

**WATER RESOURCE MANAGEMENT PLAN
CITY OF SAVAGE, MINNESOTA**

WSB Project No. 1436-06

**May 2007
Amended June 2011**

PREPARED BY

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Savage, MN 55378**

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I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.



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JUNE 2011 AMENDMENT BY CITY OF SAVAGE

TABLE OF CONTENTS

- i. TITLE PAGE
- ii. TABLE OF CONTENTS
- iii. LIST OF TABLES
- iv. LIST OF FIGURES
- v. LIST OF APPENDICES

- 1.0 EXECUTIVE SUMMARY
- 2.0 INTRODUCTION AND PURPOSE
- 3.0 LAND AND WATER RESOURCE INVENTORY
- 4.0 ASSESSMENT OF PROBLEMS AND CORRECTIVE ACTIONS
- 5.0 ESTABLISHMENT OF GOALS AND POLICIES
- 6.0 IMPLEMENTATION PLAN
- 7.0 FINANCIAL CONSIDERATIONS
- 8.0 AMENDMENT PROCEDURES
- 9.0 GLOSSARY

SECTION 1.0

1.0 EXECUTIVE SUMMARY

This Water Resource Management Plan (Plan) for the City of Savage has been developed to serve the needs of the City and comply with the Metropolitan Surface Water Management Act, Minnesota Rules 8410, and the requirements of the local Watershed Districts and Watershed Management Organizations. The original Plan was prepared in May 2007 and adopted by the Savage City Council on August 6, 2007. The 2007 Plan has been amended to address requirements of the June 2009 Scott WMO Comprehensive Water Resource Management Plan, the July 2010 Prior Lake Spring Lake Watershed District Comprehensive Water Resource Management Plan, the September 2010 Lower Minnesota River Watershed District Comprehensive Water Resource Management Plan, as well as other updated regulatory requirements. This document and its referenced literature is intended to provide a comprehensive inventory of pertinent water resource related information that affects the City and management of those resources.

Within 120 days of approval of this amended Plan by the Scott WMO, the City of Savage will revise official controls. Within 60 days of City adoption of the revised official controls, those revised official controls will be implemented.

Section 2.0 – Introduction and Purpose

Section 2.0 of this Plan provides an introduction and purpose. The Plan has been developed to provide the City of Savage with direction concerning the administration and implementation of water resource management activities within the City.

Section 3.0– Land and Water Resource Inventory

Section 3.0 of this Plan provides an inventory of land and water resources within the City including a general description and summary of data related to precipitation, geology, topography, flood problem areas, existing flood insurance studies, water quality, shoreline ordinances, surface and groundwater appropriations, groundwater, soils, land use, public utilities services, public areas for water-based recreation and access, fish and wildlife habitat, unique features, scenic areas and pollutant source locations within the City.

This section also includes a detailed hydrologic/hydraulic analysis of the City's Stormwater Management System. As a result of this analysis, the high water levels of the City's storm ponds and water bodies were identified, potential problem areas were studied, and peak discharge rates from the City were determined.

This section also contains general summary information about the soils within the City, fishery information, historical sites, and the location of various pollutant sources. A number of maps were also developed as part of the Plan to assist in summarizing this information.

Section 4.0 – Assessment of Problems and Corrective Actions

Section 4.0 of this Plan provides an assessment of the existing and potential water resource and stormwater related concerns within the City. These concerns were identified based on an analysis of the land and resource data collected as part of this Plan preparation and through public input. A number of problem areas were identified through the public input process. This section summarizes the problems and corrective actions that were identified through this process.

SECTION 1.0

Section 5.0 – Establishment of Goals and Policies

Section 5.0 of this Plan outlines water resource management related goals and policies of the City. Goals and policies have been developed for the City concerning water quantity, water quality, recreation, fish and wildlife management, enhancement of public participation, information and education, public ditch system, groundwater, wetlands, and erosion and sediment control.

Section 6.0 – Implementation Plan

Section 6.0 outlines implementation priorities and develops an implementation plan. This section contains a prioritized listing of the studies, programs and capital improvements that have been identified as necessary to respond to the water resource needs within the City.

The implementation period identified within this report for the programs, studies and capital improvements is for ten years from the adoption of this Plan. This Plan is to be used for planning purposes only. Detailed feasibility analysis has not been completed to develop this section; therefore, cost estimates are subject to change and update as more detailed information is obtained.

Section 7.0 – Financial Considerations

Section 7.0 discusses the financial considerations of implementing the proposed regulatory controls, programs and improvements, which have been identified in this Plan and their financial impact on the City. Funding sources available for implementing the policies and corrective actions identified within this Plan are identified. The Plan indicates that the majority of funding for the policies and corrective actions will be from the City's Stormwater Utility Fund, which is anticipated to generate approximately \$1,000,000 per year. Other possible funding sources for the implementation of this Plan include special assessments and grant monies, which may be secured from various local, regional, County, State or Federal agencies. These other funding sources will be necessary to aggressively implement the Plan.

Section 8.0 – Amendment Procedures

Section 8.0 discusses the procedures to be followed in the event this Plan is amended. Once this Plan is approved, no significant changes can be made without the approval of the proposed revisions by the City, the Watershed Districts and Watershed Management Organizations, and the Metropolitan Council, and the public.

Section 9.0 – Glossary

Section 9.0 provides definitions of technical language used in this Plan.

Appendices

Appendices include documents that provide supporting information to the main body of the Plan, are useful information, and/or are required by Minnesota Rules.

Additional material is referenced within this report and is available from the Savage Engineering Department.

This document is expected to be a 10-year Plan, after which time this Plan should be updated. However, if significant changes are deemed necessary prior to that date, the City may revise this Plan in its entirety.

SECTION 2.0

2.0. INTRODUCTION AND PURPOSE

A. General

This Plan has been developed to provide the City of Savage with direction concerning the administration and implementation of stormwater resource management activities within the City. This Plan meets the requirements for a local watershed management plan as required by the Metropolitan Surface Water Management Act and is in conformance with Board of Water and Soil Resources (BWSR) Rules Chapter 8410.

In addition to being in conformance with the above-stated laws, this Plan has also been developed to meet the needs, requirements, and direction outlined by the following list:

1. Scott Watershed Management Organization Plan
2. Lower Minnesota River Watershed District Plan
3. Prior Lake – Spring Lake Watershed District Plan
4. State laws and rules concerning wetland management as outlined in the Wetland Conservation Act of 1991 and amendments
5. State and federal rules regarding the need to secure a National Pollutant Discharge Elimination System (NPDES) permit
6. Metropolitan Council Comprehensive Planning Requirements for Water Resources

This Plan incorporates the approaches and direction provided in the programs and documents listed above into a comprehensive Plan that can be consistently applied across the City. A map showing the location of the City is provided on **Figure 2.1**.

B. Personnel Contacts

To implement this Plan, a coordinated water resource management approach must be used. This approach uses the services of staff personnel within the City, as well as personnel associated with the various Watershed Districts and Watershed Management Organizations having jurisdiction over areas within the City. The Watershed Districts and Watershed Management Organizations having jurisdiction within the City are shown on **Figure 2.2**.

The primary implementation responsibility will lie with the appropriate staff members at the City. Assistance from the surrounding municipalities, Watershed Districts, and Watershed Management Organizations will also be expected. Outlined below are the names, addresses, and telephone numbers for personnel having responsibilities for overseeing or implementing various aspects of the Plan:

SECTION 2.0

City of Savage

John Powell, City Engineer/Director of Public Works
6000 McColl Drive
Savage, MN 55378

Lower Minnesota River Watershed District

Terry Schwalbe, Administrator
112 East 5th Street, Suite 102
Chaska, MN 55318

Prior Lake – Spring Lake Watershed District

Mike Kinney, Administrator
14070 Commerce Avenue NE
Suite 300
Prior Lake, MN 55372

Scott Watershed Management Organization

Paul Nelson,
Scott County Community Development
200 4th Avenue W Room A200
Shakopee, MN 55379

Metropolitan Council

390 Robert Street North
St. Paul, MN 55101

Scott Soil and Water Conservation District

Troy Kuphal
7151 W. 190th Street #125
Jordan, MN 55352

C. Water Resource Related Agreements

The City has entered into water resource-related agreements that govern how the City must manage its water resources. These agreements include agreements between the City and adjoining communities or agreements it may have with other governmental units or private parties. Listed below is a description of the water resource related agreements which the City has entered into. A copy of these agreements, or appropriate portions thereof, are included in **Appendix A**.

SECTION 2.0

- **Joint Powers Agreements with the City of Burnsville:**
 - a. May 1990: Agreement regarding billing and construction of Chowen Avenue storm sewer with City of Burnsville.
 - b. January 1983: Agreement with City of Burnsville for Project 83LD-1A.
 - c. June 1983: Agreement with City of Burnsville and Sunset Pond area.

- May 2007 Long Term Water Purchase Agreement with the City of Burnsville

- November 2007 Memorandum of Agreement with the Prior Lake Spring Lake Watershed District

- January 2008 Memorandum of Understanding with the Scott Watershed Management Organization

SECTION 2.0

Figure 2.1: City Location Map

SECTION 2.0

Figure 2.2: Watershed District Boundary Map

SECTION 3.0

3.0 LAND AND WATER RESOURCE INVENTORY

As outlined in Minnesota Rules Section 8410.0060, this section of the Plan provides a general description and summary of the climate, geology, surficial topography, surface and groundwater resource data, soils, land use, public utilities services, water-based recreation, fish and wildlife habitat, unique features, scenic areas, and pollutant sources. This section also identifies where detailed information can be obtained for many of these items.

3.1 Climate and Precipitation

3.1.1 Climate

The climate within the Savage area is described as a humid continental climate with moderate precipitation, wide daily temperature variations, warm humid summers and cold winters. The total average annual precipitation is approximately 27.96 inches. Average snowfall is 49.6 inches per year. Average monthly temperature, precipitation, and snowfall are shown in **Table 3.1**.

3.1.2 Precipitation

A 24-hour duration rainfall event having a 99% chance of annual occurrence is approximately 2.3 inches (one-year storm event). A rainfall event having a 1% chance of annual occurrence in a 24-hour period is approximately 5.9 inches (100-year storm event). The 10-day runoff event having a 1% chance of annual occurrence is 7.2 inches. **Figures 3.1 and 3.2** show the rainfall event having a 1% chance of annual occurrence and the annual normal precipitation within the State of Minnesota. Additional climatological information for the area can be obtained from State Climatologist website at <http://climate.umn.edu/>.

3.2 Geology and Topographic Information

3.2.1 Geology:

The bedrock of the County is flat and cut with numerous deep river valleys now buried beneath the surficial Quaternary glacial and fluvial deposits. The bedrock ranges from Ordovician Prairie du Chien in the northern and eastern portion of the County to Cambrian formations (Jordan and Mt. Simon) in the south and west. The oldest formations, including small areas of Precambrian sediments and volcanics, subcrop beneath the surficial sediments with the buried valleys while small outlying remnants of younger St. Peter Sandstone are present on the less eroded areas.

