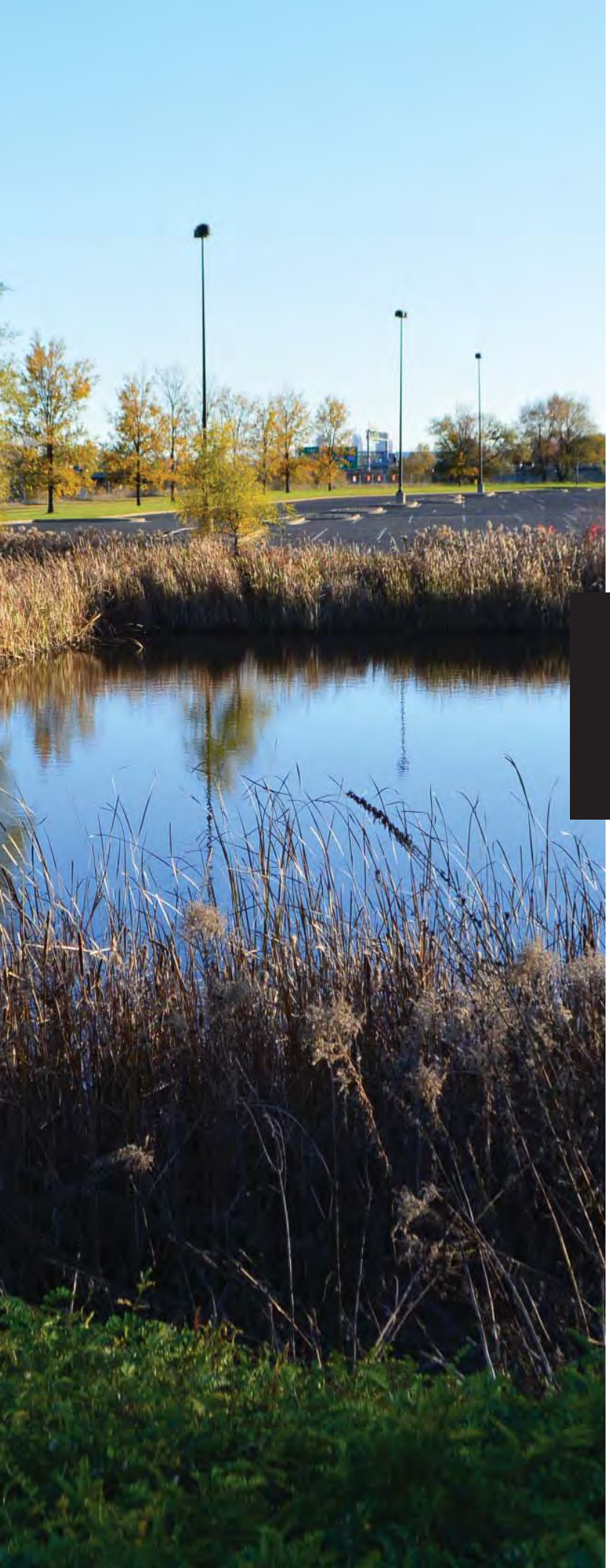
APPENDIX F:
Surface Water Management Plan

Comprehensive Plan 2040



Surface Water Management Plan

November 2018

Prepared For
City of Brooklyn Center
6301 Shingle Creek Pkwy.
Brooklyn Center, MN 55430

WSB Project No. 011247-000

SURFACE WATER MANAGEMENT PLAN

CITY OF BROOKLYN CENTER, MN

November 2018

WSB Project No. 011247-000

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

Jacob Newhall, PE Reg. No. 49170

Title Page

Certification

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BMPs – Best Management Practices

BWSR – Board of Water and Soil Resources

City – City of Brooklyn Center

DNR – Department of Natural Resources

DWSMA – Drinking Water Supply Management Area

FEMA – Federal Emergency Management Agency

FIRM – Flood Insurance Rate Map

FIS – Flood Insurance Study

LiDAR – Light Detection and Ranging

LGU – Local Governing Unit

MCBS – Minnesota Bounty Biological Survey

MDH – Minnesota Department of Health

MLCCS – Minnesota Land Cover Classification System

MPCA – Minnesota Pollution Control Agency

MS4 – Municipal Separate Storm Sewer System

NPDES – National Pollutant Discharge Elimination System

NWI – National Wetland Inventory

OHW – Ordinary High Water

PCB – Polychlorinated Biphenyl

PFOS - Perfluorooctane Sulfonate

RCWD – Rice Creek Watershed District

SCWMC – Shingle Creek Watershed Management Commission

SSTS – Subsurface Sewage Treatment System

SWMP – Surface Water Management Plan (also called the plan, City plan and local plan)

SWPPP – Storm Water Pollution Prevention Plan

TMDL – Total Maximum Daily Load

WCA – Wetland Conservation Act

WMWMC – West Mississippi Watershed Management Commission

1. EXECUTIVE SUMMARY

1.1. Surface Water Management Plan Purposes

The City of Brooklyn Center's *Surface Water Management Plan* (plan, SWMP, City plan, local plan) is a local management plan that meets the requirements of Minnesota Statutes 103B.235, Minnesota Rules 8410, the Shingle Creek and West Mississippi Watershed Management Commissions' Third Generation *Watershed Management Plan (dated April 11, 2013, as amended May 10, 2018),* and Minnesota Statute 103B.201 states that the purposes of the 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;
- Protect and enhance fish and wildlife habitat and water recreational facilities; and
- Secure the other benefits associated with the proper management of surface and groundwater.

The Brooklyn Center Surface Water Management Plan addresses these purposes.

1.2. Surface Water Management Responsibilities and Related Agreements

The City of Brooklyn Center is party to two separate joint powers agreements related to surface water management:

1. With the cities of Brooklyn Park, Crystal, Maple Grove, Minneapolis, New Hope, Osseo, Plymouth, and Robbinsdale establishing the Shingle Creek Watershed Management Commission (SCWMC).
2. With the cities of Brooklyn Park, Champlin, Maple Grove, and Osseo establishing the West Mississippi Watershed Management Commission (WMWMC).

The City also has an agreement with both the SCWMC and WMWMC establishing the watersheds as the Local Government Unit (LGU) for administering WCA within the City.

Upon approval of this SWMP by the two watersheds with jurisdiction over the City, it is the City's intent to maintain its current permitting powers through its Permit for Land Disturbing Activities. Currently, neither the SCWMC nor the WMWMC issue permits, so no impact to these organizations would occur. The watersheds would continue in their role as project review agencies.

The City of Brooklyn Center is responsible for construction, maintenance, and operation of the City's stormwater management systems (i.e., ponds, BMPs, mechanical structures, sump

manholes, pipes, channels) in accordance with its MS4 Permit.

1.3. Summary

The Brooklyn Center Surface Water Management Plan is divided into six sections:

- ***Section 1 Executive Summary*** provides background information and summarizes the plan contents.
- ***Section 2 Land and Water Resource Inventory*** presents information about the topography, geology, groundwater, soils, land use, public utilities, surface waters, hydrologic system and data, and the drainage system.
- ***Section 3 Agency Cooperation*** outlines other governmental controls and programs that affect stormwater management.
- ***Section 4 Assessment of Issues*** presents the City's water management related problems and issues.
- ***Section 5 Goals and Policies*** outlines the City's goals and policies pertaining to water management.
- ***Section 6 Implementation Program*** presents the implementation program for the City of Brooklyn Center, which includes defining responsibilities, prioritizing, and listing the program elements.

1.3.1. Background

This report provides the City of Brooklyn Center with a Surface Water Management Plan that serves as a guide to managing the City's surface water system and brings the City into compliance with Minnesota Statutes. This plan is an update to the 2015 Surface Water Management Plan, and is the 4th Generation Plan for water resource management within the City of Brooklyn Center. The plan will guide stormwater activities in the City for the next ten years (2018-2027). Periodic amendments to the Plan will likely occur in the intervening ten years so that the Plan remains current with watershed plan amendments and Metropolitan Council requirements.

The City of Brooklyn Center (population 30,104) is located in Hennepin County in the seven county Twin Cities metropolitan area, approximately six miles northwest of downtown Minneapolis. The City covers approximately 8.5 square miles. Brooklyn Center is a first-ring suburb located between the City of Fridley to the east, City of Crystal and City of Brooklyn Park to the west, City of Robbinsdale and City of Minneapolis to the south, and City of Brooklyn Park to the north.

Brooklyn Center is within two watershed districts: Shingle Creek Watershed Management Commission (SCWMC) and West Mississippi Watershed Management Commission (WMWMC). This plan addresses the rules and regulations put forth by the SCWMC and the WMWMC.

Surface water in Brooklyn Center generally drains into Shingle Creek which eventually drains into the Mississippi River. Areas on the east side of the City drain directly into the Mississippi River while areas in the south west side of the City drain to one of the Twin Lakes or Ryan Lake.

The City of Brooklyn Center is considered fully developed. **Section 2.4** of this plan discusses land use in the City.

1.3.2. Summary of Implementation Section

Section 6 of this plan presents the implementation program for the City of Brooklyn

Center, which includes defining responsibilities, prioritizing, and listing the program elements. **Table 6.1** outlines the projects, programs, studies, and Storm Water Pollution Prevention Plan (SWPPP) activities that have been identified as a priority to address water resource needs and problem areas within the City**.**

2. LAND AND WATER RESOURCE INVENTORY

2.1. Topography and Geology

The City of Brooklyn Center has a relatively flat topography resulting from outwash deposited by the Des Moines Lobe, and specifically the Grantsburg sublobe, approximately 35,000 to 10,000 years ago by the late Wisconsinan glaciations. As the Grantsburg sublobe retreated westward, the Mississippi River was uncovered. Meltwater from the glacier filled the area with sand and gravel (Soil Survey of Hennepin County, Minnesota).

The City of Brooklyn Center is located along the Mississippi River in northeastern Hennepin County. Most of Brooklyn Center is flat to gently rolling terrain. Fairly steep slopes occur along the Mississippi River along the east border of the City. Elevation ranges from approximately 810 feet along the Mississippi River to approximately 870 feet along the City's western border.

The City's hydrologic system is part of the Mississippi River watershed. The City resides within two watershed management organizations. The eastern portion of the City along the Mississippi River resides in the West Mississippi Watershed Management Commission (WMWMC). The western portion of the City resides within the Shingle Creek Watershed Management Commission (SCWMC). **Figure 13, Appendix A** shows jurisdictional boundaries for the two watershed organizations within the City.

The City of Brooklyn Center has contour data that cover the entire city and are based on 2011 LiDAR (Light Detection and Ranging) data. Additional available mapping includes various development plans and the Brooklyn Center, Minnesota USGS 10-foot contour interval topographic map.

Information regarding the city's surficial and bedrock geology and aquifers is available in the Hennepin County Geologic Atlas from the Minnesota Geological Survey.

2.2. Climate and Precipitation

The climate within the Minneapolis/St. Paul metropolitan area is described as a humid continental climate with moderate precipitation, wide daily temperature variations, warm humid summers, and cold winters. The total average annual precipitation in this area is approximately 33 inches, of which approximately one-third occurs in the months of June, July and August. The annual snowfall average is about 56 inches and is equivalent to approximately 5.6 inches of water. Additional climatological information for the area can be obtained from the Minnesota State Climatology Office.

