sobota Slough
RW - 5 (Map 7-B)	48" RCP	2025	83	Ramsey Washington Metro - Phalen
VL - 1 (Map 7-D)	Overland Flow	235	N/A	Valley Branch - Silver Lake

A number of existing basins in the City have been designated to accommodate 100-year, 24-hour duration storm events. Handlos Lake, Swamp 1, and Swamp 2 are shown on Maps 8, 9, and 10, respectively. Basin size, peak elevation, and peak discharge for several basins are presented in Table 5 on page 8. Many of these basins are identified as named ponds and lakes or as DNR protected waters. The City of White Bear Lake Storm Drain Map includes the major areas designated as detention basins. New projects must comply with the MPCA's NPDES Stormwater Permitting Program.

WHITE BEAR LAKE

GOOSE LAKE

Oak Knoll Pond

Sobota Slough

BIRCH LAKE

Rotary Pond

BEAR LAKE TOWNSHIP

VLA-1

VLA-2

VLA-3

VLA-4

VLA-5

23

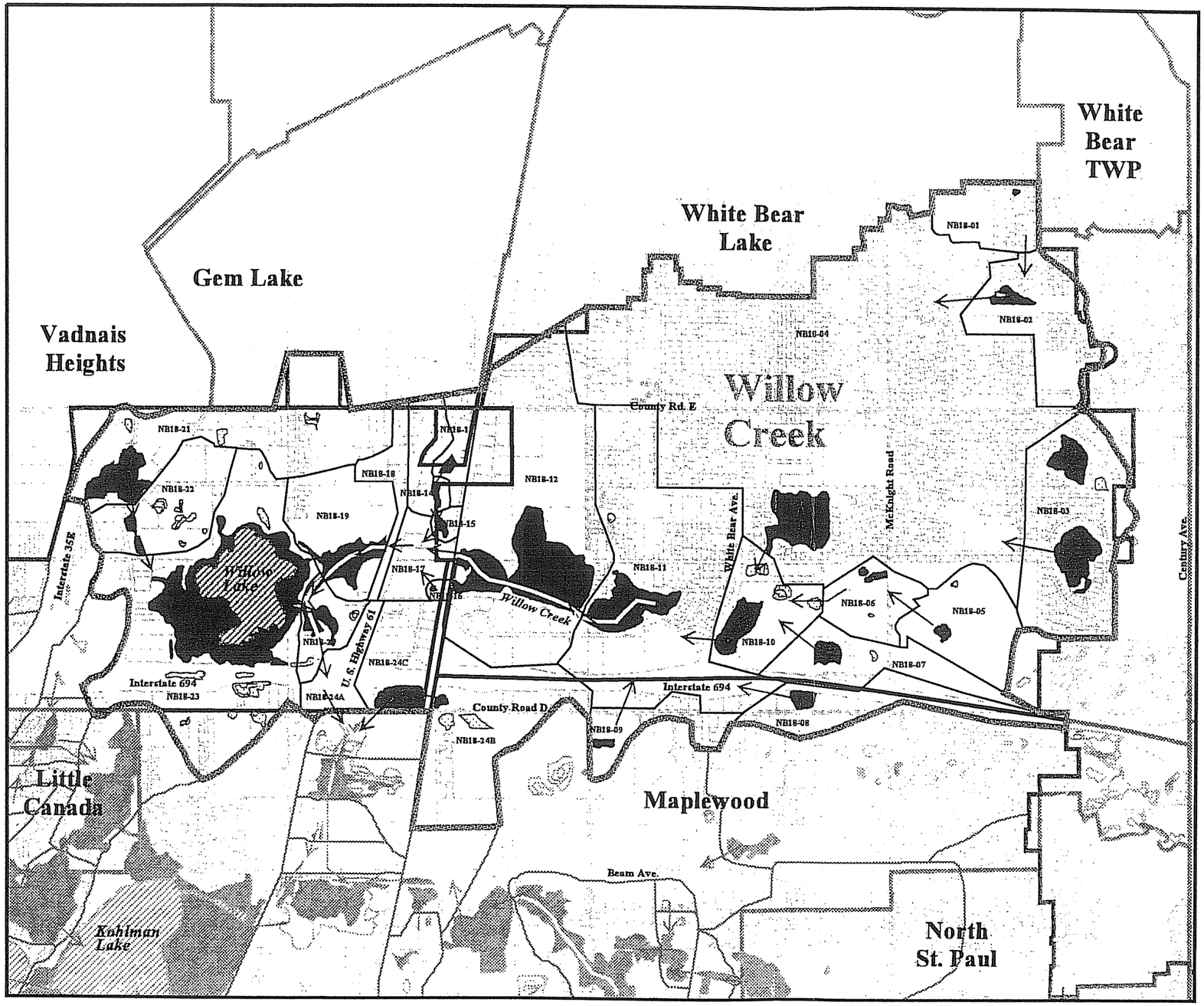
22

27

15

MAP 7-A
Subwatershed Basins
Vadnais Lake Area Water Management Organization

WATER MANAGEMENT PLAN
CITY OF WHITE BEAR LAKE



N
W E
S

Ramsey-Washington Metro Watershed District

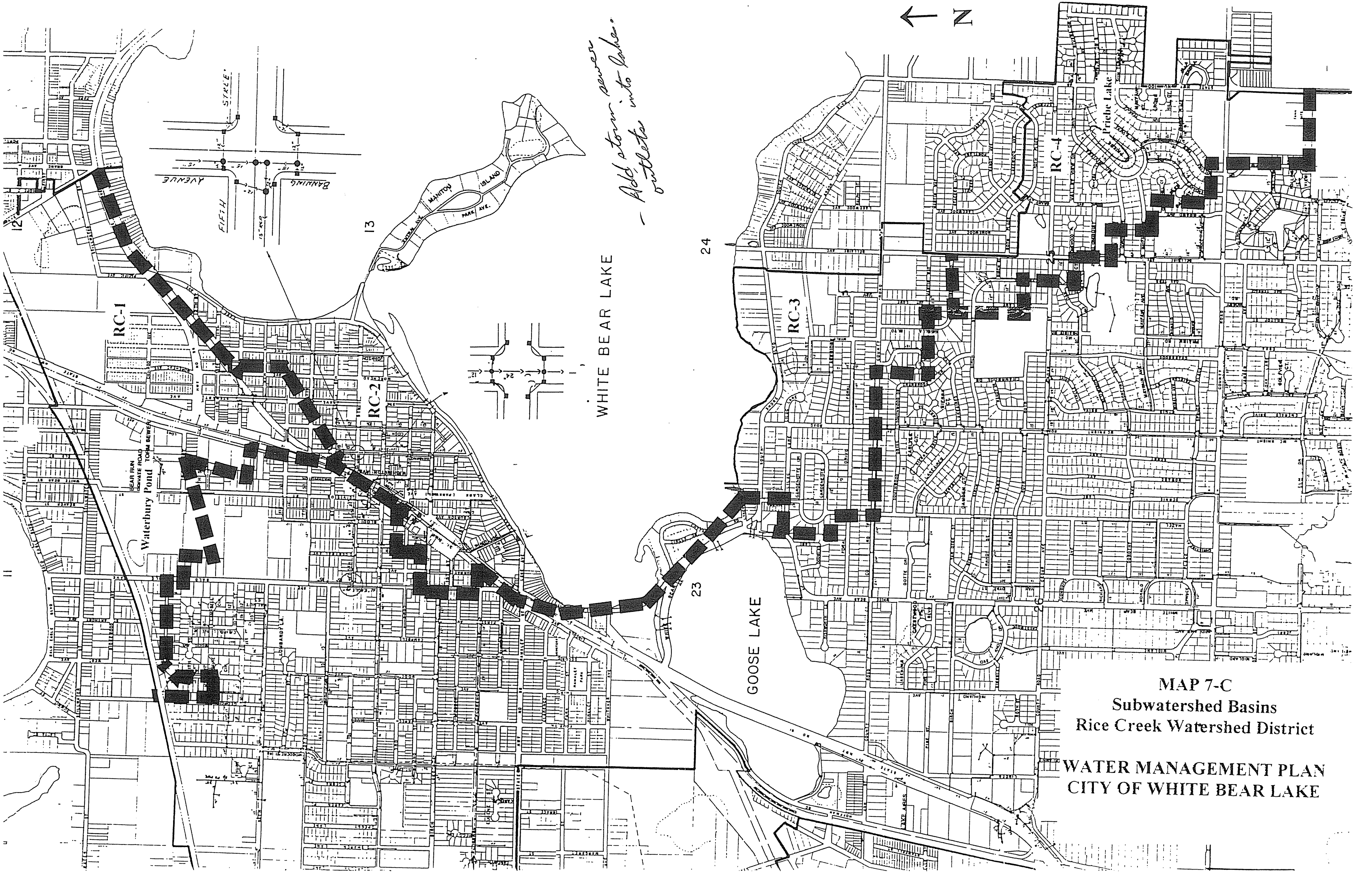
Drainage Patterns Features

- Creeks
- Lakes
- Detention Ponds
- Wetlands (not modeled)
- Subwatershed Boundary
- Flow Direction
- Municipal Boundaries
- Ramsey-Washington Metro Watershed District Boundary
- C-58 Drainage Area

SOURCE: RWMWD Plan
appendix Figure Fa

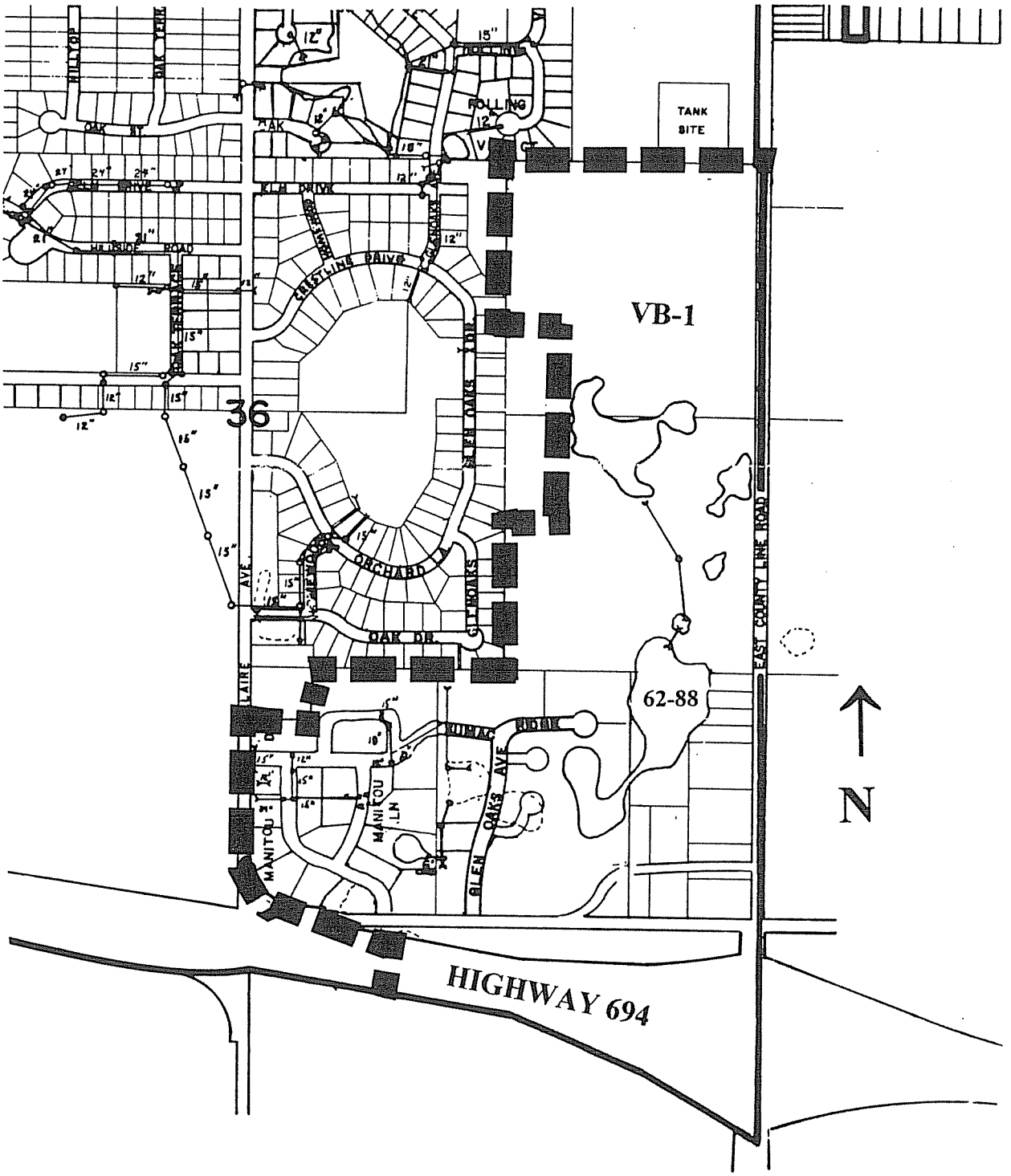
MAP 7-B
Subwatershed Basins
Ramsey-Washington Metro
Watershed District