The City of Savage is located in the northeastern corner of Scott County where the bedrock is Ordovician Prairie du Chien. One of the buried river valleys discussed above cuts into the bedrock along the eastern boundary of the City. This valley is parallel to and nearly coincident with the present day Credit River. A much deeper valley crosses the northwestern corner of the City. Both of these valleys deepen from south to north until they merge with the present Minnesota River valley which

SECTION 3.0

forms the northern boundary of the City. Elevation from the bedrock in the vicinity of the City ranges from approximately 450 feet in the Minnesota River Valley to 800 feet along the southern City limits with an average elevation near 750 feet over most of the area. The northern portion of the City also has areas where bedrock is very near or at the surface. See **Figure 3.3** for a map indicating bedrock depths.

Additional geological information can be found in the *Scott County Geologic Atlas* (Minnesota Geologic Survey, 1982) and the *Water Resources of the Lower Minnesota River Watershed, South Central Minnesota* (USGS, 1974).

TABLE 3.1 AVERAGE MONTHLY TEMPERATURE AND PRECIPITATION SUMMARY
(Minneapolis/ St. Paul Airport Station, 1940-2000)

Months	Average Temp (F°)	Average Precipitation (in.)
January	11.2	0.88
February	17.5	0.82
March	29.2	1.77
April	46.0	2.45
May	58.5	3.27
June	68.1	4.19
July	73.1	3.84
August	70.6	3.56
September	60.6	2.67
October	49.6	1.94
November	33.2	1.63
December	19.2	0.94
Annual Average	44.7	27.96 (Annual)

SECTION 3.0

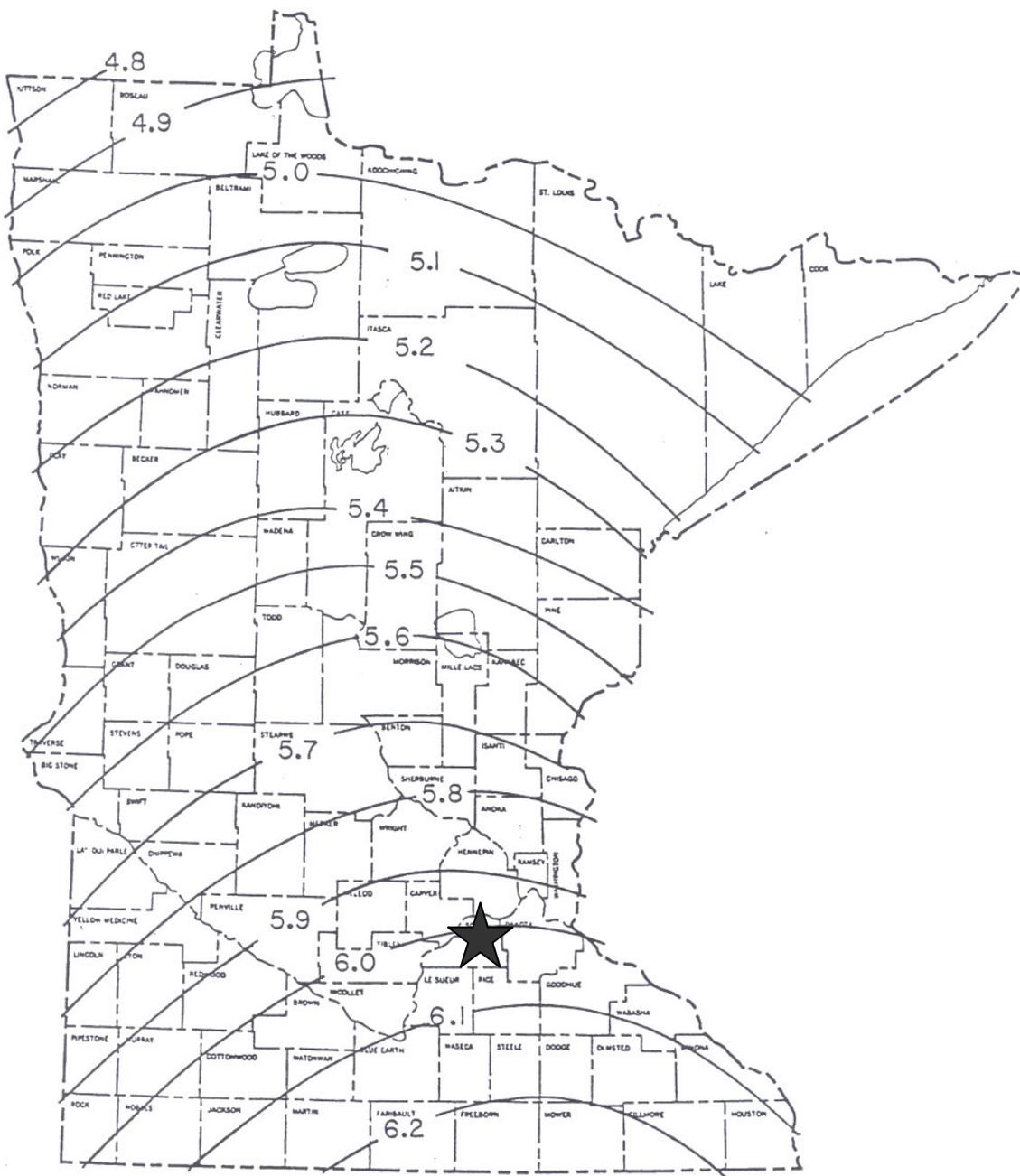


Figure 3.1 1% Chance Rainfall Event in 24-hours within the State of Minnesota.
Source: Hydrology Guide for Minnesota – USWB TP 40

SECTION 3.0

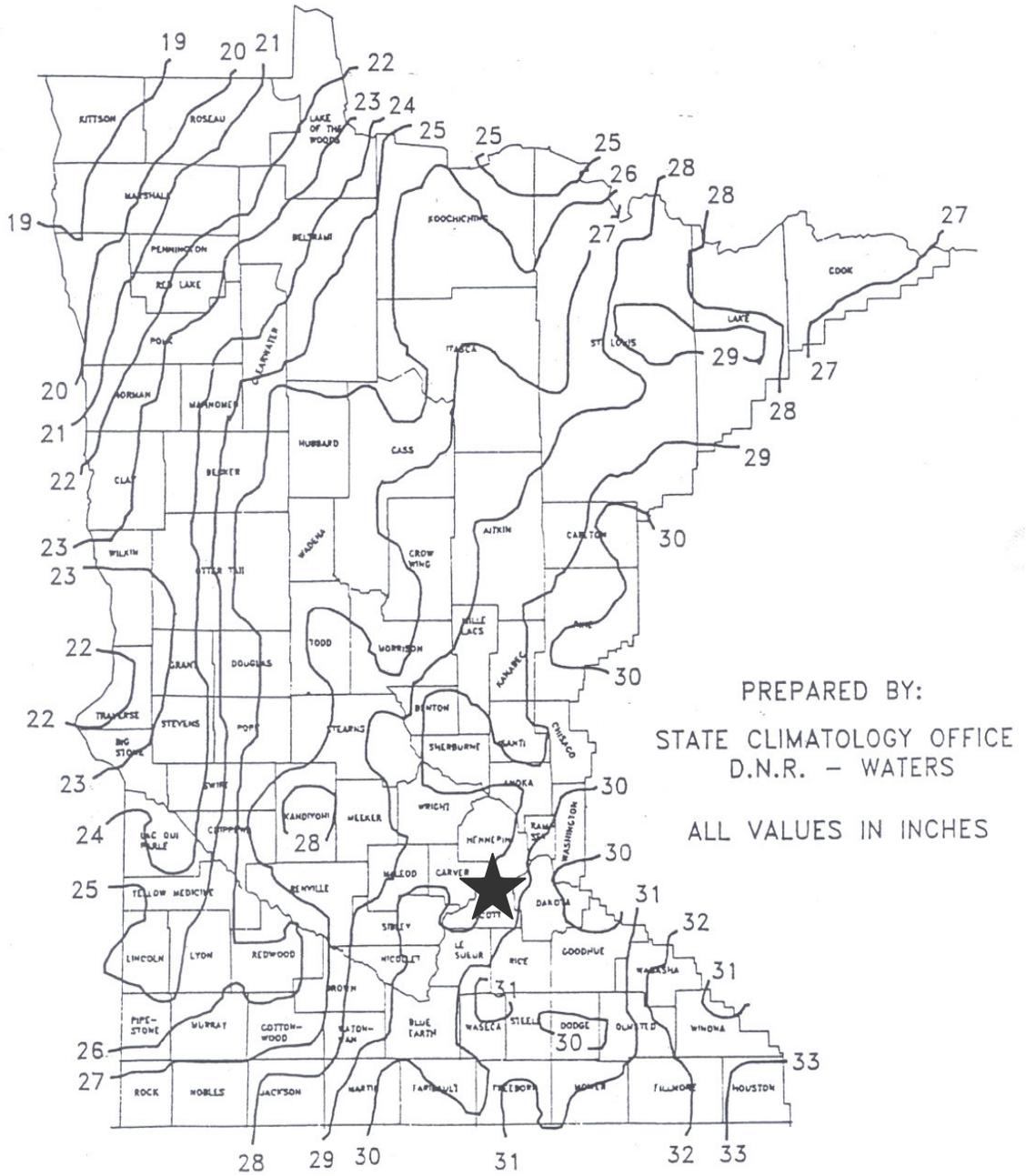


Figure 3.2 Annual Normal Precipitation with the State of Minnesota.

SECTION 3.0

Figure 3.3
Bedrock Geology Map

SECTION 3.0

3.2.2 Topography:

Stormwater in the City of Savage is generally directed in three directions, all of which are tributary to the Minnesota River. The southwest corner of the City directs storm water runoff from the north to the southwest into Prior Lake. Areas generally north of Prior Lake and west of County Road 27 drain over the river bluff to the north through the Savage Fen complex and to the Minnesota River. The remainder of the City is tributary to the Credit River which flows from the south to north and ultimately discharges to the Minnesota River.

The specific drainage patterns, which depict topography for areas within the City, are shown on the subwatershed delineation map on **Figure 3.4**. As can be observed from the subwatershed delineation map, the City of Savage is divided into many small watersheds. The subwatershed delineations utilized City topographic mapping, storm sewer as-builts, aerial photos, and field investigations.

3.3 Surface Water Resource Data

Available surface water resource data within the City is summarized in this section. Detailed information has been included either in the appendices to this report or has been identified by reference and is available from the Savage Engineering Department.