The 2-year rainfall event occurring over a 24-hour period produces approximately 2.87 inches. The 100-year rainfall event occurring over a 24-hour period produces approximately 7.36 inches. The 100-year, 10-day rainfall is 10.2 inches. The rainfall data was obtained from the Atlas 14 website produced by the National Oceanic and Atmospheric Administration (NOAA). Additional precipitation information for the area can be obtained from the National Oceanic and Atmospheric Administration (NOAA) website.

- 2-year event = 50% chance of occurring
- 100-year event = 1% chance of occurring

2.3. Soils

The soils in Brooklyn Center were mapped in the USDA-NRCS Soil Survey of Hennepin County, which was updated in 2004. The original soils of the Brooklyn Center area are largely unknown because most of the City is covered with impervious surface or has been subject to cut-and-fill activities. Onsite investigation is typically needed on a case-by-case basis to determine the soil type at a specific site. Additional information about each of the soils is available from the soil

survey.

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

Since the City is at full development, limited land grading will occur within the City in the future.

2.4. Land Use

Brooklyn Center is almost completely urbanized, with approximately 50% of the land use comprised of single family residential development and the remainder mostly commercial and industrial development. A large commercial center (Shingle Creek Crossing and Opportunity Site) occupies the northeastern portion of the area bounded by Brooklyn Boulevard on the west, I-94 on the north, and Highway 100 on the east. A large industrial park—between I-94 and 69th Avenue and between Xerxes Avenue and Humboldt Avenue—is about 80% developed with a mixture of commercial and light industrial facilities.

The City is also defined by its green space. A broad greenway of open space begins at Palmer Lake and follows Shingle Creek south through the city. In total there are 23 developed parks and a golf course, as well as considerable green space in the Twin Lakes area. Two regional park facilities are also included within the city limits: portions of the North Mississippi Regional Park and the Twin Lakes and Shingle Creek Regional Trail System.

The City of Brooklyn Center is designated by the Metropolitan Council as an “urban community” meaning that over 85% of the community is developed. Brooklyn Center is almost fully developed with just 1% of its usable land area still vacant. The following table lists the current land use percentages within the City.

Land Use Type	Land Use Percentage
Low Density Residential	36%
Medium and High Density Residential	7%
Commercial	9%
Industrial	4%
Schools	5%
Parks, Open Space, and Water	16%
Roadways	23%

The existing and future land uses in Brooklyn Center are shown on **Figures 2** and **3, Appendix A**. Land use data is an important factor for estimating surface water runoff. The hard or impervious surface areas associated with each land use greatly affect the amount of runoff generated from an area. Future land use projections indicate those areas that may be available for water resource enhancement and where improvements should be a priority. Significant changes in land use can increase runoff due to added impervious surfaces. Very little change in land use is anticipated within the City in the near future.

2.5. Public Utilities

The City of Brooklyn Center provides potable water for most residents and businesses within the City through a municipal water distribution system. This system is fed from nine municipal wells which draw water from the Prairie Du Chien and Jordan aquifers. For additional information regarding groundwater see **Section 2.7**.

Brooklyn Center is completely within the Metropolitan Urban Service Area. Sanitary sewer and

water service is provided throughout the City. The Brooklyn Center sanitary sewer system consists of approximately 137 miles of sewer mains and ten lift stations. Brooklyn Center handles its wastewater on a metropolitan level and is incorporated into the Metro Wastewater Treatment Plant located in St. Paul, Minnesota. The Metropolitan Plant is the largest in the State of Minnesota, serving 1.8 million users with a maximum capacity of 251 million gallons per day. There is one single family residential property (5306 Perry Avenue North) in the City that utilizes a Subsurface Sewage Treatment System. Sewer service is unavailable to this property.

Storm sewers, ditches, curbs, and gutters provide drainage for the City. The individual subwatersheds map **(Figure 4, Appendix A)** shows the City's stormwater system of pipes, channels, and ponds. Future street maintenance and redevelopment will likely dictate the extension or reconstruction of the storm drainage system. Mapping of stormwater utilities will be updated as improvements of the system are completed to stay in compliance with MS4 requirements.

Shingle Creek through Brooklyn Center is Hennepin County Ditch #13. This is under the ditch authority of Hennepin County.

2.6. Surface Waters

Figure 5, **Appendix A** shows the major water resources in the City of Brooklyn Center. The following table lists the named DNR-protected lakes and wetlands within the City and the associated Ordinary High Water (OHW) level.

DNR ID #	*Waterbody Name*	*OHW*	*Lake ID #*
42P	Upper Twin Lake	853.1	27-0042-03
42P	Middle Twin Lake	853.1	27-0042-02
59P	Palmer Lake	842.8	20-0059-00
58P	Ryan Lake	849.6	27-0058-00
637W	Civic Center Pond	Not established	27-0637
638W	Unnamed Wetland	Not established	27-0638
639W	Unnamed Wetland	Not established	27-0639
640W	Unnamed Wetland	Not established	27-0640

The Wetland Conservation Act of 1991 (WCA) dictates that Local Government Units (LGUs) are responsible for administering the rules. The intent of the WCA is to promote no net loss of wetlands. The Shingle Creek Watershed Management Commission (SCWMC) and the West Mississippi Watershed Management Commission (WMWMC) are the LGUs responsible for administering the WCA in the City of Brooklyn Center. SCWMC and WMWMC completed a Wetland Functional Values Assessment which is included in **Appendix H**. Refer to **Figure 5, Appendix A** for the location of National Wetland Inventory (NWI) wetlands throughout the City.

2.6.1. Water Quality Data

Water quality data for the City has been obtained from the Minnesota Pollution Control Agency (MPCA) Environmental Data Access site and is in **Appendix E**. This data provides a snapshot of overall water quality and health of local waterbodies. This database is utilized by participating agencies to compile water quality testing data and is almost entirely used for the storage of water quality parameters. This water quality monitoring information/data and monitoring locations can be found at the MPCA's Environmental Data Access site.

SCWMC and WMWMC also monitor the creeks and lakes within Brooklyn Center. Watershed staff annually monitor flow and water quality in Shingle Creek; lake monitoring is completed every other year. The most recent monitoring report is available from the watershed.

2.6.2. Impaired Waters

The MPCA lists the following water bodies located within or near the City as being impaired meaning that the waters are too polluted or otherwise degraded to meet the water quality standards set by governing bodies:

- The Mississippi River (ID 07010206-509) is impaired for Fecal Coliform and polychlorinated biphenyl (PCB) in Fish Tissue. This stretch was added to the impaired waters list by the MPCA in 1998 for PCB in Fish Tissue, and again in 2006 for Fecal Coliform.
- Shingle Creek (ID 07010206-506) has an approved TMDL for aquatic Macroinvertebrate Bioassessments, Chloride, Dissolved Oxygen, and *E. coli*. Shingle Creek was added to the impaired waters list by the MPCA in 2006.
- Upper Twin Lake (ID 27-0042-01) has an approved TMDL Plan for Nutrient/Eutrophication Biological Indicators and Mercury in Fish Tissue. Additional impairments include PCB and Perfluorooctane Sulfonate (PFOS). Upper Twin Lake was added to the impaired waters list by the MPCA in 1998.
- Middle Twin Lake (ID 27-0042-02) has an approved TMDL Plan for Nutrient/Eutrophication Biological Indicators. Additional impairments include PCB and PFOS. Middle Twin Lake was added to the impaired waters list by the MPCA in 1998.
- Ryan Lake (ID 27-0058-00) has an approved TMDL Plan for Nutrient/Eutrophication Biological Indicators. Ryan Lake was added to the impaired waters list by the MPCA in 2002 and had an approved TMDL for Nutrient/Eutrophication Biological Indicators. Ryan Lake was delisted in 2014 for meeting the applicable water quality standards.

The locations of these impaired water bodies are shown on the water resource problem areas map (**Figure 7, Appendix A).** For more information on impaired waters and TMDL Plans visit the MPCA website. **Appendix J** includes the approved TMDL plans for Shingle Creek, Twin Lakes, and Ryan Lake.

In addition to the water bodies listed above, the city is upstream of the Lake Pepin and other reaches of the Mississippi River. The City may be required to implement the TMDL plans for these water bodies once complete.

2.7. Groundwater

Various agencies are responsible for groundwater management and protection. The Minnesota Department of Natural Resources (DNR) regulates groundwater usage rate and volume as part of its charge to conserve and use the waters of the state. Suppliers of domestic water to more than 25 people or applicants proposing a use that exceeds 10,000 gallons per day or 1,000,000 gallons per year must obtain a water appropriation permit from the DNR. Many of the agencies charged with regulating water usage are currently involved in assessing and addressing concerns of water usage. When and where feasible the City of Brooklyn Center will work with the associated agencies to be good stewards of water resources. The Minnesota Department of Health (MDH) is the official state agency responsible for addressing all environmental health matters, including groundwater protection. For example, the MDH administers the well abandonment program, and along with the Minnesota DNR, regulates installation of new wells. The MPCA administers and enforces laws relating to pollution of the state's waters, including groundwater. The Minnesota Geological Survey provides a complete account of the state's groundwater resources. The SCWMC and WMWMC are charged with general responsibilities for

groundwater protection and use, but its role is limited to cooperating and assisting the DNR, MDH and MPCA in their groundwater protection efforts. Hennepin County also has statutory responsibilities for groundwater management contained in its Groundwater Management Plan. The Board of Water and Soil Resources (BWSR) adopted this plan in March 1994 while Hennepin County never officially adopted the plan.

The City of Brooklyn Center currently has nine wells in service. They are designated Well 2, Well 3, Well 4, Well 5, Well 6, Well 7, Well 8, Well 9, and Well 10. Well 2 is solely for emergency use and is not currently sent to the treatment plant. All wells draw from the Jordan aquifer. The City has built an iron and manganese removal treatment plant and treats pumped water there.

All of the City's existing water supply system meets all primary contaminant standards as set forth by regulating bodies listed above.

The City has submitted its Wellhead Protection Plan to the Minnesota Department of Health (approved February 17, 2016), which includes the development of Drinking Water Supply Management Areas (DWSMAs). The DWSMA can be seen in **Figure 12, Appendix A**. Refer to the City Wellhead Protection Plan for the DWSMA and other information regarding wellhead protection.

2.8. Hydrologic System and Data

Hydrologic and hydraulic modeling for the entire City of Brooklyn Center was completed in conjunction with the development of this Surface Water Management Plan utilizing XPSWMM, included in **Appendix I**. The SCWMC also maintains a hydrologic and hydraulic model in XPSWMM for areas tributary to Shingle Creek.

The peak runoff rates and volume from most subwatersheds in the City of Brooklyn Center are not expected to change significantly due to future development. Stormwater runoff rate and volume controls will be required to be in conformance with city, watershed, and state requirements.

With the additional precipitation data provided by Atlas 14, dependent upon funding, the City may choose to complete additional risk assessments for specific problem areas which are outlined in **Section 4**.