WATER MANAGEMENT PLAN
CITY OF WHITE BEAR LAKE



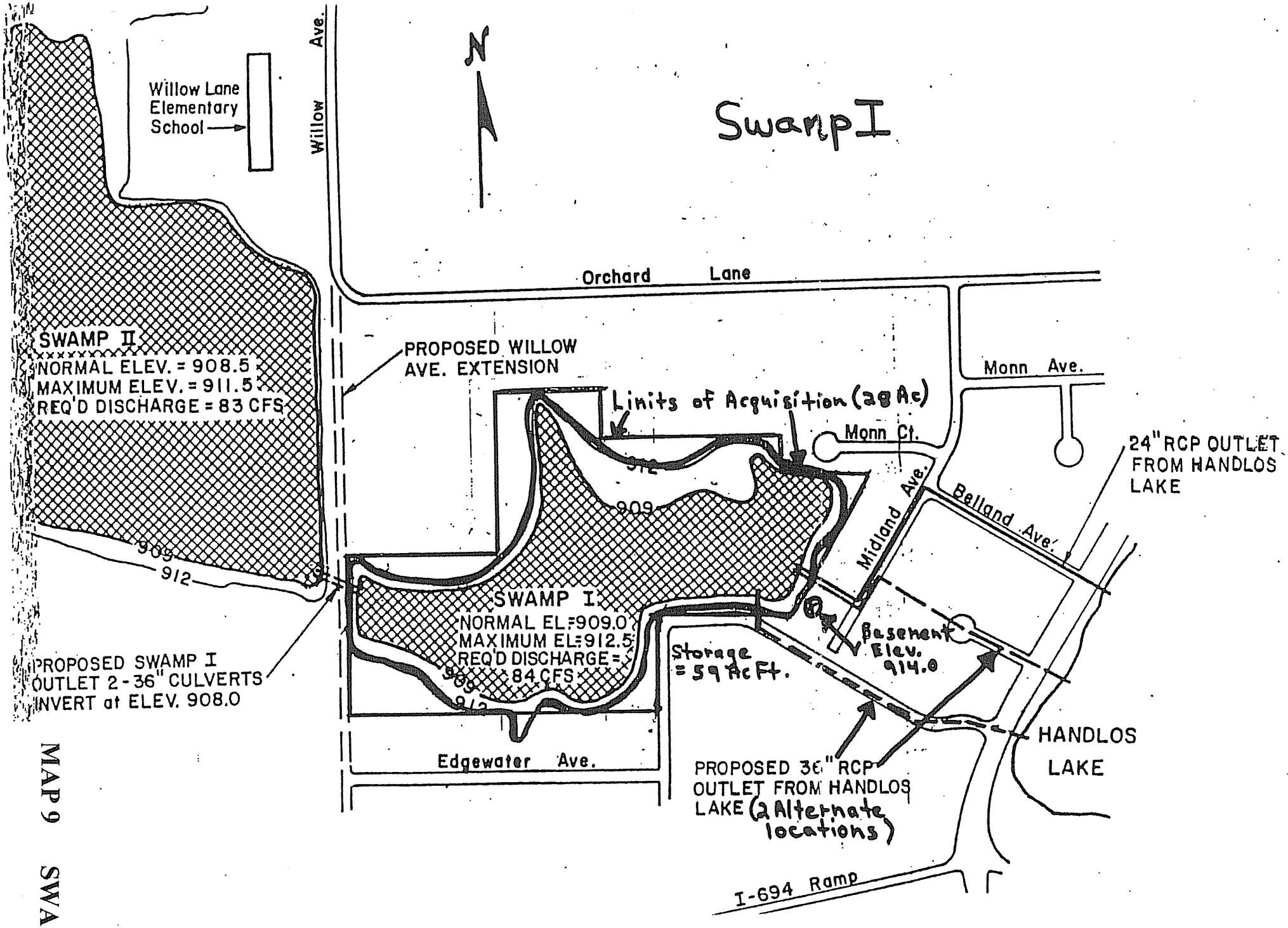
MAP 7-C
Subwatershed Basins
Rice Creek Watershed District

WATER MANAGEMENT PLAN
CITY OF WHITE BEAR LAKE



MAP 7-D
Subwatershed Basins
Valley Branch Watershed District

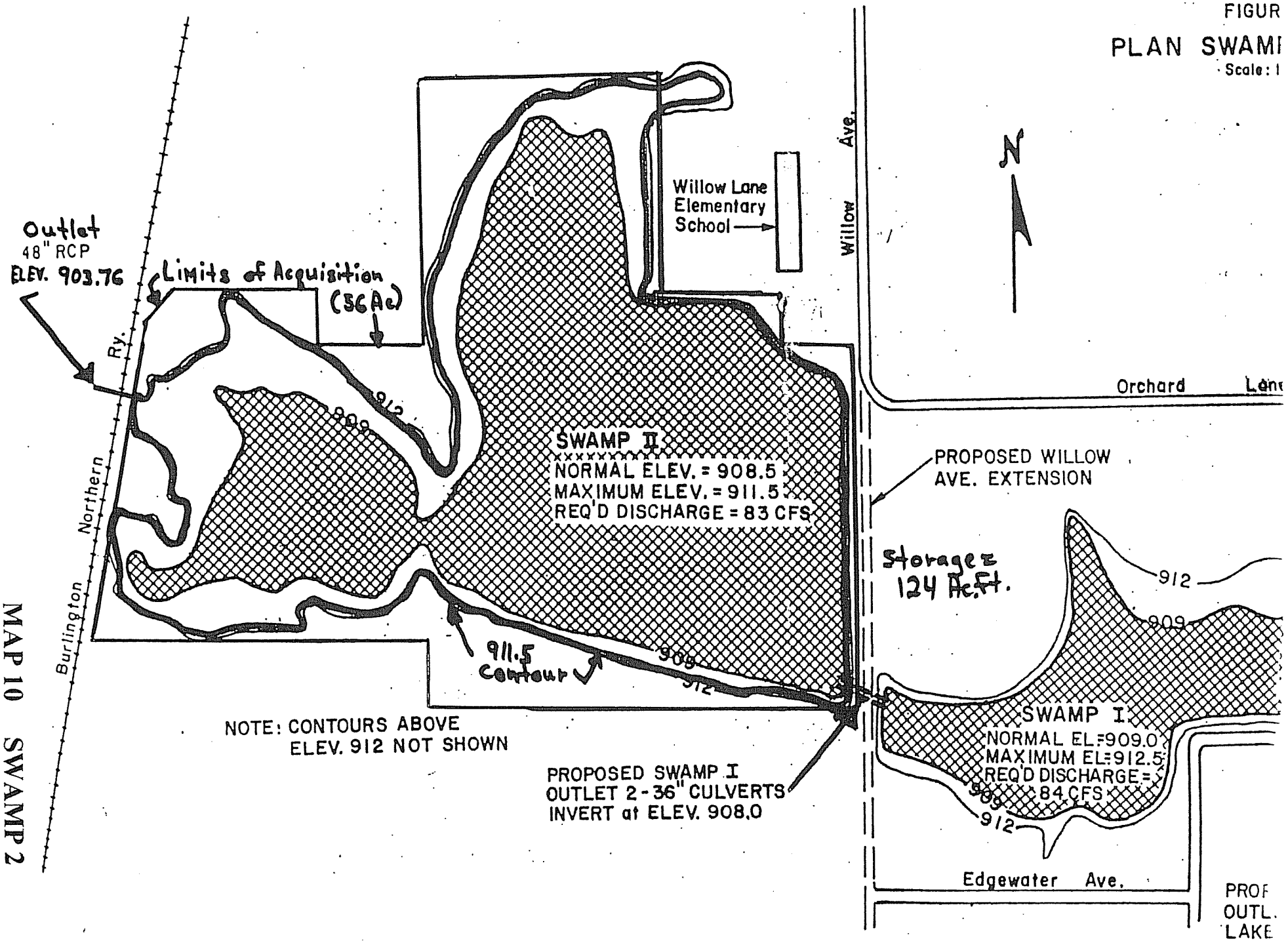
WATER MANAGEMENT PLAN
CITY OF WHITE BEAR LAKE



SOURCE: South White Bear Lake Hydrologic Study

MAP 9 SWAMP 1

Swamp II



MAP 10 SWAMP 2

Source: South White Bear Lake Hydrologic Study

TABLE 5
FLOOD LEVELS, PEAK DISCHARGES, STORAGE VOLUMES

Pond Name	Drainage Area (acre)	Storage Volume (ac-ft)	Flood Level	Peak Runoff (cfs)	Subwatershed Basin	Watershed
Priebe[6]	157	24	980.5	40	RC-4 (Map 7-C)	Rice Creek
Varney[7]	1083	131	940.3	110	RW-2 (Map 7-B)	Ramsey-Washington
Handlos[7]	71	68	935.6	97	RW-5 (Map 7-B)	Ramsey-Washington
Swanp 1[7]	262	257 (1,2)	912.5	87	RW-5 (Map 7-B)	Ramsey-Washington
Swamp 2[7]	285	257 (1,2)	912.5	87	RW-5 (Map 7-B)	Ramsey-Washington
Birch[2]	9	N/A	N/A	27	VLA-3 (Map 7-A)	Vadnais Lake Area
Goose[3]	N/A	N/A	N/A	18	VLA-5 (Map 7-A)	Vadnais Lake Area
Ramaley-Sobota[4]	N/A	105	918	131	VLA-2 (Map 7-A)	Vadnais lake Area
LL-28[5] (DNR #62-88)	N/A	32	1016	N/A	VB-1 (Map 7-D)	Valley Branch

[2] - TKDA Township Parkway Project, 1995 - flow under Soo Line Railroad.
[3] - VLAWMO Water Management Plan, 1996.
[4] - West Drainage District Plan, 1976 - flow under Otter Lake Road.
[5] - Valley Branch Watershed District Plan, 1995.
[6] - Rice Creek Watershed District, 1996.
[7] - Ramsey Washington Metro Watershed District Plan, 1997

A detailed storm drain map of the City is available for review at the White Bear Lake City Hall.

2.6 WATER QUALITY

Water quality, water surface elevations, and fish population records have been documented for White Bear Lake by various agencies for over 50 years.

Water quality has been monitored by Ramsey County, Washington County, Northeast Metro Technical College, Minnesota DNR, White Bear Lake Conservation District, and the MPCA. The data is compiled on an Environmental Protection Agency computer storage and retrieval system known as STORET. These records were requested for all the lakes and water bodies in

White Bear Lake. The STORET information was available for White Bear Lake, Birch Lake, Goose Lake and Priebe Lake only. Water quality data was not available for other lakes in the City. The data is available for review at the City Hall.

White Bear Lake is located on the east border of the City. There are public access sites in several locations and a municipal public swimming beach. Local property owners use the lake for recreation. The water quality of White Bear Lake is considered good. The communities along the lakeshore have begun programs to help maintain or improve the good water conditions. Pollution problems appear to be minimal. However, a few problems have been documented for the lake, including the presence of Eurasian milfoil. Also the "itch"--a parasite which in its fluke stage burrows into the skin--is a common complaint of swimmers in early summer. The parasite uses snails found in the lake as a host.