The hydrologic system of the City consists of wetlands, streams, and major water bodies as outlined below.

3.3.1 Wetlands

The general locations of wetlands within the City are shown on **Figures 3.5a and 3.5b**. These figures show the National Wetland Inventory and the DNR Public Waters Map, respectively. These wetlands provide habitat to many species of plants and animals. Wetlands also affect local water quality. The aquatic plants present in a healthy wetland will slow and filter water moving through the wetland, take up excess nutrients and pollutants, and provide for additional settling time for sediment. The City completed a Comprehensive Wetland Management Plan in 1999, which is available at www3.cityofsavage.com/water-resources

3.3.2 Major Bodies of Water

There are several major water bodies that convey and store water within and through the City. These water bodies are the Credit River, Cates Lake, Hanrehan Lake, Dan Patch Lake, McColl Lake, Eagle Creek, and Rice Lake and the Minnesota River (**Figure 3.5b**). More information about these water bodies is included in various portions of this section.

SECTION 3.0

3.3.3 Hydrologic Modeling (Water Quantity)

The City is divided into numerous subwatershed areas, which are shown on **Figure 3.4**. A TR-20 based hydrologic/hydraulic computer model was developed for the City.

The hydrologic/hydraulic modeling effort quantifies the 99% and 1% return frequency storm events, peak discharge rates, storage requirements, other pertinent hydrologic/hydraulic information for storm water retention areas, and trunk storm water conveyance systems within the City. The hydrologic/hydraulic modeling results are included as **Appendix B**.

3.4 Flood Insurance Studies

A Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) was completed for areas within the City in 1979. The FIS consists of a study report, a set of floodway and floodplain delineation maps, and a set of Flood Insurance Rate Maps (FIRMs) maps. A Letter of Map Revision (LOMR) for the Credit River from near McColl Drive to the Minnesota Rover was issued in 2005. The FEMA study and LOMR provide the basis for floodplain management regulations and are included in **Appendix C**. The FIRMs are available at the Savage City Hall. The floodplain boundaries for the City of Savage are shown in **Figure 3.6**. FEMA and Scott County are currently updating flooding and floodplain information within the City. The new DFIRM will be available in 2011. The City will incorporate the new information in **Appendix C** when it becomes available.

3.5 Water Resource Concerns

A number of water resource problem areas were identified within the City. **Figure 3.7** shows the locations of these water resource problem areas. These areas were identified through information obtained from City Staff and from the public input process. **Section 4.0** contains more information about these problem areas and potential corrective actions.

3.6 Water Quality Data

3.6.1 Overview

Surface water data will be obtained through cooperation and coordination with various agencies, including the Pollution Control Agency, Metropolitan Council, the Department of Natural Resources, Watershed District, Watershed Management Organizations, and Cities adjacent to the City of Savage.

Water quality data for the City can be found on the MPCA's website at:

www.pca.state.mn.us/data/edawater/index.cfm

This website is utilized by participating agencies to compile water quality testing data.

SECTION 3.0

Figure 3.8 shows the location of monitoring sites listed on the MPCA website. Other water quality information can be found on the following websites:

- Metropolitan Council monitoring information, including the Citizen-Assisted Monitoring Program (CAMP), can be found at: <http://www.metrocouncil.org/enfironment/riverslakes/>
- Minnesota Pollution Control Agency's Citizen Lake Monitoring Program (CLMP) information can be found at: <http://www.pca.state.mn.us/water/clmp.html>

3.6.2 Water Quality Model

To provide additional information on existing and future water quality within the City, an urban water quality model was developed. The computer program used to model water quality within the City is the "Program for Predicting Polluting Particle Passage through Pits, Puddles, and Ponds" referred to as the P8 Urban Catchment Model.

The P8 urban water quality model predicts the generation and transportation of storm water run-off pollutants within the City. This model can estimate pollutant loadings, concentrations and removal efficiencies for basins subject to single or continuous rainfall events. The model simulates the performance of a variety of treatment devices including swales, buffer strips, detention ponds, flow splitters, infiltration basins and general devices.

The results of the P8 water quality modeling effort are shown in **Appendix D**. It should be noted that the modeled treatment basin was assumed to be rectangular in shape with the length two times the basin width. Side slopes were assumed to be 4:1 and the modeled basin was assumed to be a total of 8 feet in depth with 4 feet of depth below the invert of the basin outlet and 4 feet between the basin outlet and the high water level.

This analysis contains estimations of water quality parameter concentrations, which may typically be found in the storm water inflow to a treatment basin, as well as those concentrations typically found in the outflow from a treatment basin. The information is a composite summary of total water treatment upon the full development and the implementation of this Plan. In addition, the average treatment efficiency of storm water detention basins within the City is included in this table. The following water quality parameters are estimated through the use of P8 Urban Water Quality Model: total suspended solids (TSS), total phosphorous (TP), total kjeldahl nitrogen (TKN), copper (Cu), lead (Pb), zinc (Zn), hydrocarbons (HC), chemical oxygen demand (COD) and biological oxygen demand (BOD).

SECTION 3.0

It must be noted here that the concentrations of individual water quality parameters estimated by the P8 water quality model may vary significantly with values obtained from field testing. This inconsistency is due to the extreme variation in water quality parameter concentrations from individual subwatersheds. However, the estimated removal efficiency of treatment basins should be comparable to the removal efficiencies determined from field investigations.

3.6.3 2006 List of Impaired Waters (Section 303d)

The Minnesota Pollution Control Agency lists the following waterbodies/water courses within the City as having impaired uses due to excess pollutant(s):

- Credit River (*Turbidity*)
- Minnesota River (*Fecal Coliform, Mercury, PCB, Dissolved Oxygen*)

These waterbodies/watercourses are designated as impaired. A Total Maximum Daily Load (TMDL) study will be completed for these waterbodies and pollutants by various agencies in the future. As of 2006, an approved study for Dissolved Oxygen for the Minnesota River has been approved. All other studies are pending. **Figure 3.8** shows the location of the impaired waters.

As of January 2011, turbidity in the Credit River had been sufficiently reduced such that MPCA staff had agreed to remove the River from the State's list of impaired waters. It is anticipated that, when the EPA publishes the next list of impaired waters, the Credit River will be excluded from that list.

3.7 Floodplain Management

The City has adopted Floodplain Management Regulations. The most recent version of these regulations can be found in Chapter 152.355 to 152.366 in the City of Savage zoning ordinance. City ordinances can be found on the City's website at www3.cityofsavage.com. These regulations prohibit uses or activities within the floodplain or floodway that include structures or fill or that obstruct flood flows or cause increased flood elevations.

3.8 Shoreland Management

The City has adopted a Shoreland Overlay District. The most recent version of these regulations can be found in Chapter 152.400 to 152.406 in the City of Savage zoning ordinance. City ordinances can be found on the City's website at www3.cityofsavage.com. Based on these regulations, the City has classified the following DNR Public Waters/Wetlands:

SECTION 3.0

Water Body No.	Water Body Name	Classification
70-25	Rice Lake	Natural Environment
70-16	Dan Patch Lake	Recreational Development
70-18	Cates Lake	Recreational Development
70-19	Hanrehan Lake	Recreational Development
259W	Twin Lakes	Recreational Development
70-17	McColl Pond	Recreational Development
NA	Credit River	General Development
NA	Eagle Creek	General Development
NA	Minnesota River – adjacent to P-1 zoning	Transitional River
NA	Minnesota River – adjacent to I-2 zoning	Urban River

Figure 3.5b shows the location of these water bodies.

3.9 Water Appropriations

The City's municipal water needs are obtained from both groundwater and surface water sources.. All groundwater wells have groundwater appropriation permits from the DNR. Information on the DNR permit number for each well, its location, permitted volume, and number of gallons withdrawn each year can be downloaded from the DNR's website at <http://www.dnr.state.mn.us>. Figure 3.9 shows the locations of the DNR permitted groundwater appropriation sites within the City.

Surface water appropriation terms and conditions are identified in the "Long Term Water Purchase Agreement" between the City's of Savage and Burnsville. A copy of this agreement is provided in Appendix A.

3.10 Groundwater Resource Data

One of the sources of water for the City of Savage is groundwater from the Cambrian Jordan formation. This formation is part of the Prairie du Chien-Jordan aquifer which includes the Shakopee, Oneota and Jordan formations. Groundwater flow in this aquifer is generally toward the Minnesota River. Because of the shallow depth of bedrock and the relatively permeable nature of the overlying surficial deposits, the bedrock aquifers in the northern half of the City have been classified as highly susceptible to contamination. In the southern portion of the City, the bedrock has been classified as moderately susceptible to short term contamination in the west and not susceptible in the east.

Additional information on groundwater resource data can be found in the following documents:

- Scott County Geologic Atlas (1982)
- Hydrogeologic Atlas H-526, Water Resources of the Minnesota River Watershed, South-Central Minnesota (1974)
- City of Savage AUAR documents, the associated Fen Management Plan, and the Multiple-Layer Analytic Element Model (MLEAM) (Barr Engineering 1995)
- Scott Watershed Management Organization Plan (2009)

SECTION 3.0

3.11 Soils Information

The soils within the City of Savage area have generally moderate infiltration rates and create a high to moderate susceptibility to groundwater contamination. The hydrologic soil classification map is shown in **Figure 3.10**. The four soil classifications are defined as follows:

Group A - These soils have high infiltration rates even when thoroughly wetted. The infiltration rates range from 0.3 to 0.5 inches per hour. These soils consist chiefly of deep, well drained to excessively drained sands and gravel. Group A soils have a high rate of water transmission, therefore resulting in a low runoff potential.

Group B - These soils have moderate infiltration rates ranging from 0.15 to 0.30 inches per hour when thoroughly wetted. Group B soils consist of deep moderately well to well drained soils with moderately fine to moderately coarse textures.

Group C - These soils have slow infiltration rates ranging from 0.05 to 0.15 inches per hour when thoroughly wetted. Group C have moderately fine to fine texture.

Group D - These soils have very slow infiltration rates ranging from 0 to 0.05 inches per hour when thoroughly wetted. Group D soils are typically clay soils with high swelling potential, soils with high permanent water table, soils with a clay layer at or near the surface, or shallow soils over nearly impervious material.

Additional information on the geology and soil for the City is included in the Scott County Soil Survey.

3.12 Land Use and Public Utilities Services

The City of Savage land use practices include residential, commercial, industrial, and public and private open space areas. **Figure 3.11** is a representation of the land use for the City based on the 2020 Comprehensive Plan.

Most of the residences and businesses in the City are served by public water and sewer systems. However, the City does contain Individual Sewage Treatment Systems (ISTS). Some of these sites are anticipated to be abandoned and converted to city services in the next 10-20 years.

