

Section 3

Land and Water Resource Inventory

Table of Contents

3.0	Land and Water Resource Inventory	3-1
3.1	Climate and Precipitation Data.....	3-1
3.2	Topographic Data	3-2
3.3	Soils Data.....	3-2
3.3.1	General Soils Information	3-3
3.3.2	Erosion and Sedimentation.....	3-4
3.4	Geology and Groundwater Resources	3-4
3.4.1	Surficial Geology.....	3-4
3.4.2	Bedrock Geology	3-5
3.4.3	Groundwater	3-5
3.4.3.1	General Groundwater Information	3-6
3.4.3.2	Groundwater Quality.....	3-6
3.5	Surface Water Resource Data.....	3-7
3.5.1	Public Waters, Ditches, Dams and Control Structures.....	3-7
3.5.1.1	District Streams.....	3-7
3.5.1.2	District Lakes	3-8
3.5.2	Wetland Information	3-8
3.5.3	Stormwater System and Flooding Information.....	3-9
3.5.3.1	Hydrologic and Hydraulic Modeling of District’s Water Resources.....	3-9
3.5.3.2	Drainage System: Minnesota River	3-10
3.5.4	Water Resources Monitoring.....	3-10
3.5.4.1	Water Quantity Monitoring.....	3-10
3.5.4.2	Water Quality Monitoring.....	3-11
3.5.4.2.1	Stream Water Quality	3-12
3.5.4.2.2	Lake Water Qualit	3-12
3.5.5	Shoreland Ordinances.....	3-12
3.5.6	DNR-Permitted Surface Water Appropriations.....	3-13
3.6	Water-Based Recreation Areas and Land Ownership	3-13
3.6.1	Minnesota Valley National Wildlife Refuge, Recreation Area and State Trail.....	3-13
3.7	Fish & Wildlife Habitat	3-13
3.7.1	Wildlife.....	3-14
3.8	Land Use and Public Utility Services	3-14
3.9	Navigation.....	3-15
3.10	Unique Features & Scenic Areas.....	3-16
3.11	Pollutant Sources	3-17
3.11.1	Known Closed and Open Sanitary Landfills, Closed and Operating Open Dumps and Hazardous Waste Sites (Per Mn 115a/115b), and a Summary of Available Water Quality Information	3-17
3.11.1.1	Environmental Hazards.....	3-17

3.11.2 Feedlots, Abandoned Wells (MDH), Registered Above and Underground Storage
Tanks, Permitted Wastewater Discharges, and a Summary of Available Water Quality
Information 3-18

List of Tables

Table 3-1	Precipitation Summary - Minneapolis/St. Paul Airport Station
Table 3-2	WMO Participation in Groundwater Planning/Issues as Specified by County Groundwater Plans
Table 3-3	Regulation of Activities for Groundwater Protection
Table 3-4	Details of Individual Lakes of the District
Table 3-5	Details of Individual Streams of the District
Table 3-6	Status of DNR-Approved Floodplain Ordinances
Table 3-7	Location and Status of MCES Surface Water Quality Monitoring Sampling Sites
Table 3-8.	Location of Minnesota Pollution Control Agency Surface Water Quality Monitoring Sampling Sites
Table 3-9	Status of DNR-Approved Shoreland Ordinances
Table 3-10	DNR-Permitted Surface Water Appropriations in LMRWD
Table 3-11	DNR Lake Management Plans and Surveys

List of Figures

Figure 3-1	Normal Annual Precipitation
Figure 3-2	“Wet Year” Representative Annual Precipitation
Figure 3-3	“Dry Year” Representative Annual Precipitation
Figure 3-4	Normal Precipitation May through September and April through October
Figure 3-5	Watershed Location Maps
Figure 3-6a	Topography and Watersheds
Figure 3-6b	Topography and Watersheds
Figure 3-6c	Topography and Watersheds
Figure 3-6d	Topography and Watersheds
Figure 3-6e	Topography and Watersheds
Figure 3-6f	Topography and Watersheds
Figure 3-6g	Topography and Watersheds
Figure 3-7	Major Soil Groups
Figure 3-8	General Stratigraphy of Geologic Bedrock Units in Twin Cities Metropolitan Area
Figure 3-9	DNR Protected Waters
Figure 3-10a	Wetlands and Streams - East
Figure 3-10b	Wetlands and Streams - Central
Figure 3-10c	Wetlands and Streams - West
Figure 3-11	FEMA Flood Boundaries
Figure 3-12	Schematic of Minnesota River Water Levels at Downstream Side of Highway 41 Bridge in Chaska
Figure 3-13	Parks and Trails
Figure 3-14	Existing Land Use
Figure 3-15	Commercial Navigation

3.0 Land and Water Resource Inventory

This section presents an inventory of land and water resources of the LMRWD in accordance with Minnesota Statutes (MS) 103B.231 and Minnesota Rules (MN Rules) 8410.0060. The statutes and rules require the WMO plan to “contain an inventory of water resource and physical factors affecting the water resources based on existing records and publications.” The paragraphs below provide general descriptions of the existing and proposed physical environment, land use, development and hydrologic system.

3.1 Climate and Precipitation Data

The Lower Minnesota River Watershed District has a cool-temperature continental climate, not subject to any severe continued extremes. It is not excessively arid, hot, foggy, or rainy. Occasional extremes in climatic conditions are of short duration. The growing season in the area varies from 142 days to 202 days, averaging 166 days. Freezing temperatures may occur until the middle of May and after the middle of September. When adequate precipitation occurs, this growing season is suitable for production of most crops.

There is a “first order” weather recording station less than two miles from the northern boundary at the eastern end of the District. This is the Minneapolis-St. Paul Metropolitan Airport Station of the United States National Oceanic and Atmospheric Administration. The data from this installation is of highest value and accuracy. The National Weather Service forecast office for the metropolitan area, located in Chanhassen, also records weather data. There is also a cooperative weather station at Chaska, Minnesota. The Chaska station provides min-max readings once a day, plus precipitation. Several Minnesota State Climatological network stations also exist and provide more detailed local weather data, kept by the Minnesota State Climatologist.

The highest temperature on record at the airport station to date was 108°F, set in 1936, and the lowest temperature was -34°F, set in 1936. The extreme conditions tell little except that temperatures range from uncomfortably hot to bitterly cold. Actually, the temperature varies greatly from day to day, as well as over the year. Temperature differences from the airport weather station to the station at Chaska are slight. The average annual temperatures of the two stations are 44.9°F and 44.5°F, respectively.

Average total annual precipitation at the airport is 28.3 inches and the annual figure is 29.3 inches at Chaska (1961-1990 average). The difference of one inch of average total annual precipitation does not indicate any trend for any one part of the District to get more precipitation than another.

Figures 3-1, 3-2, and 3-3 show the average annual precipitation for the 1961-1990 period, the representative “wet year” annual precipitation (1991), and the representative “dry year” annual precipitation (1988), respectively, over the state of Minnesota. Figure 3-4 shows the 30-year (1961-1990) average precipitation for May to September and for April through October. The State Climatology Office of the DNR prepared these figures. Table 3-1 gives a precipitation summary for the airport station. Generally, the summer precipitation far exceeds that of the winter, the summer rainfall usually being sufficient for proper plant growth. From May to September, the growing months, the average rainfall is 17.3 inches, or about 61 percent of the normal annual precipitation. Over the entire Minnesota River watershed, annual precipitation ranges from 22 inches in the

northwest to 32 inches in the southeast. Average annual runoff varies from two inches in the west to six inches in the east.

Thunderstorms are the main source of precipitation during these months. Excessive rain, and secondary phenomena of these thunderstorms such as wind, lightning, hail or any combination thereof may cause damage of varying degrees. The principal interest of the District is heavy or persistent rainfall and runoff. Heavy rainfall which began in the early summer of 1993 and continued throughout the summer resulted in significant and persistent flooding of the Minnesota River.

Winter snowfalls throughout the entire Minnesota River Watershed can be considerable and may cause flooding in the LMRWD if the spring thaw is severe. The heaviest monthly snowfall recorded to date at the Minneapolis-St. Paul International Airport was 46.4 inches of snow for the month of January 1982. The rapid melting of snow in the entire watershed was one of the most important contributing factors to the Minnesota River floods in 1951, 1965, 1969, and 1997. Snow has been recorded in all months except June, July and August.

Tornadoes and sleet or freezing rainstorms occur infrequently. Humidity, another variable in the overall climate picture, is of minor importance except that the Minnesota River Valley probably gets higher humidities than the upland areas which border the valley. Fog or low clouds occur but not with such frequency as to present any problem.

3.2 Topographic Data

Figure 3-5 illustrates how the LMRWD is a small portion of the entire Minnesota River watershed and shows its location at the downstream end of the watershed. The LMRWD legal boundaries generally follow the subwatershed boundaries of the Minnesota River valley (up to the bluff line), encompassing the area that is directly tributary to the Minnesota River (that is, does not flow into other major streams first). Many tributary streams originate outside of LMRWD but pass through the District. There are several watershed areas tributary to LMRWD under other jurisdictions. For example, although Riley, Purgatory, and Bluff Creeks enter LMRWD, these watershed areas are under the jurisdiction of the Riley-Purgatory-Bluff Creek Watershed District. Figure 3-5 also shows the adjacent WMOs and watersheds tributary to LMRWD.

The topography of the LMRWD is dominated by the Minnesota River, the broad Minnesota River floodplain and the steep river bluffs. Within LMRWD are some areas of upland above the bluffs. Figures 3-6a through 3-6g show the topography of the LMRWD from east to west, based on the USGS 7.5-minute quadrangle topographic maps. Figures 3-6a through 3-6g also show subwatersheds, which were delineated based upon information from local water management plans and USGS topographic maps. LMRWD did not determine subwatershed areas. The subwatersheds were chosen to best manage the District's water resources. See Section 5.3.3 for information regarding the classification of each subwatershed.

3.3 Soils Data

Soils are important to a water resources plan in that they may indicate sensitive resources (e.g., wetlands), may define areas important to groundwater recharge or subject to contamination, and may indicate areas where development potential is limited because of poor foundation characteristics or risk of erosion.

General soils information is presented below and shown on Figure 3-7. In-depth information, such as development limitations, infiltration characteristics, and erosion characteristics of specific soil groups at specific sites can be found in the U.S. Department of Agriculture Soil Survey for each of the counties of the District (Carver, Hennepin, Ramsey, Dakota and Scott). A copy of each county's soil survey is kept on file by the District. Information is also available at the Soil and Water Conservation District office for each county.

3.3.1 General Soils Information

Throughout most of the Minnesota River Valley in Dakota County, the break between floodplain and upland is very sharp. However, at Savage, there exist some remnants of river terracing. Above the bluff are soils which formed on glacial drift called the Mankato till, which were deposited as the Grantsburg Sublobe of the Des Moines lobe of the Mankato ice sheet retreated up the present Minnesota River Valley. These gray-brown Podzolic soils developed for the most part under forest conditions. Forest once covered most of the District. Today, only remnants of that forest remain.

The Minnesota River Valley includes, on its lowest level, floodplain soils such as alluvium, peat, and muck identified as the Chaska-Minneiska-Colo soil complex on Figure 3-7. Alluvial soils are usually flood deposits. The particulate sizes range from gravelly sand to silt and clay, with silt and very fine sands being predominant. The alluvial soils are questionable with respect to supporting structures, although some building is economically possible, with wise application of loading techniques. Peat and muck are terms for soils of high organic content. In peat, one can identify some partially decayed vegetative (organic) matter such as reeds, grasses, mosses, and leaves. In muck, the decomposition has advanced to such a stage that the materials are not definable. Peat and muck are poor soils in an engineering sense. These soft materials require expensive methods to support structures.

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

In Carver County, soils outside the floodplain are fine textured (sandy to loamy), level to gently sloping and are the result of deposits of the Glacial River Warren. Above these soils on the steeper slopes are coarser textured soils. Soils associated with glacial moraine are found on top of the bluffs.

In Hennepin County, the soil associations are similar to those in Carver County, extending over the same morainal deposits of the north bluff. Above the bluffs near Interstate Highway 35W, there is a small amount of sandy loam. These soils likely developed on stream-deposited material, with the bluff representing an old river terrace. This is further proof of the extent of the Glacial River Warren and the existence of river terraces in and near the valley.

In Scott County, about two miles west of Savage and between the floodplain and the higher upland regions, larger terraces begin to appear and continue to be evident to the western end of the District. Several related soils are found on these terraces: silt and silty clay loams on the lower terraces, and sandy loams on the upper terraces.

3.3.2 Erosion and Sedimentation

Erosion and the resulting sedimentation is the primary cause of non-point source water quality problems on the Minnesota River (see Section 4). The sediments also create problems for navigation on the river by forming sand bars and requiring dredging to maintain the navigation channel.

Sheet and rill erosion of croplands (most of which are located outside the LMRWD) is a major source of sediment problems in the Lower Minnesota River. Gully, streambank, riverbank sloughing, roadside and development-related erosion are also sources of sediment problems. Gully erosion problems can occur as a result of over-grazing, poor management, or intensive land use above steeply sloped lands such as the Minnesota River Valley bluffs. These bluffs are composed almost entirely of highly erodible, sandy soils which are difficult to control, stabilize, and revegetate once disturbed. When development occurs without regard for slope, soil type, or loss of vegetation, soil erosion and sedimentation are accelerated.