2.9. Natural Communities and Rare Species

The Minnesota DNR produces the Minnesota County Biological Survey (MCBS) identifying natural communities and rare species. Completed in 1994, the Hennepin County survey identifies where evidence indicates the presence of federally or state listed plants. The survey shows rare plants and animals are present in Brooklyn Center on the north end of Twin Lakes. The DNR has jurisdiction over these areas. Based on state statute any work within these areas is required to meet DNR permit requirements.

The entire City of Brooklyn Center has been categorized according to the Minnesota Land Cover Classification System (MLCCS). MLCCS categorizes urban areas based on five levels of land cover. **Figure 10, Appendix A** shows a map of the classified MLCCS areas. MLCCS does not place any restrictions on development, rather it informs land use planners on open space planning and comprehensive planning.

2.10. NPDES Phase II

The City of Brooklyn Center is required to have a Municipal Separate Storm Sewer System (MS4) permit through the MPCA's National Pollutant Discharge Elimination System (NPDES) Phase II Program. MS4s designated by rule are urban areas with populations over 10,000 or urban areas with populations greater than 5,000 with the potential to discharge to special or impaired waters. Additionally, NPDES Construction General Permits are required for construction activities that result in land disturbance of equal to or greater than one acre or a common plan of development

or sale.

As an MS4, the City will be required to implement the following six minimum control measures:

1. Public Education and Outreach
2. Public Participation/Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Control
5. Post-Construction Stormwater Management
6. Pollution Prevention/Good Housekeeping for Municipal Operations

For more information on NPDES Permit requirements refer tothe MPCA website. Refer to **Appendix B** for a copy of the City's MS4 SWPPP (Storm Water Pollution Prevention Plan) and a copy of the City's SWPPP BMP Sheets.

2.11. Water Resource Issue Areas

Water resource issue areas were identified through information obtained from City staff, residents, and other agencies. Each issue was analyzed and potential solutions to address the issues were developed as detailed in **Section 4**. Refer to **Figure 7**, **Appendix A** for the location of site-specific issue areas. The following is a list of some of the water resource issue areas within the City**:**

- Aging and undersized infrastructure
- Drainage issues at various locations
- Vegetation and sediment management within stormwater ponds and DNR waters
- Impaired water quality in area lakes and rivers

2.12. Flood Insurance Studies

The Federal Emergency Management Agency (FEMA) completed the map modernization process for its Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) to identify flood risk within Hennepin County in 2004. A copy of the updated FIS and FIRMs can be obtained online through the FEMA Map Service Center.

FIS and FIRMs for Hennepin County were last revised in November 2016. For the latest information visit the DNR website

For information regarding any Letter of Map Amendment (LOMA) and Letter of Map Revision (LOMR) refer to the website which is equipped with a mapping function.

Figure 8, Appendix A shows the floodplain for the City of Brooklyn Center.

2.13. Water Resource Management Ordinances and Policies

The City of Brooklyn Center has adopted a number of ordinances and zoning overlay districts in an effort to protect water resources within the City. The City will be revising ordinances to meet post construction requirements. Ordinances and zoning overlay districts currently in place include:

- **Floodplain Management** – purpose of this ordinance is to promote the public health, safety, and general welfare and to minimize potential losses due to flooding hazards. This ordinance is adopted to comply with the rules and regulations of the National Flood Insurance Program and the Watershed Management Commission Rules. The Regulatory

Flood Protection Elevation shall be an elevation no lower than one foot above the regional flood plus any increases in the flood elevation caused by encroachments on the flood plain that result from designation of a floodway.

- **Floodway District (FW)** – this district includes those areas designated as floodway on the FIRM adopted by the City. This ordinance outlines permitted uses and special uses within the Floodway.
- **Flood Fringe District (FF)** - this district includes those areas designated as floodway fringe on the FIRM adopted by the City. This ordinance outlines permitted uses and special uses within the Flood Fringe.
- **General Flood Plain District** – this district includes those areas designated as Zone A or Zones AE, Zone AO, or Zone AH without a floodway on the FIRM adopted by the City. This ordinance outlines the permissible uses and defines procedures for Floodway and Flood Fringe determinations within the General Flood Plain District.
- **Land Disturbance** – the City recently revised this ordinance per a letter received from the MPCA during the City's application for MS4 reauthorization. The City requires a satisfactory erosion control and grading plan consistent with the MPCA's Best Management Practices Handbook, NPDES Permit, and the Watershed Management Commission Rules. The erosion control and grading plan must be approved by the City Engineer before a grading or building permit is issued for construction, if the construction will result in disturbing the soil. This ordinance also officially adopts the Watershed Management Commission's stormwater rules and adopts the project review thresholds outlined by the Watershed Management Commission.

The full text for each of these ordinances or zoning overlay districts is included in **Appendix D**. The most current ordinance information can be found on the City's website.

The City has also developed policies for no wake zones for the City's lakes and a street sweeping policy. These policies are included in **Appendix F** and **Appendix G**, respectively.

The City has not developed a shoreland ordinance (as of 2018). The City will coordinate with the DNR, as necessary, to determine if a shoreland ordinance will be adopted in Brooklyn Center.

2.14. Mississippi River Critical Corridor

The Minnesota State Legislature enacted the Critical Areas Act in 1973 and an executive order (79-19) was signed in 1976 declaring the Mississippi River corridor a Critical Area (MRCCA). The executive order states the following purposes for the Critical Area designation:

- To protect and preserve a unique and valuable state and regional resource for the benefit of the health, safety and welfare of the citizens for the state, region, and nation;
- To prevent and mitigate irreversible damage to this state, regional and national resource;
- To preserve and enhance its natural, aesthetic, cultural, and historical value for the public use;
- To protect and preserve the river as an essential element in the national, state and regional transportation, sewer and water and recreational systems; and
- To protect and preserve the biological and ecological functions of the corridor.

The MRCCA includes 72 miles of the river, extending from the cities of Dayton and Ramsey to just south of of Hastings. The boundary of the MRCCA can generally be described as from the river bluff down to the river, with the corridor width varying.

In 1976, four corridor districts were established, corresponding to the following different types of

land use along the Mississippi River: rural open space district, urban developed district, urban open space district, and urban diversified district. Each district has its own set of guidelines. The Critical Area Act requires that each city having jurisdiction over land within the Critical Area develop a Critical Area Plan. Executive Order 79-19 includes the rules and guidelines that each city must incorporate in its Critical Area Plan.

In 1988, the U.S. Congress designated the Mississippi River corridor as the Mississippi Natural River and Recreation Area (MNRRA), a unit of the National Park System. The boundaries of the MNRRA corridor are the same as the Critical Area corridor. MNRRA was established to:

- Protect, preserve, and enhance the significant values of the Mississippi River corridor through the Twin Cities metropolitan area;
- Encourage coordination of federal, state, and local programs; and
- Provide a management framework to assist the state of Minnesota and local governments in the development and implementation of integrated resource management programs and ensure orderly public and private development in the area.

The Mississippi River Coordinating Commission and the National Park Service adopted the MNRRA *Comprehensive Management Plan* in 1995. This plan adopts and incorporates by reference the state Critical Area Program, Shoreland Management Program, and other applicable state and regional land use management programs. The MNRRA comprehensive plan also identifies voluntary policies that are additional to the Critical Area requirements, for the purpose of protecting and enhancing river resources.

In 2009 the Minnesota State Legislature directed the DNR to conduct new rulemaking for the MRCCA. The boundary of the existing corridor is not anticipated to change, however the boundaries and requirements within the corridor are expected to change. The adoption of updated rules will be mandatory by the local government units (LGUs) located within corridor boundaries.

In September 2016, the DNR adopted rules to guide development in the MRCCA. The rules establish six new districts in the corridor. In addition, the rules establish new standards and guidelines for development in the MRCCA.

As a result of this new legislation, local governments are required to update their Critical Area plans (these may be stand-alone plans, or they may be components in the Comprehensive Plan) and will be required to prepare new land use ordinances for MRCCA management. The DNR intends to prepare sample ordinances for communities to adopt as needed. The City intends to include an update to their Critical Area Plan that complies with DNR MRCCA rules within the 2040 Comprehensive Plan.

3. AGENCY COOPERATION

There are a number of local, state, and federal agencies that have rules and regulations related to local water management. The City recognizes the roles of these other agencies and will cooperate, coordinate, and when possible partner with these agencies.

This Plan is in conformance with but does not restate all other agency rules that are applicable to water resource management. The following agencies deal with or regulate water resources throughout the City:

- Minnesota Department of Health
- Minnesota Pollution Control Agency
- Board of Water and Soil Resources and the Wetland Conservation Act
- Minnesota Department of Natural Resources
- US Army Corps of Engineers
- Minnesota Department of Agriculture
- US Fish and Wildlife Service
- Hennepin County
- Hennepin County Environmental Services
- Shingle Creek Watershed Management Commission and West Mississippi Watershed Management Commission
- Minnesota Environmental Quality Board
- Metropolitan Council

While these other agencies' rules, policies, and guidelines are not all restated in this Plan, they are applicable to projects, programs, and planning within the City. The MPCA Minnesota Stormwater Manual, which is a document intended to be frequently updated, is also incorporated by reference into this Plan.

4. ASSESSMENT OF ISSUES

Outlined below is an assessment of existing and potential local water resource-related issues that are known as of 2018. These issues have been identified based on an analysis of the land and water resource data collected during the preparation of this plan and through information provided by the City, its residents, and the watershed organizations. A description of any existing or potential issue within the City has been listed and potential future corrective actions have been incorporated into an implementation plan. Refer to **Figure 7, Appendix A** for the location of many of the issues discussed below.

4.1. Water Quality Issues

4.1.A

Issue – The City discharges to the following impaired waters as listed by the Minnesota Pollution Control Agency (MPCA):

- The Mississippi River (ID 0701026-509) is impaired for Fecal Coliform and Polychlorinated Biphenyl (PCB) in fish tissue. This stretch was added to the impaired waters list by the MPCA in 1998 for PCB in fish tissue, and again in 2006 for Fecal Coliform.
- Shingle Creek (ID 07010206-506) has an approved TMDL for aquatic Macroinvertebrate Bioassessments, Chloride, Dissolved Oxygen, and *E. coli*. Shingle Creek was added to the impaired waters list by the MPCA in 2006.
- Upper Twin Lake (ID 27-0042-01) has an approved TMDL Plan for Nutrient/Eutrophication Biological Indicators and Mercury in Fish Tissue. Additional impairments include PCB and Perfluorooctane Sulfonate (PFOS). Upper Twin Lake was added to the impaired waters list by the MPCA in 1998.
- Middle Twin Lake (ID 27-0042-02) has an approved TMDL Plan for Nutrient/Eutrophication Biological Indicators. Additional impairments include PCB and PFOS. Middle Twin Lake was added to the impaired waters list by the MPCA in 1998.
- Ryan Lake (ID 27-0058-00) has an approved TMDL Plan for Nutrient/Eutrophication Biological Indicators. Ryan Lake was added to the impaired waters list by the MPCA in 2002 and had an approved TMDL for Nutrient/Eutrophication Biological Indicators. Ryan Lake was delisted in 2014 for meeting the applicable water quality standards.