3.13 Public Areas for Water Based Recreation and Access

There are a number of water bodies that offer active recreation such as fishing and passive recreation such as walking. These recreational resources are outlined below:

SECTION 3.0

Minnesota River: The northern boundary of the City is the Minnesota River which provides fishing, power boating, and canoeing. In addition, the National Wildlife Refuge provides hiking, biking, and walking trails through the Minnesota River Valley.

Eagle Creek: Eagle Creek is located in the northwestern portion of the City. It is a designated trout stream with a regeneration population of trout. This area is available to the public for fishing.

Murphy-Hanrehan Park: Murphy-Hanrehan Park is managed by Three Rivers Park District and is located in southeastern Savage. It provides hiking trails as well as boat access to Murphy Lake, which is south of Savage.

McCull Pond: Fishing from the shore is available at McCull Pond. The Savage Community Park is located adjacent to McCull Pond.

Additional information regarding recreational opportunities within the City is available at the Parks Department at City Hall.

3.14 **Fish and Wildlife Habitat**

The City of Savage has extensive fish and wildlife habitat unique to the Twin Cities metropolitan area. As mentioned, Eagle Creek provides a self-sustaining trout population. The Savage Fen Wetland Complex is the largest of the 76 known calcareous fens in Minnesota and provides a variety of wildlife habitat that contains many threatened and special-concern species. Murphy-Hanrehan Park offers open space for wildlife and contains a number of endangered plants and animals. The Minnesota River also provides a major flyway and greenway corridor. The Credit River and Murphy-Hanrehan Park also provides open space and greenway corridors for wildlife.

3.15 **Unique Features and Scenic Areas**

Unique features and scenic areas include State designated Scientific and Natural Areas, designated scenic areas, areas containing rare and endangered species, biologically diverse areas, and historic areas. These areas within the City were discussed previously and include the following:

- Savage Fen
- Boiling Springs and Eagle Creek
- Murphy-Hanrehan Park
- Minnesota Valley National Wildlife Refuge

SECTION 3.0

3.16 Pollutant Source Locations

Pollutant source location information from the MPCA is shown on **Figure 3.12**. This figure contains information from the MPCA Master Entity System and Leaksite list as well as lists of hazardous waste generators and registered underground and aboveground storage tanks within the City of Savage. Many of these sites have been cleaned up or are in the process of being cleaned up. The MPCA should be contacted for site-specific details.

3.17 NPDES Phase II

The Minnesota Pollution Control Agency (MPCA) implemented the National Pollutant Discharge Elimination System (NPDES) Phase II Stormwater Program in March 2003. Phase II requires (as amended in 2006) municipal separate storm sewer systems (MS4's) in urban areas with populations over 10,000 to prepare a Stormwater Pollution Prevention Plan (SWPPP) in order to obtain an NPDES permit. The City submitted the required SWPPP on June 1, 2006. The City's 5-year SWPPP is scheduled to expire on June 1, 2011. Therefore, on November 18, 2010, the City submitted an application for re-issuance of coverage under the MS4 Permit. Once the MPCA reissues the MS4 Permit, the City will revise its SWPPP to comply with this new MS4 Permit. As of March 3, 2011, the MPCA's schedule for reissuance of the MS4 Permit was January 2012.

The City has also been designated as a Selected MS4 to develop a Nondegradation Plan. The City's Nondegradation Report was submitted to the MPCA in December 2007.

SECTION 3.0

Figure 3.4 Subwatershed Delineation Map

SECTION 3.0

Figure 3.5a Wetland Map

SECTION 3.0

Figure 3.5b DNR Public Waters/Wetlands and Public Ditches

SECTION 3.0

Figure 3.6 FEMA Floodplain Boundary Map
(No change from previous Plan until new flood plain mapping available)

SECTION 3.0

Figure 3.7 Water Resource Problem Area Map

SECTION 3.0

Figure 3.8 Water Quality Monitoring and Impaired Waters Location Map

SECTION 3.0

Figure 3.9 MDNR Ground Water Appropriations Map

SECTION 3.0

Figure 3.10 Soils Classification Map

SECTION 3.0

Figure 3.11 2030 Land Use Map

SECTION 3.0

Figure 3.12 Pollutant Sources Location Map

SECTION 4.0

4.0 PROBLEMS AND CORRECTIVE ACTIONS

Outlined below is an assessment of existing and potential water resource-related problems that are known at this time. These problems have been identified based on an analysis of the land and water resource data available to the City. A description of any existing or potential problem within the topic area has been listed and corrective actions have been incorporated into an implementation plan. Locations of the problem areas are shown on **Figure 3.7**.

4.1 Lake, stream or wetland water quality problems		
	Identified Problem, Issue, or Concern	Corrective Action
4.1.1	<p>The following water bodies have been listed as impaired by the MPCA:</p> <ul style="list-style-type: none"> • Minnesota River (<i>Fecal Coliform, Mercury, PCB, Dissolved oxygen</i>) • Credit River (Turbidity) <p>MPCA staff anticipate delisting of the Credit River with the next EPA publication of the impaired waters list</p>	<p>The City will work with the MPCA, Watershed Districts, and Watershed Management Organizations to develop Total Maximum Daily Loads (TMDLs) for the impaired waters within their boundaries.</p> <p>The City will work to continue to minimize the discharge of sediments to the Credit River. To this end, the City is cooperating with the Scott WMO and MPCA in the development of a "Credit River Protection Plan".</p>
4.1.2	<p>There are concerns that, if not properly managed, the quality of stormwater runoff entering the Savage Fen complex may have an adverse affect on the stability of the Fen.</p>	<p>The City will implement the AUAR Mitigation Plan for the Savage Fen Area. This includes no new or expanded discharges into the Fen.</p> <p>The City is working with regulatory agencies in the preparation of a Bluff Area Study to define acceptable development criteria for the Savage Fen south bluff.</p>
4.1.3	<p>Wetland (20-357W) west and adjacent to City Public Works salt shed has been impacted</p>	<p>Stored material needs to be relocated. Wetland and buffer needs to be repaired. Protections need to be installed. Work will be incorporated into 2012 facility expansion.</p>

SECTION 4.0

4.2 Flooding and stormwater rate control concerns		
	Identified Problem, Issue, or Concern	Corrective Action
4.2.1	Water levels in Cates Lake are being managed by use of a temporary outlet.	A permanent outlet is proposed for construction in 2013.
4.2.2	Street flooding occurs in the Savage downtown area. Significant improvements were completed in 2009 and in 2010.	Continue to manage problem without a permanent fix. Allow water to recede on its own, or pump to nearest storm sewer inlet.
4.2.3	Flooding has occurred at the following locations: <ul style="list-style-type: none"> • 126th St. east of Pennsylvania Ave. • Xenwood at 126th St. • Trost Park area is prone to flood. • TH 13 and 128th Street. • South of Ottawa Ave. & west of Riverwood Dr. • Hampshire Ave. crossing of Credit River. 	Construct drainage improvements to correct flooding and drainage related issues at each of these locations. City will address these areas, based on priority, as opportunities arise.
4.2.4	Alabama and 143 rd /144 th (6145 144 th St.)– small pond south of 144 th draining north to wetland (M2) north of 144 th . South pond is badly plugged with silt and weeds. North portion of pond is very narrow and provides little capacity. Outlet into wetland is plugged. Wetland has overgrown with vegetation and greatly reduced capacity.	Install pipe in narrow portion of pond and fill in to improve residents' property. Clean out remaining pond to improve capacity. Reinstall buffers around M2 wetland, clean out inlet and excavate sediment from wetland to improve capacity and restore habitat, functions, and values.
4.2.5	Pond 16-346W, west of Yosemite Ave. near 132 nd St. has very large floating bog, displacing capacity. Weir wall installed in 2008 to keep bog material from clogging outlet.	Excavate and remove bog material
4.2.6	The City has stormceptors at: <ol style="list-style-type: none"> 1) 8312 152nd Place 2) 8372 153rd Place 3) 15285 Flag Avenue 4) 9002 152nd Street 5) 13321 Brunswick 6) 14049 Natchez Lane 7) 14302 Allen Blvd. 8) 4554 139th St 9) Connelly at the S end of Dan Patch Lake 10) 13826 Ottawa Ave. 	All structures need to be cleaned on a regular schedule. Stormceptor at 8372 153 rd Place needs to be field located. Stormceptor at 8312 152 nd Place is buried under a rock garden. Need to make arrangements to excavate devices and provide access for maintenance.

SECTION 4.0

4.3 Impacts of water quantity or quality management practices on recreational opportunities		
	Identified Problem, Issue, or Concern	Corrective Action
4.3.1	Fishing opportunities continue to be viable.	No issues to address.
4.3.2	Excess vegetative growth (eutrophication).	Continue to improve stormwater treatment. Continue to educate residents on use of fertilizers, lawn and garden BMPs.

4.5 Impacts of stormwater quality on fish and wildlife resources		
	Identified Problem, Issue, or Concern	Corrective Action
4.5.1	Fishing opportunities continue to be viable.	No issues to address.
4.5.2	Potential impacts to Eagle Creek.	Previously addressed by improvements to storm sewer systems. Currently monitored by Eagle Creek Aquatic Management Area Committee.

4.6 Impacts of erosion and sedimentation on water resources		
	Identified Problem, Issue, or Concern	Corrective Action
4.6.1	Water quality on the Credit River is being impacted by stream bank erosion. Significant improvements have been made but many smaller opportunities for improvement are available.	The City will continue to address Credit River erosion issues as well as erosion that is tributary to Credit River.
4.6.2	Erosion control at construction sites continues to be an area with opportunity for improvement.	Revise City ordinances to include penalties for non-compliance of construction BMPs. Provide inspections of all construction sites. Continue to implement City's MS4 SWPPP.
4.6.3	McColl's Bluff ravine from E_AP7920 to Savage Fen is badly eroded.	Energy dissipation and stabilization. Energy dissipation should reduce creek bank erosion.
4.6.4	Ravine north of Fire Station #60 to Savage Fen is badly eroded.	Energy dissipation and stabilization. Energy dissipation should reduce creek bank erosion.
4.6.5	Storm pond shoreline at 4980 W. 142 ^{1/2} St. is being washed away. Older system with no buffer. Resident is losing yard due to erosion. Little to no vegetative shelf.	Need to stabilize bank on entire east shore of pond.
4.6.6	Storm pond at 7302 Taylor Drive has significantly silted in. Outlet control is by wooden weir wall only. Badly encroached upon buffer.	Excavate pond to original design and restore buffer and install buffer signs.