Figures 3-6a through 3-6g are contour maps of the District and can be used to identify the approximate locations of steeply sloped lands (greater than 12 percent) such as the Minnesota River Valley bluffs. Slope is just one factor in determining critical erosion areas; other factors to consider include slope length, land cover, and erodibility. NRCS' Revised Universal Soil Loss equation (RUSLE) should be used to determine critical erosion areas.

3.4 Geology and Groundwater Resources

Detailed information about geology and groundwater resources is given in the Geologic Atlases for Scott, Dakota, Hennepin and Ramsey Counties, the hydrologic investigations atlas which covers Carver County, and each county's groundwater plan.

3.4.1 Surficial Geology

The geological history of Minnesota includes several periods when great sheets of ice (glaciers) covered the upper midwest region. The last period when the glaciers advanced as far as the Twin Cities was the Mankato substage of the Wisconsin Glacial Age, about 11,000 years ago.

The Mankato glacier retreated in an erratic fashion. At times, the edge, or terminus, of the glacier remained relatively static for many years. At other times, it melted at a greater rate and retreated rather quickly—geologically speaking—across the face of the land.

These two rates of glacier retreat of the glacier determined the geology and topography (see Figures 3-6a through 3-6g and Figure 3-8) of the LMRWD. First, the glacier deposited large quantities of granular material in the form of a terminal moraine during its stationary period. The hummocky terrain on the uplands south of the LMRWD is typical of such deposits.

Secondly, as the glacier retreated along what is now the Minnesota River Valley, the meltwater from the glacier was drained by the Glacial River Warren which cut a channel in the glacial deposits. That channel is now the Minnesota River Valley. While melting, the glacier released tremendous quantities of water. This water cut the channel much deeper than it appears today. At one time, water filled the valley completely from Richfield on the north to the bluffs on the south side of the valley.

As the flow receded, the valley filled with sediments. Again, the recession was not continuous, so erosion and sedimentation varied. As a result, the lower valley filled irregularly. Vestiges of this irregular sedimentation appear in terraces, most prominently in the area around Shakopee. The majority of LMRWD is covered by alluvium and terrace deposits. The remainder of the District is covered by moraine deposits and lesser amounts of outwash deposits.

3.4.2 Bedrock Geology

Information describing bedrock geology in the LMRWD was obtained from the Minnesota Geological Survey's 1986 bedrock geologic and topographic maps of the seven-county Twin Cities metropolitan area. The reader is referred to the Hennepin, Ramsey, Dakota, and Scott County geologic atlases and the hydrologic investigations atlas which covers Carver County for more detailed bedrock geology information.

From the western boundary of LMRWD to the west edge of Shakopee, the Minnesota River floodplain follows a buried bedrock valley. The oldest (and deepest) bedrock formation in this valley is the St. Lawrence/Franconia formation, made up of dolomite and sandstone. At Shakopee, this bedrock valley veers to the north side of the Minnesota River floodplain. In the area of Fisher Lake in Shakopee, another bedrock valley intersects from the south and the combined valley follows an easterly path north of LMRWD through Bloomington, crossing into and across LMRWD at the north end of Long Meadow Lake.

The majority of LMRWD is underlain by the subcropping Prairie du Chien group, comprised mainly of dolomite. Outcrops of this bedrock formation can be seen on the bluffs on the south side of the Minnesota River, especially in Scott County and the western edge of Dakota County.

Between the deeper St. Lawrence/Franconia formation and the Prairie du Chien formation is the Jordan Sandstone, which usually follows the buried bedrock valley. The Jordan sandstone also subcrops on the north side of the Minnesota River floodplain in Bloomington.

On the uplands at the very east end of LMRWD are found the shallower St. Peter sandstone and Glenwood/Platteville/Decorah formation subcropping bedrock.

3.4.3 Groundwater

The following county groundwater plans cover the lands within the LMRWD:

- ? The Carver County Ground Water Protection Plan (September 1, 1992)
- ? August, 1996 draft of the Scott County Ground Water Protection Plan]
- ? 1994 Hennepin County Ground Water Plan, approved by BWSR but not adopted by the county
- ? 1992 Dakota County Ground Water Protection Plan

The Ramsey County Ground Water Protection Plan contains similar information but has little impact on LMRWD since Pike Island is the only portion of Ramsey County located within LMRWD. Table 3-2 lists the participation of WMOs in various groundwater implementation programs, as specified in the county groundwater plans.

3.4.3.1 General Groundwater Information

The lower Minnesota River lies within an artesian basin containing glacial sediment and bedrock aquifers with large groundwater reserves. Information on groundwater usage for specific areas within the District is available from the DNR Division of Waters. The DNR requires a permit for the appropriation of surface or groundwater in excess of 10,000 gallons per day, or one million gallons per year. Tables showing the DNR-permitted appropriations are available from the DNR Division of Waters.

The County geologic atlases and groundwater plans present detailed information about the water table and bedrock aquifers, including the potentiometric surface and potential aquifer yield. The potentiometric surface indicates the direction of groundwater flow. Groundwater will flow from the areas of higher potentiometric elevation toward the lower potentiometric elevation. The cut of the Minnesota River Valley has a predominant effect on the potentiometric levels in and near the valley.

Generally, in the LMRWD, groundwater moves toward the Minnesota River and discharges into the river, floodplain lakes, springs and flowing wells, thus providing a high quality water source for the District's surface water resources.

3.4.3.2 Groundwater Quality

The general quality of deeper groundwater aquifers in the District is good and meets drinking water standards. Since most of the residents of the District receive their drinking water from these deeper groundwater supplies and many of LMRWD's water resources are groundwater-fed, protection of groundwater quality is of vital concern.

As District lands continue to develop, the areas with impervious ground cover (pavement and building) will increase. This, in turn, restricts the recharge of the aquifers by infiltration. This potential threat can be abated by use of development design practices which condense impervious areas and provide landscape features (such as ponding and open space areas with flat slopes) which promote infiltration.

Within the District, there are various potential sources of groundwater contamination. Septic tanks, spreading of chemicals and wastes, commercial/industrial sites (hazardous waste spills), and possibly stormwater retention/detention ponds, are all examples of pollution sources which could impair groundwater quality if improperly located or designed. Additional information on environmental hazards located within the District is presented in Section 3.10 of this plan.

Areas with sandy soils and a shallow depth to bedrock are particularly susceptible to groundwater contamination due to the rapid infiltration rate of the soils. An example of such an area would be the land around the city of Shakopee and Blue Lake. At this location, there is less than 50 feet of sand and gravel outwash over the Prairie du Chien aquifer. More information about areas susceptible to groundwater pollution can be obtained from the county geologic atlases and groundwater plans.

Table 3-3 lists activities regulated by various State agencies for groundwater protection.

3.5 Surface Water Resource Data

3.5.1 Public Waters, Ditches, Dams and Control Structures

Figure 3-9 shows the DNR-protected waters, wetlands and streams. There are no public ditches in LMRWD. The DNR did not provide a table of major hydrological characteristics of public waters.

According to the dam listing from the Dams Unit of the DNR, the only dam in LMRWD is the Snelling Lake Outlet at Fort Snelling State Park. Information about lake outlet control structures is listed in Table 3-4.

3.5.1.1 District Streams

Tributary streams flowing to the Minnesota River in the District vary in size from a one square mile watershed area to about 45 square miles. The smaller watershed streams such as Eagle Creek, Assumption Creek, and other unnamed streams are either totally or mostly within the District's boundaries and are groundwater dependent. The larger streams, such as Nine Mile Creek, Credit River, East (Bavaria) Creek, Chaska Creek, Bluff Creek, Purgatory Creek, Riley Creek and Carver Creek, all have origins in watersheds which are outside LMRWD, but they all enter the Minnesota River Valley from the surrounding uplands and flow across a portion of the valley before entering the Minnesota River. Figures 3-10a through 3-10c show the locations of the streams and Table 3-5 provides details about the individual streams. The information in Table 3-5 is taken from an LMRWD water resource inventory (Itasca Engineering, 1969). The inventory includes field observation and DNR information, updated as necessary.

Some of the tributary streams are administered by watershed districts such as Nine Mile Creek, Riley-Purgatory-Bluff Creek, and Prior Lake/Spring Lake; while other streams come under the jurisdiction of joint powers WMOs such as Credit River, Chaska Creek, East (Bavaria) Creek, and Carver Creek.

The DNR identifies the following six streams in LMRWD as trout streams (shown on Figure 3-9 and Figures 3-10a through 3-10c):

- ? Kennaley's Creek
- ? Unnamed Stream #1
- ? Unnamed Stream #4
- ? Unnamed Stream #7
- ? Eagle Creek
- ? Assumption Creek

The DNR is currently focused on Eagle Creek as part of its trout stream initiative. Eagle Creek is managed by the DNR as the Eagle Creek Aquatic Management Area. The DNR owns a 400-foot wide corridor along the west branch of Eagle Creek and is in the process of purchasing a riparian corridor on the east branch. The management plan for Eagle Creek covers the upland areas, riparian areas, and the stream itself.

Eagle Creek and the nearby Savage fen are the subject of an Alternative Urban Areawide Review (AUAR) which provides for the protection of the fen and groundwater resources during development of adjacent lands. Copies of the AUAR Comprehensive Mitigation Plan can be viewed at the Savage City office.

3.5.1.2 District Lakes

The LMRWD 1969 water resources inventory established information about the location, area, shoreline, elevation, depth, water supply, inlets and outlets, general type of lake (floodplain lake, quarry lake, or groundwater table lake) and some of the biota found in those lakes. The locations of the various lakes are shown on Figure 3-9. Table 3-4 gives details on each of the 16 lakes of the District. Most of the LMRWD lakes are located within or adjacent to the Minnesota Valley National Wildlife Refuge, Recreation Area and State Trail. All the LMRWD lakes were found to be in one of the following three categories: floodplain lakes, quarry lakes and a groundwater table lake.

Floodplain lakes are generally shallow. Fish populations experience frequent winterkills. However, these lakes are naturally restocked from annual flooding by the Minnesota River. In addition to the water supplied by flooding, all of the lakes are spring fed, and some have streams which flow through them. The floodplain lakes provide essential habitat for migratory birds, fish, and resident wildlife. The floodplain lakes in the refuge are managed by the U.S. Fish and Wildlife Service to promote the growth of natural wildlife foods and to provide wildlife-oriented recreation opportunities for people.

Courthouse Lake in Chaska is a good example of a quarry lake. These lakes, once a stone or clay quarry, have since filled with groundwater, and now are deep, relatively pure lakes. These lakes occasionally experience flooding by the Minnesota River which can have a degrading effect on water quality through deposition of pollutants carried in the flood waters. Courthouse Lake is a DNR-designated trout lake.

Dean Lake in Shakopee is the only groundwater table lake in the District. This lake is an expression of the groundwater table in the area. It is underlain by a relatively thin layer of porous sand and dammed by a ridge of limestone. Groundwater flows through the lake and the lake's water surface elevation is affected by fluctuations in the groundwater table.

3.5.2 Wetland Information

The LMRWD includes large areas of wetlands. Some of the wetlands are adjacent to floodplain lakes, and some result from springs and low wet areas. Springs arising from limestone aquifers produce a special wetland called a calcareous fen. This rare wetland is identified by the specific vegetative community which is found only in a calcareous fen. MN Rules 7050 identify the following calcareous fens in LMRWD and classify them as "outstanding resource waters":

- Blackdog Preserve fen - Dakota County
- Fort Snelling State Park fen - Dakota County
- Nicols Meadow fen - Dakota County
- Savage fen - Scott County
- Seminary fen - Carver County

The DNR is responsible for protection of the calcareous fens and the DNR has prepared a draft *Savage Fen Resource Plan* for managing the Savage Fen. Although the city of Savage's *Savage Fen Management Plan* is not an official fen management plan, the plan is available for viewing at the Savage city offices.

Figures 3-10a through 3-10c show the National Wetlands Inventory wetlands. More detailed information about wetlands and wetland types can be found by contacting the USFWS and the DNR. Various governmental units such as cities, the DNR, the USFWS, and the US Army Corps of Engineers delineated many of the wetlands within LMRWD. Wetland functions and values may also have been determined. LMRWD has neither delineated wetlands nor determined wetland functions and values within the District. See Section 5.9 for goals and policies regarding the process for defining wetland values, and Section 6 for implementation of the process.

The Hennepin Conservation District is currently conducting an inventory of drained wetlands in the county. This information may be useful in identifying high priority areas.

3.5.3 Stormwater System and Flooding Information

Local water management plans will be required to include maps showing areas served by each existing stormwater system, including stormwater ponds and all stormwater outfalls (see Section 6.5). For specific details of the storm drainage system, the reader is referred to the respective communities for up-to-date information. The following communities currently have local water management plans: Mendota Heights, Lilydale, Eagan, Burnsville, Savage, Shakopee, Eden Prairie, Chanhassen, and Chaska. Bloomington does not have a local water management plan, but does have information about their storm drainage system. Rather than reproduce information already contained in local water management plans, LMRWD adopts by reference these documents.

FEMA Flood Insurance Studies (FIS) are available for all of the communities in LMRWD and are available for viewing at the LMRWD office. Local water management plans show (and will be required to show) information about peak flood elevations and flowrates for existing and proposed ponds. The FEMA flood boundaries in the city of Chaska have changed since completion of the Corps of Engineers flood control project; Figure 3-11 does not show this change. The city of Savage completed a HEC-2 flood profile for Credit River as part of their local water management plan. Table 3-6 lists the status of DNR-approved floodplain ordinance adoption for the local units of government in LMRWD. All but the cities of Mendota and Mendota Heights have adopted DNR-approved floodplain ordinances. Townships in LMRWD are covered by county DNR-approved floodplain ordinances.

