

Surface Water Management Plan

Prepared for
City of Lilydale

June 2018 (Updated December 2018)
(Minor corrections February 2020)
(Major Plan Amendment April 2023 – Revised Draft)

DRAFT

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Update\Final\2022_StormwaterManagementUpdate\LilydaleSWMP_StormwaterManagementRevisions_03132023.docx

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Certifications

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

Jennifer Koehler, P.E.
PE #: 47500

Date

Acronyms

Acronym	Description
BMP	best management practice
CFS	cubic feet per second
CMP	corrugated metal pipe
CPEP	corrugated polyethylene pipe
DNR	Department of Natural Resources
FIS	Flood Insurance Study
GIS	Geographic Information System
GLISA	Great Lakes Integrated Sciences and Assessments
I&I	inflow and infiltration
LGU	local governmental unit
LMRWD	Lower Minnesota River Watershed District
LMRWMO	Lower Mississippi River Watershed Management Organization
MCES	Metropolitan Council Environmental Services
MPCA	Minnesota Pollution Control Agency
MS4	Municipal Separate Storm Sewer System
NC	not calculated
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NURP	Nationwide Urban Runoff Program
PCB	Polychlorinated Biphenyl
PEP	Polyethylene Pipe
PUD	Planned Unit Development
RCP	Reinforced Concrete Pipe
SCSWMP	Supplement to Comprehensive Stormwater Management Plan
SWCD	Soil and Water Conservation District
SWCS	Soil and Water Conservation Society
SWMP	Surface Water Management Plan
SWPPP	Stormwater Pollution Prevention Program
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solid
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
WCA	Wetland Conservation Act
WRMP	Water Resources Management Plan

Executive Summary

This Surface Water Management Plan (SWMP) was prepared for the City of Lilydale to meet the requirements of the Lower Mississippi River Watershed Management Organization (LMRWMO) and the Lower Minnesota River Watershed District (LMRWD). This SWMP may be amended to keep the plan current with conditions within Lilydale.

Previous versions of this plan were named Water Resources Management Plan (WRMP). The title was modified for this version to more accurately describe what is covered in the plan and to maintain more consistency with similar plans in nearby cities. The 2008 WRMP was designed to be an integral part of the *Lilydale Comprehensive Plan* completed in 2011. The WRMP was updated in 2013 after the local watersheds (LMRWMO and LMRWD) updated their watershed plans. The 2018 SWMP replaces the 2013 WRMP and is intended to be an integral part of an updated *Lilydale Comprehensive Plan* to be completed in 2018. It will serve as a planning document to guide Lilydale in managing stormwater and protecting its water resources, especially as additional development and redevelopment occur.

The descriptions of the physical environment (Section 2.0) and hydrologic systems (Section 3.0) are intended to provide relevant background information to understand the major components that affect runoff and how the runoff is routed to receiving waters.

A summary of Lilydale's approach to stormwater management, including past and current stormwater management issues, is provided in Section 4.0. This provides a framework for continuing to work with existing issues and new issues as they arise in the future.

General goals and specific policies (Section 5.0) outline Lilydale's policies pertaining to water resources and stormwater management, and they provide a direction for future policy considerations. Virtually the entire developable area within Lilydale has already been developed. Therefore, these goals and policies have been written with strong consideration towards redevelopment activities.

The implementation of this SWMP is described in Section 6.0, with special attention given to the requirements of Lilydale's MS4 Permit.

Amendment procedures for this SWMP are detailed in Section 7.0.

1.0 Introduction

This Surface Water Management Plan (SWMP) was prepared for the City of Lilydale to meet the requirements of the Lower Mississippi River Watershed Management Organization (LMRWMO), the Lower Minnesota River Watershed District (LMRWD), Minnesota Statutes 103B, Minnesota Rules Chapter 8410, and Metropolitan Council requirements. The SWMP updates and supersedes the *Comprehensive Stormwater Management Plan* prepared by Orr Schelen Mayeron & Associates, Inc. (November 9, 1990), the *Supplement to Comprehensive Stormwater Management Plan* (SCSWMP) prepared by Barr Engineering Co. (August 20, 1997), the *Water Resources Management Plan* prepared by Barr Engineering Co. (February 11, 2008), and the *Water Resources Management Plan* prepared by Barr Engineering Co. (December 3, 2013). This SWMP draws from and builds on the resources listed below in [Table 1-1](#) and will be incorporated into the 2020 Lilydale Comprehensive Plan.

Table 1-1 Current and past documents relevant to the Lilydale Surface Water Management Plan

Document	Publication Year	Issuing Entity
Current Documents		
Comprehensive Plan	2020	City of Lilydale
Local Surface Water Management Plan	2018 (Expected)	City of Mendota Heights
Local Surface Water Management Plan	2018 (Expected)	City of St. Paul
Minnesota Stormwater Manual Wiki	2013	MPCA
Watershed Management Plan	2011	LMRWMO
Water Management Plan	2011	LMRWD
Past Lilydale Documents		
Comprehensive Stormwater Management Plan	1990	City of Lilydale
Supplement to Comprehensive Stormwater Management Plan	1997	City of Lilydale
Water Resources Management Plan	2008	City of Lilydale
Water Resources Management Plan	2013	City of Lilydale
Comprehensive Plan	2011	City of Lilydale

1.1 Purpose and Scope

The purpose of this Surface Water Management Plan (SWMP) is identical to the purpose given in Minnesota Statute 103B.201 for metropolitan water management programs. According to statute, the purposes of these water management programs are to:

- Protect, preserve, and use natural surface and groundwater storage and retention systems.

-
- Minimize public capital expenditures needed to correct flooding and water quality problems.
 - Identify and plan for means to effectively protect and improve surface and groundwater quality.
 - Establish more uniform local policies and official controls for surface and groundwater management.
 - Prevent erosion of soil into surface water systems.
 - Promote groundwater recharge where appropriate.
 - Protect and enhance fish and wildlife habitat and water recreational facilities.
 - Secure the other benefits associated with proper management of surface and ground water.

This SWMP will guide Lilydale in protecting, preserving, and managing its surface water resources and stormwater system. It will also serve as a planning document and guide Lilydale in efforts to: (1) minimize adverse impacts on its surface water resources through proper protection; and (2) enhance water resources and management practices. This plan is based on and is consistent with the requirements of Minnesota Statutes 103B.235, Minnesota Rules Chapter 8410, the watershed organizations with jurisdiction in Lilydale, the Lower Mississippi River Watershed Management Organization (LMRWMO), the Lower Minnesota River Watershed District (LMRWD), and Lilydale's Municipal Separate Storm Sewer System (MS4) Permit.

2.0 Physical Environment

2.1 Location

Lilydale is located in northern Dakota County. It is bordered on the north by the City of St. Paul, on the east by Mendota Heights, on the south by Mendota Heights and Mendota, and on the west by the Mississippi River, as shown on **Figure 2-1**. Lilydale covers an area of 454 acres of which approximately 300 acres are in Lower Lilydale, which is below the bluff and in the Mississippi River floodplain. Lower Lilydale has largely been developed into a park that is owned and administered by St. Paul Parks. **Figure 2-2** shows the location of Lilydale and the boundaries of the LMRWMO and LMRWD.

2.2 Climate

The climate within the Minneapolis/St. Paul area is described as a humid continental climate with moderate precipitation, wide daily temperature variations, warm humid summers, and cold winters. The mean annual temperature for Lilydale is 46.2°F, as measured at the Minneapolis/ St. Paul (MSP) airport station (1981-2010). Mean monthly temperatures vary from 15.6°F in January to 73.8°F in July (1981-2010). Extreme temperatures recorded were a high of 108°F on July 14, 1936 and a low of -41°F on January 21, 1888. For the period 1948-2005, the average date for latest occurrence of freezing temperatures was April 29 at MSP, while the average date for the first autumn frost is October 7. The average frost-free period (growing season) is 166 days.

The amount, rate, and type of precipitation are important in determining flood levels and stormwater runoff rates. In urbanized watersheds, shorter duration events tend to play a larger role in predicting high water levels on basins. Shorter duration events are generally used by hydrologists to study local issues (sizing catch basins, storm sewer pipes, etc.). Longer duration events are generally used to study regional issues, such as predicting high water levels for regional basins, landlocked basins, and basins with small outlets relative to their watershed size.

Snowmelt and rainstorms that occur with snowmelt in early spring are significant in this region. The volumes of runoff generated, although occurring over a long period, can have significant impacts where the contributing drainage area to a lake or pond is large and the outlet is small or non-existent.

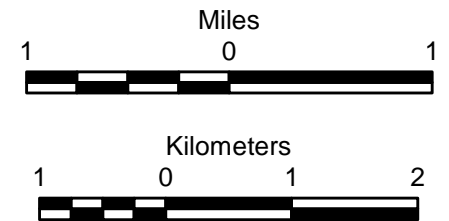
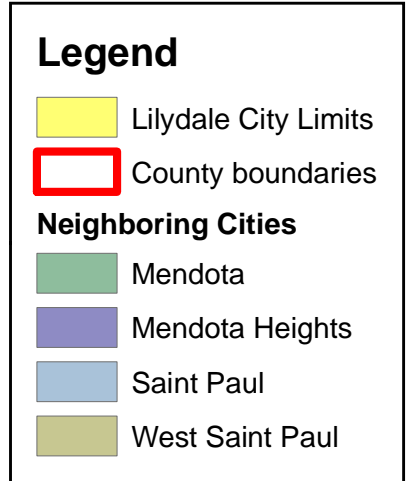
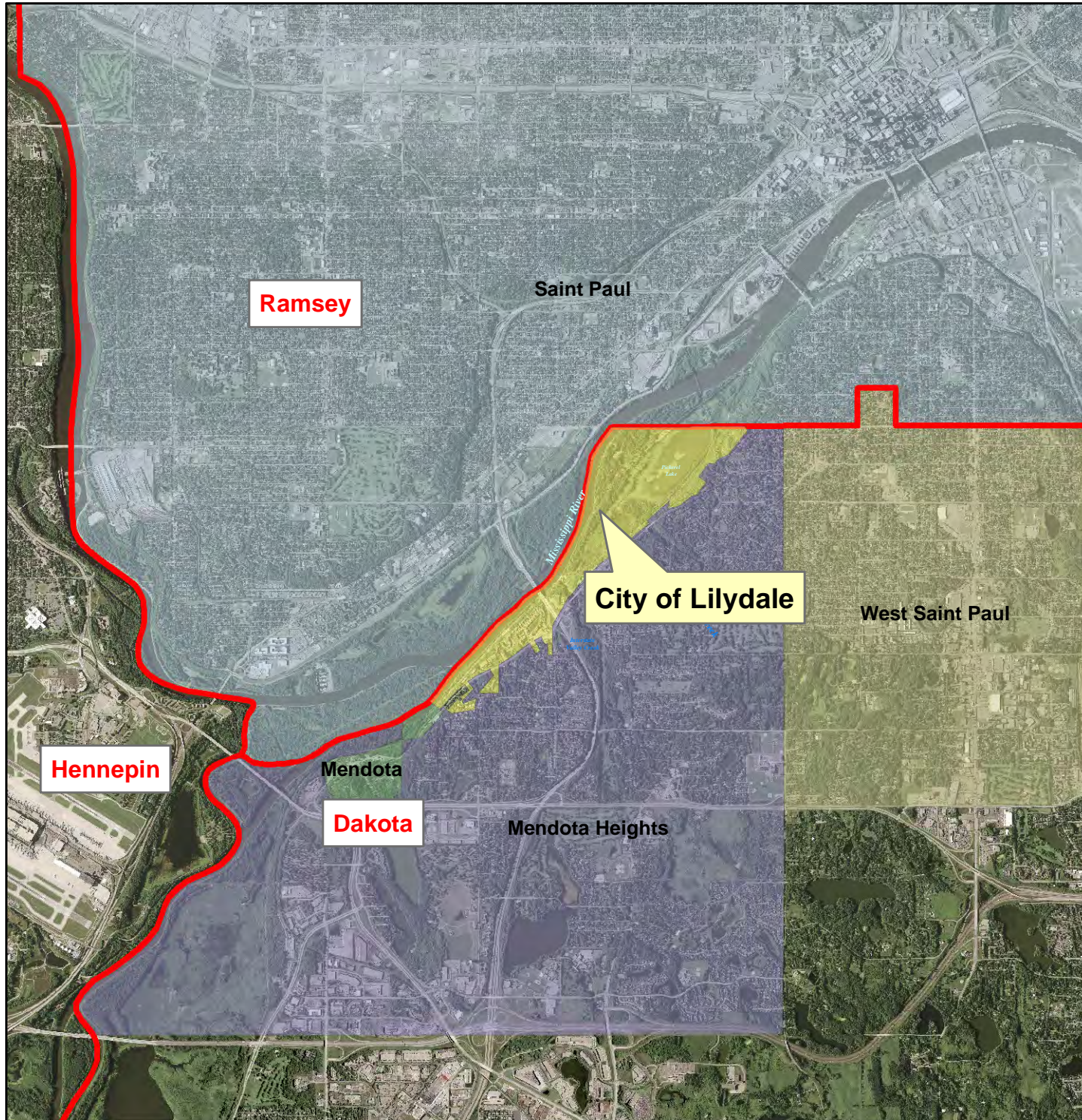


Figure 2-1

LOCATION OF LILYDALE
IN THE METRO AREA
Surface Water Management Plan
City of Lilydale on the Mississippi
Lilydale, Minnesota

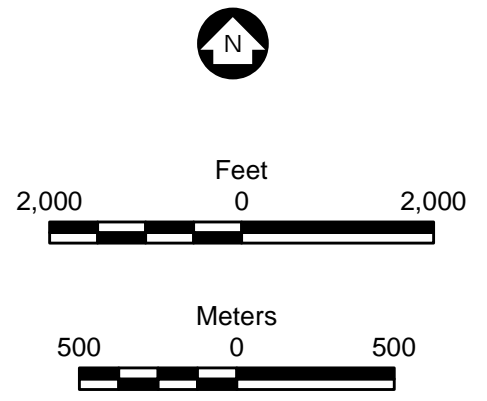
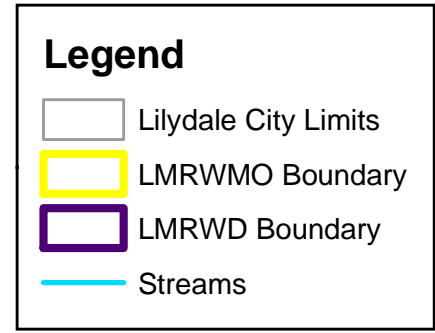
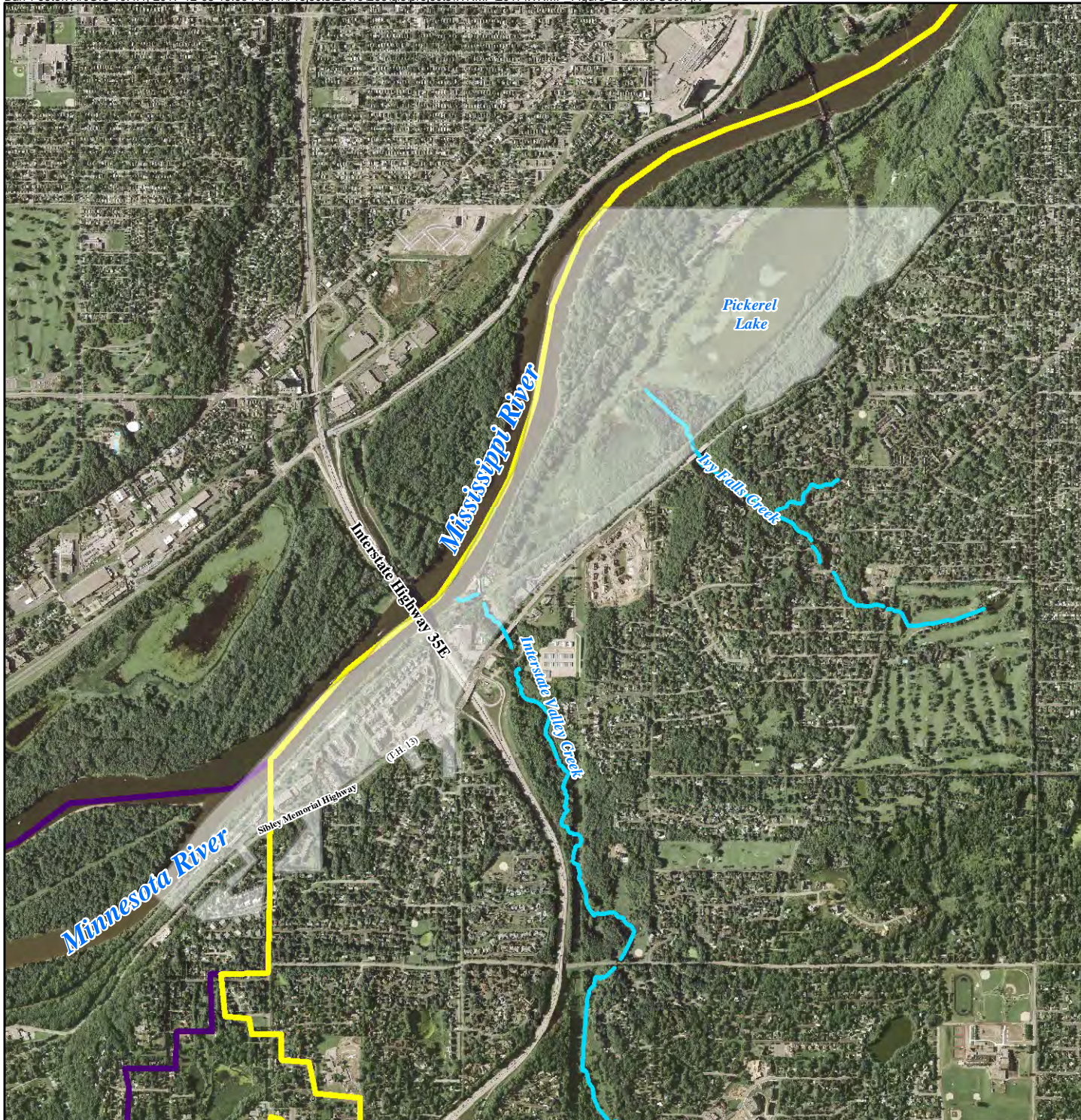


Figure 2-2

BOUNDARIES FOR LILYDALE,
LMRWMO AND LMRWD
Surface Water Management Plan
City of Lilydale on the Mississippi
Lilydale, Minnesota

Table 2-1 summarizes precipitation data for the MSP airport station. Average total annual precipitation (1981-2010) is 30.6 inches at the MSP airport station and has ranged from a low of 11.5 inches in 1910 to a high of 40.2 inches in 1911. The highest 12-month precipitation amount is 40.72 inches from August 2016 through July 2017. The mean monthly precipitation (1981-2010) varies from 4.3 inches in August to 0.77 inches in February. From May to September, the growing season months, the average rainfall (1981-2010) is 19.0 inches, or about 62 percent of the average annual precipitation. Average annual lake evaporation is about 36 inches (1981-2010 average). Average annual snowfall (1981-2010) is 54.4 inches. Extreme snowfall records range from 98.6 inches during the 1983-1984 season to 14.2 inches during the 1930-1931 season.