SECTION 4.0

4.7 Impact of land use practices and development on water resource issues		
	Identified Problem, Issue, or Concern	Corrective Action
4.7.1	Runoff volumes may be impacting the erosion potential within the Credit River.	Work to minimize runoff volume to the Credit River by minimizing runoff from new development and redevelopment. This includes continued implementation of the City's stormwater volume reduction Ordinance and Policy.
4.7.2	Runoff from development and agricultural uses may be impacting local lakes and wetlands.	An MPCA Non-degradation Report was completed and submitted to the MPCA in December 2007. Implement City's MS4 SWPPP. Continue to review development plans for conformance with City standards.
4.7.3	Lawn and shoreline maintenance practices may adversely affect water resource.	Provide education to residents and businesses on BMPs that can be implemented at the source to reduce runoff and pollutants. This is being done through the Scott Clean Water Education Program as well as City of Savage efforts.

4.8 Adequacy of existing regulations to address adverse impacts on water resources		
	Identified Problem, Issue, or Concern	Corrective Action
4.8.1	City ordinances do not currently address all of the policies contained within this Plan	Revise City ordinances to reflect the policies outlined within the WRMP, Nondegradation Report, and MS4 SWPPP.
4.8.2	There is a variance between hydrologic and geographic boundaries of Watershed Districts and Watershed Management Organizations.	City will work with Watersheds and WMOs to redefine their boundaries to match the hydrologic boundaries within the City.

4.9 Identification of potential problems which are anticipated to occur in the next 20 years based on growth projections and planned urbanization		
	Identified Problem, Issue, or Concern	Corrective Action
4.9.1	Increased flows to the Credit River from development south of the City of Savage. This may increase erosion and flooding along the River within the City of Savage.	Continue to implement stormwater management practices to mitigate development impacts to the Credit River within Savage and to work with Scott WMO to manage areas south of the City.

SECTION 4.0

4.10 Availability and adequacy of existing technical information to manage water resources		
	Identified Problem, Issue, or Concern	Corrective Action
4.10.1	The City needs to continue to track water quality trends of surface waters in the City.	The City will continue to cooperate and coordinate with other government agencies to perform monitoring and to share monitoring data.

4.11 Identification of developing areas that drain into other jurisdictions and an evaluation of infrastructure needs or planning. This item addresses Scott WMO WRMP(June 2009) Strategy 4.2.4.	
Subwatershed discharging out of Savage (from Figure 3.4 of this Plan)	Evaluation
MR11	City end-of-pipe discharges into Hwy 13 system. Further evaluation needed.
MR12	City end-of pipe ties into Burnsville system (2009 City construction). No issues at this time.
MR31	City end-of pipe discharges into wetland without treatment. Treatment required.
MR32	City end-of pipe ties into Burnsville system. No issues at this time.
PL11	Discharges into City of Savage system. No issues at this time.
PL10	South of 150 th St. discharges into City of Savage system. North of 150 th St. treated by City of Savage system before discharging to Prior Lake. No issues at this time.
PL8	Treated by City of Savage system before discharging to Prior Lake. No issues at this time.
PL5	Discharges into MnDOT system. No issues at this time.
PL1	Detention pond outlets into feature in City Prior Lake. No issue as water is treated before discharge.
PL4	Detention pond outlets into feature in City Prior Lake. No issue as water is treated before discharge.
BLB4C and F	Runoff from east half of all developed areas is managed in City of Savage system. Rear yards and all of the 10-acre lot flows over vegetated area into Shakopee. No known issues.
BLB4A	Detention pond outlets into Shakopee. No issue as water is treated before discharge.

SECTION 5.0

5.0 ESTABLISHMENT OF GOALS AND POLICIES

The City of Savage has developed a number of goals, strategies, and policies for the management of stormwater within the City. These goals and policies have been developed to complement any county, regional, or state goals and policies. The goals of the City are as follows:

Goals

1. Minimize public capital expenditures needed to correct flooding and water quality problems.
2. Protect and improve surface and groundwater quality.
3. Prevent erosion of soil into surface water systems.
4. Promote groundwater recharge.
5. Protect and enhance fish and wildlife habitat and water recreational facilities.
6. Secure benefits associated with the proper management of surface and groundwater.

In order to achieve the City's goals for managing stormwater, four strategies were developed. These strategies will assist the City in targeting its main audiences for the purposes of water resource management as follows:

Cooperation with other agencies This strategy recognizes that the City is not alone in managing water resources within its boundaries. There are a number of other local, state, regional, and federal agencies that also have rules and regulations related to stormwater management. Through this strategy, the City has recognized these other agencies' role in this endeavor and will cooperate and coordinate with these agencies as necessary.

Education: This strategy includes educating various groups within the City about proper water resource management BMPs. Education of residents, contractors, landowners, City Staff, City Council, business owners, and developers is included in this strategy to assist in meeting the City's goals.

Regulation: Many BMPs for water resource management take the form of regulations placed on new development or redevelopment within the City. These regulations assist the City in achieving its water management goals. Policies related to the management of water resources are included in the regulation strategy.

Internal operations: This strategy focuses on policies related to the internal operations of the City. These policies provide direction on BMPs that will guide City operations in the management of water resources to achieve its water resource management goals.

Based on the strategy, the City has developed a number of policies. These policies are outlined below.

SECTION 5.0

5.1 COOPERATION WITH OTHER AGENCIES

There are a number of other local, state, and federal agencies that have rules and regulations related to water resource management. The City recognizes these other agencies' role in this endeavor and will cooperate and coordinate with these agencies as necessary.

This Plan is in conformance with but does not restate all other agency rules that are applicable to water quality and natural resource protection. Rules, policies, permits and guidelines associated with the following organizations also provide guidance in managing water resources:

- Prior Lake – Spring Lake Watershed District www.plslwd.org
- Lower Minnesota River Watershed District www.watersheddistrict.org
- Scott Watershed Management Organization www.co.scott.mn.us
- Minnesota Department of Health www.health.state.mn.us
- Minnesota Pollution Control Agency www.pca.state.mn.us
- Board of Water and Soil Resources www.bwsr.state.mn.us and the Wetland Conservation Act www.bwsr.state.mn.us/wetlands/wca/index.html
- Minnesota Department of Natural Resources www.dnr.state.mn.us
- US Army Corps of Engineers www.mvp.usace.army.mil
- Minnesota Department of Agriculture www.mda.state.mn.us
- Scott County Soil and Water Conservation District www.scottswcd.org

While these other agency rules, policies, and guidelines are not restated in this Plan, they are applicable to projects, programs, and planning within the City. Specifically, but not exclusively, the City will coordinate with the Scott WMO as identified in Section 5 of the 2009-2018 Scott WMO Comprehensive Water Resource Management Plan.

The City of Savage is a Phase II NPDES MS4 Nondegradation community. The City has previously submitted its SWPPP in conformance with MPCA regulations. The components of the SWPPP are integrated into the strategies outlined in this section. The City has updated the SWPPP and has prepared a Nondegradation Report (December 2007), as required by the MPCA. The Nondegradation Report was submitted to the MPCA on December 28, 2007. These documents are incorporated by reference, as they are anticipated to be updated and modified on a regular basis.

One of the requirements identified in Section 5 of the June 2009 Scott WMO Comprehensive Water Resource Management Plan is a review and assessment of Coordinated Strategies identified in Table 5.2 of the WMO Plan, and a description of the LGU's coordination role. This requirement applies to Strategies 1.1.5, 2.6.1, 3.2.3, 4.3.4,

SECTION 5.0

4.4.1, 4.7.1, 6.1.2, and 6.1.3. All 8 of these strategies are consistent with the City's intentions for cooperation with other agencies. The City's coordination role is to work directly with Scott WMO staff as needed for successful implementation of these strategies.

5.2 EDUCATION

The purpose of the education strategy is to foster responsible water quality management practices by educating residents, contractors, landowners, business owners, City Staff, City Council, and developers about proper water resource management. If these targeted audiences recognize their role in responsible water resource management in their homes, businesses, and practices, it is another means for the City to meet its goals. This education strategy has also been designed to be in conformance with the NPDES requirements.

STRATEGY: EDUCATION		
Policy No.	Policy	Target Audience
5.2.1	The City will implement public education as part of the NPDES Phase II program.	Residents, Business Owners, Contractors, Landowners, Developers, City Staff and Council
5.2.2	The City will partner with the various Watershed Districts, Watershed Management Organizations, and Scott County in water resource public education in the City. This partnering may include participation in a joint county-wide stormwater education program to provide education components of the City's SWPPP.	Residents, Business Owners, Developers, Watershed Districts/ Management Organizations, SWCD
5.2.3	The City will develop and update their web-site for water resource management information and SWPPP information.	Residents, Business Owners, Contractors, Landowners, Developers
5.2.4	The City will create a Developer's Guide	Developers and Contractors
5.2.5	The City will solicit volunteers for water quality monitoring	Residents
5.2.6	The City will provide information newsletters, utility bill flyers, and mailings aimed at fostering responsible water quality management practices. Topics will include: <ul style="list-style-type: none"> ● Wetland and stormwater pond buffers ● Water quality monitoring ● Groundwater quality and protection ● Controlling invasive species ● Water conservation and the water cycle ● Proper hazardous waste disposal ● Yard waste management ● Agricultural BMP's ● Pet waste disposal ● Illicit discharges to stormwater 	Residents, Business Owners, Developers

SECTION 5.0

5.2.7	The City will continue to implement education regarding proper disposal of household hazardous waste. This will include posters in key locations and flyers in utility bills.	Residents, Business Owners, Developers
5.2.8	The City will provide training opportunities for erosion and sediment control, BMP's, good housekeeping, and pollution prevention.	City Staff, developers, builders, land owners
5.2.9	The City will hold an annual public meeting to discuss the City's SWPPP and water resource management practices in conformance with the NPDES permit.	Residents, Business Owners, Developers

5.3 REGULATION

The policies developed in this strategy outline specific stormwater management elements that are required to be implemented through the development and/or permitting process. The regulation strategy is targeted at the public, developers, contractors, City staff, and City Council.

As future transportation infrastructure is proposed and designed, opportunities for water quality and flooding retrofits will be incorporated.