The 1990 Water Quality Study by the White Bear Lake Conservation District is available at the City Hall. RCWD has completed a Diagnostic/Feasibility Study and more stringent guidelines are anticipated. There are two surface water monitoring sites in the City which are maintained by the St. Paul Water Utility (SPWU). They are located at the outlet of Goose Lake and at the outlet of a storm sewer pipe near Whitaker Avenue. Flow rates and concentration levels of nutrients such as phosphorous, Kjeldahl nitrogen, ammonia, chlorophyll-a, and suspended solids are recorded and analyzed by the SPWU. Maintaining the water quality of the lake continues to be a high priority for the City of White Bear Lake.

Other lakes and water bodies within the City of White Bear Lake are ponds and wetlands where water quality data has not been monitored. Siltation and erosion problems have been noted in Section 4 - Management Strategies, along with other drainage problems.

2.7 LAND USE

The City of White Bear Lake is more than 90% developed. The area along the Interstate 35E corridor north and south of Trunk Highway 96 remains partially undeveloped. Other areas of potential development are along Trunk Highway 61, north of T.H. 96 and east of T.H. 61, south of County Road E.

As areas are developed, potential runoff quantity increases. Roofs, driveways, parking lots, and other impervious surfaces increase the amount of runoff and decrease the amount of soil infiltration which is associated with an area. Maps 11 and 12 show existing and proposed land use. The floodplain map is on file at City Hall.

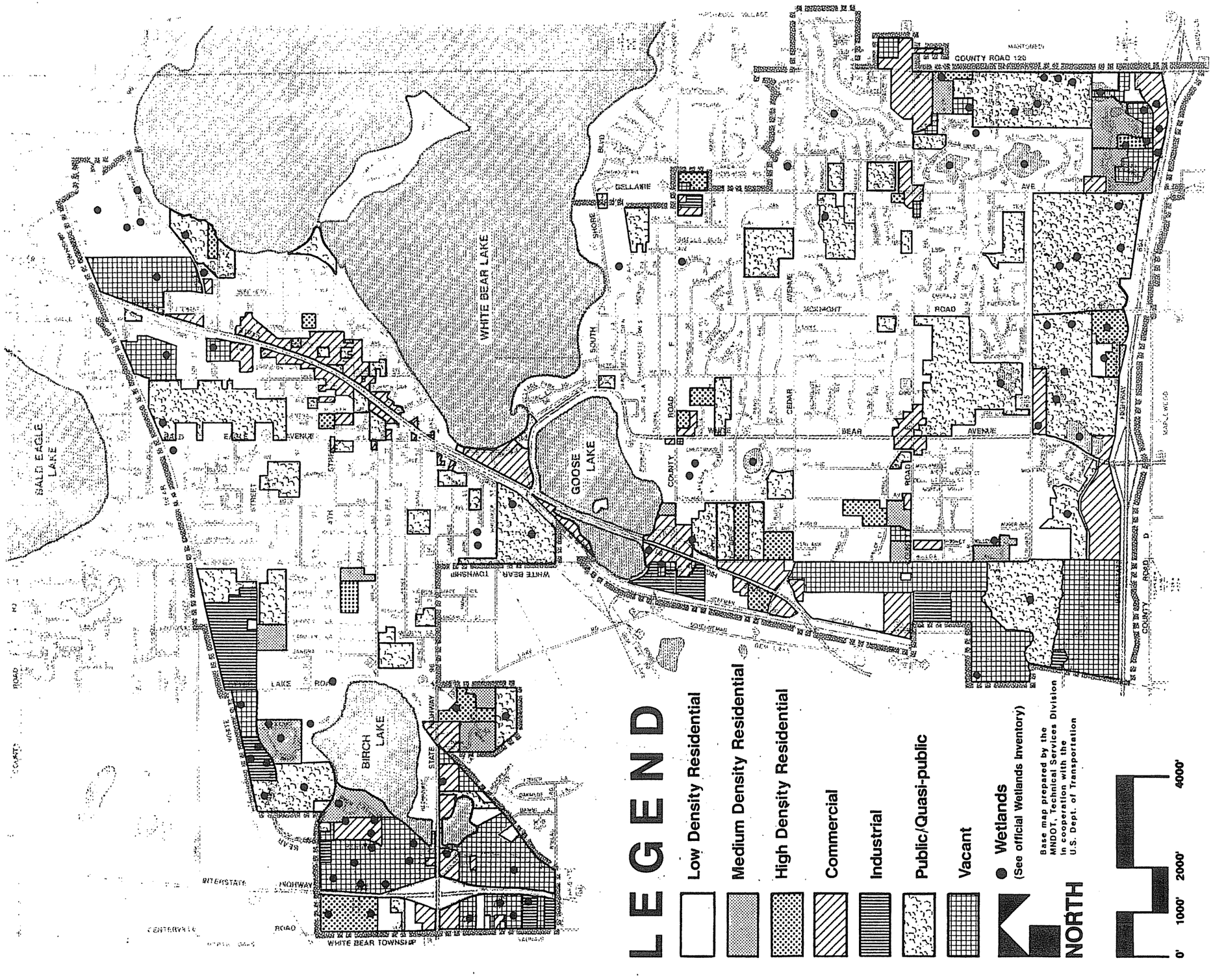
2.8 UTILITIES

The public utilities in White Bear Lake include the storm sewer, sanitary sewer and the water system.

The public sanitary sewer system services most of the City. The system is connected to the Metropolitan Council Environmental Services (MCES) system. Sewage flows to the MCES

EXISTING LAND USE

MAP 11



LAND USE

SOURCE:

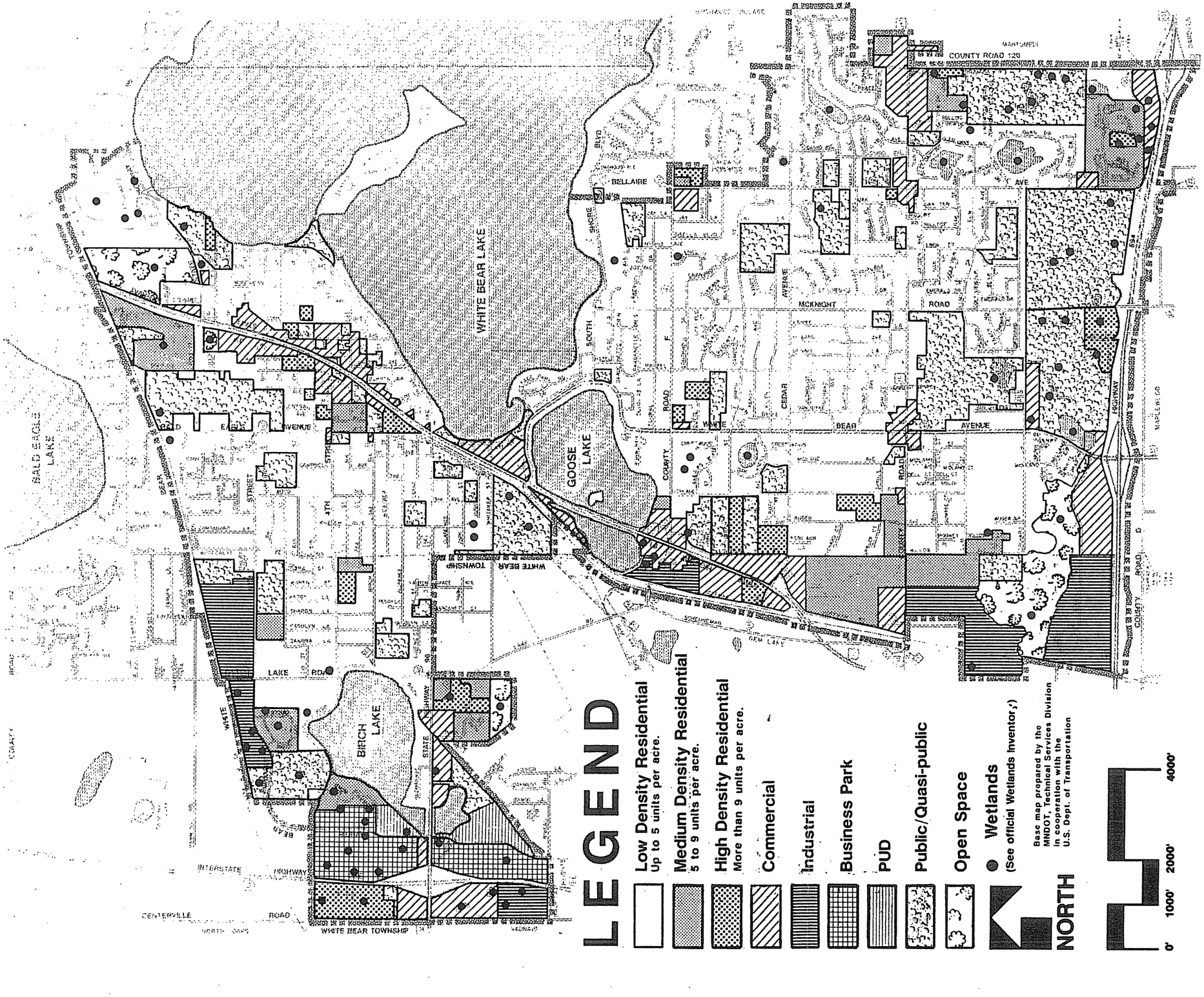
COMPREHENSIVE PLAN 1990

City of White Bear Lake

PROPOSED LAND USE

APPROVED BY CITY COUNCIL 12/8/92

MAP 12



LAND USE

SOURCE:

COMPREHENSIVE PLAN 1992

City of White Bear Lake

Metro Plant. Several private on-site sewage septic systems remain in White Bear Lake in areas not serviced by the sanitary sewer system. The water source for the White Bear Lake water system is municipal wells.

The drainage system includes the storm sewers and the surface drainage which is defined by the terrain and the existing water bodies. Some ponds have been constructed for detention of runoff. Problem areas are discussed in Section 4-Management Strategies, of this Plan.

2.9 WATER APPROPRIATION PERMITS

There are four water appropriation permits issued by the DNR in White Bear Lake. Water appropriation permits are issued to permittees who pump greater than 10,000 gallons per day or over one million gallons of water per year. Permittees and pumping limits, measured in million gallons per year (MGY), are shown on Table 6.

TABLE 6
WATER APPROPRIATIONS PERMITS

Permit No.	Owner	Purpose	Amount (MGY)
69174-5	White Bear Lake	Municipal Waterworks	858
866316-1	Kohler Mix Specialties	Industrial Processing	130
886389-RW-1	Superamerican Group	Pollution Confinement	5
886389-RW-2	Superamerican Group	Pollution Confinement	5

Reference: Minnesota DNR-Water Appropriation Permit Inventory, 3/26/96

2.10 GROUNDWATER RESOURCE DATA

Ramsey County has published The Ramsey County Groundwater Quality Protection Plan. This publication contains a comprehensive topographic and geologic overview that describes the groundwater aquifers of the county, identifies groundwater contaminated areas and predicts areas of sensitivity to groundwater contamination. The Plan includes well-head protection areas. Model ordinances can be adopted by communities to help reduce contaminating events and minimize impact to groundwater resources. The City will rely on the Ramsey County groundwater model effort to provide basic elements for the WHPP for the municipal well field.

A Wellhead Protection Plan (WHPP) will be developed for the City after the Ramsey County groundwater model is completed.

2.11 WATER-BASED RECREATION AREAS

The single most unique water-based recreation feature of the City is White Bear Lake. This lake supports all recreational water activities: swimming, boating, and fishing. As the largest lake of Ramsey County, it attracts many users from the region. See Map 13 for recreation areas. Other water bodies are listed and classified by the management organizations. Those classifications are adopted by reference.

2.12 UNIQUE FEATURES AND SCENIC AREAS

The Minnesota Department of Natural Resources maintains a database of unique and sensitive plant and animal species. The following information was obtained from the DNR Natural Heritage Database.

Natural communities and one threatened animal species are found in the City. A cluster of natural communities of wet meadows and wet prairie is found near the northern border of the City along the Soo Line railroad tracks between T.H. 61 and I-35E. This cluster of wetlands is a City protected water.