Other flood prone areas mentioned in local water management plans are discussed in Section 4.3.1.2. Other flood prone areas may exist that have not been brought to LMRWD's attention.

3.5.3.1 Hydrologic and Hydraulic Modeling of District's Water Resources

The DNR maintains a master list of available HEC-1, HEC-2, and TR-20 computer data files for the state of Minnesota. The DNR's list indicates that models have been developed for the following LMRWD water resources: HEC-2 Model East Chaska Creek, HEC-2 Model Nine Mile Creek, HEC-2 Model Minnesota River (Mouth-Carver), and HEC-2 Model Credit River. The HEC-2 computer model calculates water surface profiles for flow in natural or artificial channels.

Some of the WMOs adjacent to LMRWD may also have developed hydrologic/hydraulic models for their subwatersheds. The LMRWD has not yet obtained specific information on these existing models.

3.5.3.2 Drainage System: Minnesota River

General

The Minnesota River originates at Big Stone Lake on the Minnesota-South Dakota border. From Big Stone Lake, the river flows southeasterly to Mankato before turning northeastward to its confluence with the Mississippi River at St. Paul, a total distance of 330 miles. The river drains an area of approximately 16,900 square miles (see Figure 3-7), including about 1,610 square miles in South Dakota and 323 square miles in Iowa (LMRWD is 64 square miles in area). In Minnesota, the watershed encompasses 37 counties. Approximately 90 percent of the watershed lands are used for agricultural purposes. There is a total of approximately 825 miles of tributary streams, and 2,500 lakes in the Minnesota River Watershed.

The river has a flat, average slope of about 0.84 feet/mile. The width of the river floodplain varies from three quarters of a mile to three miles. Upstream of the Lower Minnesota River Watershed District, the river is a relatively shallow, free-flowing stream. Shortly after the river enters the District, the combined effect of channel dredging and the backwater pool created by the U.S. Army Corps of Engineers (COE) Dam No. 2 on the Mississippi River at Hastings, changes the river's character to a deeper, low-velocity channel maintained for commercial and recreational navigation.

Minnesota River Flows

The USGS monitors the Minnesota River with a continuous water stage recorder located at mile 39.4, 1.5 miles northwest of Jordan (Jordan station). Average discharge for the 1934 to 1980 period of record was 3,402 cubic feet per second (cfs). Calculated on an area basis, the mean flow represents a discharge of 2.85 inches per year over the 16,200-square-mile watershed above Jordan. A maximum discharge of 117,000 cfs occurred at Jordan during the spring flood of 1965; the maximum discharge during the summer flood of 1993 was 92,200 cfs. The maximum discharge at Jordan during the spring flood of 1997 was 82,400 cfs. The minimum recorded discharge occurred in November of 1955 at a flow of 79 cfs.

Maximum Minnesota River flows tend to occur during March and April, following the spring snowmelt. Spring and early summer rains normally maintain relatively high river flows through mid-summer. Average river flows fall off through late summer and fall; the lowest flows occur in late winter in the absence of significant surface runoff.

Figure 3-11 shows the 100-year floodplain for the Minnesota River, taken from available electronic and hard copy versions of the FEMA Flood Insurance Study (FIS). The reader is referred to each community's FIS for other floodplain information. Figure 3-12 is a schematic comparing the Minnesota River normal pool elevation and 100-year flood elevation to the 1965, 1969, 1993 and 1997 floods at the Highway 41 bridge in Chaska.

3.5.4 Water Resources Monitoring

3.5.4.1 Water Quantity Monitoring

Metropolitan Council Environmental Services (MCES) conducts automatic surface water quality sampling at the sites listed in Table 3-7, which includes flow rates. MCES also conducts continuous temperature and bi-weekly flow monitoring on Kennaley's Creek and Harnack Creek. This data can be obtained from the MCES.

A permanent electronic monitoring site on Eagle Creek provides flow data information. The LMRWD, city of Savage, MPCA, and DNR funded the monitoring site installation. The DNR's metro trout stream watershed coordinator should be contacted for more information.

Nine Mile Creek Watershed District conducts monthly monitoring of discharges at two locations very near the LMRWD border; discharges were also monitored continuously for the month of June, 1997 at a monitoring station near the LMRWD border. Monitoring data is available from Nine Mile Creek Watershed District.

Riley Purgatory Bluff Creek Watershed District monitors flows at the LMRWD border on Riley Creek, Purgatory Creek, and Bluff Creek. Discharges are monitored monthly and were also monitored continuously for the month of June, 1997. Monitoring data is available from the watershed district.

3.5.4.2 Water Quality Monitoring

As shown on Table 3-7, MCES monitors the water quality of the Minnesota River at four sites within LMRWD and at Jordan. The Fort Snelling site is an automatic sampling station.

Table 3-7 lists the location of MCES' surface water quality monitoring sites for tributaries of the Minnesota River and the Minnesota River itself. MCES established the Watershed Outlet Monitoring Program (WOMP) in 1995 to gather more data from tributary streams in the Twin Cities metropolitan area. MCES provides seed money to WMOs to establish automatic surface water quality monitoring stations and collect data. Likely future WOMP sites in or near LMRWD include the Prior Lake outlet, Riley Creek, and a Black Dog WMO site.

As part of the monitoring discussed in Section 3.5.4.1, MCES conducts continuous temperature monitoring on Kennaley's Creek and Harnack Creek. This data can be obtained from the MCES.

Limited temperature and biological data have been collected on Eagle Creek by various entities. The DNR's metro trout stream watershed coordinator should be contacted for more information.

As part of Nine Mile Creek and Riley Purgatory Bluff Creek Watershed Districts' monitoring program discussed in the previous section, various water quality parameters are being measured. More information about the monitoring parameters and data are available from those watershed districts.

The following studies have been completed on the water quality of various LMRWD lakes:

- Norman Chemical Company's Base Line Hydrological Study, 1979-1980.
- The Environmental Contaminant's Evaluation Program of USFWS completed a survey of potential contaminants in fish and sediments on the Minnesota Valley National Wildlife Refuge Lakes in June 1980.
- Contaminant Study, Stan Smith, USFWS St. Paul Field Office, July 1985.
- Blue Lake Watershed Study, USFWS, May 1988.

The USFWS summarized the findings of the first three studies (as they pertain to each Minnesota Valley National Wildlife Refuge lake) in brief, unpublished reports. These reports summarized the available water quality information for each lake, as well as the findings of each study, and are available at either the watershed district office or the USFWS.

3.5.4.2.1 Stream Water Quality

Although there are no major streams tributary to the Minnesota River's reach through the District, there are a number of small tributaries which can collectively become important sources of pollutant loading to the District's water resources (mainly the Minnesota River) during significant storm events. Surface water runoff collected by these tributaries can carry high concentrations of suspended solids, oxygen-demanding materials, nutrients, pesticides and heavy metals from nonpoint sources within the drainage area of the streams into the water resources of the District (MPCA, 1985).

The Minnesota Legislature charged the Metropolitan Council with defining "target watershed loads" for all watersheds in the metropolitan area. Since there was initially very little data to work with, MCES began the WOMP mentioned in Section 3.5.4.2 to begin collecting data. Target watershed loads will be set based on the information collected through WOMP and other sampling programs.

3.5.4.2.2 Lake Water Quality

The USFWS May 1988 Blue Lake Watershed Study identified problems and concerns for waterbodies in the Minnesota Valley National Wildlife Refuge. Many of these concerns also apply to the other lakes and wetlands in the LMRWD. A contaminant study of Long Meadow Lake was completed as part of the Blue Lake Watershed Study. The results of the studies are discussed in Section 4.2.4 of the plan.

The Metropolitan Council's *A 1997 Study of the Water Quality of 71 Metropolitan Area Lakes* provides water quality data for Courthouse Lake, which was monitored in 1997 as part of MCES' Citizen Assisted Monitoring Program (CAMP). Monitoring data was collected from early March to late October. The data show Courthouse Lake to have very low concentrations of total phosphorus and chlorophyll, but poor Secchi disc transparencies. The only other data available for Courthouse Lake is from 1996. The Metropolitan Council's *1996 Study of the Water Quality in 66 Metropolitan Area Lakes (1997)* shows that two samples were taken from Courthouse Lake in 1996, but no data is given. The data is available from MCES. No other lake water quality data is available for lakes in LMRWD.

3.5.5 Shoreland Ordinances

Table 3-8 lists the status of DNR-approved shoreland ordinance adoption for each community in LMRWD. Shoreland ordinances vary according to the shoreland classification for the particular water body. The DNR's classifications are: natural environment, recreational development, and general development. The DNR's shoreland regulations (i.e., setbacks) are strictest for natural environment water bodies and least strict for general development water bodies. Table 3-4 shows the DNR's shoreland classifications.

3.5.6 DNR-Permitted Surface Water Appropriations

Table 3-9 lists the DNR-permitted surface water appropriations within LMRWD and the permitted appropriation amount. Tables showing the DNR-permitted appropriations by county for both groundwater and surface water are available from the DNR Division of Waters.

3.6 Water-Based Recreation Areas and Land Ownership

Figure 3-13 shows the location of all existing local, regional, state, and federal parks, preserves, wildlife areas, recreational areas, canoe routes, and water accesses for public use.

3.6.1 Minnesota Valley National Wildlife Refuge, Recreation Area and State Trail

The Minnesota Valley National Wildlife Refuge, Recreation Area and State Trail (shown on Figure 3-13) was established as a result of efforts of local citizen groups to protect the Lower Minnesota River Valley. The Minnesota Valley Trail was authorized by the state legislature in 1969. Federal legislation entitled “The Minnesota Valley National Wildlife Refuge Act of 1976” declared that the policy of the Congress would be to preserve the Minnesota River Valley and, as a federal action, establish the 9,500 acre Minnesota Valley National Wildlife Refuge and an adjacent 8,000 acre wildlife recreation area.

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

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

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

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

3.7 Fish & Wildlife Habitat

The DNR no longer places lakes and streams into ecological and management classifications (i.e. “centrachid”, etc.); therefore the information is not available for this plan. Some lakes have a DNR ecological classification—these are shown in Section 5. Table 3-10 lists information provided by the DNR regarding management plans and surveys for DNR-protected waters in LMRWD.

3.7.1 Wildlife

The Lower Minnesota River Valley is an area that supports the critical needs of a large number of wildlife species. Bird clubs have recorded approximately 275 species of birds in the area during migration. There are approximately 50 species of mammals and many species of amphibians and reptiles. The lakes, streams, and rivers of the District are inhabited by carp, buffalo head, bullhead, shad drum, catfish, dogfish, gar, shiner, northern pike, walleye, trout and sunfish. Many of these species of fish are available in abundant numbers and provide excellent fishing opportunities. However, before eating these, persons should consult the Minnesota Department of Health for health warnings on consumption of fish taken from the Lower Minnesota River. Prior to completion of the Minnesota Valley (National Wildlife Refuge) Comprehensive Plan, a detailed wildlife inventory (Technical Appendix III, Wildlife Inventory) was completed for the valley.

The following are findings of the resource analysis on wildlife presented in the Minnesota Valley Comprehensive Plan, and would apply to all wildlife located in the LMRWD:

- ? The diverse floodplain habitats support a large number of birds during migration. The valley provides abundant food reserves and a shelterbelt along the migratory path. Production of birds and mammals during the summer also is excellent. The diverse habitats and relative isolation of the valley within an urban setting result in approximately 100 species of birds nesting in the valley.
- ? The area provides critical winter shelter for deer populations. Furbearer production, especially muskrat, is high. Wildlife needs are met in spite of nearby urban impacts. However, conversion of floodplain environments for agricultural, commercial, and industrial uses is destroying traditional wildlife habitat. Yet, the floodplain of the river remains basically intact. The encroachment of farming into the floodplain negatively impacts wildlife diversity. Although these types of activities fulfill important human needs, they have been detrimental to wildlife habitat.
- ? Outside influences impact the quality of habitat in the valley more subtly. Such influences include PCB contamination of fish and accelerated aging of the floodplain lakes. Fire suppression is another subtle human influence altering habitat diversity. One study found that fire suppression resulted in the virtual cessation of breeding activities by grassland-prairie savanna bird species in the valley.

3.8 Land Use and Public Utility Services

The Lower Minnesota River Watershed District is located in the midst of the Twin Cities metropolitan area, which continues to grow around St. Paul and Minneapolis. This location, coupled with commercial and recreational opportunities provided by the nine-foot navigation channel and the recently completed Highway 169 bridge, make the lands of the LMRWD highly desirable for residential, commercial, and industrial development.

Figure 3-14 shows the existing land use of the District and the boundary of the Metropolitan Urban Services Area (MUSA). Areas within the MUSA currently have sanitary sewer facilities or are planned to have sanitary sewer facilities in the future. Lands outside the MUSA boundary will be served by individual waste disposal systems. The lands located within the MUSA boundary will develop more quickly and to a greater density than lands located outside the MUSA boundary. The reader is referred to the appropriate city or county comprehensive plan for specific information

about future anticipated land use. The further development of lands in the District could have a serious adverse affect on the wildlife, water resources and other concerns of the District. However, if the projects are sited properly and the resources are adequately protected, these concerns may be alleviated.