Table 2-1 Precipitation Summary—Minneapolis/St. Paul Airport Station
Averages: 1981-2010 Extremes: 1891-2001

Month	Total Precipitation, Inches					Snow, inches			# Days with Precip.		
	Mean	High—Yr	Low—Yr	1-Day Max	Mean	High—Yr	≥ .10	≥ .50	≥ 1.0		
Jan	0.90	3.63 1967	0.05 1892	1.21 1/24/1967	12.2	46.4 1982	3.0	0.3	0.0		
Feb	0.77	3.25 1922	0.03 1894	1.90 2/4/1930	7.7	26.5 1962	2.6	0.2	0.0		
Mar	1.89	4.75 1965	0.09 1910	1.62 3/1/1965	10.3	46.1 1965	4.8	0.9	0.2		
Apr	2.66	7.00 2001	0.16 1987	2.22 4/27/1975	2.4	21.8 1983	5.9	1.7	0.2		
May	3.36	10.33 1906	0.21 1934	3.16 5/21/1906	0.0	2.4 1954	7.7	2.2	0.7		
Jun	4.25	9.82 1990	0.22 1988	2.91 6/7/1984	0.0	0.0 1949	7.4	3.0	1.1		
Jul	4.04	17.90 1987	0.11 1936	9.15 7/23/1987	0.0	0.0 1948	6.4	2.4	0.9		
Aug	4.30	9.31 1977	0.20 1925	7.28 8/30/1977	0.0	0.0 1948	6.1	2.9	0.9		
Sep	3.08	7.77 1903	0.41 1940	4.96 9/12/1903	0.0	0.4 1985	5.9	2.1	0.6		
Oct	2.43	6.42 1911	0.01 1952	2.75 10/19/1934	0.6	8.2 1991	4.7	1.4	0.4		
Nov	1.77	5.29 1991	0.02 1939	2.52 11/11/1940	9.3	46.9 1991	4.2	1.1	0.2		
Dec	1.16	4.27 1982	0.00 1943	1.50 12/14/1891	11.9	33.5 1969	3.1	0.3	0.1		
Annual	30.61	40.15 1911	11.54 1910	9.15 7/23/1987	54.4	101.5 1983	61.8	18.5	5.3		
Winter	2.83	6.24 1967	0.69 1958	1.90 2/24/1930	32.1	71.7 1967	9.3	0.8	0.2		
Spring	7.41	16.13 1965	2.12 1910	3.16 5/21/1906	13.7	48.1 1965	17.8	4.3	1.0		
Summer	12.43	23.52 1987	1.73 1894	9.15 7/23/1987	0.0	0.0 1949	20.2	8.0	3.2		
Fall	6.74	13.50 1911	1.71 1952	4.96 9/12/1903	10.6	55.1 1991	14.5	4.0	1.3		

Source: Minnesota State Climatology Office (<http://www.climate.umn.edu>)

Average weather imposes little strain on the typical stormwater drainage system. Snowmelt and rainfall extremes are important for flood control system design. The National Weather Service has data on extreme precipitation events that can be used to aid in the design of flood control systems. Snowmelt extremes most often affect major rivers, large stormwater storage areas, and landlocked basins; while rainfall extremes most often affect conveyance facilities.

In contrast with stormwater drainage facilities, stormwater quality treatment systems are designed based on the smaller, more frequent storms, which account for the majority of the annual pollutant loadings from urban watersheds. Analysis of rainfall data from the MSP station found that 90 percent of the storms produced 1.05 inches or less of precipitation (*The MN Stormwater Manual*).

In the past, the major sources of information regarding rainfall in the region were publications TP-40 and TP-49 issued by the National Weather Bureau (now the National Weather Service) in 1961 and 1964, respectively. In 2013, the National Oceanic and Atmospheric Administration (NOAA) released a new study commonly referred to as "Atlas 14." The revised maps in Atlas 14 incorporated more rain gaging stations and longer rainfall records. NOAA's published report essentially serves as an update to TP-40. The sources give information on storm durations of up to 10 days. **Table 2-2** lists many of the precipitation and runoff events used for design purposes.

Table 2-2 Selected Precipitation and Runoff Events

Type of Event and Frequency	Duration	Amount from TP40 (Inches)	Amount from Atlas 14 (Inches)
Rainfall			
1-year	24-hour	2.4	2.5
2-year		2.8	2.8
5-year		3.6	3.5
10-year		4.2	4.2
25-year		4.8	5.4
50-year		5.3	6.4
100-year		6.0	7.5
25-year	10-day	8.8	8.0
50-year		9.9	9.1
100-year		10.9	10.1
Runoff (snowmelt)			
10-year	10-day	4.7	N/A
25-year		5.7	N/A
50-year		6.4	N/A
100-year		7.1	N/A

Source: TP40: Rainfall Frequency Atlas of the United States (US Weather Bureau), Atlas 14: NOAA's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server (PFDS), data from Minneapolis/St. Paul International Airport

For the design of future stormwater systems, the City of Lilydale will consider the impact of the precipitation totals from Atlas 14 with additional consideration that the in-place systems were designed using the precipitation totals from TP-40.

Additional climate information is available from a number of sources, such as the following:

- Atlas 14
https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=mn
- Minnesota Climatology Working Group,
<http://climate.umn.edu>
http://climate.umn.edu/doc/twin_cities/twin_cities.htm
- Minnesota Department of Natural Resources
<http://www.dnr.state.mn.us/climate/index.html>

2.2.1 Climate Change

While the return period precipitation totals described above will guide the City's considerations for current and future stormwater infrastructure, continued climate change may result in additional changes to the guidance in the future. For example, total annual precipitation amounts in the Great Lakes region are trending upwards (SWCS, 2003), with the total annual average precipitation for the Minneapolis-St. Paul Airport Station steadily increasing as follows (Minnesota Climatology Working Group):

- 28.32 inches (1961-1990)
- 29.41 inches (1971-2000)
- 30.61 inches (1980-2010)

Furthermore, the Great Lakes Integrated Sciences and Assessments (GLISA) noted the following trends for the Twin Cities between 1951 and 2012:

- Annual average temperatures warmed by 3.2 degrees F, faster than national and global rates.
- The length of the freeze free season (growing season) increased 16 days.
- Total precipitation increased 20.7% with fall and spring increases over 25%
- The number of heavy precipitation events has increased by 58.3%

2.3 Geology and Soils

Lilydale lies immediately south of the Mississippi River and slightly east of the confluence of the Mississippi and Minnesota Rivers. Lilydale is on the edge of the Mississippi River gorge, which is a unique geologic region, carved out about 12,000 years ago by the retreat of glacial St. Anthony Falls. The geologic strata underlying the soil of Upper Lilydale can be physically observed in the vicinity of the steep bluffs that are present within Lilydale. A plan sheet of Lilydale's sanitary sewer system identifies the geologic strata present for much of Lilydale southwest of Interstate 35E. This plan sheet may be viewed at Lilydale's City Hall.

From the elevation of the Mississippi River, which is generally at an elevation between 690 and 710 feet above mean sea level, to an elevation of approximately 772 feet is St. Peter Sandstone. From 772 feet to

776 feet is Glenwood Shale; from 776 feet to 880 feet is Platteville Limestone. In the northeast corner of Lilydale, a layer of Decorah Shale has been exposed to an elevation of approximately 890 feet (City of Lilydale, 1990).

The soils on the slopes below the bluff lines are comprised of red and gray glacial till and exposed fragments of bedrock. These slopes are generally very steep and have only a thin layer of soil. On the bluff tops, soils in Upper Lilydale are generally shallow, well drained, and light to moderately dark-loams and sandy-loams. These soils are generally overlying glacial till and bedrock, but in some cases lie directly over bedrock. In most cases, these soils are suited to urban development.

2.4 Topography

The topography within Lilydale has been affected in the geologic past by the actions of the Mississippi River and the retreat of the glacial St. Anthony Falls. Most of the developed portions of the City are located between two bluffs. The first bluff rises from the elevation of the Mississippi River to the elevation of Highway 13. The second bluff runs roughly parallel to of Highway 13. Most of the land in Lower Lilydale, which is generally the area between the Mississippi River and the toe of the lower bluff, consists of land that has been purchased by St. Paul Parks. Elevations within Lilydale range from elevations of approximately 690 feet above mean sea level at the Mississippi River to elevations of approximately 890 feet above mean sea level in the northeast corner of Lilydale. **Figure 2-3** shows the elevation contours within Lilydale. Additional topographic detail can be found in Lilydale’s Comprehensive Plan.

2.5 Land Use

Lilydale is fully developed and any land use changes in the future will occur as a result of redevelopment activity. Park and open space occupy nearly half of the City. Lilydale Regional Park is located in both Lilydale and St. Paul and within the floodplain of the Mississippi River. St. Paul Parks and Recreation Department owns and operates the park. Lilydale’s Comprehensive Plan should be consulted for detailed information on current land use within Lilydale. The current land use is shown in **Figure 2-4** and is summarized in **Table 2-3**.

Table 2-3 Land Use in Lilydale

Land Use	Percent of Lilydale	Land Use	Percent of Lilydale
Commercial	4.6%	Residential – Single Family	0.5%
Park/Open Space	48.5%	Right of Way	2.6%
Public	0.1%	Water (including River)	30.4%
Residential – Low Density	0.1%	Vacant	0.9%
Residential – Multi-Family	11.6%		

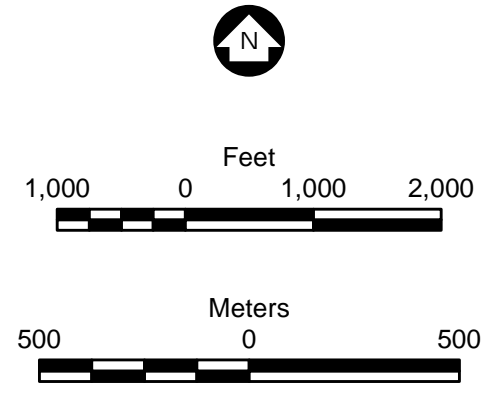
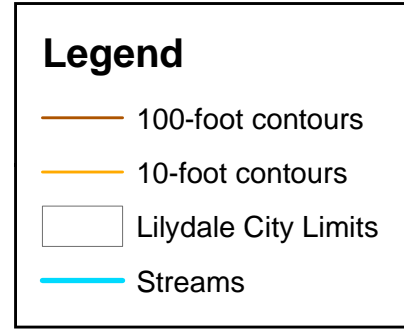
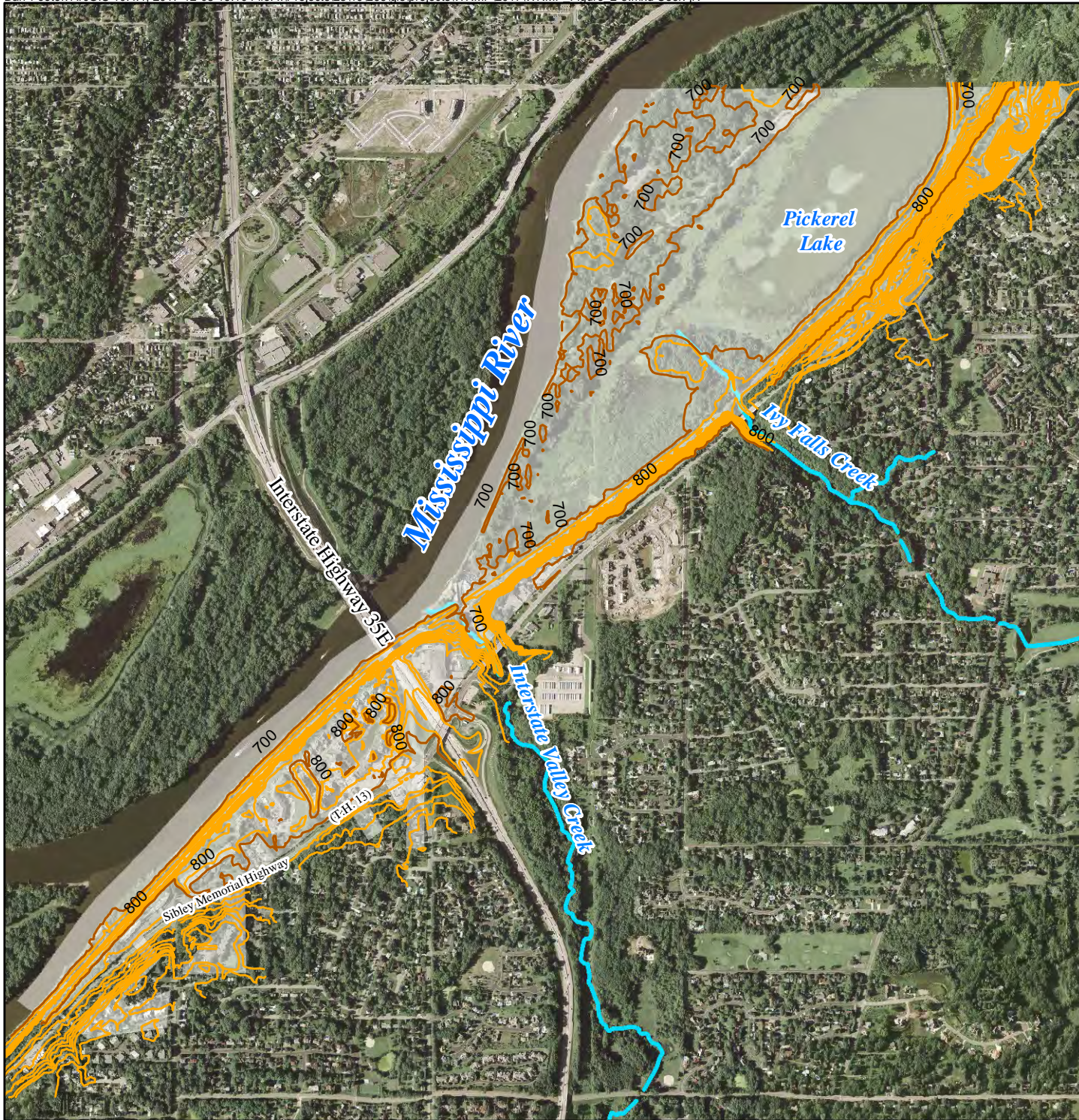


Figure 2-3
TOPOGRAPHY IN LILYDALE
Surface Water Management Plan
City of Lilydale on the Mississippi
Lilydale, Minnesota