Corrective Action - The City will continue to work with the MPCA, watershed commissions, and surrounding communities to help improve these bodies of water and address the TMDL requirements. Many of the projects outlined in the implementation plan will help work toward achieving the TMDL improvement goals. The City is also interested in partnering with the watershed commission, neighboring cities, and other agencies on future projects/opportunities that arise that help achieve the goals of the TMDLs. Refer to the detailed TMDL report or implementation plans located on the MPCA's website or in **Appendix J** for more information on each TMDL. The City's annual NPDES reports also provide additional detail on activities that have been completed.

Upper Mississippi River Bacteria TMDL
The Upper Mississippi River Bacteria TMDL, approved in November 2014, established a TMDL that requires a 69% reduction in *E. coli* load to Shingle Creek and identified West Mississippi as a protection watershed, requiring no specific load reduction. The City has constructed numerous stormwater BMPs and plans to continue implementing water quality BMPs as feasible. As opportunities are identified that can help address the Bacteria TMDL, the City is willing to contribute and work with others to implement additional BMPs. Refer to the Brooklyn Center Stormwater Management Guide (**Appendix J**) for more information on implemented BMPs and potential BMPs.

Shingle Creek Chloride TMDL
A reduction of approximately 71% in chloride levels is needed to achieve water quality standards and avoid future impairments. Reductions will result mainly using BMPs implemented by road maintenance authorities and private commercial applicators including but not limited to salt application practices, stockpile management, and plowing/sweeping procedures. Specifically, the City has completed or plans on completing the following activities to help achieve the Shingle Creek Chloride TMDL:

- The City has upgraded 100% of its fleet with electronic controls and pre-wetting. The City uses MnDOT RWIS and handheld temperature sensors to determine application rates, in lieu of equipping each individual truck with temperature sensors.
- The City will continue to provide annual training for operators, regularly calibrate equipment, use anti-icing where appropriate, and continue investigate other improvements that can be incorporated.
- Refer to the Shingle Creek Chloride TMDL Five Year Review in **Appendix J** for additional information.

Shingle Creek Biota and DO TMDL
Lower Shingle Creek (through Brooklyn Center) has a critical Dissolved Oxygen (DO) of 5.0 mg/L. The Total Oxygen Demand (kg/day) is currently approximately 949.5 and the TMDL identifies 374.9. The City has completed or plans on completing the following activities to help achieve the Shingle Creek Biota and DO TMDL:

- The City has restored streambanks, implemented and enhanced native buffers, provided reaeration, and improved habitat on the Shingle Creek corridor from I-694 to CR 10.
- The City worked with the City of Brooklyn Park to complete streambank restoration from Brooklyn Boulevard to downstream of Noble Avenue. A second phase of this streambank restoration is included in the Implementation Plan.
- The City has constructed BMPs in conjunction with street reconstruction projects in drainage areas tributary to Shingle Creek. The City plans to continue implementing treatment and infiltration BMPs with its street reconstruction program.

Twin and Ryan Lakes Nutrient TMDL
There is a gross waste load allocation to Twin Lakes and Ryan Lake, however no individual waste load allocations were developed (North Twin 16 to 76 % TP reduction, Middle Twin 13 to 33%, South Twin 0 to 65%, Ryan 8 to 54%). Ryan Lake has been delisted, but Twin Lakes remains on the impaired waters list. The City has completed or plans on completing the following activities to help achieve the Twin and Ryan Lakes Nutrient TMDL:

- The City has constructed BMPs (including rain gardens and treatment structures) in conjunction with street reconstruction projects in drainage areas tributary to Twin and Ryan Lakes. The City plans to continue implementing treatment and infiltration BMPs with its street reconstruction program.
- The City has adopted a street sweeping policy to help reduce stormwater pollutant loadings. Refer to **Appendix G** for a copy of the Street Sweeping Policy.
- The City will continue to inspect and maintain existing stormwater Ponds and BMPs to ensure they are performing as designed and providing the necessary stormwater treatment.
- The City manages geese near Twin and Ryan Lakes and throughout the City as necessary to reduce bacteria and nutrient loadings.
- The City will continue to work with the Watershed Management Commission and other neighboring cities to develop a plan for rough fish and vegetation management.

- The City will continue to educate residents, lake associations, and businesses on structural and non-structural BMPs to improve water quality in the stormwater and surface water.
- Refer to the Twin and Ryan Lakes Nutrient TMDL Five Year Review in **Appendix J** for additional information.

4.1.B

Issue – The presence of invasive fish and dense vegetation is causing water quality and habitat issues in Upper and Middle Twin Lakes.

Corrective Action – The watershed commission has completed carp tracking and harvested carp from the lake in 2018. The watershed commission is also planning to install a fish barrier to prevent invasive fish from entering Upper and Middle Twin Lakes. The City will maintain the fish barrier. The City will work with the watershed commission, neighboring cities, and other jurisdictions to develop an aquatic vegetation management plan that is reasonable, achievable, feasible, and economically viable.

4.2. Flooding and Stormwater Rate Control Issues

4.2.A

Issue – Portions of the storm sewer throughout the City are under capacity (either inlet capacity or pipe capacity) or has exceeded its design life.

Corrective Action – The City will evaluate and address these capacity issues as feasible during street reconstruction projects and other appropriate projects in the upcoming years.

4.2.B

Issue – The outlet to the Fremont Place North townhomes pond is susceptible to plugging and creates flooding issues.

Corrective Action – This pond outlet located at the connection point to the public storm sewer system will be added to the City's routine maintenance check list.

4.2.C

Issue – Shingle Creek Regional Trail from Freeway Boulevard to Shingle Creek Parkway experiences ongoing flooding issues.

Corrective Action – The City will continue to monitor this issue area on an event basis and determine if this issue will require improvements. If action is determined to be needed, the City will work with Three Rivers Park District on addressing flooding issues.

4.2.D

Issue – There are localized ponding and drainage issues on the edge of County Road 130.

Corrective Action – The City will continue to monitor this issue area and coordinate/address with County Road improvements.

4.2.E

Issue – The Kylawn Park and area surrounding the park experiences the following flooding issues:

- The natural berm at the south end of the park may be creating backwater flooding.
- There are backyard flooding issues on the west side of the Arboretum pond.
- The Twin Lake North Apartment parking lot experiences flooding issues.

Corrective Action – The City will continue to monitor and evaluate these issue areas and meet with residents as needed.

4.2.F

Issue – During the 639 W restorations a dike was installed across the wetland. This is causing peripheral flooding on the north side of the wetland.

- There are backyard flooding issues on the south side of Scott Avenue North and 61st Avenue
- The ball field at Odyssey Academy Park experiences flooding issues.

Corrective Action – The ball field at Odyssey Academy Park was raised and graded in 2015. If issues persist, the City will work with the City of Crystal and Watershed Commission to lower the outlet elevation or determine if there are other viable solutions.

4.2.G

Issue – Centennial Park West ball fields and trails flood during large rainfall events.

Corrective Action – The City installed a berm and pump system in the winter of 2014 – 2015 for the two main softball fields. The City will monitor and evaluate additional measures to reduce flood potential of the ball fields, as necessary.

4.2.H

Issue – The pond liner at the Earle Brown Heritage Center may have a leak resulting in a lower water level then the design normal water level.

Corrective Action – The City repaired the pond clay liner in 2018 as a part of the pond maintenance project. The City also modified the outlet structure with a side flow grate to help control high water levels and reduce clogging potential. The City will continue to monitor the pond and determine if further action is needed.

4.2.I

Issue – The ball field and trail at East Palmer Lake Park are susceptible to spring flooding.

Corrective Action – The City will continue to monitor this issue area. This ball field and trail were originally constructed in a low area adjacent to Palmer Lake and periodic flooding of this park area is expected. The City has marked this trail as “no maintenance.” The City will consider elevating the trails as needed.

4.2.J

Issue – The City currently does not have a formalized Mississippi River level monitoring program.

Corrective Action – A river lever monitoring program will be developed to help respond and anticipate flooding and erosion issues.

4.2.K

Issue – During storm events and periods of high water, Twin Lake backs up into the storm sewer system onto Lake Breeze Avenue and Lakeside Avenue and floods the road.

Corrective Action – The City will continue to monitor the frequency of these events, and if flooding impacts residents' ability to safely travel, flood control measures will be evaluated.

4.2.L

Issue – Storm sewer backs up from Shingle Creek during storm events and periods of high water for the creek, causing intermittent flooding of the roadway and trails in this area.

Corrective Action – The City will continue to monitor the frequency of these events, and if flooding impacts the ability for residents and businesses to safely travel, flood control measures will be evaluated.

4.3. Storm Sewer Maintenance Issues

4.3.A

Issue –The City currently does not have a routine inspection program to monitor their storm sewer conveyance system and corrections are made reactively to issues as they arise.

Corrective Action – The City will continue to televise their storm sewer in conjunction with the reconstruction projects and during general maintenance.

4.3.B

Issue – Southeast of the intersection of 61st Avenue North and Perry Avenue North, the storm sewer pipe has joint failures, resulting in leakage and transfer of sediment causing sink holes.

Corrective Action – The City will include the evaluation and repair of the storm sewer with the Mill and Overlay Project for this intersection scheduled for 2025.

4.3.C

Issue – Rehabilitate the deteriorated storm sewer from 70th Avenue North and Willow Lane to the Mississippi River.

Corrective Action – The City will evaluate this issue at both the upstream and downstream ends of the storm sewer system and plans to repair any necessary areas in 2019.

4.3.D

Issue – The trunk line along 65th Avenue between Cahlander Park and Shingle Creek is deteriorating.

Corrective Action – A pipe joint repair project was completed in the 1990s. The City will monitor and evaluate the trunk storm sewer and has planned a project for 2021.

4.3.E

Issue – The weir south of Bass Lake Road and Shingle Creek Parkway experiences excessive accumulation of debris and needs continuous maintenance.

Corrective Action – The City will monitor and work with the property owner to perform the flood protection maintenance as needed for this weir and add it to the City annual inspection plan. An overflow valve was installed in 2016. The property owner will be responsible for the aesthetic maintenance and the City will assist with maintenance to ensure weir is kept unrestricted.

4.3.F

Issue – The backflow preventer located west of Shingle Creek Parkway and John Martin Drive is not able to be secured in the closed position properly.

Corrective Action – The City will evaluate if this function is still needed and determine the appropriate course of action.

4.4. Impacts of Sedimentation and Vegetation

4.4.A

Issue – The City is currently aware that many of the City owned ponds have vegetation and sedimentation issues.

Corrective Action – The City performs maintenance on stormwater ponds as necessary to ensure they continue to provide the intended stormwater management benefit. The City recently developed a SWAMP (Storm Water Asset Management Program, **Appendix K**) to help update and prioritize inspection and maintenance needs for stormwater ponds and BMPs throughout the City. The City will annually review the SWAMP and update the prioritization and BMP inspection and maintenance activities accordingly.

4.4.B

Issue – Palmer Lake has experienced degradation due to stormwater loading and vegetation growth/encroachment.

Corrective Action – The City will continue to monitor Palmer Lake for proper drainage of Shingle Creek, and if necessary, develop a management plan to ensure drainage and flood protection related to Palmer Lake are maintained.