In addition to the residential, commercial and industrial areas, the District contains some agricultural lands and a large amount of open space area. The open space lands are mostly located in and along the floodplain of the Minnesota River. These open space areas consist almost entirely of public lands (see Figure 3-13), which are administered as follows:

1. Federal—U.S. Fish and Wildlife Service (Minnesota Valley National Wildlife Refuge).
2. State—Minnesota Department of Natural Resources (Minnesota Valley State Trail, Fort Snelling State Park).
3. Local—Counties and Municipalities (Local Parks and Open Space).

In order to provide metropolitan system services (transportation, sanitary sewer, storm sewer and other utilities) a complex infrastructure has been built throughout the District. As with other development, infrastructure development projects must be sited properly and adequate protection provided to minimize any adverse effects the projects may have on the resources of the LMRWD.

3.9 Navigation

Navigation was the prime mover for the establishment of the District. The Minnesota River is navigable from its confluence with the Mississippi River to the Carver Rapids, just above the city of Carver. The effect of the Hastings Dam, located on the Mississippi River at Hastings, Minnesota, on the Minnesota River extends as far as the Carver Rapids. The Carver Rapids are just upstream of the most westerly boundary of the District. The water surface of the Minnesota River within the District is controlled by the Hastings Dam.

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

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

The COE, with the District's local cooperation, finished installation of the 100 foot wide, nine foot deep, permanently maintained navigation channel in August of 1968, at a cost of about \$2,000,000, or about \$136,000 per mile. The resultant dredged materials were placed on temporary disposal sites.

Maintenance of this channel is accomplished by cooperative agreement between the District and the COE. Periodic dredging is required to maintain the navigation channel. Sites most frequently dredged by the COE are located between river mile 1 and 2 near Pike Island, between river mile 4 and 5, and between river mile 12 and 13. Private interests extended the navigation channel upstream to river mile 21.8 near Port Peavy in Shakopee. This channel has since been abandoned.

In 1978, the city of Savage petitioned LMRWD to acquire and develop permanent sites for the disposal of dredged materials resulting from maintenance of the nine foot channel (Itasca Engineering, 1979). The LMRWD Managers accepted the petition and ordered preparation of an engineer's report. The engineer's report (Itasca Engineering, 1979) recommended acquisition and development of six permanent disposal sites. The site recommendations took into account the recommendations of the GREAT Team established by the Upper Mississippi River Basin Commission. Figure 3-15 shows the dredge material disposal sites. LMRWD held a public hearing and the LMRWD Managers ordered the project in 1979. LMRWD has easements on Sites 1, 2, and 3 and through its cooperative agreement with the COE, the COE places dredge materials on these sites. LMRWD seeks to obtain easements on the remaining three sites (Sites 4, 5, and 6) or a replacement site(s).

Both private pleasure craft and commercial traffic navigate the Lower Minnesota River. Commercial barge traffic dominates, traveling the entire 14.7 miles upstream from the mouth to the head of the nine foot navigation channel at Continental Grain Co. in Savage. Generally, tows on the Minnesota River consist of one power unit and two to four barges. The major commodity transported on the river is bulk grain or grain products, shipped from five storage and loading terminals operated by Peavy, Continental, GTA, Bunge, and Cargill grain companies. Other commercial terminals handle petroleum products (Richards Oil Co.), salt (U.S. Salt Co.), and coal (Northern States Power Co.). Figure 3-15 shows the barge loading sites. These shippers draw from an approximate 250 mile radius. This area includes eastern South Dakota, including Sioux Falls, Mitchell and Aberdeen; southeastern North Dakota, including Fargo; all of Minnesota; the western two thirds of Wisconsin; and the northern two thirds of Iowa, including Des Moines and Sioux City. The area of this drawing circle is roughly 200,000 square miles. From 1980 to 1997, the number of barge load outs on the Minnesota River has ranged from 1,700 to 4,400, with the average being 2,900. Each barge carries approximately 50,000 bushels, the equivalent of 55 large semi truck loads. This means barges carry an average of 145,000,000 bushels each year on the Minnesota River, or the equivalent of nearly 160,000 semi truck loads.

The above discussion shows water-borne freight traffic is one of the District's greatest commercial assets, and of great importance to the local economy as well as to the State's commerce.

3.10 Unique Features & Scenic Areas

The combination of the Minnesota River, the floodplain and the river bluffs result in a high occurrence of rare and endangered species, unique features and scenic areas in the LMRWD. According to the Natural Heritage Information System, maintained by the DNR's Natural Heritage and Nongame Research Program, there are 213 known occurrences of rare species and natural communities within LMRWD. The two federally listed endangered species on the list are peregrine falcon and higgins eye mussel. In addition to various mussel species, there are other state listed endangered species on the list including western prairie fringed orchid, henslow's sparrow, and eared false foxglove. Two priority natural community types listed as occurring in the LMRWD include calcareous fens and mesic prairies. Numerous state and federal threatened species, species

of special concern, other rare species and notable natural communities (such as Boiling Springs) are listed. The DNR requested that LMRWD not show the unique features and scenic areas on a map. Instead, a copy of the printout showing all of the occurrences is included in Appendix A.

3.11 Pollutant Sources

3.11.1 Known Closed and Open Sanitary Landfills, Closed and Operating Open Dumps and Hazardous Waste Sites (Per Mn 115a/115b), and a Summary of Available Water Quality Information

3.11.1.1 Environmental Hazards

The Minnesota Pollution Control Agency (MPCA), in conjunction with the Environmental Protection Agency (EPA), maintains the following seven lists which provide information on verified or potential hazardous waste sites in the State of Minnesota:

1. EPA—National Priorities List (NPL).
2. EPA—Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS).
3. MPCA—Permanent List of Priorities (PLP).
4. MPCA—Regulatory Compliance, Hazardous Waste Enforcement Log.
5. MPCA—List of Permitted Solid Waste Facilities.
6. MPCA—Hazardous Waste Permit Unit Project Identification List.
7. MPCA—Open Dump Inventory Maps.

A search by MPCA through the first three lists (NPL, CERCLIS, and PLP) identified the following hazardous waste sites located in or near LMRWD:

1. Twin Cities Air Force Reserve Base, northeast of Highway 5 and I-494, Fort Snelling State Park, Minnesota (Lists 1-3).
2. Freeway Sanitary Landfill, 113th Street West and I-35W, Burnsville, Minnesota (Lists 1-3).
3. LCS Company, 1 486 Sibley Memorial Highway, Mendota Heights, Minnesota (List 2).
4. Old Freeway Dump, east of I-35W and one-quarter mile north of 121st Street West, Burnsville, Minnesota (List 2).
5. Burnsville Sanitary Landfill, NE ¼ Section 32, T27N, R24W, Burnsville, Minnesota (Lists 2-3).
6. Richards Oil Company, Yosemite Avenue (Port Richards), Savage, Minnesota (List 2).
7. PCI, Incorporated, one quarter mile west of County Road 89 and south of Highway 13, Shakopee, Minnesota (Lists 2-3).

8. Flying Cloud Sanitary Landfill, 9813 Flying Cloud Drives Eden Prairie, Minnesota (Lists 2-3).
9. Ashland Chemical Company, 4401 Valley Industrial Boulevard, Shakopee, Minnesota (List 2).
10. Fremont Industries, Incorporated, 4400 Valley Industrial Boulevard North, Shakopee, Minnesota (List 2).
11. Shakopee Dump, northeast of Highway 101 and Indian Road, Shakopee, Minnesota (List 2).

Information on hazardous waste sites contained in the remaining four lists is best obtained from the MPCA on a site specific basis (development project or community).

All commercial and industrial sites which handle hazardous materials, i.e. store solvents, crankcase oil, corrosives, fuels, etc., have to be considered potential environmental hazard areas.

3.11.2 Feedlots, Abandoned Wells (MDH), Registered Above and Underground Storage Tanks, Permitted Wastewater Discharges, and a Summary of Available Water Quality Information

The county groundwater plans either include an inventory of or plan to inventory registered feedlots, and plan to inventory currently unregistered feedlots. Similarly, each county has an estimate of the number of abandoned wells in the county, but they have not all been inventoried. Each plan calls for developing an abandoned well inventory. Each county also knows the number of registered underground storage tanks but many plans call for implementing an inventory program for new storage tanks. Each county plan also contains at least some groundwater quality information. None of the county ground water plans lists permitted wastewater discharges. NPDES wastewater permit information can be obtained from the MPCA.

The three wastewater treatment plants: Seneca, Blue Lake and Chaska (soon to be closed), along with the associated sanitary sewer lines, urban storm sewer discharges, and various utility lines, also present potential environmental hazards within the LMRWD.

Table 3-1. Precipitation Summary - Minneapolis/St. Paul Airport Station

Averages: 1961-1990 Extremes: 1891-1996

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

Table 3-2. WMO Participation in Groundwater Planning/Issues as Specified by County Groundwater Plans

Goal/Policy	WMO Participation (specified by county)			
	Scott	Dakota	Carver	Hennepin
Fertilizer/Pesticide Use				
Annual well testing for pesticides	X	X		
Increased monitoring at pesticide spill sites and known areas of groundwater contamination		X		
Education program regarding fertilizer and pesticide use			X— recommended	
Public water suppliers develop water conservation plan		X		
Prepare maps for extension service, etc. showing irrigation rates relative to soil types		X		
Irrigation education program/schedule	X			
Education program regarding sprinkling/water conservation	X			
Better accounting system regarding water use	X			
Underground Storage Tanks (USTs)				
Consider groundwater sensitivity when siting	X			
Inventory USTs < 1,100 gal.	X	X		
ID tanks that are a risk to groundwater—require action	X	X	X At time of development/ redevelopment— remove leaking tanks	
Unused USTs near irrigation wells be removed		X		
County ordinance regarding construction/abandonment of USTs		X		
Permits for storing petroleum or other health-hazardous products		X		
Maintenance fee for unused USTs		X		
Dumps/Landfills				
Inventory present/past dumps	X	X		
Determine if more monitoring is needed at dumps	X	X		
If problems, ID sites that can be placed on Superfund list		X		
Need action plan if monitoring is deemed necessary	X			
Inventory present/past mini-dumps	X	X		

Table 3-2 (cont). WMO Participation in Groundwater Planning/Issues as Specified by County Groundwater Plans

Goal/Policy	WMO Participation (specified by county)			
	Scott	Dakota	Carver	Hennepin
Evaluate mini-dumps/prioritize	X			
Remediate as needed. Take appropriate action	X	X		
Salvage Yards				
Inventory	X			
Determine if increased monitoring needed at salvage yards	X (require remediation if needed)	X		
County permit program	X			
Use groundwater sensitivity map	X			
Mining				
Determine if existing/abandoned sites used as dumps	X	X		
Petroleum/hazardous product storage—develop standards	X	X		
Provisions for reclamation plans regarding prevention of stormwater runoff routing into mines	X	X		
No mining below water table unless surface water routed away	X			
Highway Department Issues				
BMPs implemented on all road salt stockpiles		X		
Water used to rinse out salt trucks disposed through sewers		X		
Chloride testing pilot project		X		
Appropriate use of herbicides along roads		X		
Hazardous Materials Handling/Transportation				
Pressure indicators/auto shutoff valves on oil/gas pipelines		X		
Pipeline operators inform city of disposal of materials used to clean inside of pipelines	X (GW sensitivity map)	X		
Determine if monitoring wells needed at railyards, etc.	X	X		
Computerize inventory of hazardous material locations	X	X		
Pipeline material requirements/secondary containment	X			
Educate fire departments/emergency spill handlers	X			
Land Application of Wastes				
Map of areas where waste is/was applied		X		
Program for waste application		X		
Ordinance for waste application		X		

Table 3-2 (cont). WMO Participation in Groundwater Planning/Issues as Specified by County Groundwater Plans

Goal/Policy	WMO Participation (specified by county)			
	Scott	Dakota	Carver	Hennepin
Wellhead Protection				
Investigate development of groundwater protection ordinance		X		
Amend comprehensive plans to reflect new soil/geological information and incorporate sensitive areas		X		
ID wetlands significant to groundwater recharge		X		
Locate disappearing streams/wetlands; implement specific protection measures		X		
Inventory sinkholes		X		
County/WMO review of wellhead protection plans		X		
Develop water level/quality monitoring plans in wellhead protection areas		X		
WMOs assist small communities in developing wellhead protection plans		X		
WMOs/agents review/comment on industrial/ commercial development plans		X		
Conform to and utilize rules (MDH) when developing wellhead protection plans—Scott County to develop ordinance	X			
Use sensitivity map when developing wellhead protection plan	X			
County develop plan for development of new wells	X			
Public Sewer Systems				
Education program describing household materials that can weaken sewer pipes or cannot be treated in wastewater treatment systems		X		
Adjoining Communities				
ID areas in adjacent counties where land use can affect groundwater quality in county and vice versa		X		
Require potential contaminant source inventories from other counties		X		
Dispute resolution process regarding water resource issues		X		
Stormwater				
Water quality and design standards for replacing wetlands and other ponds		X		
ID stormwater ponds, etc. located in geologically sensitive areas; require BMPs/modifications		X		
WMO's use groundwater sensitivity map to ID regional stormwater ponds	X			
Stormwater reuse (i.e., irrigation of lawns)	X			
Wetlands for flood storage only, not for water quality treatment	X			
WMOs complete wetland inventories	X			