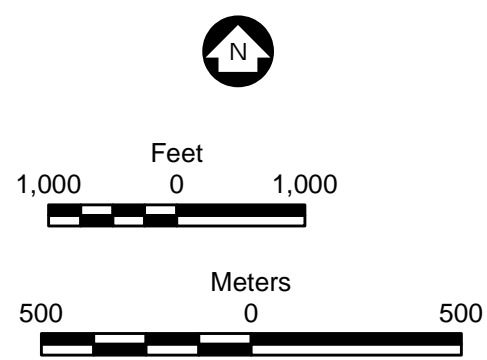
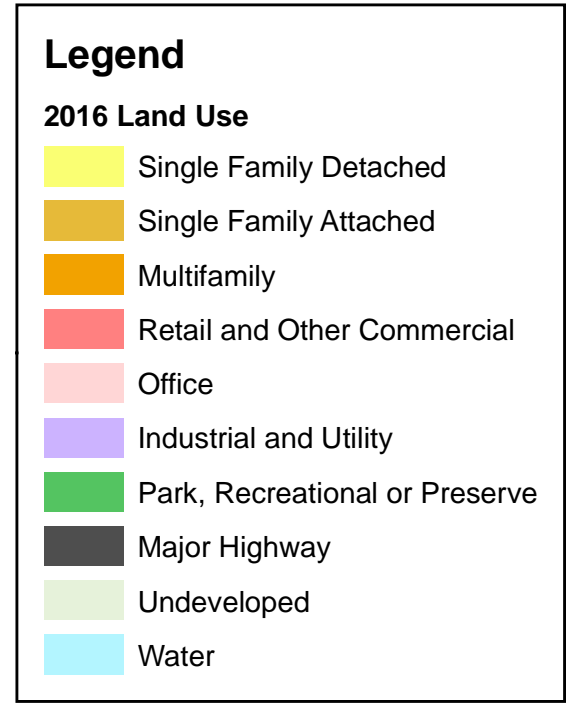
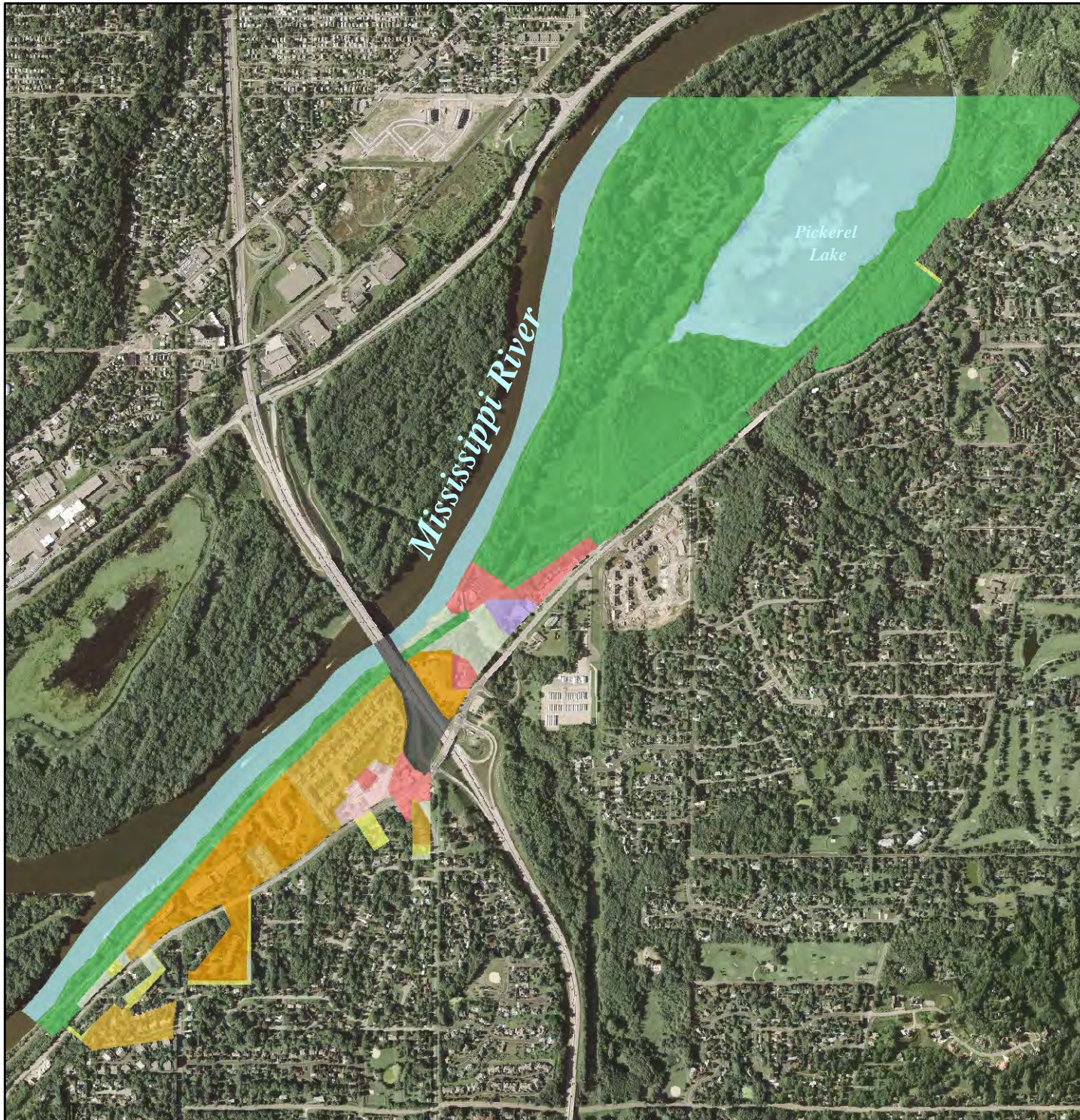


Figure 2-4
LILYDALE LAND USE
Surface Water Management Plan
City of Lilydale on the Mississippi
Lilydale, Minnesota

3.0 Hydrologic System

3.1 Drainage System and Watersheds

The drainage system serving Lilydale is shown in **Figure 3-1** and **Figure 3-2**. These figures include field-verified storm sewers and culverts, and storm sewers and culverts within Lilydale and as reported in Mn/DOT plans and in the *Mendota Heights Local Surface Water Management Plan*.

The subwatersheds which drain into Lilydale or include portions of Lilydale are shown on **Figure 3-3** and **Figure 3-4**. No attempt was made to delineate the subwatersheds lying between the Dakota County Big Rivers Regional Trail and the Mississippi River; rather flows traversing this narrow strip of land are treated as discharging to the Mississippi River. All watersheds have either natural outlets or storm sewer outlets, so there are no land-locked basins within the City.

Modeled peak flows for 10-year and 100-year storm events are presented in **Appendix A**. Some stormwater runoff flows originate in Mendota Heights and enter Lilydale through storm sewers, overland flow, or through culverts. The 2006 *Mendota Heights Local Surface Water Management Plan* presents peak flows for the areas that drain towards Lilydale; however, the modeling was less detailed than that performed for Lilydale in 1997. Therefore, the 1997 modeling results, using TP-40 precipitation data, are presented in **Appendix A** because they provide a more detailed representation of the water flows through Lilydale, and appear to be broadly consistent with the 2006 *Mendota Heights Local Surface Water Management Plan*.

3.2 Water Resources Inventory

The City of Lilydale has many natural water resources available for the use and enjoyment of its residents. These water resources are briefly described here and are shown, along with a National Wetland Inventory, in **Figure 3-5**. **Table 3-1**, below, lists the water bodies within the City and summarizes existing impairments. Additional descriptions of the water bodies are provided in the sections below.

Table 3-1 Summary of impairments for Lilydale water bodies

Water Body	Impaired Use	Current Impairments ¹	Approved TMDLs
Mississippi River	Aquatic Consumption Aquatic Life Aquatic Recreation	Mercury in fish tissue Mercury in water column Total Suspended Solids (TSS) Fecal Coliform Nutrients PCBs in fish tissue PCBs in water column Perfluorooctane Sulfonate (PFOS) in fish tissue Perfluorooctane Sulfonate (PFOS) in water column	Mercury in fish tissue Mercury in water column Total Suspended Solids (TSS)
Minnesota river	Aquatic Consumption Aquatic Life	Dissolved Oxygen Mercury in fish tissue Mercury in water column Nutrients PCBs in fish tissue Turbidity	Dissolved Oxygen Mercury in fish tissue Mercury in water column
Interstate Valley Creek	Aquatic Recreation	E. coli	E. coli
Ivy Falls Creek	None	None	None
Pickerel Lake	Aquatic Consumption	Mercury in fish tissue	Mercury in fish tissue

3.2.1 Mississippi River

The Mississippi River is listed on the Minnesota Public Waters Inventory and forms the bulk of the boundary along the west side of Lilydale. It serves as a major transportation corridor for the shipping industry and as a major recreation area for boaters, anglers, and nature lovers. Approximately half of the streambanks of the Mississippi River within the Lilydale city limits are located in Lower Lilydale, which is managed by St. Paul Parks. The remaining streambanks within Lilydale are located on private land, but remain undeveloped except for the Dakota County Regional Trail that runs adjacent to the river.

The Minnesota Pollution Control Agency (MPCA) publishes a bi-annual list of impaired waters. A full description of this list and criteria for including water bodies on this list can be found on the MPCA's website (www.pca.state.mn.us). The Mississippi River at Lilydale is included on the 2018 impaired waters list. It is listed as being impaired for fecal coliform, mercury, and total suspended solids. There are Fish Consumption Advisories for mercury and PCB. It was previously listed as being impaired for Perfluorooctane Sulfonate (PFOS) in fish tissue; however it was delisted for this impairment in 2014.

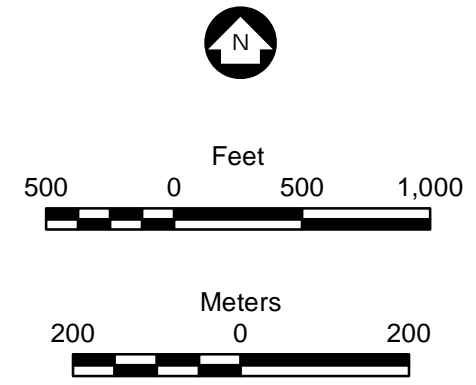
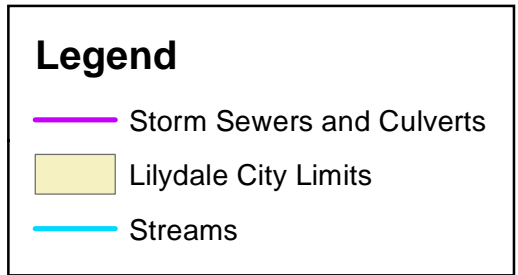


Figure 3-1
STORM SEWERS AND
CULVERTS - WEST
Water Resources Management Plan
City of Lilydale on the Mississippi
Lilydale, Minnesota

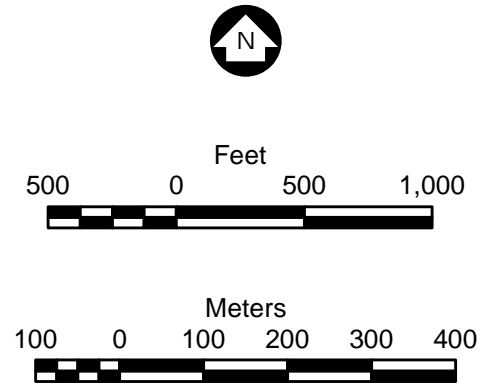
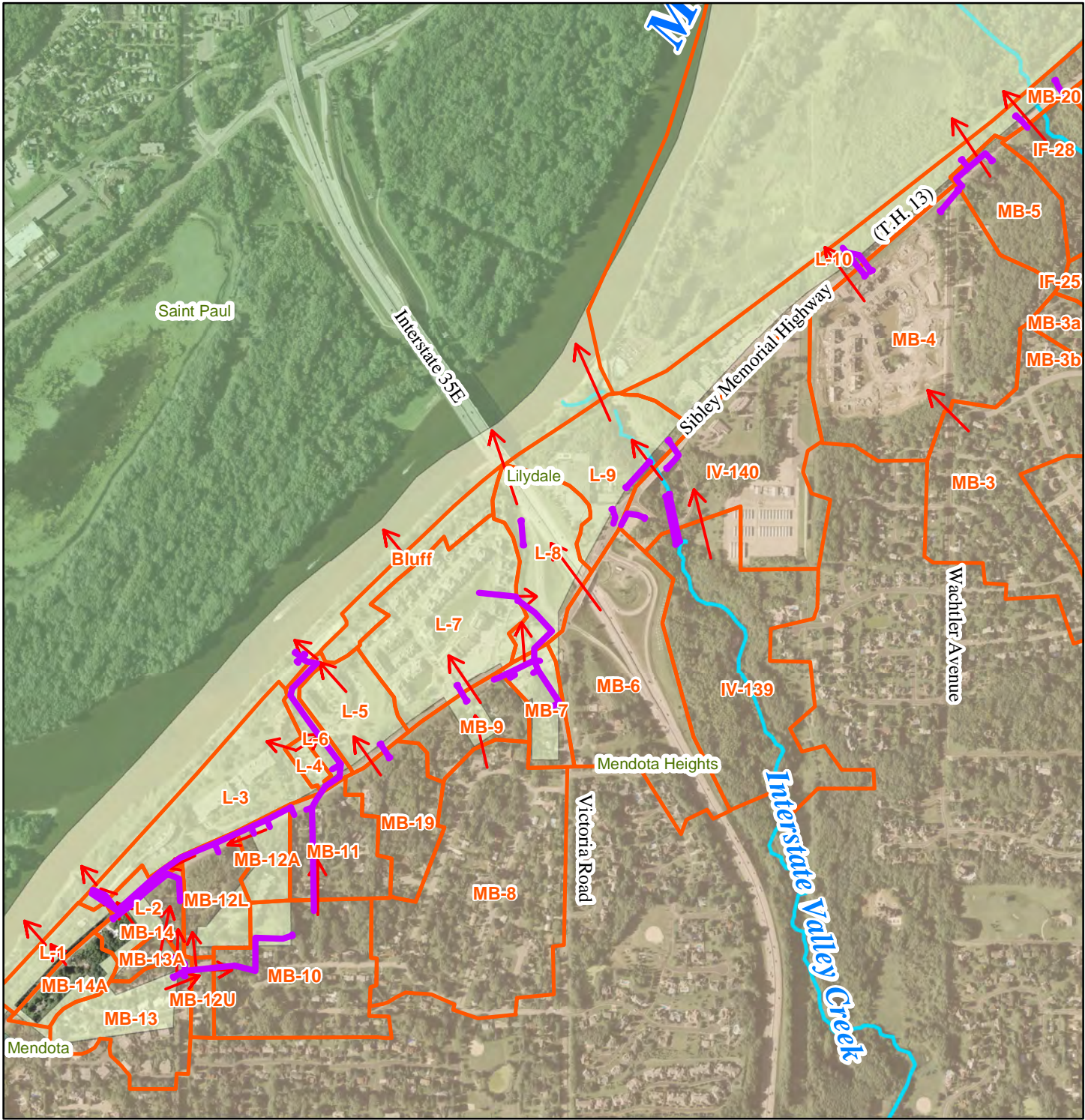


Figure 3-2
STORM SEWERS AND
CULVERTS - EAST
Surface Water Management Plan
City of Lilydale on the Mississippi
Lilydale, Minnesota



Legend

- Storm_Sewers_and_Culverts
- Drainage Areas
- Drainage Arrows
- Lilydale City Limits
- Streams

Feet

1,000 0 1,000

Meters

200 0 200 400

Figure 3-3
DRAINAGE AREAS THAT DRAIN TO THE CITY OF LILYDALE - WEST
Water Resources Management Plan
City of Lilydale on the Mississippi
Lilydale, Minnesota