4.5. Adequacy of Existing Regulations and Programs to Address Adverse Impacts on Local Water Resources

4.5.A

Issue – The grit chamber in the parking lot northeast of Topgolf needs ongoing maintenance.

Corrective Action – The City will develop a program for cleaning the underground system. It is likely this system will need to be cleaned on an annual or biennial basis. The City completed the first cycle of maintenance in 2015 and then will monitor the subsequent load accumulation to determine the proper maintenance interval, which is assumed to be approximately every two to three years.

4.5.B

Issue – Mississippi River corridor a Critical Area (MRCCA) Rules and Standards have been adopted by the DNR as of 2016.

Corrective Action – The City will update its Critical Area Plan as a part of the 2040 Comprehensive Plan to comply with MRCCA rules.

4.6. Impacts of Erosion and Sedimentation on Local Water Resources

4.6.A

Issue – The private retaining walls are deteriorating and falling within the Mallard Creek Ponds on Unity Avenue North, between 72nd Circle and 69th Avenue North.

Corrective Action - The private retaining walls will need to be reconstructed by the property owner.

4.6.B

Issue – Both sides of Shingle Creek are experiencing erosion and sedimentation issues at Brooklyn Boulevard.

Corrective Action – In 2015, the City partnered with SCWMC and the City of Brooklyn Park to complete the Connections at Shingle Creek Restoration Project from Brooklyn Boulevard to Noble Avenue North. A Phase 2 project from Regent Avenue North to Brooklyn Boulevard needs to be completed to determine the extent of the stabilization required on the remaining portion of the reach. The City will look into a possible partnership with the Shingle Creek Watershed Management Commission to help fund this project.

4.7. Impact of Land Use Practices and Development on Local Water Resource Issues

4.7.A

Issue – There is a lack of storm sewer maintenance that has been completed at the old Jerry's site off of Bass Lake Road and Xerxes Avenue. There is failing storm sewer on site.

Corrective Action – The City completed repairs to the failing storm sewer in 2018, but will continue to monitor the site and work with the property owner if issues persist.

4.8. Education Program

4.8.A

Issue – Water resource education materials are currently distributed to residents, businesses, and other organizations throughout Brooklyn Center through several different channels; however, public water resource education remains a significant component of environmental protection.

Corrective Action – The City will continue to collaborate and streamline the stormwater education programs and materials and distribute to its residents, businesses, and other organizations. These programs may focus on the following topics: getting the most out of BMPs, water quality, groundwater, wetlands, native vegetation, buffers, wildlife habitat, litter control, pet wastes, recycling, trash disposal, leaf collection, grass clippings, lawn chemicals, and hazardous materials.

The City will pursue partnerships with the watersheds and other organizations to efficiently complete its education program.

4.9. Identification of Potential Issues Which are Anticipated in the Next 20 Years.

4.9.A

Issue – Sanitary sewer lines run parallel and near the Mississippi River banks along the entire east side of the City.

Corrective Action – Regular river bank stabilization inspections are completed by the Utility Department.

4.10. Availability and Adequacy of Existing Technical Information to Manage Local Water Resources.

4.10.A

Issue – Atlas 14 (updated precipitation probability information) was released by the National Oceanic and Atmospheric Administration in 2013 and adopted by SCWMC, WMWMC, and the City for design criteria.

Corrective Action – Previously developed areas within the City (designed to meet TP-40 hydrologic demands) will continue to operate under this design criteria. New development, redevelopment, and areas where issues may exist will be evaluated (as needed) by completing a risk assessment using Atlas 14. The City will work with the DNR, SCWMC, and WMWMC in FIRM updates as needed.

5. GOALS AND POLICIES

5.1. General

The primary goal of Brooklyn Center's SWMP is to bring the City into statutory compliance and provide the City with a framework for effective stormwater management. This includes guiding redevelopment activities and identifying and implementing retrofits to the existing system. These retrofits consist of both projects and programs. Additionally, the plan provides clear guidance on how Brooklyn Center intends to manage surface water in terms of both quantity and quality.

The goals in Brooklyn Center's SWMP are consistent with the goals of the Shingle Creek Watershed Management Commission (SCWMC) and West Mississippi Watershed Management Commission (WMWMC), while addressing the more specific and changing needs of the City. This plan (4th Generation Plan) is an update to the 2015 Water Management Plan (3nd Generation Plan) and the goals of this plan were established in accordance with the guidelines contained in Minnesota Statutes 103B and Minnesota Rules 8410.

The policies and rules of SCWMC and WMWMC have been adopted by reference for the areas within each district. Refer to **Figure 13, Appendix A** for the approximate watershed organizational boundaries within the City. The most recent SCWMC and WMWMC rules and standards can be found on their website. The City is responsible for enforcing the Commissions' recommendations for projects that require a Commission review (see project review threshold table). Additional goals and policies of the City are contained throughout this section.

A general priority of the City is to cooperate, collaborate, and partner with other entities such as the SCWMC, WMWMC, and the MPCA as much as possible as the City implements this plan. Cooperation, collaboration, and partnering results in projects that are less likely to conflict with the goals of the affected entities, are better able to meet long-term goals, and are generally more cost-effective.

In addition to the goals and policies contained in this section, the City will annually review and update its Storm Water Pollution Prevention Plan (SWPPP) to effectively manage its stormwater system and be in conformance with the NPDES MS4 Program. Refer to **Appendix B** for the most recent version of the City SWPPP.

The goals and policies described in this section are intended to incorporate the foundation of several regional, state, and federally mandated programs. They are not meant to replace or alter the regional, state and federally mandated programs, rules and regulations, but to serve as an enhancement and provide some general policy guidelines. The goals address the management strategies of both watershed management commissions, West Mississippi and Shingle Creek, and are consistent with the objectives set forth in the State Wetland Conservation Act (WCA) and the Federal Nationwide Urban Runoff Program (NURP).

5.2. Background

The City completed its first comprehensive plan in 1979. The City has most recently updated its comprehensive plan in 2010 with its 2030 Comprehensive Plan. The City is in the process of updating the 2030 Comprehensive Plan is with its 2040 Comprehensive Plan. The 2040 Comprehensive Plan will reiterate the goals of the previous plan, while also responding to emerging issues and changing conditions within and around the City of Brooklyn Center.

Specific to the goals and policies of this Surface Water Management Plan is the following statement from the 2030 Comprehensive Plan under the Community Image Objectives subsection:

Minimize the impacts of storm water runoff on water resources by minimizing the increase of impervious surface and using naturally designed drainage, infiltration, other low impact development (LID) techniques and best management practices, in the development and redevelopment process.

The 2018 Brooklyn Center SWMP expands upon the goals and objectives provided in the 2030 Comprehensive Plan, the 2016 Water Management Plan, and the updated Third Generation Shingle Creek and West Mississippi Watershed Management Commission Water Management Plan.

5.3. Water Quality

5.3.1. Goal

Work with SCWMC, WMWMC, and neighboring communities to maintain and/or enhance the water quality of Brooklyn Center's lakes, wetlands, streams, and other water resources.

5.3.2. Policies

1. Brooklyn Center's preferred means of protecting water quality is to infiltrate and reuse stormwater runoff. Brooklyn Center requires that stormwater infiltration and reuse facilities include sufficient water quality pretreatment (to NPDES and watershed standards) to preserve the function of these facilities. Wellhead protection areas must also be reviewed when considering infiltration.

2. Utilize, where feasible, regional stormwater detention facilities when possible to enhance water quality by removing sediment and nutrients from runoff.

3. Support water quality monitoring efforts being undertaken by the SCWMC and WMWMC.

Refer to SCWMC and WMWMC Rules in **Appendix C** for Water Quality Policies within the City.

5.4. Runoff Management and Flood Control

5.4.1. Goal

Protect, preserve, and expand (where possible) the stormwater storage and detention systems to control excessive runoff volumes and rates, prevent flooding, protect public health and safety, and minimize public capital expenditures.

5.4.2. Policies

1. Brooklyn Center's preferred flood control strategy is to reduce the volume of its runoff through regional stormwater facilities and reuse or infiltration projects. The City will work with the SCWMC, WMWMC, and surrounding communities to achieve their flood control goals.

2. The high-water levels of stormwater detention facilities shall be based on a minimum 100-year frequency storm event. A minimum freeboard of two feet shall be provided for the lowest adjacent building opening. The 100-year high water level shall be determined based on the more restrictive of the City's hydrologic/hydraulic model, FEMA floodplain, and SCWMC/WMWMC elevation.

3. Emergency overflow drainage routes shall be provided at all low point locations a

minimum of 1.5 feet below the lowest adjacent building opening. Emergency overflow drainage routes shall be constructed in a manner that will accommodate a 100-year storm event.

4. New stormwater drainage system design shall be based on a 5-year frequency storm for local storm sewer, 10-year frequency storm for trunk storm sewer, and a 100-year frequency storm for ponds and open channels, where practical.

5. New storm sewers and open channels shall be designed using the Rational Method or other technical method approved by the City. Runoff Coefficient "C" shall be in accordance with the guidelines provided in the Minnesota Department of Transportation Drainage Manual.

6. A hydrograph method based on sound hydrologic theory shall be used to analyze runoff rates and high-water levels for proposed development and redevelopment projects.

7. Water quality treatment ponds (wet ponds) shall be designed in accordance with National Urban Runoff Program (NURP) standards.

8. Drainage and utility easements shall be dedicated over newly constructed stormwater management features (volume, rate control, and water quality treatment infrastructure) including but not limited to ponds, infiltration basis, rain gardens, underground storage and treatment devices, and tree trenches.

9. The owner of a detention basin, water quality pond, or water quality treatment device shall provide the City with an executed copy of an Agreement for Maintenance and Inspection of Utility and Storm Drainage Systems in a form acceptable to the City.

10. Prohibit encroachment that will reduce the storage capacity of floodplains, unless mitigating action is undertaken.

11. Allow only structures that have been flood-proofed or will not be subject to excessive damage in the floodway fringe.

12. Existing water storage capacity should be preserved below the 100-year critical flood elevation on all public waters within designated floodplain areas.

13. Development within the floodplain should be minimized that will unduly restrict flood flows or aggravate known high-water problems.

14. Compensatory storage will be required for floodplain fill.

Refer to the Floodway District, Flood Fringe District, General Flood Plain District Ordinances on the City's website for more information regarding floodplain management within the City.

Refer to SCWMC and WMWMC Rules and Standards in **Appendix C** for Runoff Management Policies within the City.

5.5. Wetlands

5.5.1. Goal

Achieve no net loss of wetlands, including acreage, functions, and values. Where practical, improve the functions, values, biological diversity, and acreage of existing

wetlands.

5.5.2. Policies

1. Cooperate with SCWMC's and WMWMC's administration of their wetland alteration rules. SCWMC is the Local Governing Unit (LGU) for wetlands within its jurisdictional boundary and WMWMC is the LGU responsible for administering WCA for that area of the City within the WMWMC.

2. Runoff shall not be discharged directly into wetlands without pretreatment of the runoff.

3. A vegetated buffer strip with a minimum buffer width of 20 feet and an average width of 30 feet measured from the ordinary high water level of the watercourse or wetland is required adjacent to wetlands, lakes, and natural water course.