Table 3-2 (cont). WMO Participation in Groundwater Planning/Issues as Specified by County Groundwater Plans

Goal/Policy	WMO Participation (specified by county)			
	Scott	Dakota	Carver	Hennepin
Water Supply				
Public water suppliers develop water conservation plan		X		
Cooperate with MPCA regarding water quality monitoring well program in county	X			
Cooperate with other govt. agencies to develop (GW?) quality education program	X			
Investigate appropriate use of "low quality" waters (i.e., Minnesota River)	X			
Education				
Environmental programs		X		
Environmental annual exposition		X		
Data Collection				
WMO will assist county in developing program to delineate nature/extent of groundwater problem that crosses municipal/county boundaries		X		
Observation well water levels – seasonal checks		X		
Determine location/need for more observation wells		X		
Establish revolving fund to pay for water quality site investigations		X		
Digitize WMO boundaries	X			
Data exchange programs	X			
County standards for data collection	X			
Public, Private & Abandoned Wells				
Abandoned well inventory	X		X	
Prioritize groundwater contamination for each well	X		X	
Apply for well sealing grants	X			
ID industrial private wells		X		
Overall Nonspecific Requirements:	<p style="text-align: center;">Hennepin County: Amend watershed plan for consistency with Hennepin County groundwater plan requirements. Encourage cities to fulfill plan purposes. Forward local plans to Hennepin Conservation District and Hennepin County for review. ID properties owned by WMO that may cause groundwater contamination. Similar recommendations as other county groundwater plans, but no responsibility or participation delegated to WMOs.</p>			

Table 3-3. Regulation of Activities for Groundwater Protection

	Activity	MPCA	MDH	MnDNR	Local
A.	Disposal of solid wastes	X			(X)
B.	Installation, operation, and maintenance of individual sewage systems	X			(X)
D.	Disposal of wastes or surplus waters in wells or sumps	X	X		
E.	Construction and abandonment of water wells		X		(X)
F.	Construction, operation, and abandonment of oil and gas wells			X	
G.	Drilling and abandonment of exploratory holes		X		
H.	Spreading, disposal, and storage on land of substances that may cause groundwater pollution, including placement in holding structures	X			
I.	Discharge of pollution substances into water and air	X			
J.	Mining, quarrying, and other excavating activities			X	(X?)
K.	Handling and storage of liquids, including installation and operation of tanks, pipelines, and sewers	Authority but no rule			
L.	Irrigation	X		X	
M.	Artificial recharge	X			
N.	Management of groundwater levels and pumping rates	X		X	
O.	Storage of solids, liquids, and gases underground	X		X	
P.	Adoption of zoning and building ordinances and regulations				X
Q.	Reporting and cleanup of accidental spills	X			

() Possible local authority

Source: "Ground Water in Minnesota: A User's Guide to Understanding Minnesota's Ground Water Resource," Minnesota Pollution Control Agency and Minnesota State Planning Agency, January 1984.

Table 3-4. Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

SNELLING LAKE

DNR No.	27-1P (Hennepin County)
LMRWD Water Resource Classification:	Floodplain/Level I
Location:	Sections 28, 29 and 32, T28N, R23W, Fort Snelling, Hennepin County; east of Minneapolis-St. Paul International Airport, and south of Fort Snelling.
Area:	111 and 8 acres (to parts totaling 119 acres).
Shoreline Length:	8,600 feet; 1-3/5 miles (main body).
Shoreline Type:	*
DNR Shoreland Class:	None
Approx. Elevation:	693 MSLD
DNR OHW:	--
Depth:	12.0 foot estimate (max.); 6.0 foot (average).
Water Supply:	Mainly natural springs, little surface drainage.
Inlet:	Below water surface, except for adjacent drainage.
Outlet:	Stream 2.
Special Notes:	Floodplain lake.

* Lakeshore and outlet developed by Fort Snelling State Park (MnDNR).

LONG MEADOW LAKE and MARSH

DNR No.	27-2P (Hennepin County)
LMRWD Water Resource Classification:	Floodplain/Level IV
Location:	Sections 5, 6, 7 and 18, T27N, R23W, and Sections 12, 13, 14, and 23, T27N, R24W, Bloomington, Hennepin County; north of Minnesota River in floodplain beginning south of Minneapolis-St. Paul International Airport and extending southwest to the extension of Portland Avenue.
Area:	1,188 acres; 1.85 square miles.
Shoreline Length:	49,600 feet; 9.4 miles.
Shoreline Type:	Flat with typical marsh vegetation.

Table 3-4 (cont). Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

DNR Shoreland Class:	Natural Environment
Approx. Elevation:	696 MSLD
DNR OHW:	695.5
Depth:	3.5 foot (maximum); 1.0 foot estimate (average).
Water Supply:	Natural springs and a minor amount of drainage from the bluffs to the north and the area between Long Meadow Lake and the Minnesota River.
Inlet:	Numerous springs along bluffs and drainageways to top of bluffs.
Outlet:	Little's Creek (Stream 2).
Special Notes:	Floodplain lake, wildlife area, essentially a marsh with relatively little open water.

COLEMAN LAKE and MARSH (Nine Mile Lake)

DNR No.	27-13P (Hennepin County)
LMRWD Water Resource Classification:	Floodplain/Level IV
Location:	Sections 29, 30 and 31, T27N, R24W, Bloomington, Hennepin County; north of the Minnesota River from the extension of Penn Avenue west to ? mile east of the extension of Normandale Boulevard.
Area:	114 acres.
Shoreline Length:	10,600 feet; 2 miles.
Shoreline Type:	Flat, marshy.
DNR Shoreland Class:	Natural Environment
Approx. Elevation:	690 to 693 MSLD
DNR OHW:	--
Depth:	3.5 feet (maximum); 1.0 foot or less (average).
Water Supply:	Nine Mile Creek drainage, seepage and springs in Section 30.
Inlet:	Nine Mile Creek and springs.
Outlet:	Nine Mile Creek (Stream 19).
Special Notes:	Floodplain lake with sediment deposition.

GRASS LAKE and MARSH

Table 3-4 (cont). Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

DNR No.	27-80P (Hennepin County)
LMRWD Water Resource Classification:	Floodplain/Level IV
Location:	Sections 32, 33 and 34, T116N, R22W, Eden Prairie, Hennepin County; directly south of Flying Cloud Airport in the Minnesota River floodplain.
Area:	467 acres.
Shoreline Length:	26,000 feet; 4.9 miles.
Shoreline Type:	Flat, marshy.
DNR Shoreland Class:	Natural Environment
Approx. Elevation:	697 MSLD.
DNR OHW:	697.1
Depth:	3.5 feet (maximum); 1.5 feet (average).
Water Supply:	Riley Creek drainage, seepage and natural springs.
Inlet:	Riley Creek and springs.
Outlet:	Riley Creek (Stream 32).
Special Notes:	Floodplain lake and marsh.

RICE LAKE and MARSH:

DNR No.	27-132P (Hennepin County)
LMRWD Water Resource Classification:	Floodplain/Level IV
Location:	Sections 31 and 32, T116N, R22W, Eden Prairie, Hennepin County, and Section 36, T116N, R23W, Chanhassen, Carver County; south of Highway 212 and north of Shakopee and the Minnesota River.
Area:	517 acres.
Shoreline Length:	30,600 feet; 5.8 miles.
Shoreline Type:	Flat, marshy.
DNR Shoreland Class:	Natural Environment
Approx. Elevation:	698 MSLD.
DNR OHW:	699.2
Depth:	3.0 feet (maximum); 1.0 feet (average).
Water Supply:	Surface drainage and springs.

Table 3-4 (cont). Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Inlet: Bluff Creek, springs and intermittent surface drainage.
 Outlet: Bluff Creek (Stream 33).
 Special Notes: Floodplain lake and marsh.

COURTHOUSE LAKE

DNR No. 10-5P (Carver County)
 LMRWD Water Resource Classification: Unique Resource (Trout Lake)/Level I
 Location: Section 9, T115N, R23W, Chaska, Carver County; east of Carver County Courthouse in Chaska.
 Area: 12 acres.
 Shoreline Length: 3,000 feet; 0.5 miles.
 Shoreline Type: Sharp, steep, grassy on west side, wooded on east side.
 DNR Shoreland Class: Natural Environment
 Approx. Elevation: 705 estimate MSLD.
 DNR OHW: 708.8
 Depth: Unknown.
 Water Supply: Springs.
 Inlet: Underground springs.
 Outlet: Unknown.
 Special Notes: DNR-designated trout lake. Originally a clay quarry, natural springs have filled the cavity and created a deep, clean, clear lake.

LAKE (Cy Ess)

DNR No. 10-225W (Carver County)
 LMRWD Water Resource Classification: Upland/Level I
 Location: Section 4, T115N, R23W, Chaska, Carver County; north of old Chaska Village at the base of the bluff, NNE of intersection of Highways 41 and 212 in Chaska.
 Area: 11 acres.
 Shoreline Length: 3,300 feet; 0.6 miles.
 Shoreline Type: Sharp, steep.

Table 3-4 (cont). Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

DNR Shoreland Class:	None
Approx. Elevation:	733 estimate MSLD.
DNR OHW:	—
Depth:	Unknown.
Water Supply:	Springs.
Inlet:	Springs.
Outlet:	Unknown.
Special Notes:	Originally a clay quarry, natural springs have filled the cavity and created a clear lake.

CHASKA LAKE and MARSH

DNR No.	10-4P (Carver County)
LMRWD Water Resource Classification:	Floodplain/Level IV
Location:	Sections 8 and 17, T115N, R23W, Chaska, Carver County: southwest of the Highway 41 bridge crossing the Minnesota River.
Area:	46 acres.
Shoreline Length:	6,300 feet; 1.2 miles.
Shoreline Type:	Flat, marshy.
DNR Shoreland Class:	Natural Environment
Approx. Elevation:	705 estimate MSLD.
DNR OHW:	702.4
Depth:	3.5 estimate (maximum); 1.5 feet estimate (average).
Water Supply:	Springs.
Inlet:	None (possibly overflow from West Chaska Creek).
Outlet:	No direct outlet, overflow relief probably to West Chaska Creek (Stream 41).
Special Notes:	Floodplain lake and marsh.

GIFFORD LAKE

DNR No.	70-118 (Scott County)
---------	-----------------------

Table 3-4 (cont). Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

LMRWD Water Resource Classification:	Floodplain/Level III/IV
Location:	Sections 16, 17, 20 and 21, T115N, R23W, Louisville Township, Scott County; west of the intersection of Highways 41 and 169.
Area:	116 acres.
Shoreline Length:	16,000 feet; 3.0 miles.
Shoreline Type:	Flat, marshy on west end, eastern half is fairly sharp and well-defined.
DNR Shoreland Class:	None
Approx. Elevation:	699 MSLD.
DNR OHW:	—
Depth:	Unknown.
Water Supply:	Springs and intermittent surface drainage from terrace to the southwest.
Inlet:	Natural springs and local surface drainage.
Outlet:	Stream 43.
Special Notes:	Partially a floodplain lake marsh, although eastern portion appears to have been either a quarry or an old channel of the Minnesota River.

NYSSSENS LAKE (series of three lakes and marsh areas)

DNR No.	70-116 and 70-117 (Scott County)
LMRWD Water Resource Classification:	Floodplain/Level III/IV
Location:	Sections 2, 3, 10 and 11, T115N, R23W, Jackson Township, Scott County; one mile west of Shakopee south of the Minnesota River.
Area:	185 acres.
Shoreline Length:	14,000 feet; 2.6 miles.
DNR Shoreland Class:	None
Approx. Elevation:	700 estimate MSLD.
DNR OHW:	—
Depth:	4.0 feet estimate (maximum); 1.0 feet estimate (average).
Water Supply:	Spring, seepage and a small amount of local drainage.

Table 3-4 (cont). Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Inlet: Natural spring and drainage.
 Outlet: Stream 38.
 Special Notes: Series of three lakes, two are marshy. The third (southernmost) may be an abandoned quarry or gravel pit.

DEAN LAKE

DNR No. 70-74 (Scott County)
 LMRWD Water Resource Classification: Upland/Level III
 Location: Sections 10, 11, 14 and 15, T115N, R22W, Shakopee, Scott County: north of County Road 16.
 Area: 216 acres.
 Shoreline Length: 16,800 feet; 3.2 miles.
 Shoreline Type: Flat, marshy.
 DNR Shoreland Class: Natural Environment
 Approx. Elevation: 746 MSLD.
 DNR OHW: 747.0
 Depth: 5.0 feet estimate (maximum); 3.0 feet estimate (average).
 Water Supply: Seepage, natural springs and intermittent surface drainage from terraces and bluffs to the south.
 Inlet: Springs and surface drainage (intermittent unnamed creek to the southeast).
 Outlet: Infiltration to the ground.
 Special Notes: Spring fed perched lake, an expression of the local groundwater table.

BLUE LAKE and MARSH

DNR No. 70-88 (Scott County)
 LMRWD Water Resource Classification: Floodplain/Level IV
 Location: Section 35, T116N, R22W, and Sections 2 and 3, T115N, R22W, Shakopee, Scott County; in the floodplain south of the Minnesota River.
 Area: 203 acres.