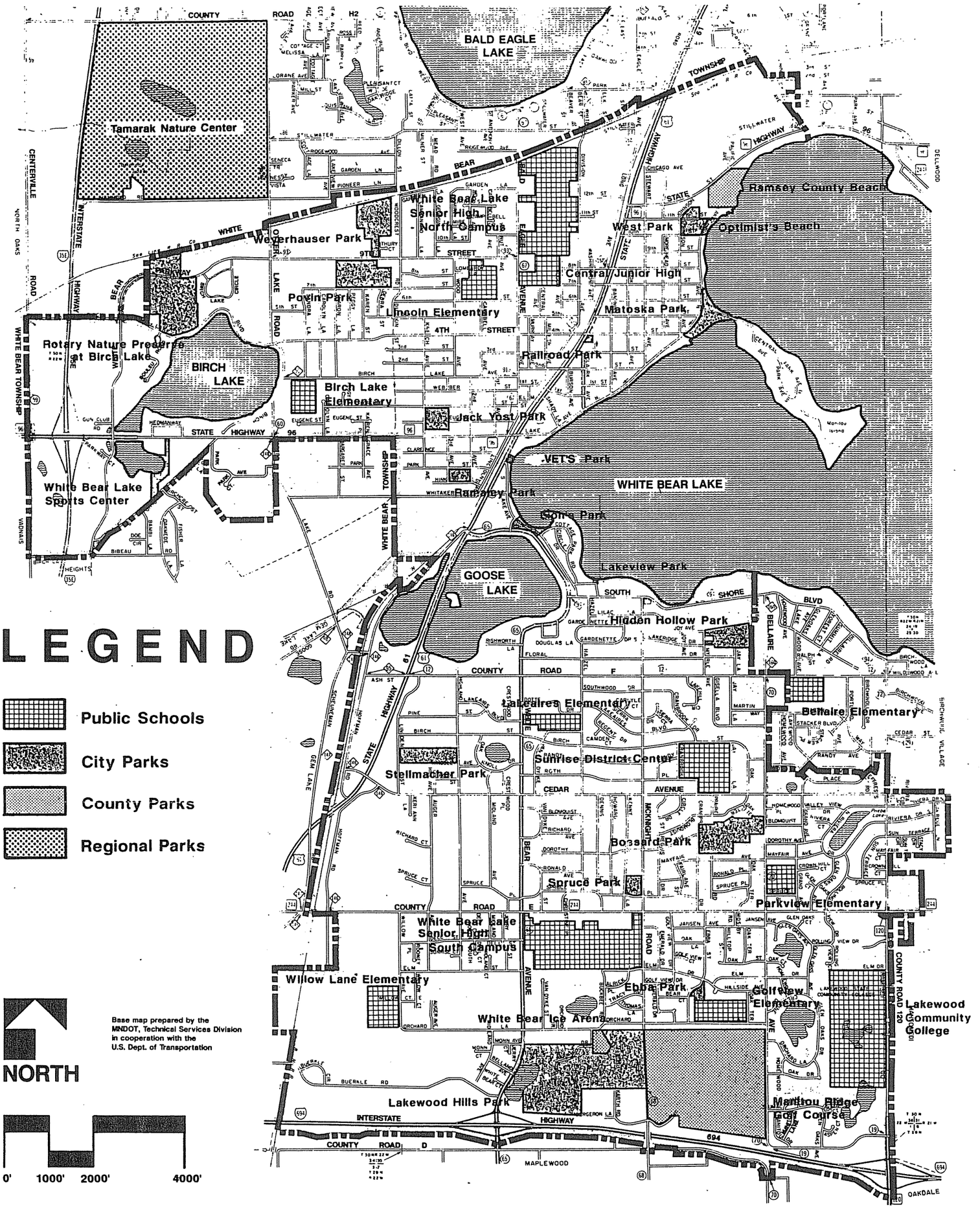
The Blanding's turtle is listed as a threatened species. It has been found near lakes and wetlands in the City.

False indigo has also been sited within the City.

2.13 POLLUTANT SOURCES

Seven pollutant sources within White Bear Lake are identified by the Minnesota Pollution Control Agency. All dumps have been closed and hazardous sites are in various stages of soil and groundwater remediation. Pollutant sources are listed in Table 7 (see page 2-12).

Other potential pollutant sources such as abandoned wells and petroleum leak sites are shown in the Ramsey County Groundwater Quality Protection Plan.



LEGEND

- Public Schools
- City Parks
- County Parks
- Regional Parks

Base map prepared by the MNDOT, Technical Services Division in cooperation with the U.S. Dept. of Transportation

RECREATIONAL FACILITIES

MAP 13

WATER MANAGEMENT PLAN
CITY OF WHITE BEAR LAKE

TABLE 7 POLLUTANT SOURCES - DUMPS AND LANDFILLS		
Name	**Address**	**Description**
Kohler Mix Specialties	4041 Highway 61	Discharge of noncontact cooling water
Lakewood Hills Apartments	3185 Karth	Old farm dump; no further action required
Old White Bear Road and Neschville/Lande Pond	35E and Highway 96	Lead shot; no action required by PCA
Old dump Site	4th Avenue and Whitaker Avenue	Residential waste dump site
Old Dump Site	Vicinity east of Division Street south of railroad tracks	Domestic waste
Lime Sludge Dump	1884 Whitaker Avenue	Lime sludge from water treatment
White Bear Municipal Sewage Treatment	Highway 61 and Whitaker Avenue	Sediment from old treatment plant

REFERENCE: Minnesota Pollution Control Agency, March 1996

SECTION 3
OBJECTIVES AND POLICIS

CITY OF WHITE BEAR LAKE
WATER MANAGEMENT PLAN

SECTION 3 - OBJECTIVES AND POLICIES

3.1 GENERAL

The White Bear Lake objectives and policies have been structured into a framework for water resource management as required by law. The Metropolitan Surface Water Management Act sets forth the purposes of municipal water resources plans as follows:

> 103B.201 Surface Water Management Program: Purposes.
>
> The purpose of the surface water management programs required by Sections 6 to 16 (103B.205 to 103B.255) is to protect, preserve, and use natural surface and ground water storage and retention systems in order to (1) reduce to the greatest practical extent the public capital expenditures necessary to control excessive volumes and rates of runoff, (2) protect and improve surface and ground water quality, (3) prevent flooding and erosion from surface flows, (4) promote ground water recharge, (5) protect and enhance fish and wildlife habitat and water recreational facilities, and (6) secure the other benefits associated with the proper management of surface and ground water.

Sections 2 and 4 of this Plan examine existing physical and hydrologic conditions and the proposed future environment. This inventory, together with the general purposes of the Metropolitan Surface Water Management Act were used to determine the water resource management objectives and policies of the City of White Bear Lake.

The objectives and policies of the White Bear Lake local plan recognize the existing conditions and problems identified in this Plan and WMO studies. The objectives and policies are to be used as a guide in the design and construction of private and public developments impacting water resources in the City. They will not circumvent accepted and correct civil and water resource design procedures.

3.2 OBJECTIVES

A "Goal" or "Objective" is a desired end towards which the City's policies, standards, criteria, and rules are directed. Under this definition, the objectives of the City of White Bear Lake Water Management Plan are:

3.2.1. Establish water resource planning to guide future development and growth in a manner that will minimize environmental impacts.

3.2.2. Reduce to the greatest practical extent the public capital expenditures necessary to control excessive volumes and rates of runoff.

3.2.3. Improve water quality.

3.2.4. Prevent erosion from surface flows.

3.2.5. Control flooding.

3.2.6. Promote groundwater recharge.

3.2.7. Protect and enhance fish and wildlife habitat and water recreation.

3.2.8. Maintain and/or improve all existing natural and artificial water courses in order to protect water quality.

3.3 POLICIES

A "Policy" is a governing principle, a means of achieving an established objective. Policies guide a general course of management that leads toward goal achievement. Under this definition the policies of the City of White Bear Lake are:

3.3.1 Water Resource Planning

a. The City of White Bear Lake Water Management Plan shall be consistent with metropolitan system plans and jurisdictional watershed plans.

b. The City of White Bear Lake will establish early planning for undeveloped areas in order to ensure conformance with the water management plan. The City will also coordinate the planning with the water management organizations in the geographic area. This will minimize long range capital costs of stormwater management and maximize effectiveness from runoff and water control strategies.

c. City planning for stormwater management will be conducted within sub-watershed - sub-basins interrelationship. The storm sewer system has been completely designed for full development conditions. Most of the designed system has been constructed.

d. The City will manage its water resources based on the ultimate development of the City watershed as reflected in the 1991 City comprehensive plan and WMO plans, respectively. The City will coordinate zoning changes with the WMO in the geographic area.

3.3.2. Minimize Public Expenditures to Control Runoffs

a. Future development will require additional storage of stormwater either on-site or through the construction of a regional detention area.

b. Preserve the present capacities of the existing drainage system with proper maintenance. This will reduce the need for remedial measures such as costly repair or replacement.

3.3.3 Improve Water Quality

a. Treat and/or control runoff to enhance water quality and to reduce pollutant loadings, especially nutrients and sediments.

b. To preserve wetlands according to their "function and value" as required by the Minnesota Wetland Conservation Act (WCA).

c. To maintain or improve water quality levels for waters and wetlands in the City in consideration of State standards.

d. The City does not promote the installation of new private on-site waste water systems. Where City sewer is not available or economically feasible to attain, design and installation shall be in accordance with Minnesota Pollution Control Agency guidelines.

e. Storm water shall be directed into waters or wetlands, in accordance with individual WMO/WD rules. New projects shall comply with the MPCA's NPDES stormwater permitting program that prohibits the direct discharge of stormwater into exposed groundwater basins, or "waters of the state".

f. The jurisdictional WMOs shall act as depositories and coordinators for the collection of water quality data to assure consistency and comparability of data.

g. The City shall provide regular maintenance and inspection, as needed, of regional detention basins. The City and the WMO must agree on identity of these areas.

3.3.4 Prevent Erosion from Surface Flows

a. For land disturbance activities of more than 100 cubic yards, an erosion and sediment control plan in compliance with each specific WMO shall be submitted and approved by the City and implemented before any construction activities are begun.

b. For excavations or regrading activities of more than 100 cubic yards, a permit shall be required in accordance with City Ordinance 903.070, Land Alteration Permit.

c. All erosion and sediment control plans prepared for applicable land disturbance shall, at a minimum, conform to the "Best Management Practices for Minnesota: Protecting Water Quality in Urban Areas", prepared by the Minnesota Pollution Control Agency, and reprinted in December 1994. Compliance with the Ramsey Soil Erosion and Sediment Control Handbook is mandatory in Ramsey County.

d. The City enforces Best Management Practices with the Land Alteration Permit (Ordinance No. 903.070).

3.3.5 Control Flooding

a. To prohibit encroachment that will reduce the capacity of floodways.

b. The City may accept measures such as flood proofing or flood protection in allowing building within the flood plain or structure types that will not receive excessive damage.

c. The City shall cooperate with jurisdictional watershed organizations and governing agencies in managing for the 100 year flood level on designated waters and wetlands.

d. The City has adopted floodplain zoning ordinances which conform to State regulations. City Ordinance 91-06-846 and City Zoning Code 1303.235 are available for review at City Hall.

e. The lowest floor elevation of all development including basements, shall be required to be at least one and one-half feet (1½ feet) above the regional flood level for the adjacent water or wetland, unless a floodway has been adopted, in the latter case the elevation shall be one (1) foot plus the floodway surcharge. The regional flood levels have been determined and mapped by the Federal Emergency Management Administration. Additional requirements may be imposed by individual watersheds.

3.3.6 Promote Groundwater Recharge

a. To protect recharge areas from potential sources of contamination to ensure that underground waters are maintained within the range of natural background quality.

b. The City encourages land use development which incorporates methods such as grassed open spaces to allow infiltration of precipitation in all land use categories.

c. The City encourages the use of facilities to enhance groundwater infiltration whenever possible, practical, and in conformance with Minnesota Rules, Chapter 7050.

3.3.7 Protect and Enhance Fish and Wildlife Habitat and Water Recreation

a. The City has adopted local shoreland ordinances based on Minnesota Department of Natural Resources regulations. It is incorporated in the City Zoning Code 1303.230.

b. To coordinate with counties and watershed districts to enhance water-based recreation.

3.3.8 Protect and Improve All Existing Natural and Artificial Watercourses

a. The City recognizes that the jurisdictional watershed organizations shall provide all operation and maintenance responsibility of county ditches and their attendant branches.

b. The watershed districts shall provide for regular inspection and maintenance, as needed, of outflow conveyors. Ditches within VLAWMO will be inspected and maintained by the City.

c. The City shall maintain and operate storm drain systems and appurtenant structures within its right-of-way.