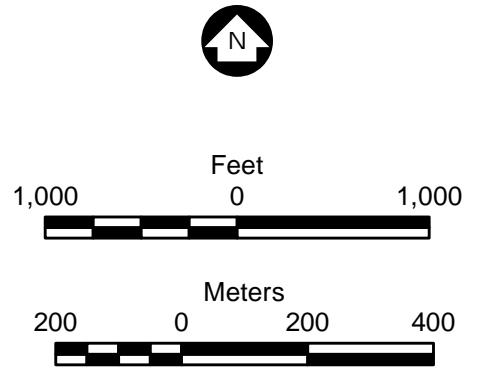
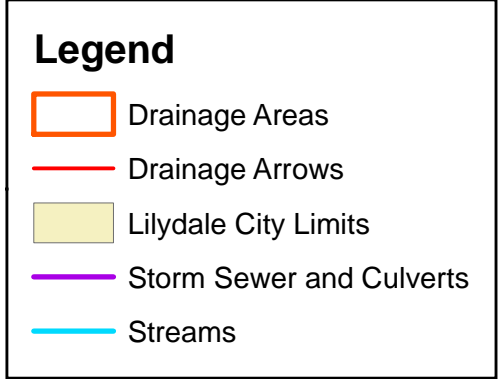
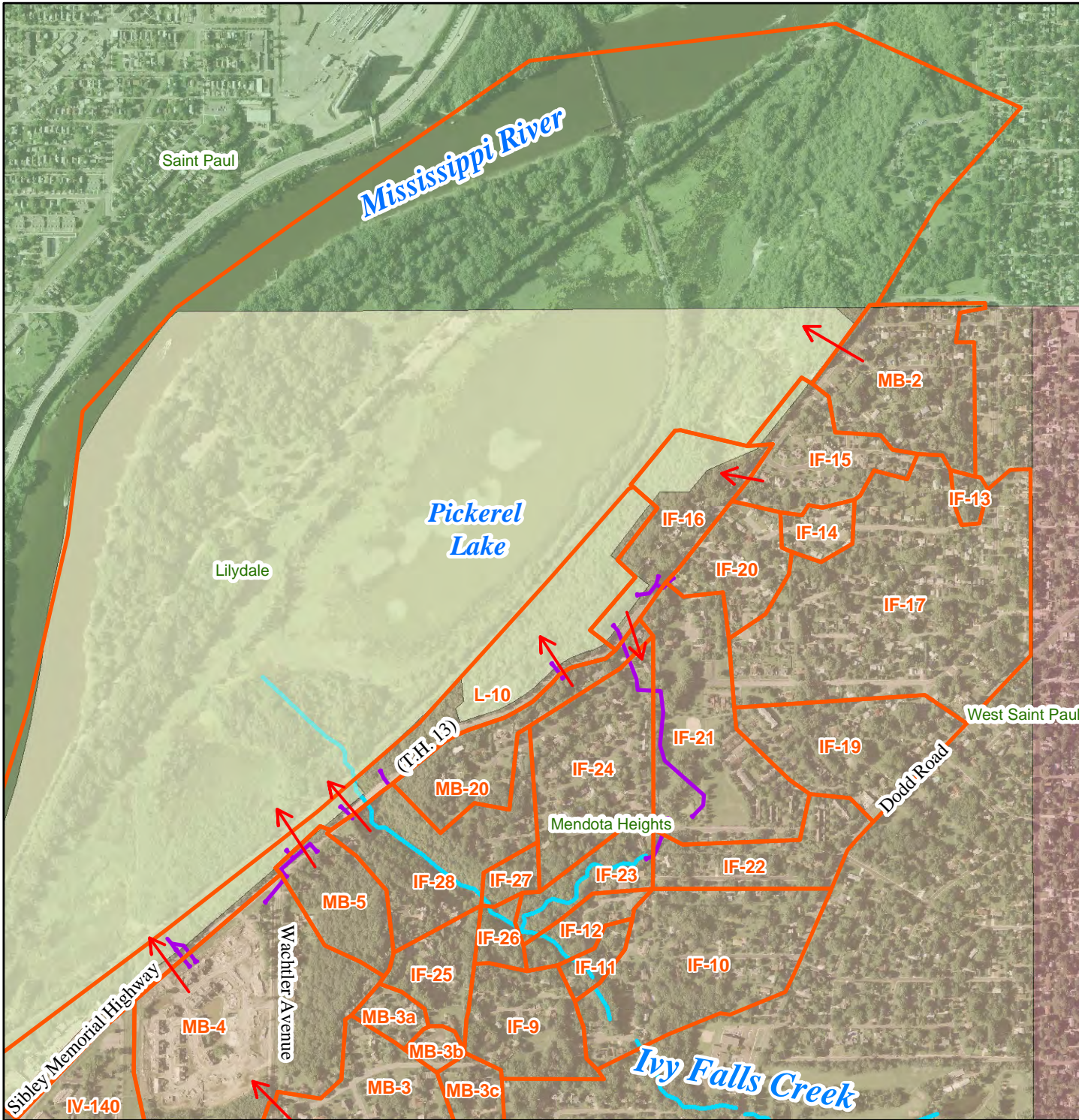


Figure 3-4

DRAINAGE AREAS THAT DRAIN TO THE CITY OF LILYDALE - EAST Surface Water Management Plan City of Lilydale on the Mississippi Lilydale, Minnesota

3.2.2 Minnesota River

The Minnesota River is also listed on the Minnesota Public Waters Inventory and forms the remaining portion of the western boundary for Lilydale. It serves the same transportation and recreation functions as the Mississippi River.

The Minnesota River at Lilydale is included on the draft 2018 impaired waters list. It is listed as being impaired for excessive nutrients, mercury, turbidity, and dissolved oxygen. There are Fish Consumption Advisories for mercury and PCB. It was previously listed as being impaired for fecal coliform; however it was delisted for this impairment in 2012.

3.2.3 Interstate Valley Creek

Interstate Valley Creek begins near the intersection of Highway 110 and Highway 149 (Dodd Road) in the City of Mendota Heights. The creek flows northward and generally parallels Interstate 35E. It passes through a culvert in Lilydale Road, then along Lilydale Road and drains directly into the Mississippi River. Within Lilydale, the stream is generally in good condition. Some eroding streambanks near the Big Rivers Regional Trail were remedied as part of the Lilydale Senior Living redevelopment project. Utility work by Xcel Energy adjacent to the creek in this area has resulted in disturbance and re-stabilization of some portions of the creek. Interstate Valley Creek is included in the draft 2018 Impaired Waters List for *E. coli* contamination. The Upper Mississippi River Bacterial TMDL includes Interstate Valley Creek, and the TMDL has been approved. The implementation program in Section 6 includes items the City will do to address the TMDL.

3.2.4 Ivy Falls Creek

Ivy Falls Creek begins in the Somerset Golf Course in the City of Mendota Heights. It has a steep gradient within Mendota Heights that has resulted in some erosion problems. It drops over a waterfall down the river bluffs, then drains to Pickerel Lake within Lilydale, and eventually drains to the Mississippi River. Within Lilydale, the stream is generally in good condition.

3.2.5 Pickerel Lake

Pickerel Lake is a Minnesota DNR public water body (19-79P). It is a 90 acre lake located in Lilydale-Harriet Island Regional Park and in the floodplain of the Mississippi River along the boundary of Lilydale and St. Paul. The lake is shallow, with a maximum depth of 11 feet. The total watershed area of Pickerel Lake is 1,500 acres, with the majority of the watershed flowing in from Ivy Falls Creek.

Pickerel Lake is ordinarily 10-12 feet above the normal elevation of the Mississippi River and normally discharges to the Mississippi River. Approximately once every 10 years, the Mississippi River backs up into Pickerel Lake, which can greatly affect the water quality of the lake. There is a public access on the lake. Pickerel Lake is included on the MPCA's draft 2018 impaired waters list due to a Fish Consumption Advisory for mercury.

3.2.6 Wetlands

The only DNR designated wetlands (public water wetlands) within the City's boundaries are Pickerel Lake and the wetlands in Lower Lilydale. The National Wetland Inventory (**Figure 3-5**) includes Pickerel Lake and the Lower Lilydale wetlands and also includes the Mississippi and Minnesota Rivers within the city limits. Lower Lilydale can generally be described as the area north of the Pool and Yacht Club property, from the toe of the bluffs to the Mississippi River. Lower Lilydale north of the Pool and Yacht Club is within the floodway of the Mississippi River, which precludes it from most categories of future development. These natural wetland areas are strongly influenced by flooding from the Mississippi River.

3.3 Water Quality Data

The City has not been a sponsor of any monitoring programs in the past; however the following summarizes other monitoring programs that have been undertaken by others.

Water quality data for the Mississippi River and Minnesota River are available through the MPCA's website <http://www.pca.state.mn.us/water/> and through the U.S. Environmental Protection Agency (USEPA) storet website.

The LMRWMO completed a watershed assessment of Ivy Falls Creek and Pickerel Lake and a limited amount of water quality data is available for Pickerel Lake and Ivy Falls Creek. (Appendix B).

The City of Mendota Heights completed informal water quality sampling for E. coli for Interstate Valley Creek as a preliminary attempt to determine a clear source for E. coli concentrations in the creek. The data has not been published.

The water quality data collected is used to help develop goals and policies (Section 5) and assessing what actions the City and its residents can take to Improve water quality.

3.4 Pollutant Sources

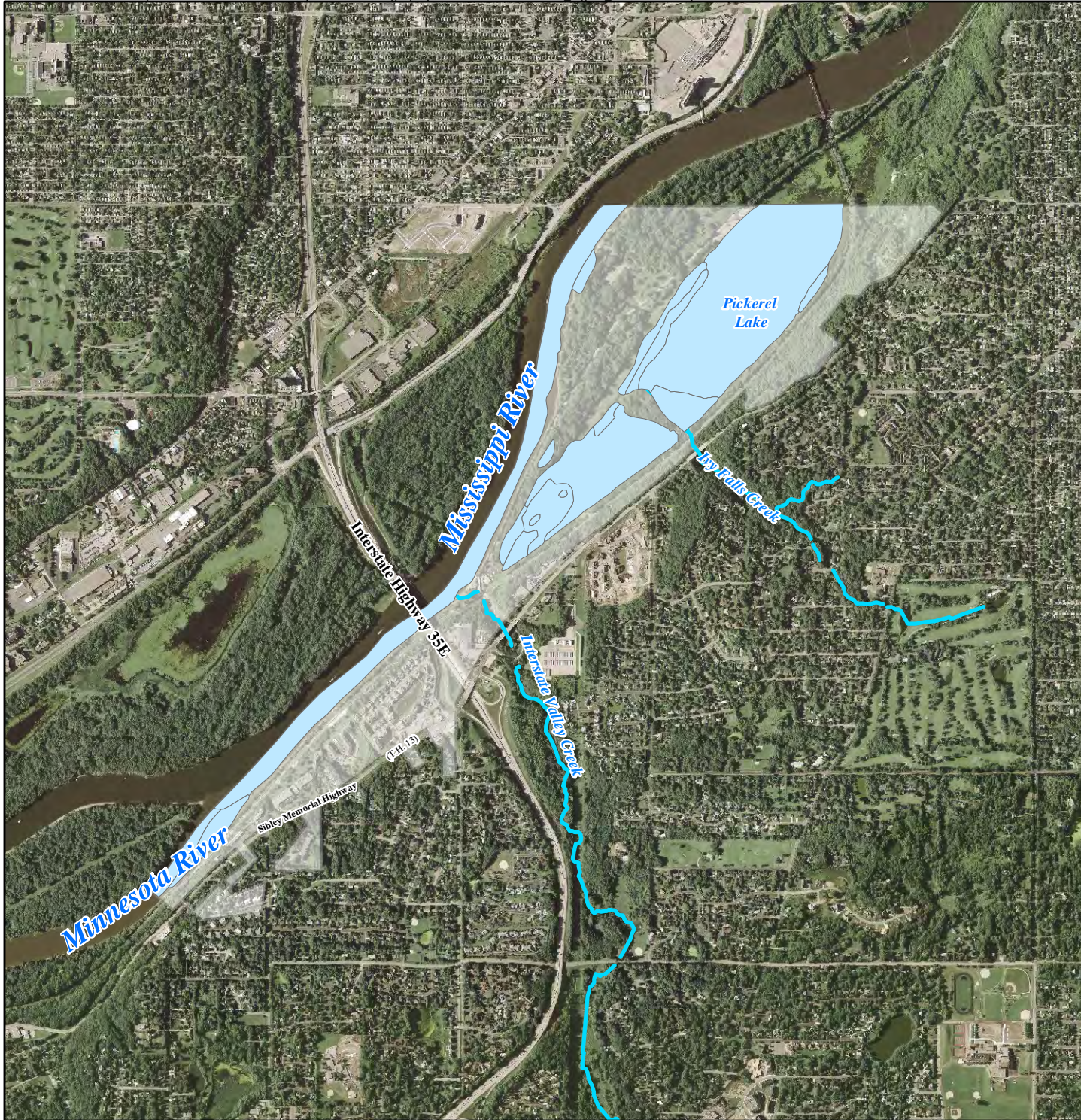
Land use within the City consists of residential, commercial, and parkland. Therefore, any pollution in the stormwater runoff is believed to be consistent with typical pollution from these types of land uses.

According to the Dakota County GIS database (<http://gis.co.dakota.mn.us/website/dakotanetgis/>), there are eleven old waste sites, five dumps, five spill sites and four underground storage tanks within the city limits. Dakota County or the MPCA may be contacted for up-to-date maps and information about these sites.




3.5 Flood Insurance Study

The Mississippi River and the Minnesota Rivers are the only water bodies within Lilydale that have been included in the 2011 *Dakota County Flood Insurance Study* (FIS). The FIS provides floodplain maps and profiles for water bodies included in the study. One recent change to the FIS is that the Pool and Yacht Club is located in the Mississippi River floodplain, but it is no longer located within the floodway. A copy

of the current Dakota County FIS is available for viewing at the Dakota County offices in Apple Valley. It can also be viewed on FEMA's Flood Map Service Center website.



Legend

-  NWI Wetlands
-  Streams
-  Lilydale City Limits

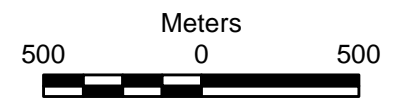


Figure 3-5

WATER RESOURCES INVENTORY
Surface Water Management Plan
City of Lilydale on the Mississippi
Lilydale, Minnesota

4.0 Stormwater Management Approach and Issues

This section summarizes Lilydale's general approach to stormwater management, projects that have been implemented, and current or past issues.

4.1 Recent Practice and General Approach

Lilydale is committed to and has been incorporating stormwater quality improvement measures into its drainage system improvements. The Mayfield Heights Diversion Project ([Section 4.3.2.1](#)), performed jointly by Lilydale and Mendota Heights, diverted the runoff from 8.5 acres of Lilydale's urban land (subwatershed MB-13, [Figure 3-3](#)) to a stormwater pond in subwatershed MB-10 that provides significant water quality benefits through removal of suspended sediments. The City has also required individual developments provide significant stormwater improvement. Riverwood Apartments (subwatershed L-7, [Figure 3-3](#)) constructed stormwater detention basins to limit their post-development runoff to predevelopment rates. The 2002 Stonebridge development (23 acres) included a pond designed to remove sediment, and with an outlet designed to retain both floating and heavier-than-water materials. The Lilydale Senior Living redevelopment (4.1 acres above the bluffs in subwatersheds L-8 and L-9, [Figure 3-3](#)) reduced impervious area by over 40 percent, and provides detention and rainwater garden treatment for the runoff from paved surfaces. The controlled area of these projects, which provide substantial water quality improvement, represents more than one-half of Lilydale's developable land above the river bluffs.

In general, Lilydale requires that property owners manage their own stormwater and all drainage that flows across their property. Lilydale has, at its discretion, participated in providing stormwater management systems that involves intercommunity drainage from upstream communities. In such cases, Lilydale, in cooperation with the LMRWMO and/or LMRWD, the upstream communities, and other non-City property owners (such as the Minnesota Department of Transportation and Dakota County), worked cooperatively with landowners to provide improved stormwater management.

Stormwater management systems will be designed to provide conveyance capacity for the 10-year storm event (level of service). The 10-year storm is the critical precipitation or runoff event which has approximately a 10-percent chance of occurring in any year. The "level of service" is that part of the storm sewer system's total capacity needed to convey runoff without unusual hardship or significant interference with day-to-day public activities. By selecting a 10-year storm event, Lilydale accepts a 10-percent probability in any year that some inconvenience will occur for the day of the storm.

Lilydale intends for drainage systems to provide a 100-year "level of protection" from flooding. The 100-year event is the critical-duration runoff event (precipitation or snowmelt) which has a 1-percent chance of occurring in any year. Thus, ponds are designed for 100-year events. Likewise, the secondary capacity provided by overflow channels and temporary storage in local depressions must be sufficient to protect permanent facilities from flood damage in the 100-year event. If damage or other unacceptable risk is predicted to occur, then the conveyance system is to be sized for a larger event, such that improvements in these areas are provided 100-year protection. Thus, the level of protection along all

trunk conveyors, streams, and open channels and around all wetlands, ponds, detention basins, and lakes will be based on the 100-year event.

The portions of the system that convey outflows from ponding areas will be sized to convey the critical 10-year storm flow or the 100-year event outflow from upstream ponding areas, whichever is greater.

The design storms described above are determined through statistical analysis of rainfall records across the region and country. In previous versions of Lilydale's Water Resources Management Plan, Technical Paper 40 (TP-40) (Hershfield, 1961) was the document used to determine design storms. In 2013, the National Oceanic and Atmospheric Administration (NOAA) released revised maps of return period precipitation totals. The revised maps incorporated more rain gaging stations and longer rainfall records. NOAA published a report that essentially serves as an update to TP-40. The new study is commonly referred to as "Atlas 14". Both studies examined total rainfall over various lengths of time, so a complete comparison of design storm rainfall totals between the two studies would require several tables. The 24-hour storm is one of the most common storm durations used in design storms, and a comparison of the 24-hour rainfall totals for various return periods is provided in [Table 2-2](#) in [Section 2.2](#).

Most previously completed storm sewer systems in Lilydale (Stormwater Project No. 1, Stormwater Project No. 2, Mayfield Heights diversion) were designed with capacity to convey the 100-year frequency peak flow rate from the TP-40 rainfall totals. There is generally some excess capacity in the system; however, some of Lilydale's storm sewer systems may no longer meet the level of service for which they were originally designed. Since these systems were originally designed to convey the peak flows from the 100-year storm, they still have enough capacity to convey the peak flows from at least the 10-year storm. The current level of service and level of protection will be evaluated during the implementation of this SWMP. It is Lilydale's intention to design new trunk stormwater conveyance systems to accommodate the 100-year frequency peak flow rate, insofar as feasible, using the best available precipitation data. The Stormwater Project No. 2 Modifications project, completed in 2017, was designed to provide a level of service for the 100-year frequency storm from Atlas 14.

Lateral systems that feed the trunk systems will be designed consistent with the receiving trunk system capacity and use Atlas 14 data when possible. For instance, systems feeding to the 10-year-design system in Victoria Road (subwatershed MB-7) should be designed for 10-year flows. The Lilywood Estates system (subwatershed L-4) was designed for the 100-year flows from the ponded runoff in the driveway, consistent with the design standard for Lilydale Stormwater Project No. 1.

4.2 Unresolved Issues

Lilydale has worked to resolve several stormwater management issues. There is one unresolved issue described in [Section 4.2.1](#) The City has addressed several issues and the resolved issues are discussed in [Section 4.3](#).