Table 3-4 (cont). Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Shoreline Length:	14,000 feet; 2.6 miles.
Shoreline Type:	Flat, marshy.
DNR Shoreland Class:	Natural Environment
Approx. Elevation:	696 MSLD.
DNR OHW:	—
Depth:	3.0 feet (maximum); 1.5 feet estimate (average).
Water Supply:	Springs and seepage.
Inlet:	Natural springs, seepage and intermittent drainage from the south across Highway 101.
Outlet:	Creek to Fisher Lake.
Special Notes:	Floodplain lake with surrounding marsh.

FISHER LAKE and MARSH

DNR No.	70-87 (Scott County)
LMRWD Water Resource Classification:	Floodplain/Level IV
Location:	Sections 1 and 2, T115N, R22W, Shakopee, Scott County; in the floodplain south of the Minnesota River.
Area:	284 acres.
Shoreline Length:	15,000 feet; 2.8 miles.
Shoreline Type:	Flat, marshy.
DNR Shoreland Class:	Natural Environment
Approx. Elevation:	696 MSLD.
DNR OHW:	—
Depth:	3.0 feet (maximum); 1.0 feet average.
Water Supply:	Drainage from Blue Lake, natural springs, seepage and a minor amount of local drainage.
Inlet:	Creek from Blue Lake.
Outlet:	Stream 26.
Special Notes:	Floodplain lake and marsh.

RICE LAKE and MARSH

Table 3-4 (cont). Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

DNR No.	70-25 (Scott County)
LMRWD Water Resource Classification:	Floodplain/Level IV
Location:	Sections 6 and 7, T115N, R21W, Savage, Scott County; in the floodplain south of the Minnesota River.
Area:	259 acres.
Shoreline Length:	16,000 feet; 3.0 miles.
Shoreline Type:	Flat, marshy.
DNR Shoreland Class:	Natural Environment
Approx. Elevation:	696 MSLD.
DNR OHW:	—
Depth:	3.0 feet (maximum); 1.0 feet (average).
Water Supply:	Natural springs, seepage and some local drainage.
Inlet:	Springs, seepage.
Outlet:	Into Eagle Creek at its confluence with the Minnesota River (see Stream 24).
Special Notes:	Floodplain lake and surrounding marsh.

BLACK DOG LAKE and MARSH

DNR No.	19-83 (Dakota County)
LMRWD Water Resource Classification:	Floodplain/Level IV
Location:	Sections 13, 23, 24, 26, 27 and 28, T27N, R24W, Burnsville, Dakota County; between Cedar Avenue and I-35W in the floodplain south of the Minnesota River.
Area:	391 acres.
Shoreline Length:	40,800 feet; 7.8 miles.
Shoreline Type:	Flat, marshy.
DNR Shoreland Class:	General Development
Approx. Elevation:	694 MSLD.
DNR OHW:	—
Depth:	3.0–4.0 feet estimate (maximum); 1.5 feet estimate (average).

Table 3-4 (cont). Details of Individual Lakes of the District (See Figures 3-9 and 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Water Supply:	Springs, seepage and intermittent drainage from the bluffs to the south (see Special Notes).
Inlet:	Springs, seepage and intermittent streams.
Outlet:	Controlled by a dam, Stream 14 and overflow released by Black Dog Creek (Stream 11).
Special Notes:	This is a floodplain lake which is used by Northern States Power for cooling of water from Black Dog steam power generating plant on the Minnesota River.

GUN CLUB LAKE and MARSH (also known as Slater's Lake)

DNR No.	19-78 (Dakota County)
LMRWD Water Resource Classification:	Floodplain/Level IV
Location:	Sections 32 and 33, T28N, R23W, Mendota Heights, and Sections 4, 5, 7, 8, 17 and 18, T27N, R23W, Eagan, Dakota County; between Cedar Avenue and the Mendota Bridge in the floodplain south of the Minnesota River.
Area:	1,216 acres.
Shoreline Length:	50,400 feet; 9.5 miles.
Shoreline Type:	Flat, marshy.
DNR Shoreland Class:	Natural Environment
Approx. Elevation:	694 MSLD.
DNR OHW:	—
Depth:	2.5 feet (maximum); 1.0 feet (average).
Water Supply:	Natural springs, seepage and some drainage from the bluffs to the southeast and east.
Inlet:	Springs, seepage.
Outlet:	Black Dog Creek and several ditches and creeks to the Minnesota River. Streams 3, 4, 8, 9, 10 and 11.
Special Notes:	Floodplain lake and marsh; principally marsh with little open water.

Table 3-5. Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

STREAM 1:	No Name.
Location:	Enters right bank of river in NW ¹ / ₄ , Section 28, T28N, R23W.
Approx. Normal Flow:	0.50 cfs (8-7-59).
Length:	Under 500 feet.
Within District:	Totally.
Draining Area:	Snelling Lake, marsh to the west of Snelling Lake and area to east of Snelling Lake. Minor drainage from Highway 110.
Outlet for:	Essentially a relief of spring fed Snelling Lake.
Controlled Outlet:	Yes.
Other Details:	With control of Snelling Lake outlet maintained, Snelling Lake surface elevation is normally several feet above Minnesota River level. Snelling Lake is a floodplain lake.
STREAM 2:	No Name
Location:	Enters from left bank in SW ¹ / ₄ , Section 28, T28N, R23W.
Approx. Normal Flow:	0.50 cfs (est.).
Length:	2,000 feet.
Within District:	Totally.
Draining Area:	Marsh north of Gun Club Lake and spring fed areas along bluff in Section 28 and 33.
Outlet for:	Spring seepage and minor storm drainage of Chicago Northwestern Railroad and bluff area between old State Highway 13 and railroad.
Controlled Outlet:	No, naturally controlled. Normal water level marsh above river.
STREAM 3:	No Name.
Location:	Enters from left river bank in NE ¹ / ₄ , Section 32, T28N, R23W.
Approx. Normal Flow:	0.50 to 0.75 cfs (8-7-59).
Length:	1,000 feet from marsh area.
Within District:	Totally.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Draining Area:	Large marsh area north of Gun Club Lake and also Gun Club Lake proper.
Outlet for:	Spring fed waters to Gun Club Lake and Marsh. Minor storm drainage of Chicago Northwestern Railroad and approximately one square mile east of railroad which includes Old State Highway 13 and area east of Highway 13.
Controlled Outlet:	Yes, weir notch dam, approximately: wall 200 feet back from river.
STREAM 4:	No Name.
Location:	Enters from left river bank in NE ¹ / ₄ , Section 32, T28N, R23W.
Approx. Normal Flow:	0.05 cfs (8-7-59).
Length:	Under 500 feet.
Within District:	Totally.
Draining Area:	Field area between Gun Club Lake marsh and river.
Outlet for:	Groundwater.
Controlled Outlet:	No.
STREAM 5:	No Name.
Location:	Enters right bank of river in SW ¹ / ₄ , Section 32, T28N, R23W.
Approx. Normal Flow:	1.0 cfs.
Length:	3,000 feet from Fort Snelling Reservation, State Highway 110 and drainage system for Minneapolis-St. Paul International Airport.
Within District:	Partially. Originates at Fort Snelling and Minneapolis-St. Paul International Airport.
Draining Area:	Area outlined above, essentially at top of bluff. Little, if any, drainage of lower floodplain area.
Outlet for:	Essentially stormwater and excess groundwater.
Controlled Outlet:	No, in its lower reaches it is a concrete flume.
Other Details:	Siltation at entry to river a problem.
STREAM 6:	No Name.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Location:	Enters right bank of river in SW $\frac{1}{4}$, Section 32, T28N, R23W, shortly above Stream 5.
Approx. Normal Flow:	0.3 cfs.
Length:	Under 500 feet.
Within District:	Totally.
Draining Area:	Gunnery Range below Fort Snelling.
Outlet for:	Springs at base of bluff.
Controlled Outlet:	No.
STREAM 7:	Little's Creek
Location:	Enters right bank of river on EW $\frac{1}{4}$ line, Section 5, T27N, R23W.
Approx. Normal Flow:	0.75 cfs.
Length:	5,000 feet from marsh area.
Within District:	Totally.
Draining Area:	Long Meadow Lake from one mile east of Lyndale Avenue to this location. This includes 4+ square miles of marsh and river bluff.
Outlet for:	Springs along the north river bluff in Bloomington, as well as stormwater from the bluff area itself and the Long Meadow Lake marsh area.
Controlled Outlet:	Yes.
Other Details:	A major outlet for an open water area.
STREAM 8:	No Name.
Location:	Enters left bank of river in NW $\frac{1}{4}$, Section 8, T27N, R23W.
Approx. Normal Flow:	0.05 cfs.
Length:	5,000 feet.
Within District:	Totally.
Draining Area:	Marsh southwest of Gun Club Lake.
Outlet for:	Springs and excess surface water.
Controlled Outlet:	No.
Other Details:	Constructed ditch for creating farmland in the river floodplain.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

STREAM 9:	No Name.
Location:	Enters left bank of river in NW ¹ / ₄ , Section 8, T27N, R23W.
Approx. Normal Flow:	0.75 cfs.
Length:	5,000 feet.
Within District:	Totally.
Draining Area:	Marsh southwest of Gun Club Lake.
Outlet for:	Springs and excess surface water.
Controlled Outlet:	No.
Other Details:	Constructed ditch for creating farmland in the river floodplain.
STREAM 10:	No Name
Location:	Enters left bank of river in NW ¹ / ₄ , Section 18, T27N, R23W.
Approx. Normal Flow:	0.50 cfs (1.5 cfs–1958).
Length:	5,000 feet.
Within District:	Totally.
Draining Area:	Marsh southwest of Gun Club Lake near Nichols Station.
Outlet for:	Springs and excess surface water.
Controlled Outlet:	No.
Other Details:	Constructed ditch for creating farmland in the river floodplain.
STREAM 11:	Kennaley's Creek
Location:	Enters left bank of river in NW ¹ / ₄ , Section 18, T27N, R23W, shortly above Stream 10.
Approx. Normal Flow:	1.25 to 1.5 cfs (2.5 cfs–1958).
Length:	5,000 feet.
Within District:	Totally.
Draining Area:	Marsh southwest of Gun Club Lake near Nicols Station, and west (under Cedar crossing) to easterly end of Black Dog Lake.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Outlet for:	Nicols fen, Seneca wastewater treatment plant area, springs and excess surface water.
Controlled Outlet:	No.
Other Details:	DNR-designated trout stream; partially a constructed ditch for previous farming activities and partially natural creek draining from east end of Black Dog Lake. LMRWD Unique Resource/Level I Classification.
STREAM 12:	Harnack Creek (DNR unnamed #1)
Location:	Enters at left bank of river in NW¼, Section 24, T27N, R24W.
Approx. Normal Flow:	0.75 cfs.
Length:	One mile through marsh area.
Within District:	Totally.
Draining Area:	East portion of Black Dog Lake marsh.
Outlet for:	Springs and excess surface water, also surface drainage from bluffs between Black Dog Lake and State Highway 13.
Controlled Outlet:	No.
Other Details:	DNR-designated trout stream. LMRWD Unique Resource/Level I Classification.
Stream 12A:	Unnamed #4
Location:	Enters Black Dog Lake in N½ Sec 24, T27N, R24W.
Approx. Normal Flow:	?
Length:	2,000 feet.
Within District:	Totally.
Draining Area:	Springs, floodplain, bluffs, and upland to TH13.
Outlet for:	Surface drainage and spring flows.
Controlled Outlet:	No.
Other Details:	DNR-designated trout stream. LMRWD Unique Resource/Level I Classification.
STREAM 12B:	Unnamed #7
Location:	Enters Black Dog Lake in N½ Sec 26, T27N, R24W.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Approx. Normal Flow: ?

Length: Unknown.

Within District: Totally.

Draining Area: Springs, floodplain, and bluff.

Outlet for: Surface drainage and spring flows.

Controlled Outlet: No

Other Details: DNR-designated trout stream. LMRWD Unique Resource/Level I Classification.

STREAM 13: No Name.

Location: Enters at left bank of river in SE¼, Section 22, T27N, R24W.

Approx. Normal Flow: 0.30 cfs (1.5 cfs-1958).

Length: 200 feet.

Within District: Totally.

Draining Area: Bluffs south of Riverside School in Bloomington and a small amount of floodplain area between these same bluffs and the river.

Outlet for: Surface drainage and spring flows.

Controlled Outlet: No.

STREAM 14: No Name.

Location: Enters at left bank of river in NS¼ line of Section 22, T27N, R24W.

Approx. Normal Flow: 0.05 to 0.10 cfs.

Length: 2,000 feet to Black Dog Lake.

Within District: Totally.

Draining Area: Black Dog Lake and bluffs between Black Dog Lake and State Highway 13, plus a small area south of Highway 13 in the south central portion of Section 34, T27N, R24W.

Outlet for: Springs, surface drainage, and cooling water used in the operations of Northern States Power at their Black Dog Plant in Section 23, T27N, R24W.

Controlled Outlet: Yes, outlet structure on riverbank.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

STREAM 15:	No Name.
Location:	Enters right bank of river in SW $\frac{1}{4}$, Section 22, T27N, R24W.
Approx. Normal Flow:	0.15 cfs.
Length:	200 feet.
Within District:	Totally.
Draining Area:	Floodplain area and bluffs below Archer Daniels Midland Co. buildings.
Outlet for:	Springs and surface drainage.
Controlled Outlet:	No.
STREAM 16:	No Name.
Location:	Enters on right bank of river on EW line between Section 22 and 27, T27N, R24W.
Approx. Normal Flow:	0.15 cfs.
Length:	200 feet.
Within District:	Totally.
Draining Area:	Low area and bluffs south of Archer Daniels Midland Co. buildings, and just east of Lyndale Avenue.
Outlet for:	Spring and excess surface waters.
Controlled Outlet:	No.
STREAM 17:	No Name.
Location:	Enters on right bank of river in NW $\frac{1}{4}$, Section 27, T27N, R24W.
Approx. Normal Flow:	10 to 12 cfs.
Length:	One mile.
Within District:	Totally.
Draining Area:	Base of bluff from Nine Mile Creek channel east to river.
Outlet for:	Springs and surface waters (see other details).
Controlled Outlet:	No.
Other Details:	Intermittent channel taking overflow from Nine Mile Creek outlet (see Stream 19).