SECTION 4
MANAGEMENT STRATEGIES

CITY OF WHITE BEAR LAKE
WATER MANAGEMENT PLAN

SECTION 4 - MANAGEMENT STRATEGIES

4.1 GENERAL

This section of the management plan addresses the strategies used or proposed for White Bear Lake to manage the water resources within the City. It includes references to the existing City ordinances. Additional proposed ordinances are identified in this section. The criteria relating to the management policies are included in the section. These criteria encompass the management of stormwater runoff, hydrology and hydraulic design; wetlands; groundwater; shoreland areas; flood plains; soil erosion and sediment control; and land designated for open space, recreation, and wildlife habitat. These criteria ensure that the management policies are consistent with the City's goals and overall comprehensive plan. Specific standards are presented for development, redevelopment, and improvements throughout the City. The regulation and enforcement practices are also included. Capital Improvement Projects identified for the City which will help manage water resources within White Bear Lake are listed and briefly described in this section.

4.2 STANDARDS AND PRIORITIES

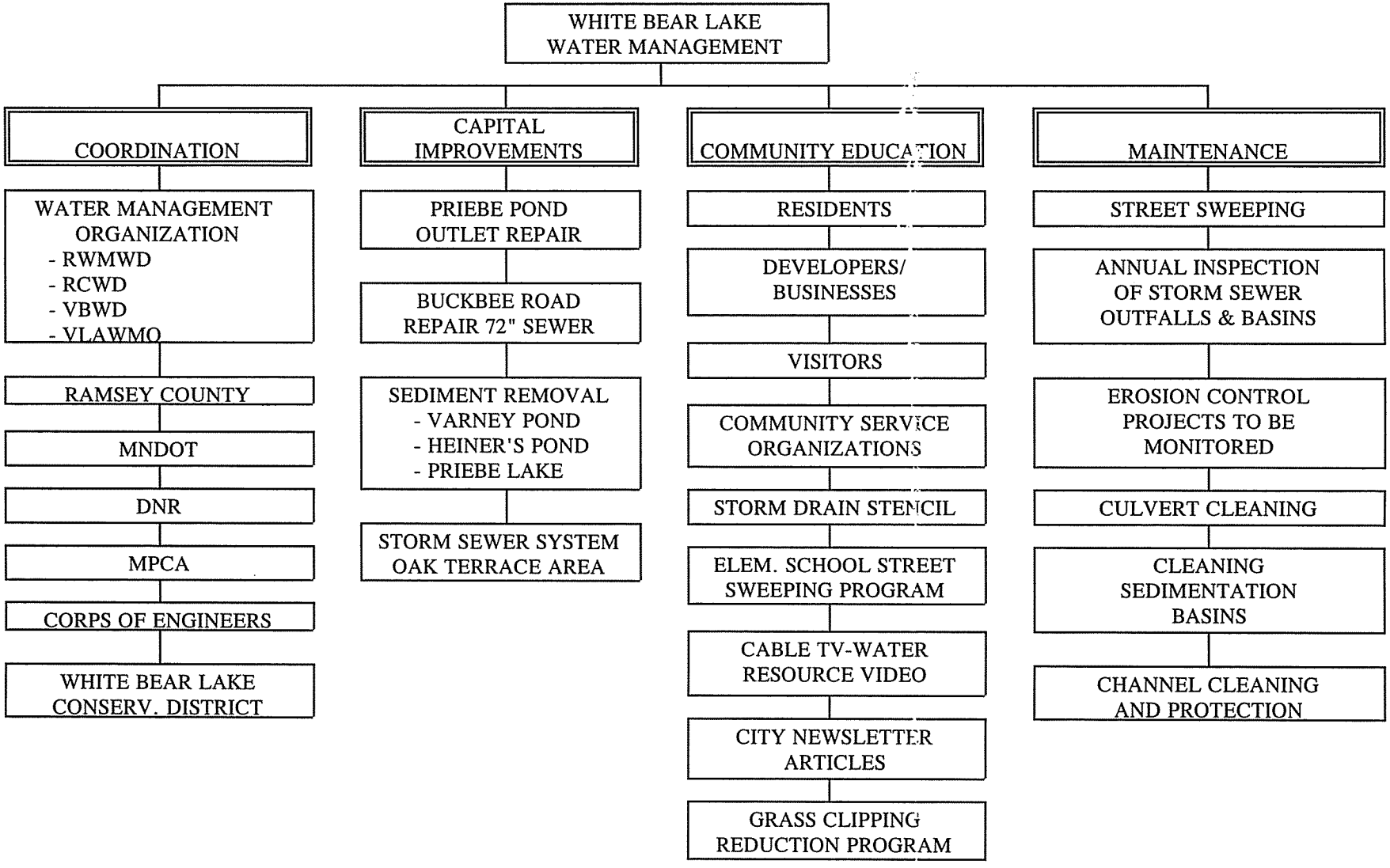
The standards, as a minimum, establish the degree of performance necessary to achieve improvements in water quantity and quality management. While these standards relate to one of the criteria areas, it should be noted that they are interrelated and may serve multiple purposes. For example, proper water quantity control measures often improve water quality and management of areas for recreation, open space or wildlife habitat.

The standards discussed in this section are the preferred or desired levels of quantity, quality or value for the City's water resources. Although the standards may not be completely achievable for every water resource, they do provide a means to rate various resource characteristics. The GLOSSARY has definitions of several terms used in this section and throughout this document.

Resources of time and money available for implementing water resource management practices in the City of White Bear Lake are, and will likely continue to be, limited. For this reason, the City recognizes the need to use management priorities to guide the use of these resources. The highest management priorities are to protect the drinking water supply and to protect the inhabited areas from flooding. Any water resource that has needs related to those highest priorities will be given immediate attention. When an immediate need is identified it is given first priority status. Resources with longer term, less immediate need of protection or enhancement such as erosion and sediment control are given priority as financing and other resources are available.

Other important water issues such as groundwater management, shoreland management, floodplain management, and preservation and enhancement of open space, water recreation, and fish and wildlife habitat are more difficult to address on a local level. Regulation and enforcement related

MANAGEMENT STRATEGY



to groundwater, shoreland, floodplain, fish and wildlife habitat tend to be regional, State, or Federal functions.

The standards and priorities for the City of White Bear Lake are reflected in the Management Strategies described in this Plan. For issues regulated by state and federal agencies, the governmental unit is described.

4.2.1. Stormwater Runoff

a. The level of service to be provided by lateral conveyors shall be a local White Bear Lake policy, subject to the requirement that the level of service, or primary capacity, shall at all times be adequate for the proper performance of affected ponds and other storage areas. Information on specific structure systems is available at the City Engineering Department.

b. Lateral conveyors shall be designed to provide primary capacity for short duration (1-hour) rainfalls with frequency of 5 years with the ability of secondary capacity for the critical duration (or snowmelt) 100-year rainfall event.

c. Stormwater shall not discharge from lateral conveyors directly into any waters or wetlands other than designated detention basins without either primary sedimentation in a natural or man-made structure, such as catch basins or grit chambers, and/or an established program of street, maintenance or house-keeping practices implemented to reduce the inflow of pollutants. RCWD requires skimming devices to provide treatment for the 1-year event and VBWD requirements are for the 5-year event.

d. Land use adjacent to flood plains shall be regulated in accordance with state and local floodplain zoning regulations (including freeboard surcharge and, where appropriate, floodway surcharge). See the Floodplain Overlay District and Ordinance #87-8-745, dated August 1987 and the amendment #91-06-846, dated June 1991.

e. Outflow conveyors shall be designed to provide for primary capacity of at least a 10 year frequency rainfall event with the ability of secondary capacity for the critical duration 100 year frequency event.

f. Proposers of all developments or construction projects greater than 2.5 acres in size shall submit rate and runoff control measures with the permit applications. Runoff management calculations and plans may be required for smaller developments by the water management organizations (RCWD, RWMWO, VBWD, and VLAWMO). The runoff control plans must provide:

    1) Calculations showing that the post-development rate of discharge will not exceed pre-development rate.
    2) Plans for an outlet control structure to provide rate control consistent with the requirements of the watershed district or watershed management organization plan. Energy dissipater devices to reduce outlet velocities to 4 fps or less are required.
    3) Design ponds with permanent standing water levels at an average of four feet in depth, as recommended in BMPs. VBWD and VLAWMO require emergency spillways.

4) Proposer must provide dead storage volume of no less than the calculated runoff from a 2.5-inch rainfall over the tributary area. The dead storage shall be below the outlet of newly constructed detention basins to allow for reasonable accumulation of sediment.
5) Proposer shall provide easements for access and maintenance.
6) Proposer shall provide as-built drawings of the runoff control measures at the completion of construction. The drawings and calculations shall be signed by a registered professional engineer.

4.2.2 Hydrology and Hydraulic Design

Hydrologic analysis of stormwater runoff for the planning and design of flows in lateral and outflow conveyors, streams and channels to lakes, detention basins, and wetlands shall be made using generally accepted hydrograph methods. The developers of the property are responsible for providing hydrologic/hydraulic assessments of pre- and post-construction conditions for WD/WMO and City review.

Determination of total runoff volume should follow the USDA-SCS curve number method which incorporates land use and hydrologic soil groups. Specific step-by-step process can be found in the SCS publication NATIONAL ENGINEERING HANDBOOK: Chapter 4, Hydrology, (1972) and HYDROLOGY GUIDE FOR MINNESOTA (1977). Peak runoff rates should be determined through the use of the SCS method incorporating *time of concentration* determined for both prior and post development conditions. Other methods used by engineers to determine peak runoff rates are available and may be used if approved by the watershed organization. The models should include mathematically routing runoff through the drainage area determining the peaks and volumes as they move in a wave progressively downstream. For large private developments, which may incorporate more than one on-site detention system, the proposer must prepare a stormwater routing analysis and plan for City and watershed approvals. For other developments, hydrograph analysis and possible routing may be done by the City Engineer or the jurisdictional watershed organization where regional detention basins or outflow conveyors are impacted. The developers may be assessed for this analysis.

"**Design Storms**" or storm volumes for hydrologic analyses shall be based upon Hershfield, D.M., 1961, Rainfall Frequency Atlas of the United States for Durations of 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years, Technical Publication Number 40 (TP-40) and supplemented with Oberts, G.L., 1984, Surface Water Management; Precipitation Frequency Analysis for the Twin Cities Metropolitan Area, Metropolitan Council, Publication Number 10-84-007 along with Fredrick, R.H., 1977, Five to 6; Minute Precipitation Frequency for the Eastern United States, NOAA Technical Memorandum NWS HYDRO-35, Office of Hydrology, Silver Spring, Maryland. The data developed by the WMOs will be adopted by reference.

4.2.3 Sub-basin Hydrology

Peak stormwater discharges from any single sub-basin or group of sub-basins tributary to an outflow conveyor, regional retention basin, or wetland shall be limited to those rates shown in watershed management plans, or if not shown, as may be determined by the watershed organization. The developer is responsible for providing this information as required.

In those areas where storm water runoff conveyance system has not been fully developed, the normal levels and flood levels reported in jurisdictional watershed organization, or if not shown, as may be determined by the watershed, are generally intended to guide detailed design. These levels must assure that adequate storage volume can be provided, outflow conveyor discharge requirements can be met, an adequate level of protection results, and there is not a conflict with water quality management criteria. The storm sewer system has been designed for all of White Bear Lake and most of the system has been constructed and is in operation.

4.2.4. Wetlands

The State of Minnesota adopted legislation in 1991 which affects development or any land alteration near wetlands. The legislation is known as the Wetland Conservation Act (WCA). The regulatory provisions of WCA are in effect for the entire state of Minnesota. Minnesota Rule, Chapter 8420 was approved by the Chief Administrative Law Judge in 1993 and the permanent Program began in 1994. The WCA was further amended by the 1996 legislature. These amendments, 1996 Laws of MN, Chapter 462, Section 24 became effective April 12, 1996.

Wetlands are identified according to the WCA rules. Maps are available showing many of the wetlands in the City. Copies of the NWI and DNR protected water maps are available for review at the White Bear Lake City Hall.