Applicability based on project size

- Development or redevelopment resulting in less than 5,000 square feet of new impervious surface area is exempt from Section 5.3, with the exception of erosion and sediment control requirements (identified in 5.3.29) and set back requirements (identified in 5.3.30).
- Development or redevelopment resulting in more than 5,000 square feet of new impervious surface area, but less than 1 acre of total drainage area, is exempt from Section 5.3, with the exception of erosion and sediment control requirements (identified in 5.3.29), set back requirements (identified in 5.3.30) and infiltration/volume control (identified in 5.3.17, 5.3.18 and 5.3.19).
- Development or redevelopment resulting in more than 5,000 square feet of new impervious surface area, and more than 1 acre of total drainage area, must comply with Section 5.3,

STRATEGY: REGULATION		
Policy No.	Policy	Target Audience
Rate Control		
5.3.1	<p>Future discharge rates from new development and redevelopment will, at a minimum, not exceed the existing discharge rates for storm events with a 50% (2-yr), 10% (10-yr) and 1% (100-yr) chance of annual occurrence.</p> <p>Post development discharge rates for the 1% chance of annual occurrence storm event shall not exceed 0.10 cfs per acre of tributary drainage area for any new development within the City.</p>	Developers

SECTION 5.0

STRATEGY: REGULATION		
Policy No.	Policy	Target Audience
5.3.2	New storm sewer systems shall be designed to accommodate discharge rates with a 10% (10-yr) chance of annual occurrence. The design of all major stormwater storage facilities shall attempt to accommodate a critical duration event with a 1% (100-yr) chance of annual occurrence.	Developers
5.3.3	No orifice smaller than 4" is allowed in the construction of ponds or outlets within the City. A trashguard shall be installed on orifices less than 6". Skimming of Floatables shall occur upstream of all pond outlet devices.	Developers

SECTION 5.0

STRATEGY: REGULATION		
Policy No.	Policy	Target Audience
Flood Control		
5.3.4	<p>Building elevations within the City of Savage shall conform to the following requirements:</p> <ul style="list-style-type: none"> • The lowest floor elevation of all development, including basements, shall be required to be at least 2 feet above the 1% storm event high water level or regional flood level for the adjacent water or wetlands which have positive outlets. • The basement floor will be 4 feet above the currently observed groundwater elevations in the area. • There shall be a minimum 3 feet of separation between low floor and 1% storm event high water level elevations for landlocked basins. • Any new or redevelopment within the City will maintain a minimum building opening of 3 feet above the anticipated 1% storm event high water elevation or maintain a lowest floor elevation of 2 feet above the 1% storm event high water level, whichever is highest. However, if this 3 foot freeboard requirement is considered a hardship, the standard could be lowered to 2 feet if the following can be demonstrated: <ol style="list-style-type: none"> 1. That, within the 2-foot freeboard area, stormwater storage is available which is equal to or exceeds 50% of the stormwater storage currently available in the basin below the 1% storm event elevation. 2. That a 25% obstruction of the basin outlet over a 24-hour period would not result in more than 1-foot of additional bounce in the basin. 3. An adequate overflow route from the basin is available that will provide assurance that one-foot of freeboard will be maintained for the proposed low building opening. 	Developers, Builders
5.3.5	<p>The City prohibits activities within the 100-year floodplain unless compensatory floodplain mitigation is provided at a 1:1 ratio by volume and it is demonstrated that the 100-year floodplain will not be impacted. In addition, no filling within the designated floodway of a drainage channel shall be allowed. Suitable calculations must be submitted and approved demonstrating that filling in the flood fringe will not impact the 100-year flood profile.</p>	Developers, Builders, Residents

SECTION 5.0

STRATEGY: REGULATION		
Policy No.	Policy	Target Audience
5.3.6	Landlocked depressions that presently do not have a defined outlet and do not typically overflow may be allowed a positive outlet to protect adjacent properties. This outlet must be in conformance with current wetland regulations and demonstrate that downstream properties are not adversely affected by the flows. These outlets will be provided above the existing conditions 1% back-to-back 10-day storm event HWL, unless a lower outlet elevation is required to provide protection to existing adjacent structures.	City Staff, Developer
5.3.7	If an outlet is not available or provided for a landlocked basin, the area shall be modeled to accommodate a back-to-back 1%, 24-hour return frequency event or 1% 10-day runoff event (7.2 inches) on saturated or frozen soil conditions (CN=100). The required flood storage shall be established by the highest water surface elevation of the two events.	City Staff, Developer
5.3.8	The City requires as-builts of all ponding areas and designated emergency overflows.	City Staff, Developers
5.3.9	The City requires drainage and utility easements over significant hydrologic features such as stormwater storage areas, floodplains, and conveyance systems; and requires conservation easements over wetlands and wetland buffers..	City Staff, Developers

STRATEGY: REGULATION		
Policy No.	Policy	Target Audience
Water Quality Treatment		
5.3.10	<p>Treatment of stormwater to NURP guidelines is required prior to stormwater discharge to a lake, stream, or wetland and prior to discharge from the site as part of development. The NURP guidelines for the design of stormwater treatment basins are as follows:</p> <ul style="list-style-type: none"> a. A permanent pool ("dead storage") volume below the principal spillway (normal outlet) which shall be greater than or equal to the runoff from a 2.5-inch storm over the entire contributing drainage area assuming full development. b. A permanent pool average depth (basin volume/basin area) which shall be \geq 4 feet, with a maximum depth of 10 feet. c. An emergency spillway (emergency outlet) adequate to control the 1% frequency critical duration event. 	Developers

SECTION 5.0

STRATEGY: REGULATION		
Policy No.	Policy	Target Audience
	<p>d. Basin side slopes above the normal water level should be no steeper than 3:1, and preferably flatter.</p> <p>e. A safety bench (vegetation bench) with a minimum width of 10 feet and 1 foot (10:1) deep below the normal water level is required to improve performance, enhance wildlife habitat, reduce potential safety hazards, and improve access for long-term maintenance.</p> <p>f. Basin shall contain a maintenance bench with a minimum width of 10-feet at a 10:1 slope beginning at the NWL and extending to 1-foot above the NWL.</p> <p>g. Ponds shall have a 16.5 foot vegetated buffer around the pond starting at the normal pool elevation. City-approved monuments shall be placed at the outside perimeter of the buffer. Minimum space between monuments shall be 300 feet or at each lot line, whichever is most frequent.</p> <p>h. To prevent short-circuiting, the distance between the major inlets and normal outlet should be maximized.</p> <p>i. A flood pool ("live storage") volume above the principal spillway shall be adequate so that the peak discharge rates from the 50%, 10%, and 1% critical duration storms are no greater than pre-development conditions.</p> <p>Reduction of peak discharges for the more frequent storms can be achieved through a principal spillway design that may include a perforated vertical riser, small orifice retention outlet, or compound weir.</p>	
5.3.11	<p>In areas where NURP treatment basins are not feasible to construct and a variance from the City has been acquired, the MPCA NPDES requirements may be substituted. NPDES requirements can be found on the following website:</p> <p style="text-align: center;">http://www.pca.state.mn.us/water/stormwater</p>	Developers
5.3.12	<p>In areas of redevelopment where ponding is not feasible or available, in-line stormwater treatment systems will be required to treat storm water runoff.</p>	Developers

SECTION 5.0

STRATEGY: REGULATION		
Policy No.	Policy	Target Audience
5.3.13	The City requires that all new and existing ponds be modified where feasible and practical to incorporate submerged outlet structures that will skim floatable materials. The outlets shall be submerged a minimum of 6 inches below the NWL and have velocities of less than 0.5 feet per second in the 99% return frequency storm event. A typical pond outlet detail is available in Appendix E .	Developers
5.3.14	All new ponds shall have at least 18" of C or D soil or 24" of A or B soil separating pond bottoms from bedrock.	Developers
5.3.15	The City will cooperate with the MPCA to develop Total Maximum Daily Load (TMDL) studies on the listed impaired waters in the City.	City, MPCA, WMO, WD
5.3.16	Water quality goals have been developed for various water bodies as shown in Table 5.1 .	City, Developers
<i>Infiltration/Volume Control</i>		
5.3.17	<ul style="list-style-type: none"> • Infiltration of stormwater is required for a volume that is equal to 0.5 inches of runoff from all newly created impervious surfaces. • Additional design guidance for infiltration features is available in the Minnesota Stormwater Manual, available through the Minnesota Pollution Control Agency. • <u>Infiltration facilities must:</u> <ul style="list-style-type: none"> • Be designed and function to completely infiltrate all standing water within 48 hours of the last precipitation event. • be designed using site-specific soil infiltration rates or hydraulic conductivity or in-situ infiltration evaluations. Regional soil data may not be used. • Include pretreatment to remove particulates, oil/grease and other components that may plug the system. • Have at least 36 inches of soil separation from the bottom of the facility to the seasonally saturated soils or bedrock. • Be designed to bypass higher flows. • Newly constructed infiltration areas may be inspected by the City, Watershed Management Organization, or Watershed District after constructed to ensure that water is infiltrating as designed. 	Developers
5.3.18	<p><u>Infiltration facilities shall not be used:</u></p> <ul style="list-style-type: none"> • For runoff from fueling and vehicle maintenance areas. 	

SECTION 5.0

STRATEGY: REGULATION		
Policy No.	Policy	Target Audience
	<ul style="list-style-type: none"> • On areas with less than 3 feet of vertical separation from the bottom of the infiltration system to the seasonal high groundwater or top of bedrock. • For areas with runoff from industrial or commercial parking lots and roads where there is less than 5 feet of vertical separation from the bottom of the infiltration system to the seasonal high groundwater or top of bedrock. • On areas with Type D soils. • Within 10 feet of a property line. • Within 10 feet of a building foundation (with slopes directed away from building) • Within 50 feet of a private or public water supply well • Within 35 feet of a septic system tank/leach field 	
5.3.19	<p>In developments where the infiltration requirement cannot be met, the requirement can be satisfied with credits, as detailed in Appendix G (Scott WMO Standard D part 2(m)(6) (aa) through (jj)). To receive credit, developers must request the credits and provide calculations and documentation showing that the criteria in Appendix G have been met. Any future update or revision to Scott WMO Standard D is incorporated by reference to Appendix G of this Water Resource Management Plan.</p> <p>In developments where the infiltration requirement will not be met, physical evidence of the site's inability to comply with 5.3.18 of this Plan must be provided.</p>	

SECTION 5.0

Wetlands		
5.3.20	The City is the Local Government Unit (LGU) for the Wetland Conservation Act (WCA) and therefore requires any projects that impact wetlands to conform to the WCA, the City's Wetland Management Plan, and the City's Wetland Ordinance. The City's Wetland Management Plan is expected to be updated by early 2012.	
5.3.21	<p>The City requires wetland buffers and buffer monumentation as part of new development or redevelopment per the Wetland Management Plan as follows.</p> <p>Preserve: 50 feet Manage 1: 40 feet Manage 2: 30 feet Utilize: 16.5 feet</p>	<i>These items will be deleted from this Water Resource Plan upon completion of the updated Wetland Management Plan.</i>
5.3.22	The City encourages and will supply technical assistance to existing homeowners with properties adjacent to wetlands that were in existence prior to the adoption of the Wetland Management Plan (1999) to establish a 16.5 foot wetland buffer strip.	
5.3.23	The City requires a 25-foot principal structure and 15-foot deck or patio setback plus buffer width from all wetlands and treatment berms.	
5.3.24	Wetland mitigation and buffer areas must be constructed and maintained in accordance with BWSR and Mn/DOT guidelines.	
5.3.25	Development must maintain hydrology to existing and newly created wetlands.	
Groundwater		
5.3.26	The City will review and consider incorporating the Scott County Groundwater Plan into ordinances.	City Staff and Council
5.3.27	The City will develop a spill prevention, control, and counter measure plan that is consistent with state and/or federal regulations such as Minnesota Statutes 115E and the Federal Oil Pollution Act 33USCA Sec. 2701-2761.	City Staff and Council
5.3.28	The City requires that the design, installation and inspection of individual sewage treatment systems shall be in conformance with State standards and enforced jointly with Scott County.	Residents, Developers
Erosion and Sediment Control		
5.3.29	Development and redevelopment are required to conform to	Developers