4.2.1 Interstate Valley Creek Bacteria Impairment

In early 2013, the MPCA issued a *draft Upper Mississippi River Bacterial TMDL and Protection Plan*. The draft study determined that Interstate Valley Creek is impaired for bacteria, and the City learned that it can expect to receive a Waste Load Allocation for reducing bacteria levels in stormwater runoff.

The study included one sampling location on Interstate Valley Creek between the railroad tracks and Lilydale Pool and Yacht Club. The data showed that bacteria concentrations were strongly correlated to stormwater runoff. The study did not determine if the bacteria is of animal or human origin.

A TMDL has been approved, and Lilydale will work to find items in the TMDL's implementation plan that can or should be implemented within Lilydale.

4.3 Resolved Issues

4.3.1 Pickerel Lake

Pickerel Lake (DNR public water body 19-79P) drains to the Mississippi River, which is also a DNR public water body. Pickerel Lake is currently included on the State of Minnesota Impaired Waters List for an Aquatic Consumption Advisory due to mercury in fish tissue. The origin of mercury in public waters is atmospheric, and therefore any mercury present in runoff is also derived from the atmosphere. This issue is addressed in the statewide mercury TMDL. Pickerel Lake also periodically exceeds MPCA eutrophication water quality standards, but has not been included on the impaired waters list due to the MPCA's conclusion that high nutrient concentrations are likely due to flooding from the Mississippi River, rather than watershed loading.

4.3.2 Lexington West Watershed

Peak runoff rates have been a long, on-going concern at the intersection of Lexington Avenue and Highway 13. Stormwater runoff has resulted in sediment deposition within the Highway 13 right-of-way; created a potential for inflow and infiltration issues at Lexington-Riverside Condominiums; and contributed to long-term concerns about bluff erosion and stability. The City completed three projects to address ongoing stormwater management issues in this area, as described below.

4.3.2.1 Mayfield Heights Diversion

The City constructed a new storm sewer to convey the watershed MB-13 stormwater (from Lexington Court and Kingsley Estates) to Mayfield Heights Pond. That pond had ample excess capacity to receive this water. The pond improves water quality and releases the water at a slow rate along Mayfield Heights Road. This project was completed in 1994.

4.3.2.2 Lilydale Storm Sewer Project #2

The City completed a second project within this drainage area to provide storm sewer management along the lower part of Lexington Avenue, on the west side. It carries the water along Highway 13, then across the Colony Townhomes property and down a drop shaft to a tunnel that connects to the Mississippi River.

This project also eliminated use of an old storm sewer that discharged near the top of the bluffs, eliminating a potential source of bluff erosion. This project was completed in 1995.

4.3.2.3 Lilydale Storm Sewer Project #2 Modification

Despite improvements from the Mayfield Heights Diversion and the Lilydale Storm Sewer Project #2, stormwater management continued to be an issue within this drainage area. LMRWMO and the City of Lilydale completed a feasibility study in 2010 to examine potential drainage improvements in the vicinity of Lexington Avenue and Highway 13. The study recommended two feasible alternatives, both including capturing runoff in an extension of the Lilydale Stormwater Project #1 storm sewer system. The more feasible option was to construct a new storm sewer along Lexington Avenue and tie into storm sewer Project #1 in front of Lilywood.

Following completion of the feasibility study, the Minnesota Department of Transportation (Mn/DOT) informed the City of their intent to complete a project along Highway 13 that would involve repaving the road, installing curb and gutter, and improving drainage within the right-of-way. The City initially assumed that the storm sewer system along Highway 13 would tie into Lilydale Stormwater Project #1; however an additional analysis determined that this would not provide a sufficient level of service for stormwater management along Highway 13. Instead, the stormwater collected on Highway 13 was directed to Lilydale Stormwater Project #2, and a new drop shaft was constructed to safely convey the water down the bluff to the drainage system along the Big Rivers Regional Trail. Construction was finished in 2017, and the new storm sewer systems are shown in [Figure 3-3](#).

4.3.3 Mayfield District

The drainage system from the intersection of Highway 13 and Mayfield Heights was inadequate to convey the storm drainage caused by erosion of this channel and erosion of the Mississippi River Bluffs. When a new development was constructed (Lilywood Estates) that would add water to this system, the City installed Lilydale Stormwater Project #1 from the north side of Highway 13 to the Big Rivers Regional Trail. This system, in addition to serving the Lilydale developments that border it, receives the outflow from Mayfield Heights Pond, and other runoff from Mendota Heights and from Highway 13. This project was completed in 1995.

4.4 Existing Agreements with Landowners

As a condition for approval of development and redevelopment plans, Lilydale has required the use of stormwater detention and/or flow rate restrictions. The following conditions are part of the development agreements at the properties and have been successfully implemented:

- **Lilydale Senior Living** ([Figure 3-3](#), subwatershed L-9): Provide runoff detention and infiltration with ponds and rainwater gardens for major portions of the property to reduce the peak flows and eliminate a top-of-bluff discharge location behind the Lilydale Garden Center. The property owners are responsible for maintaining the system, including the ponds, rainwater gardens, pipes, energy dissipaters, and inlets.

- **Stonebridge (Figure 3-3, subwatershed L-7):**The Stonebridge stormwater drains to a large detention basin. The outlet from the pond is designed to retain floating materials, as well as sediment, in the pond. The Homeowners Association is responsible for all maintenance of the storm sewer system within this development.
- **Lilywood Estates (Figure 3-3, subwatershed L-4):** Provide ponding of 1.5 feet deep over the dual catch basin inlets at the northwest end of the driveway. This is needed to develop 10 cfs of inlet capacity in storms of up to 100-year return frequency. Overflow for larger storms is to be directed west so that it passes west of the Riverain Condominiums.
- **Cliff Side (Figure 3-3, subwatershed MB-7):** Provide ponding of 1,100 cubic feet of water on the driveway to reduce the 10-year discharge rate to 1 cfs.
- **Lilydale Garden Center (Figure 3-3, subwatershed L-9):** In concert with the construction of the storm sewer system for Lilydale Senior Living, Lilydale Garden Center directs their stormwater into a pond that drains into that system, taking measures to minimize sediment carried by the water.

4.5 Top-of-Bluff Outfalls

Stormwater runoff discharged in a channel or pipe at or near the top of the bluff creates a long-term erosion problem for the bluff. The City has not permitted new top-of-bluff discharges for many years and the City has sought ways to either eliminate or reduce the volume of flow at any existing outfall locations. The City will continue to explore means to eliminate or reduce runoff discharged at or near the top of the bluff.

4.6 Inflow and Infiltration

In the Metropolitan Council's 2005 report titled "Preliminary Inflow/Infiltration Surcharge Program," Lilydale was identified as a potential source of excess stormwater inflow and infiltration (I&I) into the metro-wide sanitary sewer system. The City completed a study to determine sources of excess stormwater inflow in 2008. Inflow is where stormwater is misdirected into Lilydale's sanitary sewer system through intentional connections such as sump pumps, outside area drains, and roof leaders. Infiltration is where storm and ground water enter the sanitary sewer system through cracks or leaks in the sewer pipes or manholes. I&I can lead to backups, overflows and unnecessary and expensive treatment of stormwater.

A certain amount of I&I is inevitable in all sanitary systems, and systems are designed to account for some I&I. However, excessive and uncontrolled I&I creates the need to build larger interceptors and treatment plants than would otherwise be needed and to treat relatively clean stormwater that would otherwise not require this level of treatment. The City worked with property owners to address all identified I/I issues. The following summarizes the completed projects:

- *RiverPointe Condominiums:* Roof drains that were connected to the sanitary sewer were sealed and roof runoff was diverted to downspouts

-
- *Lexington Riverside Condominiums*: Drainage around the sides of the buildings was improved to prevent runoff from entering the underground garages. In 2021 Lexington Riverside re-roofed their east building and diverted the roof runoff to downspouts following the discovery that the roof drained to the sanitary sewer. This action resulted in a substantial reduction in the increase in Lilydale's sanitary sewer flows from heavy rains.
 - *Riverwood Apartments*: Drainage in front of the underground garage was improved to prevent runoff from entering the garage.
 - *Lexington Court*: A broken manhole was repaired to prevent groundwater from entering the sanitary sewer system.

It is Lilydale policy to correct any sources of excess inflow that originate from City-owned property. It is also Lilydale policy to work with private landowners to correct sources of excess inflow that originate from private property.

In 2022, the City of Lilydale replaced the sanitary sewer lift station that discharges to the MCES system. As part of this project, the manhole upstream of the lift station has been replaced. This existing structure was identified as having significant I&I potential. With its replacement, we expect to see a reduction in I&I into the city's sanitary sewer system.

5.0 Goals and Policies

Almost all of the developable land within Lilydale has already been developed, therefore, Lilydale's Goals and Policies relate almost entirely to the maintenance of existing systems or to redevelopment activities.

Lilydale participates in the LMRWMO and is also partially located in LMRWD. LMRWMO was formed as agreement between cities and residents within each watershed to work together towards the common goal of maintaining or improving the quality of the surface waters and stormwater runoff. The goals and policies of these organizations are also the goals and policies of Lilydale. The goals and policies of the DNR, MPCA, Metropolitan Council, and any other relevant regulatory agency should also be consulted in addition to those discussed here.

5.1 Lake and Stream Water Quality

5.1.1 Goal

All work in Lilydale will be managed for non-degradation of the surface water quality within the city limits, with allowance for natural variability. Therefore, as property redevelops, Lilydale intends to require stormwater management practices that will minimize adverse impacts on the surface waters within the city limits.

5.1.2 Policies

5.1.2.1 WQ1

Land development, redevelopment and other projects within the tributary watershed will be designed to preserve or improve existing water quality so far as reasonably possible. To conform to this policy, Lilydale will require implementation of best management practices during land development and other construction in the tributary watershed.

5.1.2.2 WQ2

Lilydale will address mandatory Total Maximum Daily Load (TMDL) requirements.

5.1.2.3 WQ3

For redevelopment of properties, the developer must provide pretreatment of stormwater runoff for those portions of the stormwater system that receive direct stormwater runoff (i.e., no pretreatment) from highly impervious land uses.

5.1.2.4 WQ4

Lilydale will cooperate with the LMRWMO, LMRWD, Met Council, Minnesota DNR, City of Mendota Heights, City of St. Paul, Dakota County SWCD, MPCA, or any other agency that desires to conduct water quality monitoring of surface waters within Lilydale.

5.1.2.5 WQ5

Lilydale will cooperate with the LMRWMO, LMRWD, Met Council, Minnesota DNR, City of Mendota Heights, City of St. Paul, Dakota County SWCD, MPCA, or other interested governmental bodies to establish water quality goals for surface waters that pass through or lie within the city limits.

5.1.2.6 WQ6

Lilydale will cooperate in efforts to assess and prioritize shoreland areas for restoration. Shoreland areas include streambanks and lakeshore areas. Any areas identified for restoration will be included in future management plans. Lilydale will prepare a schedule for the assessment and prioritization of shoreland areas. The schedule will be based on the stability of the areas, local major rain events, and changes in the watersheds to the shoreland areas. Lilydale will assess shoreland areas on Ivy Falls Creek and Interstate Valley Creek. Lilydale will cooperate with St. Paul Parks on assessments of shoreland areas of Pickerel Lake and will cooperate with the United States Army Corps of Engineers on assessments of shoreland areas of the Mississippi River and Minnesota River.

5.1.2.7 WQ7

Lilydale encourages the use of low impact development (LID) practices during development or redevelopment, wherever possible, to reduce impervious surfaces and improve water quality. Although infiltration practices are not recommended in most of Lilydale, filtration practices or low impact site design may be used as alternatives.

5.1.2.8 WQ8

An average 15-foot buffer of natural vegetation above the 100-year high water level (if established) or wetted boundary shall be established and maintained around lakes, streams, and wetlands, for new or redevelopment projects that exceed one acre in land disturbance (for this policy, mill and overlay and pavement rehabilitation projects are not considered land disturbance). In addition, the city encourages buffer widths be increased where the steepness of the land poses additional erosion or slope failure potential. (See WM3)

5.1.2.9 WQ9

Design of stream bank stabilization and streambed control measures should consider unique or special site conditions, energy dissipation potential, adverse effects, preservation of natural processes and habitat, and aesthetics, in addition to standard engineering and economic criteria.

5.1.2.10 WQ10

Regulated substances, hazardous or biological waste, or petroleum products, whether treated or untreated, may not be discharged to any stormwater system if those discharges may have a deleterious effect upon a water of the state (surface and groundwater), unless the discharge is in compliance with federal, state, and local regulations.

5.1.2.11 WQ11

Lilydale will manage the floodplains within the City in accordance with standards established by the State and LMRWMO and LMRWD, whichever is more stringent. This will include regulations related to fill and structures within the floodplain..

5.1.2.12 WQ12

To protect water quality and natural resources, Lilydale will manage vegetation, land alteration activities, and stormwater management in accordance with the City of Lilydale ordinances, the MPCA's NPDES General Permit to Discharge Stormwater from Construction Sites, the MPCA's Small Municipal Separate Storm Sewer Systems (MS4) General Permit, the Mississippi River Corridor Critical Area (MCCRA) ordinance, and the rules of the Lower Minnesota River Watershed District (LMRWD) and the Lower Mississippi River Watershed Management Organization (LMRWMO). When multiple standards apply to a given project, the most stringent of rules will apply.

5.2 Stormwater Pollution Prevention Program

As a participant in the NPDES Phase II MS4 program, Lilydale established the following goals and policies.

5.2.1 Goal 1

Operate, manage, and maintain Lilydale's stormwater system to ensure proper functioning of the system and to meet the requirements of Lilydale's NPDES Phase II MS4 Permit and other agency requirements.

5.2.2 Policies

5.2.2.1 SWPPP1

Lilydale will implement the BMPs identified in its SWPPP for its NPDES Phase II MS4 Permit.

5.2.2.2 SWPPP2

Lilydale will inspect, operate, maintain, and repair its stormwater system, following a regular work schedule.

5.2.2.3 SWPPP3

Lilydale will implement BMPs on City projects in accordance with the NPDES General Construction Stormwater Permit and Lilydale's NPDES Phase II MS4 Permit.

5.2.2.4 SWPPP4

Lilydale will address mandatory Total Maximum Daily Load (TMDL) requirements.

5.3 Stormwater Quality

5.3.1 Goal

Improve the quality of stormwater runoff reaching the Minnesota River and Mississippi River by reducing nonpoint source pollution (including sediment) carried in stormwater runoff, reducing volumes of stormwater runoff and reducing the amount of impervious surface in the developed parts of Lilydale.

5.3.2 Policies

5.3.2.1 SWQ1

New development and redevelopment (generally, development) shall incorporate best management practices (BMPs) that result in net reductions in total suspended solids (TSS) and Total Phosphorus (TP) consistent with LMRWMO and LMRWD policies and NPDES permit requirements.

Volume reduction practices shall be considered as the preferred water quality treatment practice provided that infiltration can be achieved consistent with the guidance and prohibitions described in the MPCA's Construction Stormwater General Permit, the MPCA's MS4 Stormwater General Permit and Minnesota Stormwater Manual.

Minimum water quality treatment volumes are defined for non-linear and linear projects as:

- Non-linear projects: 1 inch of runoff from new or redeveloped impervious surface.
- Linear projects: 1 inch of runoff from new impervious surface or 0.5 inch of runoff from new and redeveloped impervious surface, whichever is greater. Where the entire treatment volume cannot be treated within the existing right-of-way, a reasonable attempt to treat stormwater must be made consistent with the MS4 permit, as updated.

Where volume reduction practices (i.e. infiltration) are prohibited or cannot be achieved at reasonable cost, alternative water quality treatment methods consistent with the most current version of the MPCA's Construction Stormwater General Permit, MPCA's MS4 Stormwater General Permit and Minnesota Stormwater Manual may be utilized. The target reductions of TSS and TP are 80% and 50%, respectively, compared to untreated water quality from the development, nor may the development result in a net increase of TSS and TP loading to downstream water bodies. Explanations must be provided if the development is unable to achieve these targets.

BMPs can be found in the *Minnesota Stormwater Manual* (www.pca.state.mn.us/water/stormwater/stormwater-manual.html), and other resources.

Findings in TMDLs may supersede established standards and may require greater removals. Lilydale requires pretreatment of stormwater prior to discharge to protect the functionality of the system. Pretreatment shall collect sediment, skim floatables, and be easily accessed for

inspection and maintenance. The development shall include provisions for the ongoing operation, maintenance, renewal, and replacement of the BMPs to assure their effectiveness. Each development shall annually submit a letter to Lilydale describing the maintenance or other work performed on their BMPs, and characterizing their condition and whether they remain effective for stormwater quality improvement.

5.3.2.2 SWQ2

Lilydale will require submittal of stormwater management plans (Runoff Control Plans or Runoff Management Plans in terminology used by the LMRWMO and LMRWD, respectively) for land disturbance and development or redevelopment activities exceeding one acre of disturbance (including projects less than one acre that are part of a larger common plan of development totaling one acre or more).

The stormwater management plans must meet the stormwater management design criteria in this SWMP, City of Lilydale ordinances, and either the Lower Mississippi River Watershed Management Organization Watershed Management Plan or the Lower Minnesota River Watershed District Watershed Management Plan (depending on the project location), including stormwater rate control, water quality treatment, and volume retention (if applicable) requirements.