The watershed organizations have been the administrators of the Wetland Conservation Act for wetland issues in White Bear Lake since 1991. It is the intent of the City of White Bear Lake to maintain that arrangement. The watershed organizations are the designated local government unit (LGU) for the White Bear Lake wetland issues. The Minnesota Board of Water and Soil Resources (BWSR) is the state administrative agency for the Wetland Conservation Act. The administration and the authority of Chapter 8420 is the BWSR. The US Army Corps of Engineers (COE) also reviews plans for projects which impact wetlands and issues permits for the impact and mitigation plans.

Activities such as fill or excavation in a wetland are regulated by the Minnesota Rules, the COE, and the watershed organizations. Wetland impacts must be avoided if possible. When impacts are unavoidable, a replacement plan and application are required for most construction and grading which impacts a wetland.

Some activity in a wetland is exempt from the requirement to create a replacement wetland. Those exemptions are listed and described in 8420.0120 Exemption Standards of the rules and the 1996 amendments. For exempt activities, the proposer shall submit a request for a certificate of exemption to the watershed management organization. The water management organizations have some additional, stricter standards for particular wetland impacts. The City will inform persons proposing any land-disturbing activities, including drainage affecting a DNR protected water, that the project may require a DNR permit and that a COE permit may be required for all wetland impacts.

The Commissioner of the Department of Natural Resources (DNR) is responsible for enforcement of the Act (WCA). Although conservation officers are primarily responsible for this enforcement, the City Engineer shall assist the DNR. The water management organizations administer the WCA.

4.2.5. Groundwater

The City shall support the proper utilization of groundwater resources and advocate better groundwater management procedures. Specifically to:

a. Attempt to preserve groundwater quality and quantity.

b. Concentrate protection of groundwater quality in areas designated by County or watershed organization.

c. Promote groundwater recharge by using regional detention/treatment ponds to store water from snow melt and rain storms and by using channels and natural drainageways wherever feasible.

4.2.6. Shoreland Management

The City of White Bear Lake has many lakes and wetlands located in the City. The largest of the lakes, White Bear Lake, receives significant amounts of runoff from some quite dense commercial and residential areas. Two other significant lakes are Birch Lake and Goose Lake, both of which suffer water quality problems associated with small, shallow lakes. Other lakes in the City are Handlos, Varney, Priebe, Bergeron, Peppertree, Heiners, and Oak Knoll as shown on Map 4 in Section 2. It is imperative that the shoreland of lakes in the City be developed in a manner consistent with MN/DNR protection standards in order to maintain or improve the quality of lakes within the City.

The City of White Bear Lake has adopted a State approved shoreland ordinance. The ordinance includes setback requirements which are regulated by zoning requirements.

4.2.7. Floodplain Management

The legislature of the State of Minnesota has in Minnesota Statutes Chapters 462, delegated the authority to local governmental units to adopt regulations designed to minimize flood losses. Minnesota Statute, Chapter 103F further stipulates that communities subject to recurrent flooding must participate and maintain eligibility in the National Flood Insurance Program. Additional requirements may be imposed by individual watershed plans.

As part of the Flood Insurance Program, the boundaries of floods that have a recurrence interval of 100 years (100-year flood) have been defined on maps for the City of White Bear Lake. The Flood Insurance Rate Map for the City, dated September 4, 1987, developed by the Federal Emergency Management Agency, has been adopted as the official floodplain district map. This map is on file at City Hall. More detailed information developed by the WMOs will be adopted by reference when provided to the City.

A significant problem exists in the sole usage of this data to determine the 100-year floodplains within the City. The data provided in the flood insurance studies are based upon development existing at the time of the studies. Development since the study and future development may significantly alter the delineation of the 100-year floodplain and the elevation of the 100-year flood profile within the City. Therefore, it should be recognized that the sole use of information from flood insurance studies may result in a floodplain management program that will not meet the purposes of the City's Floodplain Management Regulations 87-8-745.

The City does not allow site development involving outside storage of soluble, toxic, or buoyant materials in the floodplain. Flood fringe encroachment within shoreland areas associated with public waters is not allowed.

4.2.8. Soil Erosion and Sediment Control

As development continues in response to the growth needs of the City, construction practices are usually accompanied by a loss of soil through erosion. Most areas of the City have granular soil types and are therefore, susceptible to the forces causing erosion. Sediment removed from areas stripped of vegetation cover can be carried into downstream drainage ways and water bodies. Once present in these downstream areas, the sediment often degrades the water quality, obstructs flow, and reduces the depth of downstream water bodies. To reduce and eliminate sediment from construction sites, proposers of new development and/or construction sites shall submit erosion and sediment control plans as part of their permitting process for all projects that disturb vegetated cover or that affect critical erosion areas.

The contractor/owner must implement the best management practices for the site conditions involved and shall consider erosion sediment resulting from flowing water, wave action, and wind.

Specifically, erosion control plans must:

a. Require that contractor complete erosion and sediment control facilities before beginning rough grading.

b. Require that silt fences be supplemented and supported with hay bales staked with at least two sturdy metal or wooden posts per bale in all areas where minor runoff (less than 1 cfs) may be concentrated.

c. Route flows from diversion channels or pipes to sedimentation basins or appropriate energy dissipaters to prevent transport of sediment to outflow or lateral conveyors and to prevent erosion and sedimentation when runoff flows into the conveyors. Protect storm sewer inlets not needed for drainage.

d. Provide that site-access roads be graded or otherwise protected with silt fences, diversion channels, or dikes and pipes to prevent sediment from exiting the site via the access roads. Primary site-access roads shall be surfaced with crushed rock for 50 feet where they adjoin existing paved roadways.

e. Require that soils tracked from the site by motor vehicles be cleaned from paved roadway surfaces daily throughout the duration of construction.

f. Assure that silt fences and diversion channels or dikes and pipes will be used and maintained for the duration of site construction. If construction operations interfere with these control measures, the silt fences, diversion channels, or dikes and pipes may be removed or altered as needed but shall be restored to serve their intended function at the end of each day.

g. Disturbed areas must be revegetated or mulched permanently or temporarily if it can be reasonably anticipated that significant additional grading will not occur within 30 calendar days. A schedule of significant grading work will be required as part of the erosion and sedimentation control plan.

h. Require that temporary or permanent mulch be disc-anchored and applied at a uniform rate of not less than 2 tons per acre.

i. Provide a temporary vegetative cover consisting of a suitable, fast-growing, dense grass-seed mix spread at 1.5 times the usual rate per acre. If temporary cover is to remain in-place beyond the present growing season, two-thirds of the seed mix shall be composed of perennial grasses.

j. Specify a permanent vegetation cover consisting of sod or a suitable grass-seed mixture or a combination thereof. Seeded areas shall be either mulched or covered by fibrous blankets to protect seeds and limit erosion.

k. Provide temporary on-site sedimentation basins that conform to the criteria for on-site detention basins whenever other erosion and sedimentation control practices are inadequate.

l. Employ soil conservation practices that limit after development soil loss to not more than 0.5 tons/acre/year based on the universal soil loss equation.

m. Additional items as required by the geographic WMO.

4.2.9. Open Space, Recreation, and Wildlife Management

In concert with the intention of the Metropolitan Surface Water Management Act, the City of White Bear Lake recognizes the need to protect and enhance wildlife habitat, water recreation, and open space as the intensity of urban land use increases. Accordingly, the City is in the process of updating its comprehensive plan detailing open space and recreation resources planning. A copy of the most recent update of the comprehensive plan may be reviewed at City Hall.

4.2.10. Education and Public Involvement

The City of White Bear Lake recognizes the need to inform citizens of the protection measures in progress and advisable to better manage our natural water resources. The City has several programs to increase public awareness and involvement in these issues. The City of White Bear Lake is committed to additional programs for public education and involvement.

Existing Programs
Storm drain stenciling
Street sweeping
Elementary Education street sweeping program.
City newsletter articles
Careful use of de-icing chemical for sidewalks and for dewatering
Educational videos on Cable TV
Public information seminars
Fertilizer information/requirements

Proposed New Programs
Grass clipping reduction/ change in trash collection rate structure to encourage mulching
Continuing news/TV articles
Encourage use of County compost sites

Watershed Organizations and Ramsey County
Information developed by other agencies will be used to inform the public of ways to protect water quality within the City

4.3 ASSESSMENT OF PROBLEMS

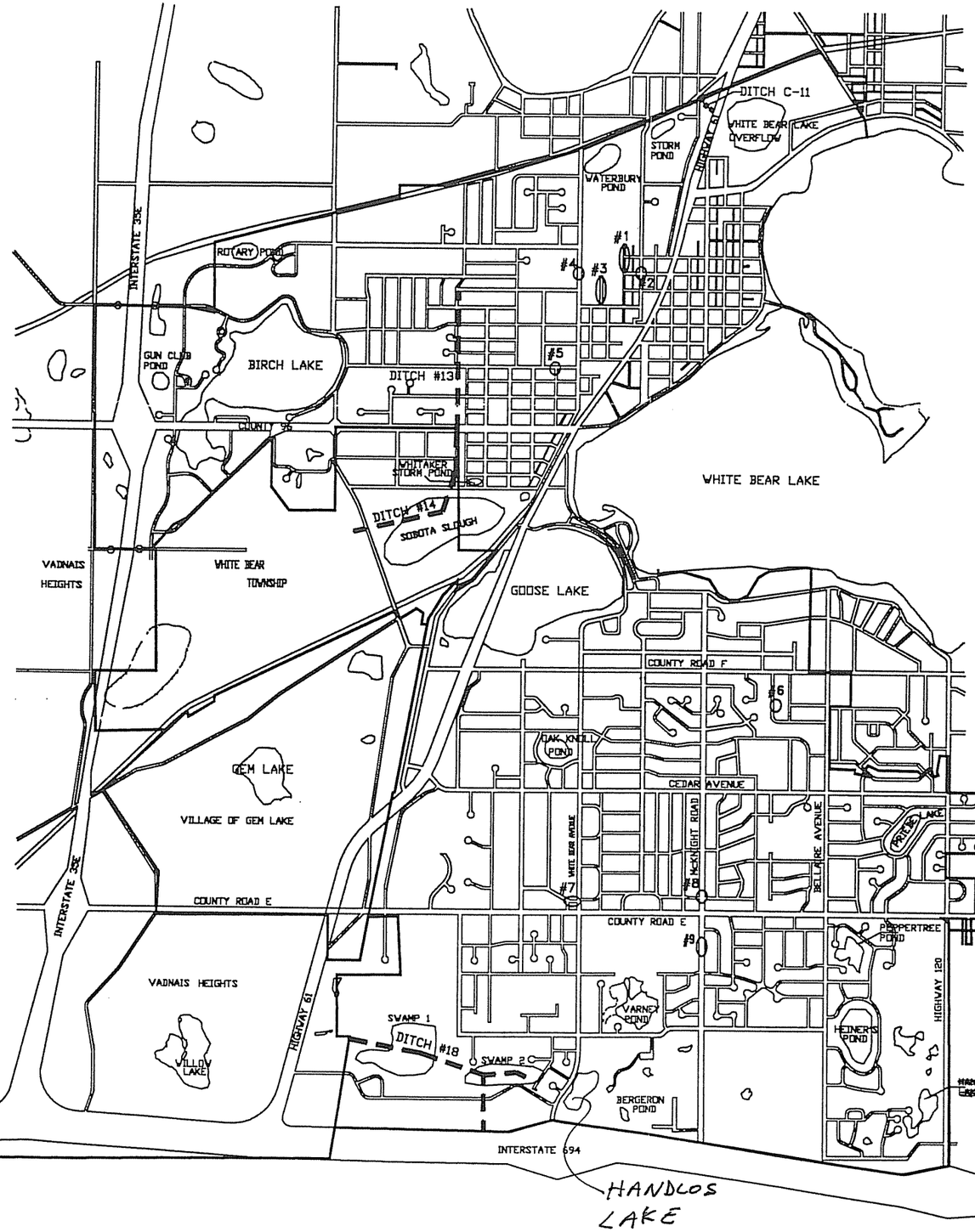
The Public Works Department staff has identified water resource related problem areas within the City of White Bear Lake. Temporary flooding occurs at several locations during intense rainfall or low frequency storm events. This temporary flooding occurs due to undersized storm drains, insufficient numbers of catch basin inlets, and street settlement. The areas subject to temporary flooding have been streets and ditches. Property damage to nearby structures and facilities has not been a problem. The problem areas are shown on Map 14.

4.4 CAPITAL IMPROVEMENTS

The City of White Bear Lake has identified capital improvement projects related to water resource protection. The Capital Improvement Plan (CIP) includes projects scheduled for the next several years.