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

STREAM 18:	No Name.
Location:	Enters left bank of river in NW¼, Section 27, T27N, R24W.
Approx. Normal Flow:	0.1 cfs.
Length:	100 feet.
Within District:	Totally.
Draining Area:	East side of Lyndale Avenue.
Outlet for:	Surface drainage.
Controlled Outlet:	No.
STREAM 19:	Nine Mile Creek.
Location:	Enters right bank of river in SW¼, Section 29, T27N, R24W.
Approx. Normal Flow:	2.5 cfs (3.5 cfs–1958) (8-7-59).
Length:	Approximately 12 miles.
Within District:	Partially.
Draining Area:	From southeast Minnetonka and northeast Eden Prairie, southern part of Edina and a good share of Bloomington. This creek extends in dendritic fashion through the area connecting many surface lakes.
Outlet for:	Excess surface waters and springs along the lower portion of the creek, also a small area of the floodplain to the river in the area of Coleman Lake.
Controlled Outlet:	No.
STREAM 20:	Credit River
Location:	Enters left bank of river in NE¼, Section 31, T27N, R24W.
Approx. Normal Flow:	1.75 cfs (8-7-59) (5.0 cfs–1958).
Length:	15 miles.
Within District:	Partially.
Draining Area:	Above bluffs and to the south of the city of Savage.
Outlet for:	Surface drainage and along the northern reaches as it comes off of the bluff. Springs and groundwater flow from the natural terrain, also stormwater from the city of Savage and State Highway 13.
Controlled Outlet:	No.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

STREAM 21: No Name.

Location: Enters right bank of river in SW¹/₄, Section 30, T27N, R24W.

Approx. Normal Flow: Less than 0.05 cfs (8-7-59).

Length: 1,000 feet.

Within District: Totally.

Draining Area: Adjacent to river.

Outlet for: Flowing spring which sets back to approximately 700 feet from the river.

Controlled Outlet: No.

STREAM 22: No Name.

Location: Enters left bank of river in NE ¹/₄, Section 8, T115N, R21W.

Approx. Normal Flow: 0.45 cfs (8-6-59) (3.0 cfs-1958).

Length: Two miles.

Within District: Totally.

Draining Area: Below bluffs and marsh area west of Savage.

Outlet for: Intermittent surface drainage and marsh drainage and springs.

Controlled Outlet: No.

STREAM 23: No Name.

Location: Enters right bank of river in NW ¹/₄, Section 8, T115N, R21W.

Approx. Normal Flow: 0.35 cfs (8-6-59).

Length: 1,500 feet.

Within District: Totally.

Draining Area: South of bluffs in Section 5 in Bloomington.

Outlet for: Surface drainage on bluffs south of Auto Club Road and marsh drainage below bluff. Also, drainage for spring seepage.

Controlled Outlet: No.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

STREAM 24:	Eagle Creek
Location:	Enters left bank of river at the NS section line between Section 7 and 8, T115N, R21W.
Approx. Normal Flow:	12.42 cfs (8-6-59) (10 to 12 cfs-1958).
Length:	Two miles.
Within District:	Totally.
Draining Area:	Rice Lake and Boiling Springs and the bluffs to the south.
Outlet for:	Spring flow from Boiling Springs, intermittent surface drainage and a lake and marsh outlet for Rice Lake.
Controlled Outlet:	Partially.
Other Details:	This is a managed trout stream and a managed drainage outlet for Rice Lake. LMRWD Unique Resource/Level I Classification.
STREAM 25:	No Name
Location:	Enters right bank of river in NE ¼, Section 6, T115N, R21W.
Approx. Normal Flow:	0.2 cfs.
Length:	200 feet.
Within District:	Totally.
Draining Area:	Marsh and bluffs southeast of Bloomington Ferry.
Outlet for:	Springs and surface drainage.
Controlled Outlet:	No.
STREAM 26:	No Name.
Location:	Enters left bank of river on EW ¼ line of Section 6, T115N, R21W.
Approx. Normal Flow:	3.0 cfs.
Length:	1,500 feet.
Within District:	Totally.
Draining Area:	Blue and Fisher Lakes and areas south to the south bluff of the river valley.
Outlet for:	Blue and Fisher Lakes are maintained for hunting clubs and their levels are regulated by culverts and small dams.
STREAM 27:	Purgatory Creek.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Location:	Enters right bank of river in SW ¼, Section 36, T116N, R22W.
Approx. Normal Flow:	1.0 to 1.5 cfs (3.0 cfs–1958).
Length:	Approximately 12 miles.
Within District:	Partially.
Draining Area:	Central Eden Prairie. Flows through Staring Lake.
Outlet for:	Surface drainage, stormwater, springs at the lower end of Purgatory Creek where the creek cuts down to the river valley floor.
Controlled Outlet:	No.
STREAM 28:	No Name.
Location:	Enters right bank of river in NE ¼, Section 34, T116N, R22W.
Approx. Normal Flow:	0.1 cfs.
Length:	2,000 feet.
Within District:	Totally.
Draining Area:	Bluff and area below bluffs in NE ¼ of Section 34.
Outlet for:	Springs and surface drainage.
Controlled Outlet:	No.
STREAM 29:	No Name.
Location:	Enters left bank of river in NW ¼, Section 3, T115N, R22W.
Approx. Normal Flow:	0.35 cfs.
Length:	2,000 feet.
Within District:	Totally.
Draining Area:	Marsh in NE ¼ of Section 4 and NW ¼ of Section 3, and area between State Highway 101 and Chicago Northwestern Railroad to the south.
Outlet for:	Stormwater, surface drainage and possibly some seepage.
Controlled Outlet:	No.
STREAM 30:	No name.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Location:	Enters left bank of river on north line of NW ¼ of Section 4, T115N, R22W.
Approx. Normal Flow:	0.05 cfs.
Length:	1,000 feet.
Within District:	Totally.
Draining Area:	Marsh in north-central part of Section 4 and surface drainage from State Highway 101.
Outlet for:	Surface water and stormwater.
Controlled Outlet:	No.
STREAM 31:	No Name.
Location:	Enters left bank of river on north line of NW ¼ of Section 4, T115N, R22W, shortly above Stream 30.
Approx. Normal Flow:	0.10 cfs.
Length:	1,000 feet.
Within District:	Totally.
Draining Area:	Marsh in north-central part of Section 4 and surface drainage from State Highway 101.
Outlet for:	Surface water and stormwater.
Controlled Outlet:	No.
STREAM 32:	Riley Creek.
Location:	Enters right bank of river in SE ¼, Section 32, T116N, R22W.
Approx. Normal Flow:	0.20 cfs.
Length:	2,000 feet to Grass Lake and 4+ miles of Riley Creek.
Within District:	Partially.
Draining Area:	Connecting Lake Susan, Rice Marsh Lake, Lake Riley (above bluff) and Grass Lake (in floodplain of river). Riley Creek is the drainage outlet for about 7 square miles of area in eastern Chanhassen and western edge of Eden Prairie lying in Carver and Hennepin Counties, respectively.
Outlet for:	Surface waters of Lakes Susan, Rice Marsh, Riley and Grass. Stormwater and springs in the Grass Lake area of the valley.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

STREAM 33:	Bluff Creek.
Location:	Enters right bank of river in SE ¼, Section 32, T116N, R22W, shortly above Stream 32, Riley Creek.
Approx. Normal Flow:	2.0 to 2.5 cfs (2.5 cfs-1958).
Length:	One and one-half miles to Rice Lake (Hennepin County) and five plus miles of Bluff Creek.
Within District:	Partially.
Draining Area:	Central Chanhassen, beginning at a marsh east of Lake Minnewashta and river valley NE of Shakopee.
Outlet for:	Surface drainage and stormwater drainage and Rice Lake, marsh and springs at base of bluff on north side of river, northeast of Shakopee.
Controlled Outlet:	No.
STREAM 34:	No Name.
Location:	Enters left bank of river at center of north line of Section 5, T115N, R22W.
Approx. Normal Flow:	0.1 cfs.
Length:	500 feet.
Within District:	Totally.
Draining Area:	Base of river terrace north of State Highway 101.
Outlet for:	Springs and surface water.
Controlled Outlet:	No.
STREAM 35:	No Name.
Location:	Enters left bank of river in SW ¼, Section 32, T116N, R22W.
Approx. Normal Flow:	1.25 to 1.50 cfs.
Length:	550 feet.
Within District:	Totally.
Draining Area:	Surface drainage from a small chain of ponds or lakes paralleling and lying just north of State Highway 101.
Outlet for:	Surface drainage and spring flows.
Controlled Outlet:	No.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

STREAM 36:	No Name.
Location:	Enters left bank of river on north line in NE ¼, Section 6, T115N, R22W.
Approx. Normal Flow:	0.75 to 1.00 cfs.
Length:	2,000 feet.
Within District:	Totally.
Draining Area:	Several small sloughs or ponds at the NE corner of Shakopee.
Outlet for:	Surface water and springs.
Controlled Outlet:	No.
STREAM 37:	Assumption Creek.
Location:	Enters right bank of river in NE ¼, Section 2, T115N, R23W.
Approx. Normal Flow:	1.75 to 2.00 cfs.
Length:	Two miles.
Within District:	Totally.
Draining Area:	Marsh and first river terrace to the northwest and west from Assumption Seminary.
Outlet for:	Intermittent surface drainage, springs and surface water from marsh area.
Controlled Outlet:	No.
Other Details:	DNR-designated trout stream. LMRWD Unique Resource/Level I Classification.
STREAM 38:	No Name.
Location:	Enters left bank of river in SE ¼, Section 2, T115N, R23W.
Approx. Normal Flow:	?
Length:	4,000 feet.
Within District:	Totally.
Draining Area:	Nyssens Lake, marsh and two other lakes below the Chicago and Northwestern Railroad, south of the river between Chaska and Shakopee in the floodplain.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Outlet for:	Nyssens and two other lakes, surface water, springs and some storm drainage.
Controlled Outlet:	No.
STREAM 39:	No Name.
Location:	Enters from right bank of river in NW ¼, Section 2, T115N, R23W.
Approx. Normal Flow:	1.75 to 2.00 cfs.
Length:	One mile.
Within District:	Totally.
Draining Area:	Marsh area north of river in NW ¼ of Section 2, and NE ¼ of Section 3.
Outlet for:	Intermittent surface waters and possibly some seepage.
Controlled Outlet:	No.
STREAM 40:	No Name.
Location:	Enters from right bank of river in SW ¼, Section 3, T115N, R23W.
Approx. Normal Flow:	0.6 cfs.
Length:	1,500 feet.
Within District:	Totally.
Draining Area:	Drains marsh area east of American Crystal Sugar Refinery.
Outlet for:	Surface water and springs.
Controlled Outlet:	No.
STREAM 41:	East Chaska Creek (Bavaria Creek).
Location:	Enters right bank of river in SE ¼, Section 4, T115N, R23W.
Approx. Normal Flow:	0.35 cfs.
Length:	Seven miles.
Within District:	Partially.
Draining Area:	North of Chaska into western Chanhassen.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Outlet for:	Surface waters of Hazeltine Lake, surface drainage above bluff and surface and drainage below bluff in the floodplains of the river.
Controlled Outlet:	Control outlet located at the head of the diversion channel, installed as part of the Chaska Flood Control Project; there are 3 additional control structures in the Hazeltine-Bavaria WMO.
STREAM 42:	No Name.
Location:	Enters left bank of river in NW ¼, Section 10, T115N, R23W.
Approx. Normal Flow:	
Length:	3,000 feet.
Within District:	Totally.
Draining Area:	Floodplain area, below bluff east of river as it flows northeast of Chaska.
Outlet for:	Intermittent drainage from bluffs to south and Chicago, Milwaukee, St. Paul and Pacific Railroad.
Controlled Outlet:	No.
STREAM 43:	No Name.
Location:	Enters left bank of river in SE ¼, Section 9, T115N, R23W.
Approx. Normal Flow:	?
Length:	3,000 feet.
Within District:	Partially.
Draining Area:	Gifford Lake and area below south bluff south of Chaska.
Outlet for:	Surface water of Gifford Lake, springs and some storm drainage.
Controlled Outlet:	No.
Other Details:	During periods of flooding on the Minnesota River this channel carries part of the waters of the Minnesota.
STREAM 44:	Chaska Creek.
Location:	Enters right bank of river in SW ¼, Section 9, T115N, R23W.
Approx. Normal Flow:	0.75 cfs.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

Length:	Eight and one-half miles.
Within District:	Partially.
Draining Area:	South central and southeast portion of Laketown Township and north central and northeast portion of Dahlgren Township, through the north and west sides of Chaska.
Outlet for:	Surface waters and marshes above bluff, stormwater, and some seepage in the river valley.
Controlled Outlet:	No.
Other Details:	As part of the Chaska Flood Control Project, a siltation pond was constructed where the concrete channel ends at the athletic park.
 STREAM 45:	 No Name.
Location:	Enters on right bank of river in SW ¼, Section 17, T115N, R23W.
Approx. Normal Flow:	0.10 cfs.
Length:	1,500 feet.
Within District:	Totally.
Draining Area:	Surface water from swamp southwest of Chaska Lake and intermittent drainage from bluffs west of Chaska Lake.
Outlet for:	Surface waters, storm drainage and marsh drainage with possibly some seepage at base of bluff.
Controlled Outlet:	No.
 STREAM 46:	 Spring Creek.
Location:	Enters right bank of river in NE ¼, Section 19, T115N, R23W.
Approx. Normal Flow:	?
Length:	Two miles.
Within District:	Partially.
Draining Area:	Northwest of Carver, above bluff.
Outlet for:	Surface water drainage, some seepage, and stormwater.
Controlled Outlet:	No.
Other Details:	Courses through center of Carver.