SECTION 5.0

	<p>the City's erosion control ordinance available on the City's website at www.cityofsavage.com</p> <p>In addition to complying with the City's ordinance, development and redevelopment are required to conform to the Minnesota Pollution Control Agency's NPDES construction permit rules, which can be found at http://www.pca.state.mn.us/water/stormwater. Evidence of NPDES permit coverage shall be provided to the City prior to construction.</p>	
Setbacks		
5.3.30	<p>Placement of structures and removal of vegetation is prohibited on bluff land that is in excess of 33-1/3% vertical slope.</p> <p>A 40-foot structure setback is required along the Minnesota River bluff from the point at which the gradient reaches 33 1/3% slope.</p> <p>A 30-foot structure setback is required along the Credit River and bluff areas adjacent to other wetlands from the point at which the gradient reaches 33 1/3% slope.</p> <p>A 50-foot setback for ponds, infiltrations areas, and ISTS is required from any bluff where the gradient reaches 33 1/3% slope.</p> <p>The most recent version of the City's Bluffland Ordinance is available on the City's web site at www.cityofsavage.com.</p>	Developers, Residents

5.4 INTERNAL OPERATIONS

The City's internal operations can have a significant impact on water resource management. This strategy is targeted primarily at the City with some items targeted at the public and/or another agency. These policies are aimed at operation and maintenance activities associated with water resource management within the City.

SECTION 5.0

STRATEGY: INTERNAL OPERATIONS		
Policy No.	Policy	Target Audience
5.4.1	The City will sweep main and collector streets a minimum of four times per year. Other streets will be swept at least two times per year. Sweeping frequency can be increased for public events or evidence of increased need.	City Staff
5.4.2	The City will inspect, at a minimum, 20% of the MS4 storm sewer outfalls and stormwater treatment basins each year on a rotating basis and keep records of the inspections, finding, and maintenance activities completed.	City Staff
5.4.3	The City and/or property owner shall annually inspect and clean as needed all sump catch basins, sump manholes, and pipeline treatment devices (Stormceptors, V ₂ , B ₂ , etc.).	City Staff, Property Owner, Developer
5.4.4	The City will inspect all exposed stockpile, storage and material handling areas on an annual basis.	City Staff
5.4.5	The City prefers to use regional detention and treatment areas rather than site specific detention areas where feasible. These areas are show on Figure 3.4 as part of the City's stormwater model.	City Staff
5.4.6	The City will continue to support other agencies in their implementation of water quality monitoring programs that include monitoring of Savage Fen and Eagle Creek.	City Staff, WMO, WD, State Agencies
5.4.7	The City shall implement the BMP's and report annually to the MPCA in accordance with the City's SWPPP. The City incorporates the SWPPP and its BMP's into this Plan by reference. The SWPPP is available on the City's website at www.cityofsavage.com .	City Staff, Developer
5.4.8	The City of Savage shall manage wetlands in accordance with the Wetland Conservation Act and the City's Wetland Management Plan. The City incorporates the Wetland Management Plan in this Plan be reference. The City's WMP is available at www.cityofsavage.com .	City Staff, Developer
5.4.9	The City will continue to consider its Comprehensive Plan when planning water resource activities within the City. The City incorporates its Comprehensive Plan into this plan by reference. The Comprehensive Plan is available at www.cityofsavage.com .	City Staff, Developer
5.4.10	The City of Savage has a variety of options for snow and ice control in the winter. Anti-icing, salt application, and salt/sand mixture application are commonly used. Many times, anti-icing can be used in advance of a snow or ice event; a brine solution (salt/water) is sprayed on the surface as a pre-treatment. This application	

SECTION 5.0

STRATEGY: INTERNAL OPERATIONS		
Policy No.	Policy	Target Audience
	<p>reduces the bonding of snow or ice to surface and the result is that less overall salt is needed to treat icy roads. Straight salt is used throughout most of the winter season; a brine solution is sprayed directly on the salt just before it is dispensed to the road surface. This process is done to provide density to the salt and activates the break down process of the salt. This also prevents the salt from bouncing into the curb line, thus reducing the amount wasted. At times a salt/sand mixture is also used; this process is used in the coldest times as salt alone does not melt the ice as effectively. A salt/sand mixture can also be used when there is a shortage of salt. Salt and salt/sand uses are monitored by visual inspection of the trucks and the source. The City's Snowplowing, Snow Removal and Ice Control Policy (PW.06.2010) is on the City's website.</p>	
5.4.11	<p>The City of Savage recognizes that Pike Lake is on the Minnesota Pollution Control Agency CWA 303(d) list of impaired waters. A small portion of the City of Savage drains to Lower Prior Lake, which in turn drains to Pike Lake. The City of Savage will be an active partner in any future TMDL activities regarding Pike Lake, including water modeling updates and reviewing draft reports.</p>	

SECTION 5.0

Table 5.1 Water Body Management Classifications and Water Quality Goals

Water Body	Water Quality Classification	Desired Water Quality Parameters	Goals
Eagle Creek	Unique Resource; Level I	TP: < 30 ug/L Chl a: < 10 ug/L	Maintain unique characteristics of the resource
Minnesota River	Minnesota River; Level II/III	TP: 30-75 ug/L Chl a: 10-40 ug/L	Achieve 40% reduction in non-source pollution
Savage Fen	Unique Resource; Level I	TP: < 30 ug/L Chl a: < 10 ug/L	Maintain unique characteristics of the resource
Credit River	Upland; Level III	TP: 45-75 ug/L Chl a: 20-40 ug/L	Support fishing, aesthetic viewing, and observing wildlife
Rice Lake	Floodplain Level IV	Unspecified	Aesthetic viewing and observing wildlife

Water quality parameters are as required by Lower Minnesota Watershed District's Plan.

SECTION 6.0

6.0 IMPLEMENTATION PRIORITIES/IMPLEMENTATION PROGRAM

Based on the information developed in **Sections 3.0 through 5.0**, the City has developed a Water Resource Management Priority list that reflects the needs and concerns of the City Council, City Staff, citizens, and the funding capabilities of the City. A prioritized listing of the studies, programs and capital improvements that have been identified to respond to the water resource needs within the City is outlined on the following tables. The City will attempt to implement the regulatory programs, studies, or improvements identified within this plan within the next 10 years.

Table 6.1 contains Storm Water Capital Improvement Projects (CIP), **Table 6.2** contains Water Resource Management Programs, and **Table 6.3** contains Water Resource Management Studies. **Table 6.4** summarizes the information from all of these tables. The costs associated with these items reflect year 2011 costs and do not take into account inflation. These tables are for planning and budgeting purposes and are considered rough estimates. It is anticipated that these cost estimates will be reviewed annually and updated as needed.

SECTION 6.0

TABLE 6.1				
CAPITAL IMPROVEMENT PROJECTS				
No.	Priority	Project Description	Cost Estimate¹	Comments
CIP-1	Medium	Downtown storm sewer reconstruction and improvements.	\$1,000,000	See Section 4.2.4
CIP-2	Medium	Regrade, install energy dissipation, and stabilize drainage from E_AP7920, Storm pond in McColl Bluffs development to Savage Fen	\$250,000	See Sections 4.6.3
CIP-3	Medium	Regrade, install energy dissipation, and stabilize drainage north of Fire Station #60 to Savage Fen	\$250,000	See Section 4.6.4
CIP-4	Medium	Restore Wetland (20-357W) west of, and adjacent to, City Public Works salt shed	\$60,000	See Section 4.1.3
CIP-5	Medium	Acquire easements for maintenance access to underground water quality treatment structures.	\$40,000	See Section 4.2.7
CIP-6	Medium	Excavate floating bog in Yosemite pond. East of Alabama, south of McColl Drive and west of Webster Rd.	\$500,000	See Section 4.2.6
CIP-7	Medium	Construct drainage improvements at pond west of Alabama and between 143rd and 144th Streets.	\$60,000	See Section 4.2.5
CIP-8	Medium	Construct permanent outlet at Cates Lake.	\$160,000	See Section 4.2.2
CIP-9	Medium	Restore storm pond shoreline at 4980 W. 142 ^{1/2} St.	\$60,000	See Section 4.6.5
CIP-10	Medium	Restore storm pond at 7302 Taylor Drive. Pond has significantly silted in. Outlet control is by wooden weir wall only. Badly encroached upon buffer.	\$60,000	See Section 4.6.6
CIP-11	Low	Construct drainage improvements at Trost Park.	\$20,000	See Section 4.2.4
CIP-12	Low	Construct drainage improvements west or east of Xenwood Ave. at 126th Street.	\$75,000	See Section 4.2.4
CIP-13	Low	Construct drainage improvements at Hampshire Ave. crossing of the Credit River.	\$120,000	See Section 4.2.5
TOTAL			\$2,655,000	For 10-year period

1) Cost estimates provided are for planning purposes only. Detailed feasibility analyses have not been completed for these projects; therefore, cost estimates are subject to change upon final design

SECTION 6.0

TABLE 6.2				
WATER RESOURCE MANAGEMENT PROGRAMS				
No.	Priority	Project Description	Annual Cost Estimate¹	Comments
WRMP-1	High	Continue to perform LGU responsibility for the Wetland Conservation Act.	\$15,000	
WRMP-2	High	Provide review for all new development or redevelopment of sites within the City of Savage to assure the goals, policies, and objectives outlined in this plan are implemented.	\$20,000	See Section 4.7.2
WRMP-3	High	Coordinate inspection & enforcement of erosion control measures required for site development activities within the City of Savage with the NPDES Erosion Control Program.	\$20,000	See Section 4.6.2
WRMP-4	High	Continue to provide City compliance with local, county, state, and federal stormwater management requirements.	\$20,000	
WRMP-5	High	Implement SWPPP BMP's.	\$80,000	See Sections 4.6.2 and 4.8.1
WRMP-6	Medium	Continue to inspect and maintain underground water quality treatment devices such as stormceptors.	\$5,000	See Section 4.2.7
WRMP-7	Medium	Assist & Encourage the DNR in the management of Eagle Creek.	\$5,000	
WRMP-8	Medium	Continue to complete periodic inspections identifying areas within the City with erosion problems.	\$5,000	
WRMP-9	Medium	Continue implementation of community education to increase the residents' awareness concerning proper water resource management.	\$10,000	See Section 4.7.3
WRMP-10	Medium	Continue to support Water Quality Monitoring in Savage.	\$10,000	See Section 4.10.1
WRMP-11	Medium	Continue to implement approved mitigation plans.	\$50,000	See Section 4.1.2
TOTAL			\$240,000	(\$2,400,000 for 10-yr period)

1) Cost estimates provided are for planning purposes only. Cost estimates are subject to change and/or updates.