MAP 14
PROBLEM AREAS

WATER MANAGEMENT PLAN
CITY OF WHITE BEAR LAKE



NORTH

LEGEND

CITY BOUNDARY ——

KEY OF PROBLEM AREAS

1. BLOOM, 7th ST to 8th ST — 1997
2. 7th ST. & DIVISION ST. — 1998
3. CENTRAL AVE., 5th ST. to 7th ST. — 1996
4. BALD EAGLE AVE. & 7th ST. — 99-2000
5. FIRST AVE. & BIRCH LAKE BLVD.
6. GISELLA BLVD.
7. SPRUCE PL., MIDLAND AVE. to WHITE BEAR AVE.
8. SPRUCE PL. & MCKNIGHT RD.
9. MCKNIGHT RD. between EMERALD DR. & ELM DR.

Year	Location	Description
1996	Banning Avenue: 4th St. to Lake Ave	Storm sewer (completed 1996)
1996	Washington Avenue: 4th St. to 3rd St.	Storm sewer (completed 1996)
1997	Priebe Pond	Outlet repair
1997	Buckbee Road	Repair 72" sewer
1998	Varney Pond	Pond maintenance, sediment removal
1998	Heiner's Pond	Pond maintenance
1998	Priebe Lake	Pond maintenance
2000	Oak Terrace area	New storm sewer system

The areas with temporary flooding problems will be addressed as part of the planned street improvement projects scheduled over the next several years. The projects will include grading changes and construction of new storm sewers and catch basin inlets.

SECTION 5
PLAN IMPLEMENTATION

CITY OF WHITE BEAR LAKE
WATER MANAGEMENT PLAN

SECTION 5 - PLAN IMPLEMENTATION

This section of the management plan addresses the plan implementation. It includes the process which shall be followed to adopt the Water Management Plan. The Chart on the following page shows the major considerations to be addressed during the process.

5.1 PROCESS

The Plan has been prepared to incorporate the BWSR rules and the requirements of the state and federal agencies and of the watershed organizations. The Plan is to be approved by the City Council. Once approved by the Council, it will be sent to the four watershed organizations for their review and comment.

The Council-approved Plan will be sent to the watershed organizations for their approval. The staff or representatives of the Ramsey Washington Metro Watershed District, the Rice Creek Watershed District, the Valley Branch Watershed District, and the Vadnais Lake Area Watershed Management Organization will review the Plan for conformance with the requirements of their plans. Once their reviews are completed, any necessary revisions will be made and the Plan will be approved for City implementation. The Plan Amendment Procedure is addressed at the end of this section in Paragraph 5.

5.2 REGULATORY ACTION

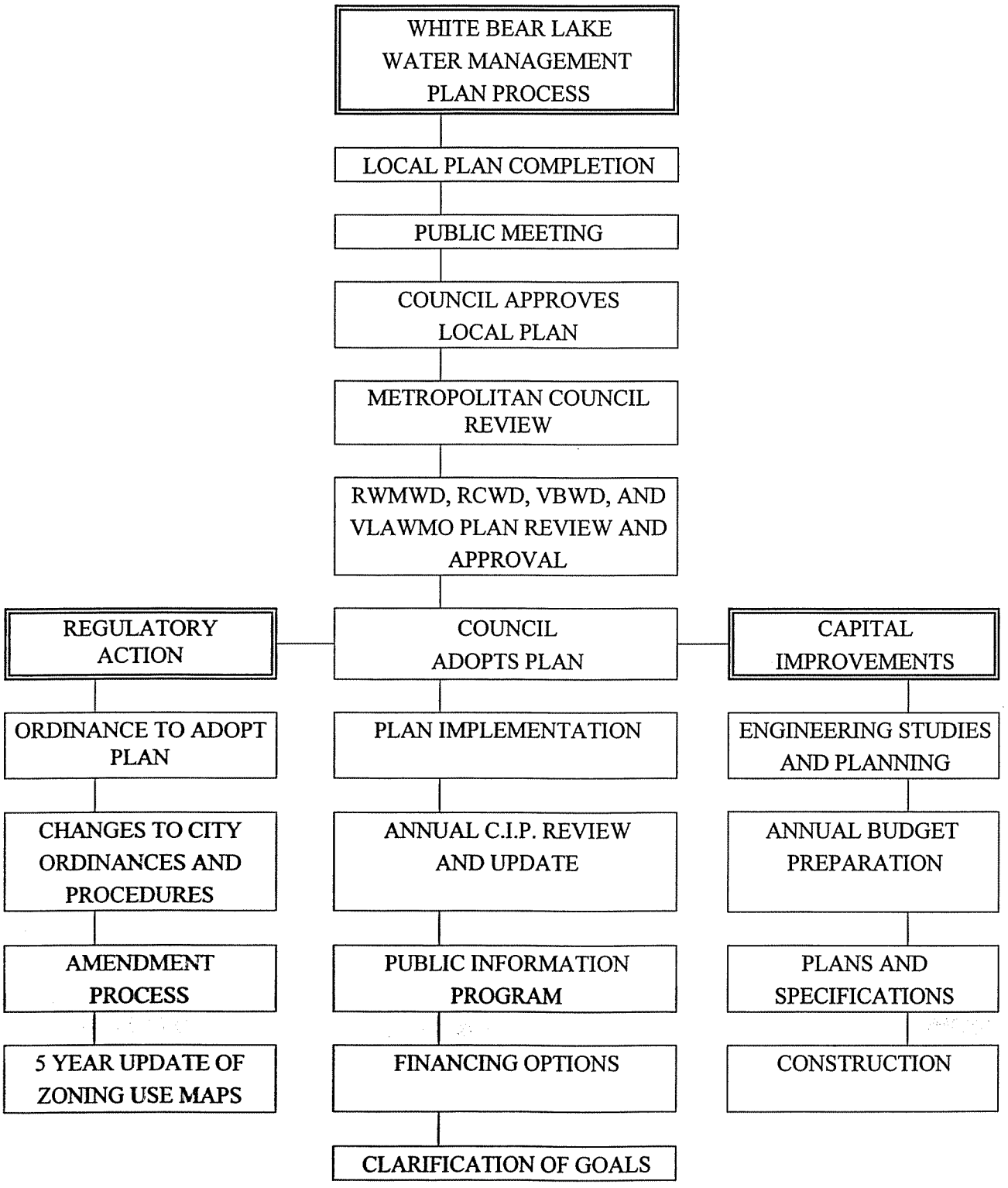
Several state and federal agencies are responsible for some water resource issues. The City of White Bear Lake will continue to cooperate with those agencies and will update the City rules and procedures to meet the requirements of those agencies.

The City of White Bear Lake requires that the proposer of a project obtain a Land Alteration Permit prior to any grading operation. A building permit is also required for construction of structures. Some of the required attachments to the application for the permit involve water resources protection issues. Those attachments include: the grading plan showing contours, the drainage plan, calculations for excavation and fill, and a sediment and erosion control plan. The applicant is also required to conform to the requirements of the White Bear Lake Water Management Plan.

5.2.1. Water Quantity

The City has established criteria for design of the water conveyor systems to provide both primary

IMPLEMENTATION PROCESS



and secondary capacity. The primary capacity relates to the "level of service" provided by the conveyor system. The **level of service** is defined as that part of the conveyor system's total capacity needed to convey runoff without unusual hardship or significant interference with day-to-day public activities. Proposers of new developments or construction projects or land development greater than 2.5 acres in size shall submit rate and runoff control measures with the permit applications. The criteria within the different watershed organizations vary slightly. The criteria are addressed in SECTION 4 - MANAGEMENT STRATEGIES.

5.2.2. Water Quality

The City has developed criteria for treatment levels required for runoff. The minimum treatment required is according to the National Pollutant Discharge Elimination System (NPDES) construction regulations and best management practices (BMP) for each particular site. Development within the drainage area of the St. Paul Water Utility Protected Waters are specifically addressed in the VLAWMO Watershed Management Plan. The City of White Bear Lake requires that all development in those areas conform to the special requirements of the watershed organizations. The RCWD has identified White Bear Lake as a "Tier 1" waterbody. The City commits to working with the geographic WMOs to identify water quality treatment locations as they become available.

5.2.3. Wetlands

The City established a Wetland District and Wetlands Ordinance No. 1303.240 in August of 1987. The State of Minnesota adopted legislation in 1991 which affects development or any land alteration near wetlands. The legislation is known as the Wetland Conservation Act Rules, Chapter 8420 (WCA). Amendments were adopted in July 1993. Major revisions were adopted by the legislature in 1996.

The water management organizations and watershed districts have been the administrators of WCA for wetland issues in White Bear Lake since 1991. It is the intent of the City of White Bear Lake to maintain that arrangement. The watershed organizations (watershed districts and watershed management organizations) are designated as the local governmental unit (LGU) for White Bear Lake wetland issues. The Minnesota Board of Water and Soil Resources (BWSR) is the state administrative agency for the Wetland Conservation Act (Chapter 8420).

Activities such as fill in a wetland are regulated by the Minnesota Rules and the U.S. Army Corps of Engineers. A replacement plan is required for most construction and grading which impacts a wetland. The geographic WMOs administer the WCA and wetland alteration permitting according to their plans.

All activities which may impact a wetland must be approved by the watershed district prior to construction. If a wetland is impacted without the proper approvals a cease and desist order may be issued. The Commissioner of the Department of Natural Resources (DNR) is responsible for enforcement of the WCA. Although conservation officers are primarily responsible for this enforcement, the City Engineer shall assist the DNR.

5.2.4. Groundwater

The State of Minnesota has directed the counties to develop groundwater protection plans. The state has prepared a priority list for implementation of the wellhead protection program. The City of White Bear Lake will coordinate with the state and with Ramsey County to protect the groundwater resource from contamination and to protect the groundwater recharge areas. The City does not have any groundwater ordinances at this time. As model ordinances become available, the City shall review the need for a new ordinance. The City supports the protection of groundwater resources and advocates better groundwater management procedures.

5.2.5. Shoreland Management

The City of White Bear Lake has many lakes and wetlands located in the City. The largest of the lakes, White Bear Lake, receives significant amounts of runoff from dense commercial and residential areas. The White Bear Lake Conservation District has programs for protection of this resource.

Other small shallow lakes within the City have water quality problems typical of similar size water bodies in the Twin Cities Metro area. The City of White Bear Lake adopted a State approved shoreland ordinance in December 1994. The City Shoreland Code 1303.230 is consistent with MN/DNR protection standards to maintain or improve the quality of lakes within the City.

5.2.6. Floodplain Management

As part of the Flood Insurance Program, the boundaries of floods that have a recurrence interval of 100 years (100-year flood) have been defined on maps for the City of White Bear Lake. The Flood Insurance Rate Map for the City, dated September 4, 1987, developed by the Federal Emergency Management Agency, has been adopted as the official floodplain district map. The map is on file at the City Hall.

The City adopted a Flood Plain Ordinance, Code No. 1303.235, in June 1991. The City continues to enforce the provisions of that ordinance.

5.2.7. Soil Erosion and Sediment Control

As development occurs, construction practices are usually accompanied by a loss of soil through erosion. Most areas of the City have granular soil types and are therefore, more susceptible to the forces causing erosion. Sediment removed from areas stripped of vegetation cover can be carried into downstream drainage ways and water bodies. Once present in these downstream areas, the sediment can degrade the water quality, obstruct flow, and reduce the depth of downstream water bodies.

White Bear Lake has adopted a Land Alteration and Mining Ordinance No. 1302.070 in 1989. Proposers must submit erosion and sediment control plans with their Land Alteration Permit Application.

In addition, for all construction impacting more than five acres, the owner and the contractor must sign the MPCA General Construction Permit I order to meet the NPDES requirements. This is consistent with the requirements in the Watershed Management Plans for RWMWD, RCWD, VBWD, and VLAWMO.

5.2.8. Open Space, Recreation, and Wildlife Management

In concert with the intention of the Metropolitan Surface Water Management Act, the City of White Bear Lake recognizes the need to protect and enhance wildlife habitat, water recreation, and open space as the intensity of urban land use increases. Accordingly, the City is in the process of updating its comprehensive plan detailing open space and recreation resources planning. A copy of the most recent update of the comprehensive plan may be reviewed at City Hall.