4. Wetlands may not be drained, filled, or excavated without prior approval from the Shingle Creek or West Mississippi Watershed Management Commissions in accordance with WCA.

5. Drainage and utility easements shall be dedicated over wetland buffer areas.

Refer to SCWMC and WMWMC Rules and Standards in **Appendix C** for Wetland Management Policies within the City.

5.6. Erosion and Sediment Control

5.6.1. Goal

Protect the capacity of the City's stormwater management system, prevent flooding, and maintain water quality by preventing erosion and sedimentation from occurring and correct existing erosion and sedimentation problems.

5.6.2. Policies

1. The City of Brooklyn Center is responsible for the review and enforcement of erosion and sediment controls for activities that require a grading and erosion control plan.

2. Erosion control must meet the requirements outlined in the Minnesota Pollution Control Agency's NPDES General Permit to Discharge Stormwater from Construction Sites and the following criteria. A copy of the most recent requirements can be found on the MPCA website.

5.7. Groundwater

5.7.1. Goal

Protect the quality and quantity of groundwater resources.

5.7.2. Policies

1. Encourage groundwater recharge and cooperate with SCWMC and WMWMC efforts to protect recharge areas from potential sources of contamination. Provide increased green space, native vegetation, and pond "dead" storage wherever possible and appropriate to allow for the infiltration of stormwater runoff and promote groundwater recharge. The Wellhead Protection Plan was approved by the Department of Health on February 17, 2016. This plan should be referenced when considering infiltration to verify the location of Drinking Water Supply Management Areas (DWSMAs) and

other sensitive areas.

2. Provide groundwater protection as laid out in the City's Wellhead Protection Plan.

5.8. Recreation, Habitat, and Shoreland Management

5.8.1. Goal

Protect and enhance fish and wildlife habitat and recreation opportunities.

5.8.2. Policies

1. Cooperate with SCWMC, WMWMC, and other units of government to complete habitat and recreation corridor connections (greenways).

2. Maintain, enhance, or provide new habitat as part of wetland modification, stormwater facility construction, or other appropriate projects.

3. Encourage alternative landscape designs that a) increase beneficial habitat, wildlife and recreational uses; promote infiltration and vegetative water use; and that b) decrease detrimental wildlife uses (such as beaver dams, goose overabundance), which damage water control facilities, shoreline vegetation, water quality or recreational facilities.

4. Continue to manage key conservation areas within the City. Coordinate efforts to protect rare and endangered species and areas of significant natural communities with the Minnesota Department of Natural Resources. Refer to the zoning map from the comprehensive plan for a reference of these areas (**Appendix D**).

5. Coordinate efforts with state, county and neighboring municipalities to enhance water-based recreation to the extent practical.

5.9. Education and Public Involvement

5.9.1. Goal

Increase public awareness, understanding, and involvement in water and natural resource management issues.

5.9.2. Policies

1. Continue to distribute educational materials to the general public and targeted groups in accordance with the City's SWPPP. Specific topics could include water resources, groundwater, wetlands, native vegetation, buffers, wildlife habitat, litter control, pet wastes, recycling, trash disposal, leaf collection, grass clippings, lawn chemicals, and hazardous materials. Information may be distributed via the City's newsletter, City website, local newspapers, cable television, or other appropriate methods.

2. Continue to coordinate education efforts with SCWMC and WMWMC to take advantage of efficiencies of scale where appropriate.

5.10. Financing

5.10.1. Goal

Minimize and fairly distribute public expenditures for plan implementation with emphasis on using the City's stormwater utility to finance projects and collaborating/partnering with other entities.

5.10.2. Policies

1. Use the City's Stormwater Utility Fund to pay for stormwater management projects and implementation activities.

2. Use other funding sources including land sale proceeds, partner with the watersheds, State Aid funds, grants, among other sources to pay for the implementation activities, when available and appropriate.

3. The City will use its Stormwater Utility Fund to pay for the public education and information programs.

6. IMPLEMENTATION PROGRAM

6.1. Implementation Program Components

Table 6.1 contains a comprehensive list of the MS4 activities and projects, programs, and studies that make up the City of Brooklyn Center's implementation program for the next 15 years (2018 through 2032). The program was developed by evaluating the requirements in the MS4 permit (see MS4 SWPPP Application for Reauthorization in **Appendix B**), reviewing existing information (**Section 2**), identifying potential and existing problems (**Section 4**), reviewing goals and policies (**Section 5**), and then assessing the need for programs, studies, maintenance, or projects. Costs were estimated, possible funding sources were identified, and a schedule was developed to complete the implementation activities. It is anticipated these tables will be updated/revised on a yearly basis.

6.2. Implementation Priorities

The implementation components listed in **Table 6.1** were prioritized to make the best use of available local funding, meet MS4 Permit requirements, address existing stormwater management problems, and prevent future stormwater management problems from occurring. **Table 6.1** identifies which activities are MS4 Permit Requirements, Annual Requirements, or Capital Projects/Programs/Studies. The City's implementation plan reflects its responsibility to protect the public health, safety, and general welfare of its citizens by addressing problems and issues that are specific to the City of Brooklyn Center.

6.3. Financial Considerations

The City will use funds generated from its Stormwater Utility as the primary funding mechanism for its implementation program including maintenance, repairs, capital projects, or studies. It is anticipated that the 2018 Stormwater Utility will generate approximately $1.6 million. If funds from this utility fee do not cover necessary costs, the City will consider adjusting the Stormwater Utility Fee to cover the costs associated with the implementation program. The City will continue to review the Stormwater Utility Fee annually and adjust based on the stormwater related needs of the City and other available funding mechanisms. The City will also take advantage of grant or loan programs to offset project costs where appropriate and cost-effective.

6.4. Plan Revision and Amendments

The City may need to revise this Plan to keep it current. Before the City can adopt any significant plan amendments that change the purpose or intent, the amendments must be submitted to the Shingle Creek Watershed Management Commission and West Mississippi Watershed Management Commission. The City anticipates updating the Implementation Plan annually. These changes will be submitted to the watershed commissions for their record but not for review and approval. The City may amend this plan at any time in response to a petition by a resident or business. Written petitions for plan amendments must be submitted to the City Administrator. The petition must state the reason for the requested amendment and provide supporting information for the City to consider the request. The City may reject the petition, delay action on the petition until the next full plan revision, or accept the petition as an urgent issue that requires immediate amendment of the plan. The City of Brooklyn Center may also revise/amend the plan in response to City-identified needs. This Plan is intended to be in effect for ten years (implementation program outlines cost/activities for 15 years) per state statute. The Plan will be revised/updated at that time, to the extent necessary.

TABLE 6.1

LOCAL WATER MANAGEMENT IMPLEMENTATION PLAN

No.	Project Description	15 Year Total Cost Estimate [1,3]	15 Year Cost Estimate (Soft Costs) [1,3]	Possible Funding Sources [2]	Proposed Cost By Year[1] 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Comments
CIP																				
1	Storm Sewer Infrastructure Improvements - Upgrade storm sewer in the coming years in conjunction with street reconstruction projects or other appropriate projects.	$18,623,470	-	Stormwater Utility/Special Assessment	$2,330,000	$3,629,470	$2,140,000	$1,624,000	$490,000	$690,000	$350,000	$320,000	$620,000	$220,000	$880,000	$2,710,000	$1,170,000	$770,000	$680,000	See Section 4.2.A and refer to the City CIP for more information on the annual street reconstruction schedule and program.
2	Deteriorating Trunk Line - Rehabilitate the deteriorated storm sewer from 70th Avenue North and Willow Lane to the Mississippi River.	$328,000	-	Stormwater Utility		$328,000														See Section 4.3.C
3	Faulty Backflow Preventer - The backflow preventer at Shingle Creek Parkway and John Martin Drive is not working properly and will need to be repaired.	$20,000	-	Stormwater Utility			$20,000													See Section 4.3.F
4	Deteriorating Trunk Line - The city will continue to monitor the trunk line along 65th Avenue between Cahlander Park and Shingle Creek as the existing line is deteriorating. The line will need to be televised and repaired as necessary.	$464,000	$464,000	Stormwater Utility				$464,000												See Section 4.3.D
5	Shingle Creek Erosion - Shingle Creek Restoration Project. This will involve a partnership with Brooklyn Park and the Shingle Creek Management Commission	$350,000	-	Stormwater Utility / Brooklyn Park / SCWMC / Grant Funding					$350,000											See Section 4.6.B
6	Storm Sewer - The storm pipe at 61st Avenue North and Perry Avenue North has joint failures and sink holes causing it to leak and transfer sediment. Evaluate and rehabilitate storm sewer segment.	$170,000	-	Stormwater Utility								$170,000								See Section 4.3.B
7	Storm Water Pond Maintenance Projects - Maintain stormwater ponds and other BMPs on a regular basis. The SWAMP will help prioritize these maintenance activities.	$1,921,000	-	Stormwater Utility	$270,000	$149,000	$258,000		$118,000	$202,000		$154,000	$138,000			$116,000	$83,000	$67,000	$366,000	See Section 4.4.A and refer to the City CIP for more information on the annual pond maintenance schedule

No.	Project Description	15 Year Total Cost Estimate [1,3]	15 Year Cost Estimate (Soft Costs) [1,3]	Possible Funding Sources [2]	Proposed Cost By Year [1]															Comments
					2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
SWPPP																				
8	Public Education and Outreach Program - refer to SWPPP	$7,500	$7,500	Stormwater Utility / Staff Time	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	See SWPPP Application for Reauthorization (Appendix B)
9	Construction Site Stormwater Runoff Control - Refer to SWPPP	$4,000	$4,000	Stormwater Utility / Staff Time	$4,000															See SWPPP Application for Reauthorization (Appendix B)
10	Water Resource Inventory - Refer to SWPPP	$2,000	$2,000	Stormwater Utility / Staff Time	$2,000															See SWPPP Application for Reauthorization (Appendix B)
11	Annual SWPPP Assessment & Annual Reporting - Refer to SWPPP	$22,500	$22,500	Stormwater Utility / Staff Time	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	See SWPPP Application for Reauthorization (Appendix B)
12	Annual Public Meeting/Event - Refer to SWPPP	$15,000	$15,000	Stormwater Utility / Staff Time	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	See SWPPP Application for Reauthorization (Appendix B)
13	Online Availability of the Stormwater Pollution Prevention Plan (SWPPP) Program Document - Refer to SWPPP	$7,500	$7,500	Stormwater Utility / Staff Time	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	See SWPPP Application for Reauthorization (Appendix B)
14	IDDE Public Education and Outreach - Refer to SWPPP	$7,500	$7,500	Stormwater Utility / Staff Time	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	See SWPPP Application for Reauthorization (Appendix B)
15	Post Construction Stormwater Management Program Evaluation/Update	$5,000	$5,000	Stormwater Utility / Staff Time	$5,000															See SWPPP Application for Reauthorization (Appendix B)
16	Municipal Operations Facility Inventory - Refer to SWPPP	$1,500	$1,500	Stormwater Utility / Staff Time	$1,500															See SWPPP Application for Reauthorization (Appendix B)
17	Pollution Prevention & Good Housekeeping BMPs - Refer to SWPPP	$22,500	$22,500	Stormwater Utility / Staff Time	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	See SWPPP Application for Reauthorization (Appendix B)