5.3.2.3 SWQ3

Lilydale is in a unique setting, at the bluffs of the Mississippi River. An important consequence of this setting is that water which infiltrates above the bluffs tends to discharge at the steep bedrock and soil slopes of the bluffs. Such discharges accelerate the weathering and deterioration of the steep bluff slopes. Therefore, Lilydale does not encourage infiltration of stormwater for groundwater recharge on top of the bluffs.

In areas where proximity to bedrock limits infiltration, filtration for stormwater quality improvement is encouraged and the design will use filtration media, subsurface draitile, and impermeable liners to direct water to a stormwater conveyance system. Filtration systems must be design to treat the water quality volume outlined in the MPCA's construction stormwater permit and must drawdown within 48 hours.

Pretreatment of stormwater prior to discharge into the new filtration practices must be included to protect the functionality of the system. Pretreatment shall remove sediment/solids, skim floatables, and oil and grease to the maximum extent practicable, and be easily accessed for inspection and maintenance.

5.3.2.4 SWQ4

Lilydale discourages stormwater infiltration practices when soil conditions, groundwater supply issues, shallow depth to bedrock, safety issues, snow removal, and other concerns would make such practices inappropriate or impractical.

5.3.2.5 SWQ5

Lilydale shall prohibit infiltration as a stormwater management practice where:

- a) Industrial facilities are not authorized to infiltrate industrial stormwater under an NPDES/SDS Industrial Stormwater permit issued by the MPCA.
- b) Vehicle fueling and maintenance occur.
- c) Less than three (3) feet of separation distance from the bottom of the infiltration system to the elevation of the seasonally saturated soils or the top of bedrock, including the St Peter Sandstone.
- d) High levels of contaminants in soil or groundwater will be mobilized by the infiltrating stormwater.
- e) Soil infiltration rates are field measured at more than 8.3 inches per hour unless they amend soils to slow the infiltration rate below 8.3 inches per hour.
- f) Where Hydrologic Soil Group D (clay) soils are predominant.
- g) Within 1,000 feet up-gradient or 100 feet down-gradient of active karst features.
- h) Within a Drinking Water Supply Management Area (DWSMA) as defined in Minn. R. 4720.5100, subp. 13, and meets the requirements of the MPCA Construction Stormwater Permit (MNR100001).

5.3.2.6 SWQ6

If an infiltration practice is determined to be appropriate and practical, the water quality volume should meet the sizing and drawdown requirements of the LMRWD, the LMRWMO, and the MPCA Construction Stormwater Permit.

Additionally, pretreatment of stormwater prior to discharge into the new infiltration practice must be included to protect the functionality of the system. Pretreatment shall remove sediment/solids, skim floatables, and oil and grease to the maximum extent practicable, and be easily accessed for inspection and maintenance.

5.3.2.7 SWQ7

Lilydale will encourage new development and redevelopment to disconnect impervious surfaces to the extent possible.

5.3.2.8 SWQ8

For all commercial or industrial land uses and all other uses where the potential for pollution by oil or grease, or both, exists, Lilydale encourages the property owner to treat the first 0.5 inches of runoff using the best oil and grease removal technology available.

5.3.2.9 SWQ9

Lilydale may impose additional performance criteria or may restrict certain stormwater management practices where stormwater discharges to critical areas with sensitive resources (i.e., shellfish beds, swimming beaches).

5.3.2.10 SWQ10

Lilydale is committed to proper snow and ice management on properties within the city, including commitment to using smart salting practices to minimize use of chlorides and other deicing materials while also protecting public safety.

Providers of winter snow and ice management services for multi-family residential units, commercial, and institutional facilities must participate in Minnesota state-approved training in minimizing the use of deicers.

5.4 Stormwater Rates and Volumes

5.4.1 Goal

Minimize flood damage to residential, business, commercial and public structures and property, and protect against increased flooding caused by land disturbing activities and other projects.

5.4.2 Policies

5.4.2.1 SRV1

Stormwater System Capacity Criteria

- a) Conveyance systems should handle 10-year flows without overtopping, and should handle 100-year flows without damage. Where feasible without compromising the downstream stormwater system, public stormwater conveyance systems should be designed for the critical-duration 100-year flowrates. This is important as the city is generally on steep land making ponding difficult and potentially dangerous or has shallow depth to bedrock which makes infiltration undesirable. Safely conveying larger storms can help reduce erosion from stormwater at the Minnesota and Mississippi River bluffs.
- b) Ponds should be designed to accommodate 100-year volumes, with a minimum of one foot of freeboard to overflow.

Detention basins on trunk stormwater systems must be designed for the 100-year event that produces the highest ponding (considering storms of short duration through long snowmelt events), plus a minimum of one foot of freeboard. The effect of exceeding the detention basin capacity must also be considered. Lilydale will promote the use of multi-stage outlets into pond designs to control flows from smaller, more frequent storms and help maintain base flows in downstream open channels. Depending on the separation from bedrock, impermeable liners may also be required below ponding areas.

- c) All structures and permanent improvements should be protected from failure or severe damage for 100-year frequency storms. If possible, this is to be accomplished with the

stormwater management system. Otherwise, this may be accomplished with “floodproofing.”

- d) Discharges from the site stormwater management systems must have a stable outlet capable of carrying the design storm event flows at a non-erosive velocity and consider flow capacity and flow duration.
- e) A safe pathway for flows in excess of 100-year return frequency should be identified and provided. Lilydale requires the incorporation of emergency overflow structures (e.g., swales, spillways), where feasible, to minimize the potential for flooding from storms larger than the 100-year (1 percent) event or plugged outlet conditions. Where feasible, those drainage pathways must be arranged to minimize flooding of inhabited structures; avoid failure of ponding areas that would cause substantial release of the impounded water; and avoid conditions likely to cause loss of life, failures that obstruct the functioning of the downstream stormwater management system, or other foreseeable catastrophic outcomes.
- f) The grades of any streets shall not exceed 10 percent.

5.4.2.2 SRV2

Lilydale requires that development and redevelopment cause no increase over existing conditions in 1-year, 2-year, 10-year and 100-year discharges from the property, as determined by Atlas 14 criteria for 24-hour rainfall depths (Table 2.2) and using Atlas 14 nested distributions. Development and redevelopment projects shall also safely convey that discharge to the existing downstream drainage facility. In addition, Lilydale requires that proposed development, redevelopment, and/or infrastructure projects show that they will not overtax the capacity of the existing downstream stormwater management system.

5.4.2.3 SRV3

As areas develop or redevelop, Lilydale will require developers to allow the City to secure easements extending up to at least the 100-year flood elevation over floodplains, detention areas, wetlands, ditches, storm sewers and/or all other City-owned parts of the stormwater system.

5.4.2.4 SRV4

Any intercommunity water resources planning conducted by Lilydale will consider alternative solutions.

- a) All drainage studies or feasibility studies conducted by Lilydale that lead to projects in a subwatershed with an intercommunity drainage issue will consider the impact of the project on the drainage issue and will consider the total intercommunity project cost.
- b) No solutions or partial solutions to intercommunity drainage issues will be implemented without prior completion of a feasibility study of the options and adoption of a preferred option by the WMO, except in emergencies.

5.4.2.5 SRV5

It is Lilydale policy that existing drainage is the responsibility of the landowners. Landowners must provide safe, erosion-resistant conveyance of stormwater across their property for natural and/or existing drainage. This includes the responsibility to convey the water from groundwater seeps and springs, as well as culverts, drainageways, and overflow pathways. Water must be conveyed in a drain system to the next downstream property, lake, stream, or pond. Along the bluffs of the Mississippi and Minnesota Rivers, the City encourages property owners to convey the water to the drainage system under the Big Rivers Regional Trail in a manner that does not erode or damage the bluffs or the receiving drainage system.

Modifications to drainage systems on private property not associated with redevelopment, at a minimum, must not increase flows to the point where they diminish the capacity and functionality of existing downstream stormwater management systems.

5.4.2.6 SRV6

Lilydale will respond to citizen-identified drainage issues, depending on the type of drainage issue:

- a) If the drainage issue is limited to the resident's lot, it is the responsibility of the property owner to resolve the drainage problem, but City staff can provide recommendations to the property owner, if so directed by the City Council.
- b) If the drainage issue is the result of a larger scale problem that is not covered by Lilydale's Code, Ordinances, or Policies, it is the involved property owners' responsibility to resolve the drainage problem.
- c) If the drainage issue is the result of a larger scale problem that is covered by Lilydale's Code, Ordinances, or Policies, there are two levels of City involvement:
 1. Relatively minor issues that can be resolved/addressed quickly by maintenance staff; or
 2. Larger issues that can be resolved only through a public improvement project, which requires a longer process to implement.

5.4.2.7 SRV7

Land disturbing activities on bluffs adjacent to property, waterbodies, and unique natural resources shall incorporate protection from erosion, sedimentation, flooding, and other damage.

5.5 Erosion and Sediment Control

5.5.1 Goal 1

Prevent erosion and sedimentation to the greatest extent possible.

5.5.2 Goal 2

Regulate land-disturbing activities to protect against erosion and sedimentation.

5.5.3 Goal 3

Implement soil protection and sedimentation controls to maintain health, safety, and welfare.

5.5.4 Policies

5.5.4.1 ESC1

Lilydale requires the preparation and submittal of erosion control plans for land development, redevelopment, and other construction work through its stormwater ordinance. Erosion control plans must be prepared by a qualified individual, conform to the MPCA's NPDES General Permit to Discharge Stormwater from Construction Sites, and incorporate the appropriate BMPs described in the *Minnesota Stormwater Manual*, and other resources. Erosion control plans shall also conform to all NPDES stormwater regulations that apply to erosion control. The NPDES General Permit requirements cover both temporary and permanent erosion controls.

The erosion control plan must contain sufficient detail to show erosion control methods on individual building sites, such as silt fence and gravel driveway entrances. Waterborne sediment must be prevented from leaving the site during and after construction to prevent sedimentation of downstream water bodies.

5.5.4.2 ESC2

Lilydale requires implementation of site restoration and erosion control measures for development or redevelopment excavation or fill activities under Lilydale's Ordinance for Stormwater Management for Development or Redevelopment of Property (Appendix C).

5.5.4.3 ESC3

To prevent bluff erosion the city prohibits new outfalls of any kind at the top of the bluffs. Outfalls include storm sewer pipes, drains, channels, swales, or any other point source of concentrated runoff. The city will assess existing outfalls as part of the development of a bluff management plan. If existing outfalls are causing erosion, they may be required to be modified. As requested, Lilydale will provide advice and resources to assist property owners in finding economically feasible best management practices to prevent bluff erosion.

5.5.4.4 ESC4

All land disturbing activities impacting the bluff shall comply with Lilydale's Bluff Management Plan (under development) and bluff management standards established by LMRWMO and LMRWD.

5.5.4.5 ESC5

Lilydale requires inspection of City-permitted/approved projects to monitor compliance with and enforce City requirements and permit/approval conditions, including in accordance with the MPCA Construction stormwater permit as required.. The city may inspect the work at any time, and the permittee may not deny access to the city's inspector. The frequency of inspection will

depend upon the project size, the risk of failure, and the level of activity. City enforcement includes promptly notifying permittees of any erosion and sedimentation problems found on the site and requiring permittees to correct the problems.

5.5.4.6 ESC6

Lilydale may collect a cash surety charge or another type of fee or obligation to ensure that City-permitted/ approved projects are completed in accordance with City regulations and permit/approval conditions. If a permittee does not correct an identified problem within a reasonable amount of time, Lilydale can use the cash surety (or other collected fee) to pay for correcting the problem. Lilydale will use other enforcement measures as necessary and as allowed by Minnesota law.

5.5.4.7 ESC7

Lilydale requires effective energy dissipation devices at all conveyance system discharges to minimize bank, channel, or shoreline erosion.

5.5.4.8 ESC8

Lilydale limits acceptable erosion in drainage ways to that which causes no increase in erosion over the natural erosion process of the watercourse and does not cause destruction of properties adjacent to the watercourse. For proposals which will involve development at or near the riverfront, applicants are encouraged to use plantings or similar appropriate natural means to stabilize riverbanks which are subject to erosion.

5.5.4.9 ESC9

The city will collaborate with its respective watersheds when they develop a vegetation management plan to enhance the natural environment and reduce the risk of erosion.

5.5.4.10 ESC10

Lilydale requires that development and redevelopment site plans shall be located in such a manner as to minimize the removal of vegetation and alteration of the natural topography. Any removal or alteration shall be the minimum area necessary for a structure or development undertaken pursuant to an approved building permit or site plan.

In order to achieve erosion control and buffering, revegetation will be required wherever removal of vegetation and alteration of the natural topography occurred. Any revegetation should be comprised of native and other compatible vegetation and landscaping. Existing developments should pursue strategies to incorporate native plantings or other appropriate means to stabilize the bank on top of the bluff and near their structures.

5.5.4.11 ESC11

Erosion protection measures shall first make maximum use of natural in-place vegetation. If that is not possible, the placing of new vegetation on the site as erosion control facilities will be

allowed. The construction of artificial drainage devices including culverts, holding ponds, and ditches shall be used only if the use of natural erosion control devices is not feasible.

5.6 Groundwater

The city does not have any wellhead protection areas that protect groundwater for public drinking water supplies. Due to the proximity to the bluff, most surface water or storm water infiltrated is likely to exit the bluff through seeps and springs in a short period of time. Therefore, the following policies protect groundwater and surface water within Lilydale.

5.6.1 Goal

Protect the quality and quantity of Lilydale's groundwater resources.

5.6.2 Policies

5.6.2.1 GW1

Lilydale will cooperate with Dakota County in its efforts to promote awareness of groundwater resource issues through public education and information programs and support the policies in the Dakota County groundwater plan.

5.6.2.2 GW2

Lilydale will consider the use of specific pollution prevention methods to protect groundwater quality where necessary.

5.6.2.3 GW3

Lilydale will advise citizens that Dakota County provides water test kits and sampling assistance to well owners for the purposes of water quality monitoring.

5.6.2.4 GW4

Lilydale will require landowners to seal abandoned wells. Landowners may seek assistance through Dakota County's Well Sealing Grant Program.

5.6.2.5 GW5

Lilydale will maintain updated records of the one known on-site septic system and prohibit installation of new individual sewer systems or alteration, repair or extension of the existing system when connection can be made to a publicly-owned sanitary sewer system. The owner of the on-site septic system must submit annual records to the city pertaining to the septic system. The city will maintain the records for a minimum of 10-years.

5.6.2.6 GW6

Lilydale will comply with the provisions in the LMRWD Water Appropriations Standard.

5.7 Wetland Management

The only DNR designated wetlands (public water wetlands) within the City's boundaries are Pickerel Lake and the wetlands in Lower Lilydale. The National Wetland Inventory (**Figure 3-5**) includes Pickerel Lake and the Lower Lilydale wetlands and also includes the Mississippi and Minnesota Rivers within the city limits. Lower Lilydale can generally be described as the area north of the Pool and Yacht Club property, from the toe of the bluffs to the Mississippi River. Lower Lilydale north of the Pool and Yacht Club is within the floodway of the Mississippi River, which precludes it from most categories of future development. These natural wetland areas are strongly influenced by flooding from the Mississippi River. Lilydale will cooperate with St. Paul Parks to manage the wetlands in the Pickerel Lake area. Should any new wetlands be constructed within the City of Lilydale, Lilydale will manage and preserve the wetlands according to the following goals and policies.

5.7.1 Goal 1

Preserve wetlands for water retention, soil conservation, wildlife habitat, aesthetics, and natural enhancement of water quality.

5.7.2 Goal 2

Achieve no net loss of wetlands, in conformance with the Minnesota Wetland Conservation Act (WCA) and associated rules (Minnesota Rules 8420).

5.7.3 Policies

5.7.3.1 WM1

Lilydale is the local governmental unit (LGU) responsible for administering the Wetland Conservation Act and rules.

5.7.3.2 WM2

Lilydale will protect wetlands from impacts (e.g., filling or draining) in the following order: avoid, minimize, mitigate. Mitigation of unavoidable wetland impacts must be accomplished through restoration (first priority), enhancement (second priority), or wetland creation (third priority). Wetland functions and values will be assessed on a case-by-case basis. Lilydale does not have sufficient natural wetland areas subject to development pressure to merit development of a comprehensive wetland inventory.

5.7.3.3 WM3

An average 15-foot buffer of natural vegetation above the 100-year High Water Level (if -established) or wetted boundary shall be used around lakes, streams, and wetlands, upon new or redevelopment projects that exceed one acre in land disturbance (for this policy, mill and overlay and pavement rehabilitation projects are not considered land disturbance). In addition, the City encourages buffer widths be increased where the steepness of the land poses additional erosion or slope failure potential. (See WQ8)

5.7.3.4 WM4

Lilydale will inventory, classify and assess function of wetlands that will be impacted, directly or indirectly, by development and redevelopment projects, in accordance with LMRWMO policy. Since nearly all wetlands within Lilydale are located within land operated by St. Paul Parks, it is anticipated that wetland inventory and classification will be a collaborative effort with St. Paul Parks.

5.7.3.5 WM5

Wetlands, as defined by the Wetland Conservation Act (WCA), and other waterbodies shall not be used as primary sediment traps during or after construction. Runoff from new or redevelopment projects shall not be discharged directly into a wetland without necessary sediment and erosion control or meeting permanent stormwater management performance criteria.

5.8 Water Resources Enjoyment

5.8.1 Goal

Protect and enhance fish and wildlife habitat, recreation opportunities, and shoreland integrity.