SECTION 6.0

TABLE 6.3				
WATER RESOURCE MANAGEMENT STUDIES				
No.	Priority	Project Description	Cost Estimate¹	Comments
WRMS-1	High	Update wetland management plan policies.	\$45,000	
WRMS-2	High	Complete update of ordinances to be in compliance with City's Plan and WMO/WD Plans.	\$15,000	See Sections 4.6.2 and 4.8.1
WRMS-3	High	Investigate and/or prepare a feasibility study for the drainage problems west of Xenwood Ave. at 126th Street.	\$10,000	See Section 4.2.4
WRMS-4	High	Investigate and/or prepare a feasibility study for at the excavation of a floating bog in Yosemite Pond.	\$10,000	See Section 4.2.6
WRMS-5	High	Investigate and/or prepare a feasibility study for the drainage problems at Trost Park.	\$1,500	See Section 4.2.4
WRMS-6	Medium	Investigate and/or prepare a feasibility study on the pond west of Alabama and between 143rd and 144th Streets (6145 144 th St.).	\$10,000	See Section 4.2.5
WRMS-7	Medium	Investigate and/or prepare a feasibility study for acquiring easements and constructing maintenance access to underground water quality treatment structures.	\$10,000	See Section 4.2.7
WRMS-9	Low	Investigate and/or prepare a feasibility study for the drainage problems at Hampshire Ave. crossing of the Credit River.	\$5,000	See Section 4.2.4
TOTAL			\$106,500	

1) Cost estimates provided are for planning purposes only. Cost estimates are subject to change and/or updates.

SECTION 6.0

TABLE 6.4		
SUMMARY OF IMPLEMENTATION TASKS		
Improvements, Programs, and Studies	Totals ¹	Comments
Totals for Capital Improvements:	\$2,655,000	
Totals for Management Programs:	\$2,400,000	
Totals for Management Studies:	\$106,500	
Grand Totals:	\$5,161,500	

1) Cost estimates provided are for planning purposes only. Detailed feasibility analyses have not been completed for these projects, programs, and studies; therefore, cost estimates are subject to change upon final design and/or updated information. Totals are based on a 10-year period.

SECTION 7.0

7.0. FINANCIAL CONSIDERATIONS

Implementation of the proposed regulatory controls, programs and improvements that are identified in this plan will have a financial impact on the City. To establish how significant this impact will be, a review of the means and ability of the City to fund these controls, programs and improvements is necessary. Toward this end, please find outlined below a listing of various sources of revenue that the City will endeavor to implement for the water resource management efforts outlined in this Plan.

For 2011-2020, the capital improvement projects are estimated to cost approximately **\$2,655,000**. The water resource management program costs are estimated at **\$240,000** annually. The stormwater studies are estimated to cost about **\$106,500**. Over a 10- year period, these projects, programs, and studies are estimated to cost about **\$5,161,500**.

Funding sources for these activities include the following:

1. Revenue generated by City's Storm Water Utility.
2. Special assessments for local improvements made under the authority granted by Minnesota Statutes Chapter 429.
3. Revenue generated by Watershed Management Special Tax Districts provided for under Minnesota Statutes Chapter 473.882.
4. For projects being completed by or in cooperation with the Prior Lake-Spring Lake Watershed District or the Lower Minnesota River Watershed District, projects funds could be obtained from watershed district levies as provided for in Minnesota Statutes Chapter 103D.905. At the time of preparation of this document,
5. Grant monies that may be secured from various local, regional, County, State, or Federal agencies. This would include the County, Mn/DOT, MPCA, the DNR and others.
6. Other Sources: These may be other sources of funding for storm water activities such as tax increment financing, state aid, etc. The City will continue to explore additional revenue sources as they become available.
7. Tax abatement.

The Stormwater Utility Fund is the primary source for the activities proposed in this plan. In addition to funds directly generated within the City, other funding sources will be pursued to complete activities outlined in this Plan. Sources of such funds may include grants or collaborative efforts provided by Watershed Districts, Watershed Management Organizations, Scott County, the State, Federal funds, or adjacent municipalities.

Although the City has identified activities within this Plan that will be pursued, the City will also look for opportunities to fund other water resource related improvement projects within the City as funding sources become available.

SECTION 8.0

8.0 AMENDMENT PROCEDURES

It is the intention of the City to have this Water Resource Management Plan reviewed and approved by Prior Lake-Spring Lake Watershed District, Lower Minnesota River Watershed District, the Scott Watershed Management Organization and the Metropolitan Council. Once approved, no significant changes to this Plan can be made without the approval of the proposed revisions by the Watershed Management Organizations and Districts. Significant changes to the local Plan shall be made known to the following parties:

1. Mayor and City Council
2. City Administrator and Public Works Director/City Engineer
3. Affected Watershed Management Organizations, Districts, and Metropolitan Council
4. Public within the City through a public hearing process

Following notification to the above parties, they shall have 60 days (45 days for Metropolitan Council) to comment on the proposed revisions. Failure to respond within 60 (45) days constitutes approval. Upon receipt of approvals of the affected Watershed Management Organizations and District, any proposed amendments will be considered approved.

Minor changes to the Plan shall be defined as changes that do not modify the goals, policies, or commitments expressly defined in this Plan by the City. Adjustment to subwatershed boundaries will be considered minor changes provided that the change will have no significant impact on the rate or quality in which storm water runoff is discharged from the City boundaries. Minor changes to this Plan can be made by the staff at the City without outside review. It is the intention of the City that this Plan be updated by the year 2021 unless significant changes to the Plan are deemed necessary prior to that date.

SECTION 9.0

9.0 GLOSSARY

1% CHANCE RAINFALL EVENT	A rainfall event that has a 1% chance of being equaled or exceeded during any given year.
10% CHANCE RAINFALL EVENT	A rainfall event that has a 10% chance of being equaled or exceeded during any given year.
50% CHANCE RAINFALL EVENT	A rainfall event that has a 50% chance of being equaled or exceeded during any given year.
ALLUVIUM	Material, such as sand, silt, or clay, deposited on land by streams.
AQUIFER	A formation, group of formations, or part of a formation that contains enough saturated permeable material to yield significant quantities of water.
ARTESIAN AQUIFER	An aquifer which is bounded above and below by formations of impermeable material or relatively impermeable material.
BEDROCK	The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.
BUFFER	An upland area adjacent to a wetland that is covered with natural vegetation and experiences little to no human impact such as mowing or fertilizing. The buffer starts at the delineated wetland edge.
CONVEYANCE SYSTEM	A surface water transport system that may include rivers, streams, man-made channels, grass waterways, storm water sewers, culverts, and other man-made control structures.
CRITICAL EVENT STORM	When comparing the 1%, 24-hour high water level and discharge rate to the 1%, 10-day high water level and discharge rate, the event that produces the highest high water level and discharge rate is defined as the critical event storm.
DRIFT (GLACIAL)	Rock material transported by glacial ice or material deposited by streams from glaciers.
EUTROPHIC	A condition where a body of water has reduced level of dissolved oxygen producing an increased level of plant life. A water body with a Trophic State Index from 51 to 70.

SECTION 9.0

FLOODPLAIN	A nearly level alluvial plain that borders a river or stream and is subject to flooding unless protected artificially.
GEOMORPHOLOGY	The geologic study of the configuration and evolution of land forms.
HWL	High Water Level. The highest water level achieved in a pond is predicted by the 100-year critical event model.
HYDRAULIC	Involving, moved, or operated by a fluid, especially water, under pressure.
HYDROGRAPH	A plot of streamflow against time.
HYDROLOGIC BOUNDARY	The boundary defining watershed or subwatershed units.
HYDROLOGY	The science concerned with waters of the earth, their occurrence, distribution, and circulation; their physical and chemical properties; and their reaction to the environment.
MEAN	Average. The sum of the magnitudes of all items of a set, divided by the items.
NWL	Normal Water Level. The lowest controlling elevation of the pond.
100-YEAR FLOOD PLAIN	That flood plain associated with a storm that has a 1 percent chance of being equaled or exceeded during any year (100-year recurrence interval). Usually calculated assuming a rainfall event of 24 hours in duration.
ORDINARY HIGH WATER MARK (OHWM)	The boundary of protected waters as defined in Minnesota Statutes.
OUTWASH	Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.
OUTWASH PLAIN	A land form of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.
P8	"Program for Predicting Polluting Particle Passage through Pits, Puddles, and Ponds." This computer program is used for water quality monitoring within subwatersheds.
PARENT MATERIAL	The unconsolidated organic and mineral material in which soil forms.

SECTION 9.0

PERMEABILITY	A characteristic of soil that enables water to move downward through the profile. Measured in inches per hour.
MAJOR STORM WATER STORAGE FACILITY	A facility which has the ability to provide flood protection for the critical 1% chance storm event.
NVGD	National Vertical Geodetic Datum. The nationwide reference surface for elevations.
PROTECTED WATERS AND WETLANDS	Those waters of the state identified as Public Waters or Wetlands under Minnesota Statutes. Generally, all lakes and Type 3, 4, and 5 wetlands as identified in the Department of Interior Circular 39, Wetlands of the United States, 1971. Public wetlands are generally those 10 or more acres in size in unincorporated areas, or 2.5 or more acres in size in incorporated areas.
SOIL ASSOCIATION	A group of soils geographically associated in a characteristic repeating pattern defined and delineated as a single map unit.
SUBWATERSHED	A minor drainage unit and a hydrologic component of a watershed.
SURFICIAL MATERIAL	Unconsolidated deposits of variable content and texture that overlie the bedrock surface. Major textural categories include alluvium, terraced sands and gravels, loess, till and outwash.
TILL	Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.
TILL PLAIN	An extensive flat to undulating area underlain by glacial till.
TROPIC STATE INDEX	A numeric index for lakes that rates the water quality of the lakes from a scale of 0 to 100 based on algal biomass. The index number can be calculated from any of several parameters, including secchi disc transparency, chlorophyll, and total phosphorus.
WATER APPROPRIATIONS	Waters of the state that are appropriated in excess of 10,000 gallons per day and/or 1 million gallons/year. A permit from the DNR is required for this type of activity.
WATER RESOURCE LIBRARY	A compilation of information from various agencies used in the preparation of the Surface Water Management Plan. This library is available at Public Works.

SECTION 9.0

WATERSHED

All lands which are enclosed by a continuous hydrologic drainage divide and lie upslope from a specified outlet point.