Table 3-5 (cont). Details of Individual Streams of the District (See Figure 3-10 for Locations - Information Taken from Itasca Engineering (1969))

STREAM 47:	Carver Creek.
Location:	Enters on right bank of river in NE ¼, Section 19, T115N, R23W.
Approx. Normal Flow:	1.5 to 2.0 cfs.
Length:	Eight-plus miles.
Within District:	Partially.
Draining Area:	Central and northwest parts of Dahlgren Township, Miller Lake, marshes and bluff area west of Carver.
Outlet for:	Miller Lake, surface drainage, some springs, storm drainage.
Controlled Outlet:	No.
Other Details:	Siltation problem severe in time of high flows.

Table 3-6. Status of DNR-Approved Floodplain Ordinances

Local Unit of Government	Adopted Floodplain Ordinance?
<i>Cities:</i>	
Bloomington	Yes
Burnsville	Yes
Carver	Yes
Chanhassen	Yes
Chaska	Yes
Eagan	Yes
Eden Prairie	Yes
Lilydale	Yes
Mendota	No ¹
Mendota Heights	No ¹
Savage	Yes
Shakopee	Yes
<i>Townships:</i>	
Chaska	No ²
Jackson	No ²
Louisville	No ²
<i>Counties:</i>	
Carver	Yes
Dakota	Yes
Hennepin	No
Scott	Yes

Notes: ¹ Although no ordinances are in place, both cities are enrolled in the Flood Insurance Program. There are no FEMA floodplain maps for these cities.

² Chaska Township, Jackson Township and Louisville Township are covered under the appropriate county floodplain ordinance.

Table 3-7. Location and Status of MCES Surface Water Quality Monitoring Sampling Sites

River/Tributary	Monitoring Site Location	Status	Property Owner	Written Agreement with Owner
Automatic Sampling Sites Within LMRWD:				
Credit R.	123rd St. Bridge in Savage, Scott County, 0.6 miles upstream of mouth	Active	City of Savage	Complete
Bluff Cr.	Hwy. 212 intersection with Hwy. 101 in Chanhassen, Carver County, 3.5 miles upstream of mouth	Active	Mn/DOT	Complete
Riley Cr.	Hwy. 212 in Eden Prairie, Hennepin County	Abandoned	Mn/DOT	NA
Nine Mile Cr.	1,390 ft. south of 106th Street in Bloomington, Hennepin County, 1.8 miles upstream of mouth	Active	City of Bloomington	Complete
Minnesota R.	Fort Snelling State Park at River Mile 3.5	Active	Mn/DNR	Complete
Automatic Sampling Sites Outside LMRWD:				
Sand Cr.	Foot bridge below the lake in Louisville Swamp Wildlife Refuge, Scott County	Abandoned	MN Valley Wildlife Refuge, Dept. of Interior	NA
Sand Cr.	Hwy. 282 bridge— 102 Creek Ln. S. in Jordan, Scott County, 8.2 miles upstream of mouth	Active	Mn/DOT	Complete
Carver Cr.	1501 County Rd. 40, ¾ mile west of city of Carver, 50 feet south of Co. Hwy. 40, Carver County, 1.7 miles upstream of mouth	Active	City of Carver	Complete
Bevens Cr. (lower)	16183 County Rd. 40, 7 miles southwest of Carver in San Francisco Township, Carver County, 2.0 miles upstream of mouth	Active	—	—
Bevens Cr. (upper)	Domehouse, 7312 Maplewood Rd., Dahlgren Township, Carver County, 5.0 miles upstream of mouth	Active	P.&B. Tice	Complete

Table 3-7 (cont). Location and Status of MCES Surface Water Quality Monitoring Sampling Sites

River/Tributary	Monitoring Site Location	Status	Property Owner	Written Agreement with Owner
Non-Automatic Sampling Sites Within LMRWD:				
Minnesota R.	Near NSP Black Dog Plant at River Mile 8.5	Active	—	—
Minnesota R.	Railroad-Highway Swing Bridge, Savage, at River Mile 14.3	Active	—	—
Minnesota R.	Hwy. 101 Bridge, Shakopee, at River Mile 25.1	Active	—	—
Non-Automatic Sampling Sites Outside LMRWD:				
Minnesota R.	Carver County Rd. 45 and Scott County Road 9 Bridge, Jordan, at River Mile 39.4	Active	—	—

Source: *Nonpoint Source Pollution Automonitoring Program*, Metropolitan Council, Environmental Planning and Evaluation, Water Quality; *NPS Site Locations and Site Plans for Gopher State One Call*, updated 9/13/95.

Table 3-8. Location of Minnesota Pollution Control Agency Surface Water Quality Monitoring Sampling Sites

River/Tributary	Monitoring Site Location	Status
Minnesota River	River Mile 0.3 - at Mendota	Inactive
Minnesota River	River Mile 1.0 - near TH 55 at St. Paul	Inactive
Minnesota River	River Mile 3.5 - under landing lights at Ft. Snelling State Park	Active
Minnesota River	River Mile 7.0 - in Bloomington	Inactive
Unnamed Tributary of Minnesota River	River Mile 11.0 - in Burnsville, west edge of I-35W	Inactive
Minnesota River	River Mile 11.5 - at I-35W in Bloomington	Inactive
Minnesota River	River Mile 12.7 - below Port Cargill at Savage	Inactive
Minnesota River	River Mile 15.0 - at railroad bridge ½ mile northwest of Savage	Inactive
Minnesota River	River Mile 17.0 - by Shakopee at CSAH 25	Inactive
Minnesota River	River Mile 17.5 - ½ mile upstream of Bloomington Ferry Bridge	Inactive
Minnesota River	River Mile 18.5 - at Government Damark in Shakopee	Inactive
Minnesota River	River Mile 21.4 - at Government Damark in Shakopee	Inactive
Unnamed Tributary of Minnesota River	River Mile 23.0 - in Memorial Park in Shakopee	Inactive
Minnesota River	River Mile 25.0 - US Highway 212 at Shakopee	Active
Minnesota River	River Mile 32.0 - TH 41 at Chaska	Inactive
Minnesota River	River Mile 39.0 - at CSAH 10 in Jordan (outside LMRWD)	Active

Table 3-9. Status of DNR-Approved Shoreland Ordinances

Local Unit of Government	Adopted Shoreland Ordinance?
<i>Cities:</i>	
Bloomington	Yes ¹
Eden Prairie	Yes
Chanhassen	Yes
Chaska	No
Burnsville	Yes
Savage	Yes
Shakopee	No (anticipated in 1997)
Eagan	Yes
Mendota Heights	No
Lilydale	No
Mendota	No
Carver	No
<i>Townships:</i>	
Chaska	No ²
Jackson	No ²
Louisville	No ²
<i>Counties:</i>	
Carver County	Yes
Dakota County	N/A ³
Hennepin County	N/A ³
Scott County	Yes

Notes: ¹Not DNR-approved but were not notified by DNR to adopt local ordinance.
²Townships are covered under the appropriate county's shoreland ordinance.
³No lands under County land use control are located in LMRWD.

Table 3-10. DNR-Permitted Surface Water Appropriations in LMRWD*

Permit #	Permit Holder	Use	Twp/Rng	Section	Water Source	Permitted Use MGY	Permitted Use GPM
Carver County:							
956215-1	US Fish & Wildlife Service	Lake Level Maintenance	115N/23W	8	Chaska Lake	8.4	700
Dakota County:							
906292-1	Wayne J. Pahl	Major Crop Irrigation	27N/23W	18	Minnesota River	4.1	400
610270-1	NSP	Power Generation: Steam Power Cooling - Once through	27N/24W	23	Minnesota River	149,305	268,175
866002-1	NSP	Industrial Processing	27N/24W	24	Minnesota River	0.3	800
886329-1	Edward Kraemer & Sons, Inc.	Quarry Dewatering	27N/24W	33	Quarry/Gravel Pit	4,000	6,000
Hennepin County:							
896345-1	Calvin Chadwick	Major Crop Irrigation	115N/21W	8	Minnesota River	3.3	500
776377-1	Sever Peterson	Major Crop Irrigation	115N/23W	1	Minnesota River	13.0	500
776377-2	Sever Peterson	Major Crop Irrigation	116N/22W	32	Minnesota River	13.0	500
776377-3	Sever Peterson	Major Crop Irrigation	116N/22W	31	Minnesota River	13.0	500
Scott County:							
670172-1	Shiely Company	Quarry Dewatering	115N/22W	2	Quarry/Gravel Pit	2,750	6,000
956090-1	William Mueller & Sons, Inc.	Sand/Gravel Pit Dewatering	115N/23W	15	Quarry/Gravel Pit	70	2,000

* Table lists permits through 1996; updated lists are available from the DNR - Division of Waters

Table 3-11. DNR Lake Management Plans & Surveys

DNR No.	Name	Management Plan	Survey/Date
Carver County			
10-0004P	Chaska Lake	No	No survey
10-0005P	Courthouse Lake	Yes-1995	No survey
10-0221W	—	No	No survey
10-0222W	—	No	No survey
10-0223W	—	No	No survey
10-0224W	—	No	No survey
10-0225W	Chaska Clay Pit	No	Yes—6/83
—	Carver Creek	No	No survey
—	Chaska Creek	No	No survey
—	East Chaska Creek	No	No survey
—	Assumption Creek	No	Yes—8/96
—	Bluff Creek	Yes—12/96	Yes—8/94
Scott County			
70-0025P	Rice Lake	No	No survey
70-0074P	Dean Lake	No	Yes—6/75
70-0087P	Fisher Lake	No	No survey
70-0088P	Blue Lake	No	No survey
70-0116P	Strunks Lake	No	No survey
70-0118P	Gifford Lake	No	Yes—7/81
70-0235P	Shakopee Mill Pond	Yes—3/93	Yes—8/92
70-0117W	—	No	No survey
70-0229W	—	No	No survey
70-0230W	—	No	No survey
70-0234W	—	No	No survey
70-0244W	—	No	No survey
70-0245W	—	No	No survey

Table 3-11 (cont). DNR Lake Management Plans & Surveys

DNR No.	Name	Management Plan	Survey/Date
70-0322W	—	No	No survey
70-0323W	—	No	No survey
—	Eagle Creek	No	Yes—10/96
—	Credit River	No	No survey
Hennepin County			
27-0001P	Snelling Lake	Yes—92	Yes—5/96
27-0002P	Long Meadow Lake	No	No survey
27-0013P	Nine Mile Lake	No	No
27-0080P	Grass Lake	No	No survey
27-0132P	Rice Lake	No	No survey
27-1005P	—	No	No survey
27-1036P	—	No	No survey
Hennepin County (cont.)			
27-1069P	Heritage Hills Pond	No	No survey
27-1071P	Overlook Lake	No/Kids Fishing Ponds	No survey
27-1072P	—	No	No survey
27-1073P	—	No	No survey
27-1074P	Sylvia Mae Marsh	No	No survey
27-1075P	—	No	No survey
27-1076P	—	No	No survey
27-1083P	—	No	No survey
27-1084P	Izaak Walton League	No	No survey
27-1085P	Izaak Walton League	No	No survey
27-1086P	Izaak Walton League	No	No survey
27-1037W	Valley Marsh	No	No survey
27-1066W	Tarnhill Pond	No	No survey
27-1067W	Scarsborough Marsh	No	No survey
27-1068W	Angels Glen	No	No survey
27-1070W	Ford Pond	No	No survey

Table 3-11 (cont). DNR Lake Management Plans & Surveys

DNR No.	Name	Management Plan	Survey/Date
—	Riley Creek	No	No survey
—	Purgatory Creek	No	Yes—8/91
—	Nine Mile Creek	No	Yes—6/61
Dakota County			
19-0078	Gun Club Lake	No—rearing pond	No survey
19-0081	Augusta Lake	No	No survey
19-0083	Black Dog Lake	No	No survey
19-0107		No	No survey
19-0109		No	No survey
19-0110		No	No survey
19-0111		No	No survey
19-0112		No	No survey
19-0128	Snelling Gravel Pits	Yes—1993	Yes—8/94 Resurvey
19-0129		No	No survey
19-0130		No	No survey
19-0142		No	No survey
	Kennaley's Creek	No	Yes—10/94 Resurvey
	Unnamed Creek #1 (Harnack)	No	Yes—7/90 Assess
	Unnamed Creek #4	No	Yes—8/90 pop assess
	Unnamed Creek #7	No	Yes—7/80 Survey