5.8.2 Policies

5.8.2.1 WRE1

Lilydale will encourage public and private landowners to maintain wetlands and natural habitat for the benefit of wildlife.

5.8.2.2 WRE2

Lilydale will promote and encourage protection of undisturbed shoreland areas and restoration of disturbed shoreland areas to their natural state as much as possible.

5.8.2.3 WRE3

Lilydale will encourage the creation of additional buffer zones, beyond the minimum required in Policy 5.7.3.3, along shorelines where natural vegetation is maintained to provide wildlife habitat and help improve water quality.

5.8.2.4 WRE4

Lilydale will seek opportunities to maintain, enhance, or provide new habitat as part of wetland modification, stormwater facility construction, or other appropriate projects.

5.8.2.5 WRE5

Lilydale will seek to incorporate into proposed projects alternative landscape designs that (a) increase beneficial habitat, wildlife and recreational uses; promote vegetative water use; and (b) decrease detrimental wildlife uses (such as beaver dams, goose overabundance) that damage water control facilities, shoreline vegetation, water quality or recreational facilities.

5.8.2.6 WRE6

Retaining walls are to be used along watercourses when there is no adequate stabilization alternative an in accordance with MN Rules 6115.0211.

5.8.2.7 WRE7

All new or replacement stream crossings shall comply with the provisions in the LMRWD Stream and Lake Crossing Standard

5.8.2.8 WRE8

Lilydale currently meets Mississippi River Critical Area requirements for protecting the bluffs and the shoreland of the Mississippi River. Lilydale will strive to meet any future requirements.

6.0 Implementation

This section describes the significant parts of Lilydale’s SWMP implementation program, including its NPDES Phase II MS4 permit, operation and maintenance of its stormwater system, education and public involvement, funding, design standards, ordinance implementation and official controls, implementation priorities, and SWMP update and amendment procedures.

As required by the LMRWMO, Lilydale will submit an annual report that documents progress made in the implementation of this plan. Metrics used to assess the progress will include the tasks listed in this implementation plan, plus any new tasks that result from new studies (such as TMDLs) that impact Lilydale. The report will also be provided to LMRWD.

6.1 NPDES Phase II MS4 Permit

Under the U.S. Environmental Protection Agency’s (EPA) Stormwater Phase II National Pollutant Discharge Elimination System (NPDES) Rules, small municipal separate storm sewer systems (“MS4s”) serving populations under 100,000 that are located in urbanized areas are required to obtain a NPDES Phase II Stormwater permit under the Clean Water Act. MS4s must develop, implement, and enforce a Stormwater Pollution Prevention Program (SWPPP) designed to minimize the discharge of pollutants from the MS4, to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act. Common pollutants include oils and grease from roadways, pesticides from lawns, sediment from construction sites, and litter. Once runoff containing these contaminants reaches storm sewer systems, it is typically untreated before discharging to receiving waters. The MPCA identified Lilydale as a MS4 based on the 2000 census. A complete description of the MS4 Stormwater Program and its requirement can be found at the MPCA’s MS4 website (<http://www.pca.state.mn.us/water/stormwater/stormwater-ms4.html>).

Lilydale applied for and received a NPDES Phase II MS4 Permit in 2003 and applied for reissuance, as required due to permit expiration or permit updates, in 2006, 2011, and 2013. The MPCA most recently reissued the City of Lilydale MS4 general permit in September 2021 and the city will need to update its SWPPP and program documents to meet the requirements of the reissued permit.

Lilydale prepared and adopted a SWPPP in 2006 that has been updated with each subsequent application.

The SWPPP requires the city maintain a storm sewer system map depicting all storm sewer 12-inch diameter or greater, outfalls, structural stormwater BMPs, and all receiving waters.

The SWPPP outlines the appropriate best management practices (BMPs) for Lilydale to control or reduce the pollutants in stormwater runoff. Lilydale will accomplish this through the implementation of the BMPs outlined within its SWPPP. These BMPs could be a combination of education, maintenance, control techniques, system design and engineering methods, and other such provisions that are appropriate to meet the requirements of the NPDES Phase II permit. BMPs have been prepared to address each of the six minimum control measures as outlined in the rules:

1. Public education and outreach on stormwater impacts

2. Public participation/involvement
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction stormwater management in new development and redevelopment
6. Pollution prevention/good housekeeping for municipal operations

For each of these six minimum control measures, Lilydale identified appropriate BMPs, along with measurable goals, an implementation schedule, and the persons responsible to complete each measure.

Prior to June 30 of each year of the 5-year permit cycle, Lilydale must hold an annual public meeting. At this meeting, Lilydale also receives oral and written statements and considers them for inclusion into the SWPPP.

Also prior to June 30 of each year, Lilydale must submit an annual report to the MPCA. This annual report summarizes the following:

1. **Status of Compliance with Permit Conditions.** The annual report contains an assessment of the appropriateness of the BMPs and Lilydale's progress toward achieving the identified measurable goals for each of the minimum control measures. This assessment is based on results collected and analyzed, inspection findings, and public input received during the reporting period.
2. **Work Plan.** The annual report lists the stormwater activities that are planned to be undertaken in the next reporting cycle.
3. **Modifications to the SWPPP.** The annual report identifies any changes to BMPs or measurable goals for any of the minimum control measures.
4. **Notice of Coordinated Activities.** A notice is included in the annual report for any portions of the permit for which a government entity or organization outside of the MS4 is being utilized to fulfill any BMP contained in the SWPPP.

Lilydale implements the requirements of the MS4 Stormwater Program through the following measures.

6.1.1 Public Education and Outreach

It is important and necessary for Lilydale to conduct a public education and outreach program with regards to stormwater management. When the general public has a working knowledge of stormwater issues and pollution prevention, they are better able to contribute to the dialogue regarding any proposed stormwater projects; they have a better understanding of actions that can be taken on their properties; and they are better equipped to notice and report problems within Lilydale, such as a failure of the stormwater system or an illicit discharge into Lilydale's storm sewer system.

The primary method of public education and outreach has been and will continue to be through the newsletter Lilydale sends to all residents. Lilydale periodically receives materials about stormwater issues from a variety of sources, including the Lower Mississippi River Watershed Management Organization (LMRWMO), the Lower Minnesota River Watershed District (LMRWD), LMRWMO member cities, and their advisory bodies. The information may be the LMRWMO or the LMRWD annual newsletter, or other information provided by the LMRWMO or the LMRWD. Educational materials received will be compiled and distributed in the spring newsletter. This information will also be made available at the City Hall.

In accordance with LMRWMO policy, Lilydale will seek opportunities to provide presentations to active community groups to increase awareness of water resources issues.

Lilydale will continue to seek public input about stormwater issues. Lilydale will specifically request public comments when stormwater issues are before the City Council, and there will be a section about stormwater on the agenda at each annual meeting. All comments will be noted and considered. Prior to the annual meeting, a public notice will be printed in the newspaper of record, the South-West Review. Unsolicited comments throughout the year will also be welcomed.

6.1.2 Public Participation and Involvement

The public is invited and encouraged to participate in the development of the Stormwater Pollution Prevention Program (SWPPP). Participation has been and will continue to be facilitated by an annual meeting to discuss the SWPPP; however, comments will be accepted at any time.

6.1.3 Illicit Discharge Detection and Elimination

If illicit discharge is found, Lilydale will investigate the source and the property owner/manager will be contacted to eliminate the discharge, in accordance with city ordinance.

6.1.4 Construction Site Stormwater Runoff Control

Lilydale has ordinances regarding the many aspects of construction site stormwater runoff control. Ordinances are occasionally updated or added, so Lilydale should be contacted directly for information regarding current ordinances. In addition, permits may need to be obtained from state or federal agencies. The current City ordinance on erosion and stormwater control is in Appendix C (Ordinance 903.09).

6.1.5 Post-Construction Stormwater Management in New Development and Redevelopment

As part of the approval process for new development and redevelopment, City ordinances require a plan for the management of stormwater. Agreements with developers regarding stormwater management are summarized in **Section 4.0** of this SWMP. Ordinances are occasionally updated or added, so Lilydale should be contacted directly for information regarding current ordinances. In addition, permits may need to be obtained from state or federal agencies.

6.1.6 Pollution Prevention and Good Housekeeping

Lilydale coordinates street sweeping activities for all City-owned streets. Street sweeping on streets owned by other entities is coordinated by those entities. Lilydale also keeps records of all relevant stormwater pollution prevention documents.

6.2 Operation and Maintenance of Stormwater Systems

Lilydale will continue its operation and maintenance activities to ensure that Lilydale's stormwater system functions as designed. Lilydale's operation and maintenance program is closely tied with Lilydale's implementation of its NPDES Phase II MS4 permit (described in [Section 6.1](#)).

Lilydale has worked with the City of Mendota Heights to provide inspection of the outfall/energy dissipation structure of the storm sewer at Riverwood Apartments, and of the drop structure portion of the storm sewer outfall system at Colony Townhomes. Lilydale will continue to either work with the City of Mendota Heights or find alternative means to complete such inspections to observe for evidence of illicit discharges.

6.3 Assessment and Prioritization of Shoreland Restoration

Lilydale will assess and prioritize shoreland areas for restoration in cooperation with St. Paul Parks and the Army Corps of Engineers. Shoreland areas include streambanks and lakeshore areas. The City will include any areas identified for restoration in future management plans and will budget for as necessary. Lilydale will prepare a schedule for the assessment and prioritization of shoreland areas. The schedule will be based on the stability of the areas, local major rain events, and changes in the watersheds to the shoreland areas.

6.4 Record Keeping for On-Site Septic Systems

Lilydale shall maintain updated records of the one known on-site septic system. The property owner will be required to submit a report to the City annually on the maintenance and operation of the septic system. The City will maintain these annual records. Alteration, repair, or extension of existing systems shall be prohibited when connection can be made to a city sanitary sewer system. The Mendota Heights sanitary sewer system is the closest to the property and the most likely connection location.

6.5 Funding of Implementation Program

Lilydale implemented a stormwater utility to fund the implementation of this plan and to provide funding for additional future stormwater work (Appendix F). Other means to fully or partially fund items in the implementation plan include LMRWMO cost-share and grants from various entities.

In addition, the LMRWD Cost Share Incentive and Water Quality Restoration Program offers financial assistance to promote public and private entities within the LMRWD to implement Best Management Practices (BMPs) or carry out studies to protect and improve natural resources within the District.

6.6 Ordinance Implementation and Official Controls

Lilydale's current ordinances are provided in Appendices C through G. Some of Lilydale's ordinances and official controls are tied with Lilydale's implementation of its NPDES Phase II MS4 permit (described in [Section 6.1](#)).

To meet the future needs of Lilydale, City ordinances need to be reviewed to determine if updates are necessary to existing ordinances or if new ordinances need to be adopted if existing ordinances do not sufficiently meet the needs of the City in meeting regulatory requirements. The list below includes the ordinances and topics that The City will review and consider for updates or new ordinances.

- Waste control for construction site operators
- Regulatory Mechanism to Address Post Construction Runoff from New Development and Redevelopment
- Wetland Protection Ordinance
- Stormwater Maintenance Ordinance
- Shoreland Protection Ordinance

6.6.1 Permitting Process

To ensure that all development and redevelopment meets Lilydale's ordinances, goals and policies, development and redevelopment plans must go through a review process and receive permits prior to construction. The typical permits and reviews related to stormwater that are required of redevelopments are listed here:

- General Stormwater Permit for Construction Activity from the MPCA
- NPDES Permit from the MPCA
- City review of onsite erosion control measures during construction
- City review of proposed BMPs and their effectiveness in improving stormwater quality
- City review of plan for post-construction stormwater management (Runoff Control Plan)

A complete list of all permits and approvals required by Lilydale can be found in Lilydale's Comprehensive Plan. In addition to the typical stormwater permits and reviews listed above, additional City permits and reviews typically required include the following:

- PUD Plan review and approval, including Concept Plan and Final Plan
- Plat review and approval, including Preliminary and Final Plat
- Environmental Review
- Building Permit
- Demolition Permit (for redevelopment)

Additional City permits and reviews may be required, depending on the nature of the development/redevelopment.

6.7 Implementation Program

Table 6-1 includes the items in Lilydale’s Implementation Program, along with estimated budgets and completion dates. The City must report progress on the implementation of the items in Table 6-1 to the LMRWMO.

Table 6-1 Surface Water Implementation Program—City of Lilydale

Project Number	Project Description	Cost Estimate ¹	Potential Funding Sources	Proposed Year(s) of Implementation
1.0 Ongoing Projects				
1.1	Newsletter distribution. Distribute newsletter to provide residents with critical information regarding stormwater issues.	\$2,500/year	Stormwater/ General Fund	2018-2028
1.2	Annual Stormwater Pollution Prevention Program (SWPPP) public hearing	\$1,000/year	Stormwater Fund	2018-2028
1.3	Complete Annual Report for SWPPP	\$1,000/year	Stormwater Fund	2018-2028
1.4	Complete Annual Report to LMRWMO	\$1,000/year	Stormwater Fund	2018-2028
1.5	Provide presentations about water quality to community	\$1,000/year	Stormwater Fund	2018-2028
1.6	Street Sweeping Program. Sweep streets once annually. Record the annual number of times streets are brush swept as well as document any additional activities that were undertaken regarding this program.	\$200/year	Stormwater Fund	2018-2028
1.7	Complete initial and follow-up assessment of streambanks and shoreland	\$2,500/ assessment	Stormwater/ General Fund	2018 (initial) TBD (follow-up)
1.8	Maintain records of septic system	\$250/year	Stormwater Fund	2018-2028

Project Number	Project Description	Cost Estimate ¹	Potential Funding Sources	Proposed Year(s) of Implementation
2.0 One-time Projects				
2.1	Complete MS4 Permit Renewal	\$3,000	Stormwater Fund	2018 (anticipated)
2.2	Develop maintenance, inspection and reporting guidelines for BMPs	\$1,000	Stormwater Fund	2018
2.3	Develop permits for grading and erosion control	\$2,500	Stormwater Fund	2018
2.4	Develop a Bluff Management Plan	\$5,000	Stormwater Fund	2019
2.5	Update City-wide stormwater modeling include Atlas-14 data and re-determine levels of service for existing infrastructure	\$10,000	Stormwater Fund	2020
2.6	Develop public outreach and education plan	\$2,000	Stormwater Fund	2020
2.7	Erosion stabilization project	\$50,000	Stormwater Fund	2021
2.8	Stormwater maintenance project	\$50,000	Stormwater Fund	2022
3.0 Ordinance reviews and updates				
3.1	Review, revise, and adopt stormwater management and maintenance ordinance, including post construction runoff from new development and redevelopment	\$3,500	Stormwater Fund	2018
3.2	Review floodplain management ordinance	\$2,000	Stormwater Fund	2019
3.3	Adopt ordinance for wetland protection	\$2,000	Stormwater Fund	2019
3.4	Adopt ordinance for shoreland protection	\$2,000	Stormwater Fund	2019
3.5	Adopt ordinance regarding waste controls for construction site operators	\$2,000	Stormwater / General Fund	2019
4.0 TMDL Implementation				
4.1	Complete a public outreach regarding the importance of picking up pet waste	\$500/yr	Stormwater/ General Fund	2018-2028
4.2	Assess the need and adopt, if necessary, an ordinance regarding cleaning up pet waste	\$2,000	Stormwater Fund	2019

¹. Assumes that City staff will be able to provide model ordinances for consideration.

7.0 Plan Update and Amendment Procedure

This Surface Water Management Plan (SWMP) will guide Lilydale's activities through 2028, or until superseded by adoption and approval of a subsequent SWMP. Lilydale will begin the process of updating this plan 1 to 2 years before its expiration date. The updated plan will meet the requirements of the applicable Minnesota laws and rules, the LMRWMO, and the LMRWD.

Lilydale may revise this SWMP through an amendment prior to updating the plan, if either minor changes are required, or if problems arise that are not addressed in the SWMP. However, this SWMP remains in full force and effect until an updated SWMP is approved by the LMRWMO and the LMRWD.

LMRWMO and LMRWD maintain watershed management plans, and this SWMP is consistent with the watershed plans in effect at the approval of this plan. However, LMRWMO and/or LMRWD may adopt amendments to their respective plans prior to Lilydale adopting an updated plan. If LMRWMO or LMRWD adopts a plan amendment, Lilydale will review the amendment and work with the watershed that adopted the amendment to determine if Lilydale should take action of its own.

Any significant changes to this SWMP must be approved by both the LMRWMO and the LMRWD. Minor changes to this SWMP will not require LMRWMO or LMRWD approval and can be made by City staff, but such minor amendments will be supplied to the LMRWMO and LMRWD for their information. Lilydale considers minor changes to be those that do not modify the goals, policies, or commitments identified in the SWMP. Examples of minor changes include:

- Inclusion of new or corrected hydrologic modeling results and mapping, as long as the changes do not significantly affect the rate or quality of intercommunity stormwater runoff.
- Inclusion of new/updated water quality monitoring data.
- Minor changes to Lilydale's implementation program, such as added projects, schedule changes, and revised cost estimates, as long as there are no intercommunity impacts of such changes and the changes stem from the goals and policies in the SWMP.

If it is unclear whether a proposed SWMP change is minor or not, Lilydale will bring the issue to the LMRWMO and LMRWD Boards for their determination.