No.	Project Description	15 Year Total Cost Estimate [1,3]	15 Year Cost Estimate (Soft Costs) [1,3]	Possible Funding Sources [2]	Proposed Cost By Year [1]															Comments
					2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	
Routine Maintenance																				
18	Pond Inspection and Maintenance - Maintain the SWAMP (Storm Water Asset Management Program) to prioritize inspection and maintenance of BMPs throughout the City to help manage vegetation, sedimentation, and other degradation issues. This program will also help estimate the effectiveness of TP and TSS treatment of stormwater ponds.	$42,000	$42,000	Stormwater Utility	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	See SWPPP Application for Reauthorization (Appendix B), Section 4.4.A, See SWAMP for more information.
19	Street Sweeping - Continue to conduct street sweeping operations of all public streets four times annually and as necessary. Refer to SWPPP.	$1,400,000	$1,400,000	Stormwater Utility	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	See SWPPP Application for Reauthorization (Appendix B), refer to Street Sweeping Policy in Appendix G
20	Fremont Place Townhomes Flooding - The outlet to the Fremont Place North townhomes pond is susceptible to plugging and creates flooding issues. The City will add this outlet to the Cities routine maintenance check list.	$7,000	$7,000	Stormwater Utility	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	See Section 4.2.B
21	Weir Maintenance - The Weir south of Bass Lake Road and Shingle Creek Parkway is in need of continual maintenance. The City will conduct the flood protection maintenance necessary and add it to its maintenance plan. Private properties are responsible for aesthetic maintenance, City to assist with maintenance to ensure an unrestricted weir.	$7,000	$7,000	Stormwater Utility / Private Land Owner	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	See Section 4.3.E
22	Grit Chamber Maintenance - Biennial maintenance is needed to clean the underground grit chambers northeast of the Top Golf parking lot.	$140,000	$140,000	Stormwater Utility	$5,000	$15,000	$5,000	$15,000	$5,000	$15,000	$5,000	$15,000	$5,000	$15,000	$5,000	$15,000	$5,000	$15,000	$15,000	See Section 4.5.A
23	Cahlander Park Outfall Cleaning - The City will include Cahlander Park Outfall in its routine maintenance program and continue to clean on a regular basis.	$7,000	$7,000	Stormwater Utility	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	

No.	Project Description	15 Year Total Cost Estimate [1,3]	15 Year Cost Estimate (Soft Costs) [1,3]	Possible Funding Sources [2]	Proposed Cost By Year [1] 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Comments
Monitor and Study																				
24	Shingle Creek Flooding - The City is aware of flooding issues along the Shingle Creek Trail between Freeway Boulevard and Shingle Creek Parkway. If action is needed the City will complete a study and construction plans to address the issue.	TBD	TBD	Stormwater Utility / Three Rivers Park District																See Section 4.2.C
25	Flooding Issue - The City will continue to monitor flooding issues on CR 130 to determine if improvements are necessary. If necessary they will be completed in conjunction with a County reconstruction project in that area.	TBD	TBD	Stormwater Utility / Hennepin County																See Section 4.2.D
26	Flooding at Kylawn Park Arboretum - The City is aware of a number of flooding issues in and around the park. The City will continue to monitor these problems and complete a study to determine feasible improvement options. Improvements will then be constructed as warranted.	TBD	TBD	Stormwater Utility																See Section 4.2.E
27	Peripheral Flooding - The Odyssey ball field was regraded in 2015. If issues continue, the City will work with the City of Crystal to have the outlet elevation from the 639 W wetland lowered or determine another solution to reduce flood potential.	$5,000	$5,000	Stormwater Utility			$5,000													See Section 4.2.F
28	River Level Monitoring Program - A river level monitoring program will be developed to help respond and anticipate flooding and erosion issues on the Mississippi River.	$9,000	$9,000	Stormwater Utility	$2,000	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	See Section 4.2.K
29	Storm Sewer Monitoring - The City will continue to televise storm sewer in conjunction with reconstruction projects and develop/implement a storm sewer routine inspection program which will notify city employees when storm sewers need cleaning, maintenance and replacement.	$150,000	$150,000	Stormwater Utility	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	See Section 4.3.A
30	Palmer Lake - The City will continue to monitor Palmer Lake for proper drainage of Shingle Creek and if necessary develop a management plan for Palmer Lake.	TBD	TBD	Stormwater Utility																See Section 4.4.B
31	Erosion and Monitoring Program - Regular river bank stabilization inspections will need to be completed along the Mississippi River to monitor and help prevent any future erosion issues and sanitary sewer washouts.	$15,000	$15,000	Stormwater Utility	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	See Section 4.9.A

No.	Project Description	15 Year Total Cost Estimate [1,3]	15 Year Cost Estimate (Soft Costs)[1,3]	Possible Funding Sources [2]	Proposed Cost By Year[1] 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Comments
Other																				
32	Centennial Park East - Flooding occurs at the ball fields and trails during large rainfall events. The City installed a berm and pump system in 2014/2015. This area will continue to be monitored to evaluate if additional flood reduction measures are needed.	$10,000		Stormwater Utility			$10,000													See Section 4.2.G
33	Fish and Weed Management -The City will work with neighboring cities and watershed to develop a fish and vegetation management plan for Upper and Middle Twin Lakes.	TBD	TBD	Stormwater Utility / Neighboring Cities / SCWMC / Grant Funding																See Section 4.1.B
34	Ordinance Updates - The City will complete updates to its stormwater management related ordinances following the adoption of its Local Water Management Plan and MRCCA rules update and consistent with its MS4 Application for Reauthorization.	$28,000	$28,000	Stormwater Utility	$4,000	$4,000	$4,000			$8,000					$8,000					See Section 4.5.C
	TOTAL	$23,763,470	$2,341,000		$2,744,500	$4,246,970	$2,563,500	$2,224,500	$1,084,500	$1,036,500	$476,500	$780,500	$884,500	$356,500	$1,014,500	$2,962,500	$1,379,500	$973,500	$1,182,500	

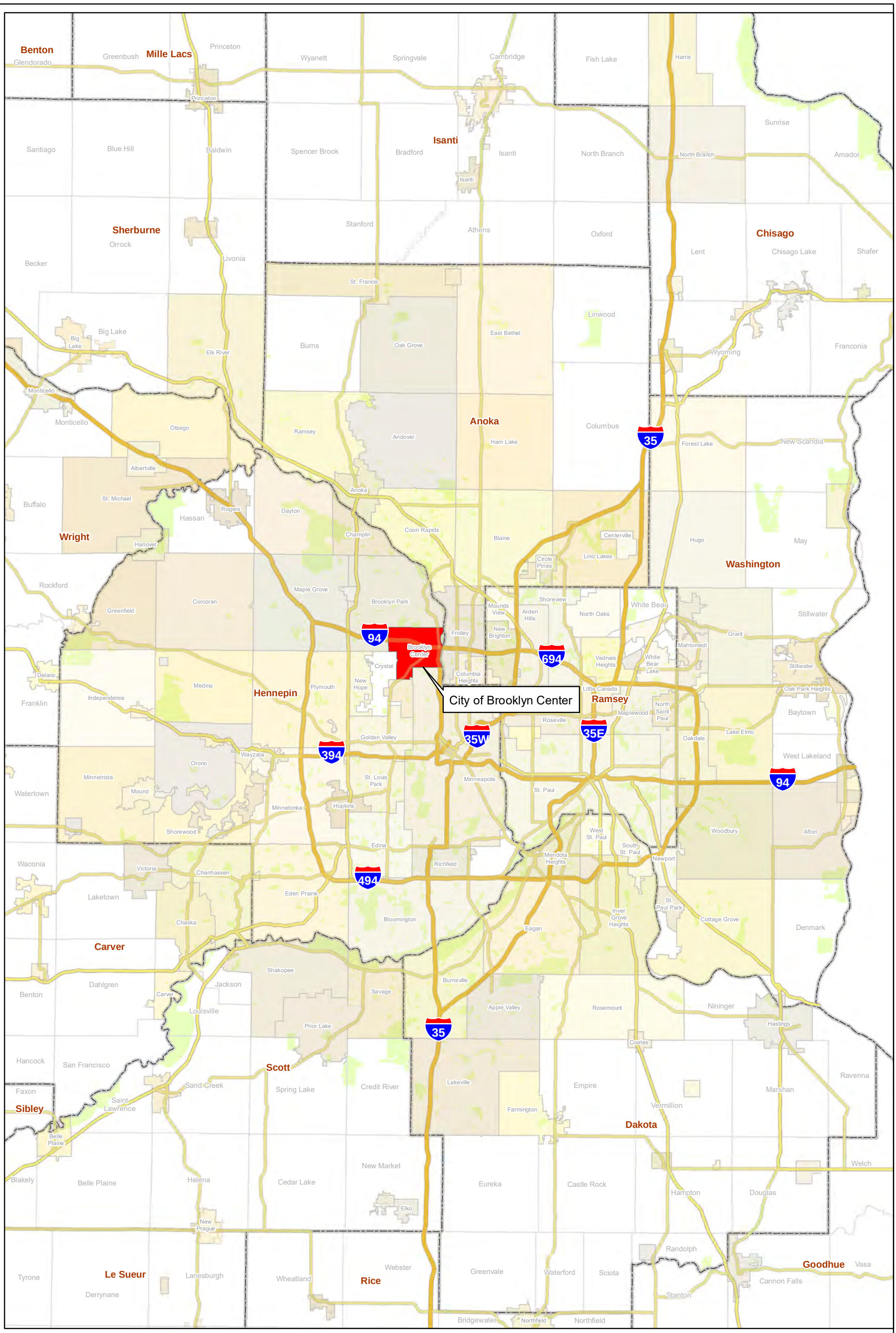
[1] Cost estimates are preliminary and subject to review and revision as engineer's reports are completed and more information becomes available. Table reflects 2018 costs and does not account for inflation. Costs generally include labor, equipment, materials, and all other costs necessary to complete each activity. Some of the costs outlined above may be included in other operational costs budgeted by the City.

[2] Funding for stormwater program activities projected to come from following sources - Surface Water Management Fund, Developers Agreements, Grant Funds, General Operating Fund, or Special Assessments.

[3] Staff time is not included in the cost shown.