5.2.9. Education and Public Involvement

The City of White Bear Lake has developed several procedures to inform citizens of possible protection measures to better manage our natural water resources. The City commits to continuing programs for public education and involvement.

The storm drain stenciling program involves citizen volunteers who paint reminders on catch basins. The City will continue to visit the schools to demonstrate equipment used for cleaning the streets. The City will continue to distribute information to residents in newsletters and brochures.

New programs include a proposed change to the trash collection rates to encourage citizens to mulch grass clippings. The proposed fee for collection of yard debris will encourage many residents to consider mulching as an alternative to disposal of clippings in the trash.

The City cooperated with the local cable TV personnel to produce a special documentary on water resource issues. The City will distribute information encouraging citizens to use the Ramsey County compost sites.

5.2.10. Maintenance and Inspection

- frequency of sweeping & pump cleaning
- pond inspection

The City of White Bear Lake has developed a maintenance and inspection schedule for many items which impact water resources. The City maintenance crews sweep sand and sediments from the streets which drain directly to White Bear Lake at frequent intervals. The City crews are responsible for inspection of structures within the City. The inspections are completed at a minimum of once each year.

Ramsey County has an inspection program to check the individual sewage treatment systems (ISTS) as recommended by the state statutes. Most of the properties within the City limits are connected to the City sanitary sewer system. Therefore, the County will continue inspection of those properties which are not connected to the City system to ensure compliance with MPCA standards. Currently inspections occur at 2 (?) year intervals.

5.2.11. Finance

Resources of time and money available for implementing water resource management practices in the City of White Bear Lake are, and will likely continue to be, limited. For this reason, the City recognizes the need to use management priorities to guide the use of these resources. The highest management priority is any water resource need related to stormwater runoff or water quality management. When an immediate need is identified it is given first priority status. Longer term needs for erosion and sediment control will be addressed as a second priority.

The standards, as a minimum, establish the degree of performance necessary to achieve improvements in water quantity and quality management. While these standards relate to one of the criteria areas, it should be noted that they are interrelated and may serve multiple purposes. For example, proper water quantity control measures often improve water quality and management of areas for recreation, open space or wildlife habitat.

Funding sources for water quality and water quality improvement projects will be determined for individual projects by the City. Possible sources include:

- Special assessments to impacted property owner
- City funds for budgeted projects
- State aid funds
- Assistance from special interest groups
- Watershed district funds for projects budgeted by those organizations.

5.3 ASSESSMENT OF PROBLEMS

The City of White Bear Lake staff and Council identified areas where temporary flooding occurs after intense rainfall events. Some local temporary flooding problems have been resolved. The areas along City streets which do not damage homes, other structures, or property will be addressed as part of the street improvement projects scheduled over the next five years. Improvements may include adding or replacing catch basin inlets, adding or replacing storm sewer piping, and regrading streets.

5.4 CAPITAL IMPROVEMENT PROJECTS

The City of White Bear Lake has developed a list of capital improvements planned for the next five years. The projects related to protection of water resources are listed in Section 4.4 of this Plan. The City includes the items scheduled for a particular year in the annual budget. Additional items may be identified and added to the project list according to the budgeting procedure.

5.5 AMENDMENT PROCEDURES

This section establishes the process by which interim amendments to the Plan may be made and who may initiate the amendments. This City of White Bear Lake Water Management Plan is effective through the year 2007 or within a two year interval after publication and adoption of this watershed plan revision.

The City of White Bear Lake recognizes that the Water Management Plan must periodically be amended to remain a useful long-term planning tool. Comprehensive studies and some capital improvements programs undertaken will warrant review or amendment. Occasionally, the goals, policies, criteria, and management strategies may need revisions.

Information will be revised and updated whenever new site-specific data is generated by state, federal, regional agencies, counties, local governments, City of White Bear Lake, individuals, or developers. The City of White Bear Lake will keep a record of the supplemental data until the Council decides that republication of the Plan is warranted (based on the extent of the revisions). In the interim, the supplemental data will be available for review at the City of White Bear Lake City Engineer's Office.

Recommendations for program changes or Plan amendments may be initiated by individuals, special-interest groups, local and County governments, federal, state, and regional agencies, and the City of White Bear Lake itself. All recommendations must be submitted to the City Engineer in writing along with a statement of problem and need, a rationale for the City of White Bear Lake involvement, and an estimate of the cost. The City Engineer will keep a record of all recommendations and will forward the requests for amendment to the City Council at least annually. The Council shall schedule a meeting annually for review of the recommendations and to hear testimony from sponsors.

Any proposed amendments to the Water Management Plan involving the goals, policies, criteria, management strategies, or technical appendix shall be considered and adopted or rejected by the Council.

General Amendment Procedures

The City will adhere to the review process provided in Minnesota Statutes, Section 103B.235, Subdivision 3, 3a, and 5 for adoption of amendments.

- The staff will review the proposed amendments and provide the Council with information and a recommendation.
- The City of White Bear Lake will hold a public meeting to explain the amendments and publish a legal notice of the meeting twice, at least seven days and 14 days before the date of the meeting.
- The City will send copies of the amendments to the watershed organizations and the state review agencies for review and comment.

- The Council may determine that the amendments are approved or may reject the proposed amendment.

- Following City Council approval and prior to City Council adoption, the proposed amendment shall be reviewed and approved by the WMO(s) District Board. The review shall occur within a 60 day period in accordance with Minnesota Statutes 473.879, Subdivision 5.

- Final action on an amendment is City Council adoption. However, prior to adoption, an additional public hearing may be held, if in the opinion of City staff, City Council, or WMO, public input would be of value.

- The City's Plan will remain in effect through 2007. The management plan will then be reviewed for consistency with current water resources, management methods, and watershed organization plans. At that time, past amendments can be added to the document. Depending on the significance of changes, a new printing of the Plan may be necessary. At a minimum, the Capital Improvement Program shall be amended every five years.

Form and Distribution of Plan Amendments

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

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

The City of White Bear Lake will maintain a distribution list of agencies and individuals who have received a copy of the Plan and shall distribute copies of amendments within 30 days of adoption. The City of White Bear Lake will send draft copies of proposed amendments to all plan review authorities to seek their comments before establishing a hearing date or commencing the formal review process.

REFERENCES

REFERENCE

Metropolitan Council. "Interim Strategy to Reduce Nonpoint Source Pollution to all Metropolitan Water Bodies", November 1, 1992.

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GLOSSARY

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Conveyors

A ditch, stream overland flow channel or storm sewer which carries surface runoff water to detention basins, between detention basins or transports runoff between municipal boundaries. A lateral conveyor is a locally controlled system which provides drainage for areas usually absent of detention basins. A lateral conveyor may outlet to a detention basin or outflow conveyor between detention basins. An outflow conveyor forms the outlet for an identified regional detention basin, transports runoff between regional detention basins or carries runoff between municipal boundaries.

Criteria

The measures, principles, models, design levels, or rates which are used to gauge the suitablilty and accuracy of policies or performance of management strategies.

Critical Storm Event

A rainfall of 1% frequency (100 year), 24 hour duration used in the planning of outflow conveyor and storage facilities.

Design Frequency/Duration Storm

That precipitation event used in the construction of a conveyance or storage facility (synonymous with the critical storm event) and expected to occur once during a period of years and over a given period of hours or days. For example, a 10-year, 24 hour storm would be a precipitation event occurring on the average once every 10 years and over 24 consecutive hours. On an annual basis, there would be a 10% probability of this storm occurring.

Detention Basin

Basins generally used to reduce flooding and enhance water quality. Specific design criteria for each watershed are addressed in the water management organization plans.

Flood Level

The specific water elevation resulting from snowmelt or rainfall runoff into lateral or outflow conveyors and storage facilities in excess of their normal pipe or bank-full design capacity. For basins, the flood level may be higher than the ordinary high water elevation.

Goals

The objectives which the City will strive to attain in complying with the Metropolitan Surface Water Management Act.

Hydraulics

The physical science and technology of the static and dynamic behavior of fluids (water).

Hydrograph

A graphical representation of stage, flow, velocity, or other characteristics of water at a given point as a function of time.

Hydrology

The science that treats the occurrence, circulation, distribution, and properties of the waters of the earth, and their reaction with the environment.

Infiltration

Movement of water through the soil surface into the ground.

Level of Protection

The amount of secondary stormwater runoff capacity required to avoid flood damage and provide for public safety.

Level of Service

The amount of primary stormwater runoff capacity required to avoid unusual hardship or significant interference with normal public activities (transportation, sanitary, or utilities).

Management Strategy

The specific physical, legal or administrative actions recommended or implemented based upon the established criteria will achieve the policies and goals.

Nonpoint Source Pollution

Pollution from any source other than any discernible, confined and discrete conveyances, including, but not limited, to surface runoff from agricultural, silvicultural, mining, construction, subsurface disposal and urban activities.

Normal Level

For basins, that water elevation maintained by a natural or man-made outlet.

Nutrient Assimilation

The process by which plants use minerals and organic nutrients, changing nourishment into living tissue.

One Hundred-Year (100 year) Storm

Rainstorm of varying duration (e.g., 2, 6, or 24 hour) and intensities (inches per hour) expected to recur on the average of once every one hundred years (1% frequency probability).

On-Site Detention

A method of storing storm water runoff at a development site in the form of wet basins. While the primary objective is water quality control, significant reduction in outflow conveyor overloading is accomplished for high intensity, short duration storm events. This method is employed on developments when the regional detention basin approach is not available, usually due to site location of either facility.

Ordinary High Water (OHW) Level

That elevation delineating the highest water level which as been maintained for a sufficient period of time to leave evidence upon the landscape. Generally, it is the point where the natural vegetation changes from predominately aquatic to terrestrial.

Policies

The plans or course of action to be followed by the City in achieving the goals.

Post-Disturbance Condition

The state of a site following crop or development establishment in which source and/or structural control measures have been implemented resulting in erosion and sedimentation control achieving soil loss limits.

Primary Capacity

The volume and/or rate of storm water runoff defined as that level of service provided by a lateral or outflow conveyor system.

Recharge

The process by which waters on the earths surface infiltrate the soils to replenish the groundwater.

Regional Detention Basin

A pond or basin designed to detain runoff at full development levels from a specific geographic area or subwatershed. During periods of storm water runoff of various durations, the basin receives additional water, stores it temporarily, and releases it at a controlled rate(s). In addition to reducing flooding problems, the basin serves to reduce to the greatest practical extent, the suspended solids and associated pollutants in the stormwater flow.

Retention Basin

Any area that retains all runoff to that area, that is, an area without an outlet. A retention area is referred to as a landlocked area.

Secondary Capacity

The volume and/or rate of storm water runoff in excess of the primary capacity and defined as that level of protection provided by a lateral or outflow conveyor system.

Sediment

Materials transported by water or air that eventually settles out, being deposited in ponds, wetlands, lakes, reservoirs, etc.

Sedimentation Basin

Similar to a detention basin except that it has the purpose of enhancing water quality by allowing a portion of the solids transported in runoff to settle out.

Source Control

The application of erosion techniques including but not limited to: mulching, seeding, sodding, and greenbelts.

Stormwater Runoff

The flow on the surface of the ground, resulting from precipitation in the form of rainfall or snowmelt.

Structural Control

The application of construction erosion techniques including, but not limited to: sediment basins, silt fences, debris dams, dikes, terracing, rip-rap and diversions.

Time of Concentration

The time required for surface runoff from the most remote part of a drainage basin to reach the basin outlet.

Watershed

A ridge of high land dividing two areas that are drained by different conveyance systems.

Water Table

The upper surface or top of the saturated portion of the soil or bedrock layer; indicates the upper most extent of groundwater.

Wetland Buffer Zone

Upland areas immediately adjacent to wetlands and designated by the city or one of the watershed organizations as special protection zones. VLAWMO defines the zone as that land area measured horizontally between the designated normal elevation of the preservation area and either an elevation of 2 feet above that area or 100 feet outward, whichever is less.

Wetland Treatment

The routing of stormwater through wetland area to allow for the removal of sediment and to maximize nutrient assimilation.

Water Resources

All lakes, ponds, wetlands, outflow conveyors, and County ditches. An inventory of the water resources within the City is found in the appendix of this plan. The management of a particular water resource in the City may be either a watershed, County, or municipal responsibility, or a cooperative effort between them.