Lilydale's amendment procedure for significant changes to the SWMP is as follows:

- City Staff preparation and review of SWMP amendment.
- City Council consideration of SWMP amendment. City Council would either approve submittal of the amendment for LMRWMO and LMRWD review and approval, or decide not to move forward with the amendment. If the City Council decides to submit the amendment for LMRWMO and LMRWD approval, the council would also need to determine when/if a public hearing or other public process should be undertaken.

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- Submittal of proposed SWMP amendment to LMRWMO and LMRWD for review and approval. Lilydale must also submit the proposed SWMP amendment to the Metropolitan Council and Dakota County. The proposed SWMP amendment would also be distributed to appropriate City staff (e.g., City Clerk/Treasurer, City Engineer). The review process for a SWMP amendment is the same as for the original SWMP—the LMRWMO and LMRWD have 60 days to review and comment on the proposed SWMP amendment.
 - City Council adoption of SWMP amendment, after LMRWMO and LMRWD approval of the SWMP amendment.

8.0 References

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- U.S. Department of Agriculture, Soil Conservation Service. 1977. *Getting the Most Out of Your Raindrop: Hydrology Guide for Minnesota*.
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Appendix A

Stormwater Design Flow Rates

Table A-1. Stormwater Design Flow Rates for Lilydale, Minnesota. This table is reprinted from the 1997 Supplement to Comprehensive Stormwater Management Plan for the City of Lilydale

Subwatershed	Area (acres)	Downstream Subwatershed	Outlet Type	Peak Discharge (cfs)		Stormwater Detention	Comments
				10-Year	100-Year		
South Tip of Lilydale							
MB-14A	7.8	L-1		7	14	N	Mn/DOT drainage system serves this area.
L-1	NC	Minnesota River		NC	NC	N	Dakota County trail drainage system serves this area.
Lilydale Stormwater Project No. 2 Watershed							
MB-13A	1.0	MB-14	Overland	NC	2.8	N	This area drains by 12" RCP to Mayfield Heights Pond, but overflows in most large storms, draining to Stormwater Project No. 2.
MB-14	5.3	L-2 Outlet System	18" RCP	NC	13	N	See Lilydale Stormwater Project No. 2 for details.
L-2	1.3	12" Drop Shaft and 22" CPEP outlet to Dakota County Trail drainage system	12" RCP	NC	21	N	This watershed is Colony Townhomes' driveway and front lot area. See Lilydale Stormwater Project No. 2 for details.
Between Lilydale Stormwater Projects No. 1 and No. 2							
MB-12L	7.4	L-3	24" CMP	21.0	58.0	N	Outlets to Lexington-Riverside lawn.
MB-12A	5.0	L-3	18" and 15" CMPs	21.0	36.0	N	Outlets to Lexington-Riverside decorative pond.
L-3	NC	Mississippi River	—	—	—	Y	Lexington-Riverside decorative pond.
Mayfield Heights Pond and Lilydale Stormwater Project No. 1 Watershed							
MB-13	12.5	MB-12U	36" RCP	47	80	Y	This stormwater detention area serves primarily to allow the head to build up, increasing the pipe flow rate. Overflow above 100-year discharge goes to Lilydale Stormwater Project No. 2.
MB-12U	2.6	MB-10	30" RCP	39	67	N	

Table A-1. Stormwater Design Flow Rates for Lilydale, Minnesota. This table is reprinted from the 1997 Supplement to Comprehensive Stormwater Management Plan for the City of Lilydale

Subwatershed	Area (acres)	Downstream Subwatershed	Outlet Type	Peak Discharge (cfs)		Stormwater Detention	Comments
				10-Year	100-Year		
MB-10	22.6	MB-11	6" CMP and 15" RCP two-stage outlet	2.1	9.1	Y	Mayfield Heights Pond.
MB-11	10.3	L-6	30" RCP	29	42	Y	The 100-year flow rate was revised down from 55 cfs in the 2006 Mendota Heights plan to 42 cfs for Lilydale Stormwater Project No. 1 based on a detailed review of MB-11 drainage.
L-4	2	L-6	12" RCP	NC	10	Y	This stormwater detention, up to 1.5 feet deep, serves primarily to allow the head to build up, increasing the pipe flow rate.
MB-19	16.7	L-5	24" CMP	26	48	N	Watershed shown on map is reduced to about half the area listed here. No revised flow rates were available at time of publication.
L-5	NC	L-6	Three 12" RCP One 24" RCP from driveway catch basins		18	Y	See Riverwood drainage planning for details, included with Riverwood ditch evaluation.
L-6	NC	Mississippi River	36" PEP	NC	55	N	See Lilydale Stormwater Project No. 1 for details.
Between Lilydale Stormwater Project No. 1 and Interstate 35E Drainage Area							
Bluff	NC	Mississippi River	None	NC	NC	N	
Interstate 35E Drainage Area							
MB-8	39.4	MB-9	None	NC	4.0	Y	Includes stormwater flow modeling from Caren Road and Caren Court
MB-9	7.9	L-7	12" CMP	16	35	N	
L-7	23.2	L-8	24" RCP	NC	18	Y	

Table A-1. Stormwater Design Flow Rates for Lilydale, Minnesota. This table is reprinted from the 1997 Supplement to Comprehensive Stormwater Management Plan for the City of Lilydale

Subwatershed	Area (acres)	Downstream Subwatershed	Outlet Type	Peak Discharge (cfs)		Stormwater Detention	Comments
				10-Year	100-Year		
MB-6	29.2	L-8		68	117	N	
MB-7	6.1	L-8		21	NC	Y	10-year flow rate set at 21 cfs per Mn/DOT calculation and added flows from Amoco, Chet's Liquors, and Cliff Side (10-year flow rate was 11 cfs in 2006 Mendota Heights Plan; 100-year flow rate was 23 cfs in 2006 Mendota Heights Plan). Stormwater detention at the Cliff Side development is required for flow rate control. See Strub development file for copy of Mn/DOT computations.
L-8	NC	Mississippi River	Open channel	NC	NC	Y	Mn/DOT system along Interstate 35E.
Interstate Valley Creek							
IV-139	—	IV-140	60" RCP	491	626	Y	Stormwater detention on the upstream side of the Lilydale Road embankment is minor.
IV-140	30.6	L-9	Creek	500	633	N	
L-9	NC	Mississippi River	Open channel	NC	NC	Y	Stormwater detention is required at Lilydale Gardens located in L-9.
Between Ivy Falls Creek and Interstate Valley Creek							
MB-5	9.6	L-10		22.8	46.3	N	
MB-4	41.2	L-10	24" CMP	140	253	N	

Table A-1. Stormwater Design Flow Rates for Lilydale, Minnesota. This table is reprinted from the 1997 Supplement to Comprehensive Stormwater Management Plan for the City of Lilydale

Subwatershed	Area (acres)	Downstream Subwatershed	Outlet Type	Peak Discharge (cfs)		Stormwater Detention	Comments
				10-Year	100-Year		
Ivy Falls Creek							
IF-15	13.9	IF-16	12" RCP	9.0	9.0	Y	See Mendota Heights Water Resources Management Plan.
IF-16	15.3	IF-21	12" RCP	7.0	8.3	Y	See Mendota Heights Water Resources Management Plan.
IF-28	23.0	L-10	Creek	290	610	N	Flows to Pickerel Lake.
North End of Lilydale							
MB-2	21.9	L-10		34.8	62.7	N	
MB-20	NC	L-10	24" CMP	NC	NC	N	No information in Mendota Heights Water Resource Management Plan.
L-10	NC	Mississippi River		NC	NC	Y	Pickerel Lake and Mississippi River floodplain.

Appendix B

Pickereel Lake Water Quality Data



CITY OF SAINT PAUL
INTERDEPARTMENTAL MEMORANDUM

October 3, 1984

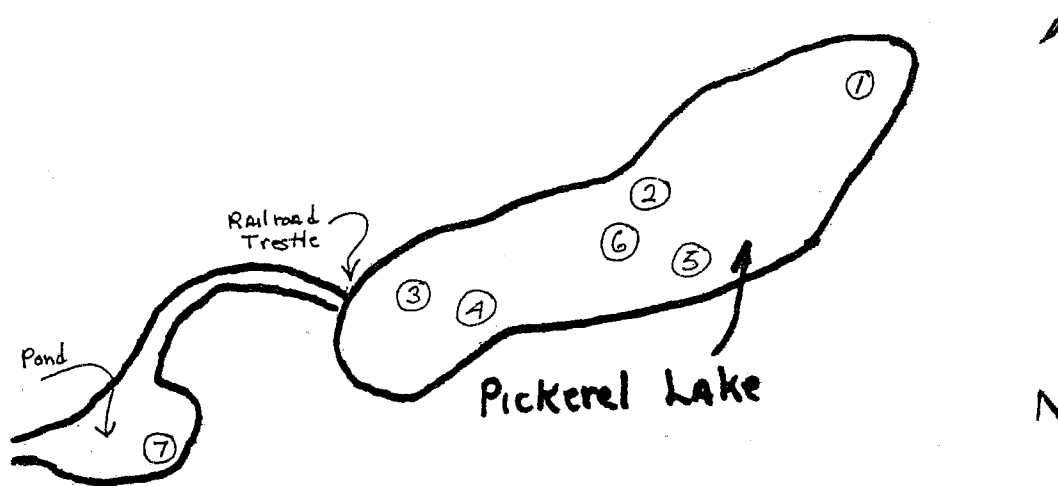
TO: Timothy M. Agness

FROM: William F. Gunther, Laboratory Director *WFG*
CITY OF ST. PAUL HEALTH DIVISION

SUBJECT: Test results from Pickerel Lake

The test results from the water samples taken from Pickerel Lake on Sept. 14, 1984 are as follows:

Location number	Fecal Coliform	Total Plate Count
1	43	220
2	93	750 est
3	9	160
4	< 3	430 est
5	< 3	320 est
6	3	170
7	240	1,080 est



The standard for natural water for swimming is less than 200 fecal coliforms and less than a 1,000 on the total plate count. All of the samples passed bacteriologically except the pond sample #7.

The samples indicate that the lake water quality is bacteriologically safe for swimming.

WFG:cw

DIVISION OF FISH AND WILDLIFE



FISHERIES LAKE SURVEY

Date of Survey 6/30-7/2/80

Date Mapped None

- Initial Survey
- Re-Survey
- Other Population Assessment

Lake Identification, Location and Accessibility

(1) Name(s) Pickeral (2) No. 19-79 (3) No. 33 (4) Meandered Yes

(5) County(ies) Dakota, Ramsey Twp. 28 R. 23 S. 12,13

(6) Nearest town (Distance and direction to lake) in Lilydale

(7) Accessibility
(a) Designated public access (Location and Ownership) None

(b) Other access areas _____

(8) Reason for Survey and Requested by Initial assessment of fish population. Edward L. Feiler, Area Fisheries Manager

(9) Previous Investigations, Surveys, and Dates None

Lake and Drainage Basin Characteristics and Use

(10) Lake Area 78.4 acres (Planimetered from 1972 U.S.G.S. Quads sounding map) D.O.W. 103 acres (date)

(11) Maximum Depth 10 ft.

(12) Littoral Area 78.4 acres Percent littoral 100

(13) Length of Shoreline 1.86 mile(s) Greatest length .71 mile(s)

Field Crew: Richard Berowski, Donn Schrader

Special Problems and Conditions Affecting Fish or Fishing (Winter kill records, algae problems, etc.) _____

Frequent winterkill; periodic inundation from Mississippi River.

(37) Additional Field Notes _____

(38) Present Fish Population Status The fish population of Pickeral Lake consists of 19 different species. Of these species only northern pike, black bullhead, and bluegill are particularly numerous. Because this is a river backwater lake, it is difficult to judge the nature of this population against typical lakes of the region. The northern pike appear to maintain themselves quite well by natural reproduction. Reproduction of bluegill is also apparently quite good. Frequent winterkills may hold down their numbers. Black bullhead reproduction is evident.

Crew Leader _____

LILYDALE

ENVIRONMENTAL ASSESSMENT

Applicant: Ramsey County, Minnesota

Statement Draft

Administrative Action

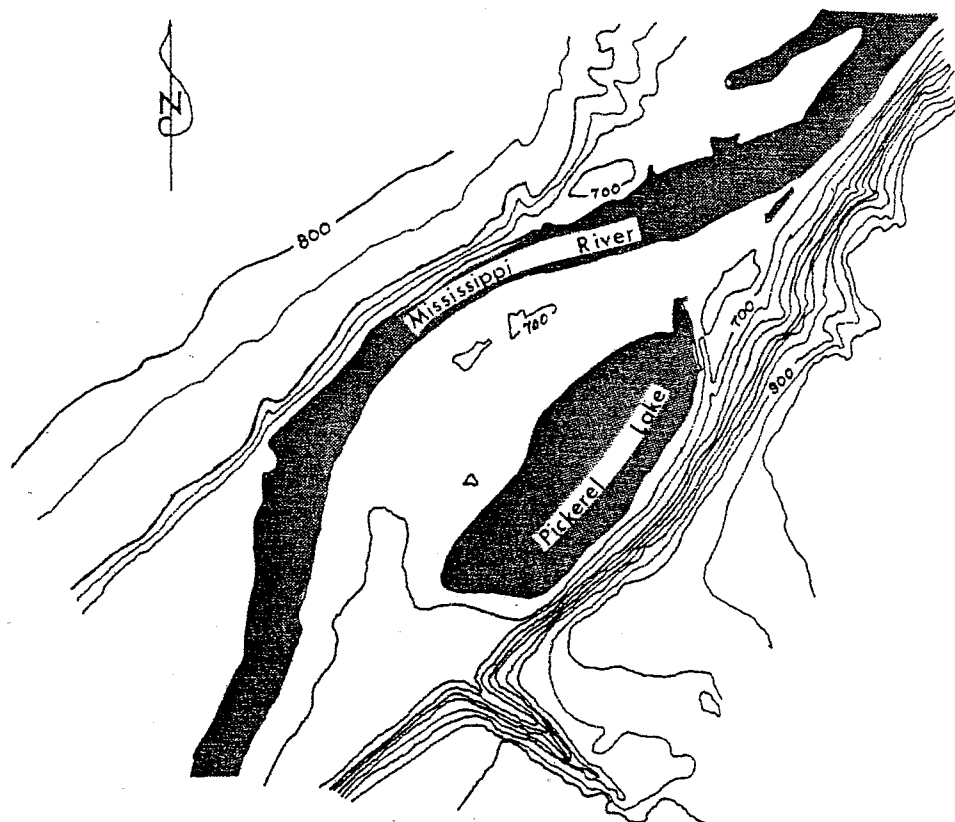
Project Number: LW 27-00561

Minneapolis and St. Paul Parkway System, Riverside Park - St. Paul, Minnehaha Park, Fort Snelling State Park, Mendota Historical sites, Crosby Lake, Hidden Falls Park, Cherokee Heights Park, Harriet Island Park, and Port Authority property. Other park and recreation areas within the region include the Hennepin County Park Reserve District,* the Old Soldiers' Home in Minneapolis and 2200 acres along the Minnesota River acquired by the City of Bloomington. Also, it will extend the Minnesota Valley Trail System which will provide 70 miles of contiguous open space to LeSueur, Minnesota.

Topography

The physiographic features of this site are noteworthy. It is defined by the Mississippi River on the north and west and by steep bluffs on the south and east. These cliffs rise 200 feet from the base of the flood plain and have an average slope of 45°. Pickere] Lake is entirely within the Mississippi flood plain and is approximately 100 acres in size. Its length is 3500 feet and it is 1250 feet at the widest point. The steep hillside is heavily wooded and a small stream flows down its face into the eastern marsh.**

Pickere] Lake is 692 feet above mean sea level; The Mississippi River at this point has an elevation of 687 feet. Land between the lake and the River is approximately 702 feet above mean sea level.



*The Hennepin County Park Reserve District includes 6 major parks; Lake Rebecca, Crow-Hassan, Carver, Morris T. Baker, Elm Creek and Hyland Lake.

** Ivy Falls

The Minnesota Science Museum regularly conducts field trips to the site to study geologic formations and hunt fossils.*

Numerous springs** occur along the River bluff. These are formed where glacial drift overlies the shale and limestone formations. Water percolates down through the drift material and is forced to flow horizontally when it encounters the Platteville limestone.

Air Quality

There is no scientific data concerning the air quality at Lilydale. Since there is little vehicular traffic or industry, air quality can safely be called good.

Water Quality

Pickereel Lake is a hard water lake with moderate submerged plant life. The maximum depth is 11 feet and it is not presently suitable for swimming or boating other than canoes.

At this point the Mississippi River has a high coliform count and does not meet Pollution Control Agency standards for swimming.

Flora

The vegetation in this area is primarily of three types: flood plain, hillside, and marsh associations. Some of the main species identified:

FLOODPLAIN

<u>Species</u>	<u>Common Name</u>
Populus deltoides	Cottonwood
Ulmus americana	American elm
Acer saccharinum	Silver maple
Cornus florida	Dogwood
Urtica sp.	Nettle
Parthenociseus sp.	Virginia creeper
Alnus rugosa	Alder
Populus tremuloides	Aspen

*Typical fossils include brachiopods, trilobites, cephalopods, crinoids, bryozoans and others

** "Spring" here is used to denote underground water flowing to the surface from a natural channel.