Appendix A – Figures

Figure 1: Location Map
Figure 2: Existing Land Use Map
Figure 3: Future Land Use Map
Figure 4: Subwatersheds Map
Figure 5: NWI & DNR Lakes Map
Figure 6: Soils Map
Figure 7: Issue Areas Map
Figure 8: Floodplain Map
Figure 9: Water Quality Monitoring Map
Figure 10: MLCCS Map
Figure 11: Pollutant Sources Map
Figure 12: Groundwater Appropriations Map
Figure 13: WMO Boundaries



K:\011247-000\GIS\MAPS\FIGURE1_LOCATIONMAP.MXD DATE: THURSDAY, AUGUST 02, 2018

BROOKLYN CENTER AT THE CENTER

Surface Water MANAGEMENT PLAN

FIGURE 1: Location Map

1 inch = 5 miles

July 2018

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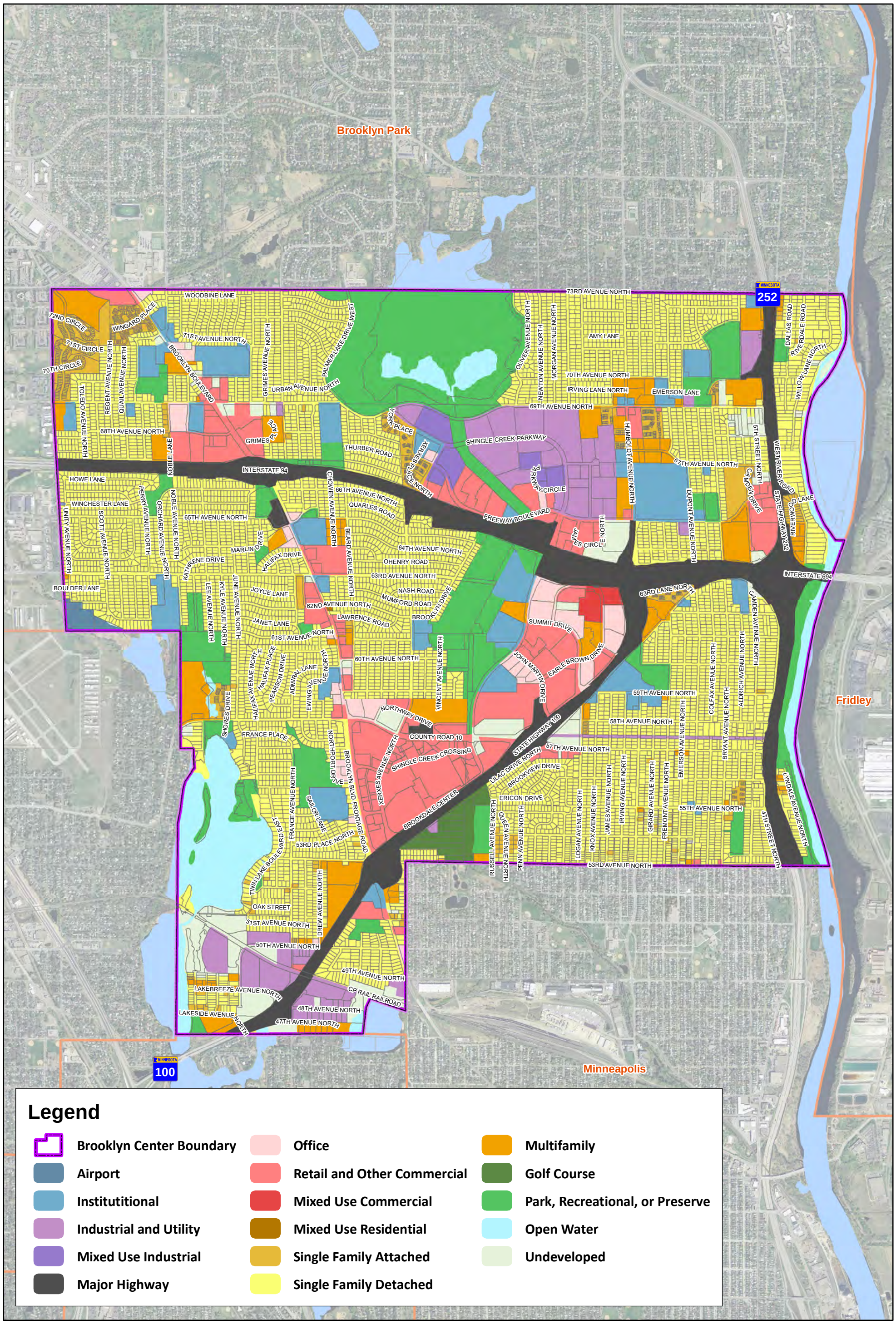


Legend

- Brooklyn Center Boundary
- Airport
- Institutitional
- Industrial and Utility
- Mixed Use Industrial
- Major Highway
- Office
- Retail and Other Commercial
- Mixed Use Commercial
- Mixed Use Residential
- Single Family Attached
- Single Family Detached
- Multifamily
- Golf Course
- Park, Recreational, or Preserve
- Open Water
- Undeveloped

Surface Water Management Plan

FIGURE 2: Existing Land Use Map

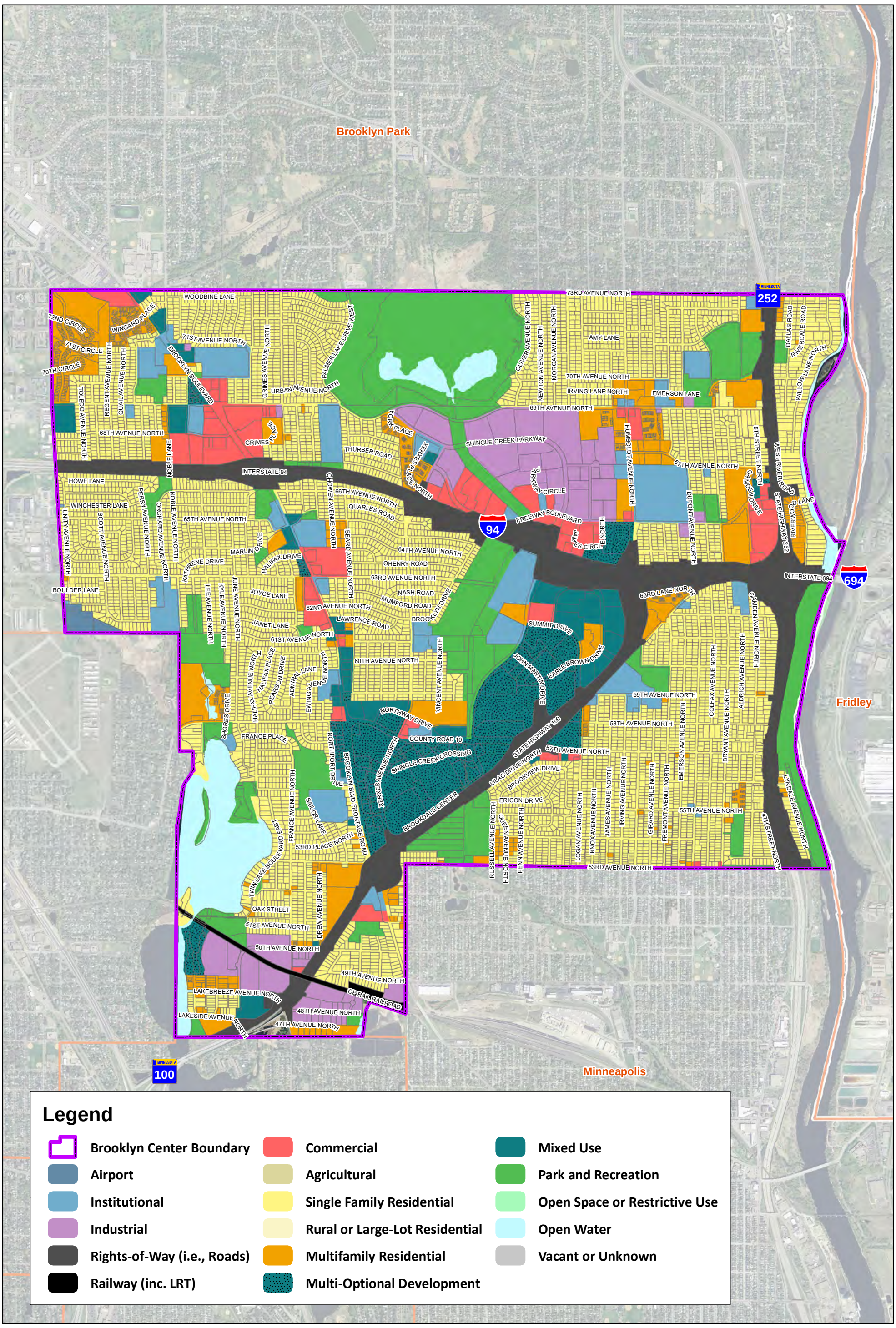
Data Source: MET Council 2014

1 inch = 2,000 feet

July 2018

N

K:\011247-000\GIS\MAPS\FIGURE2_EXISTINGLANDUSE.MXD DATE: THURSDAY, AUGUST 02, 2018



Legend

- Brooklyn Center Boundary
- Airport
- Institutional
- Industrial
- Rights-of-Way (i.e., Roads)
- Railway (inc. LRT)
- Commercial
- Agricultural
- Single Family Residential
- Rural or Large-Lot Residential
- Multifamily Residential
- Multi-Optional Development
- Mixed Use
- Park and Recreation
- Open Space or Restrictive Use
- Open Water
- Vacant or Unknown

Surface Water MANAGEMENT PLAN

FIGURE 3: Future Land Use Map

Data Source: MET Council 2014

1 inch = 2,000 feet

July 2018

N

Brooklyn Park

SHINGLE CREEK

WEST MISSISSIPPI

Fridley

Robbinsdale

WOODBINE LANE
72ND CIRCLE
WINGARD PLACE
71ST CIRCLE
71ST AVENUE NORTH
70TH CIRCLE
REGENT AVENUE NORTH
QUAIL AVENUE NORTH
BROOKLYN BOULEVARD
GRIMES AVENUE NORTH
PALMER LAKE DRIVE WEST
URBAN AVENUE NORTH
TOLEDO AVENUE NORTH
68TH AVENUE NORTH
GRIMES PLACE
YORK PLACE
KERXES PLACE NORTH
THURBER ROAD
INTERSTATE 94
SHINGLE CREEK PARKWAY
HOWE LANE
NOBLE LANE
PERRY AVENUE NORTH
ORCHARD AVENUE NORTH
CHOWEN AVENUE NORTH
66TH AVENUE NORTH
QUARLES ROAD
WINCHESTER LANE
UNITY AVENUE NORTH
SCOTT AVENUE NORTH
LEE AVENUE NORTH
65TH AVENUE NORTH
MARLIN DRIVE
HALIFAX DRIVE
POE ROAD
OHENRY ROAD
64TH AVENUE NORTH
63RD AVENUE NORTH
BOULDER LANE
JOYCE LANE
KYLE AVENUE NORTH
JUNE AVENUE NORTH
NASH ROAD
MUMFORD ROAD
BROOKLYN DRIVE
62ND AVENUE NORTH
JANET LANE
61ST AVENUE NORTH
HALIFAX PLACE
PEARSON DRIVE
ADMIRAL LANE
EWING AVENUE NORTH
BEARD AVENUE NORTH
60TH AVENUE NORTH
VINCENT AVENUE NORTH
JOHN MARTIN DRIVE
EARLE BROWN DRIVE
SHORES DRIVE
NORTHWAY DRIVE
59TH AVENUE NORTH
58TH AVENUE NORTH
FRANCE PLACE
COUNTY ROAD 10
NORTHPORT DRIVE
BROOKLYN BLVD FRONTAGE ROAD
XERXES AVENUE NORTH
SHINGLE CREEK CROSSING
57TH AVENUE NORTH
STATE HIGHWAY 100
LILAC DRIVE NORTH
BROOKVIEW DRIVE
FRANCE AVENUE NORTH
SAILOR LANE
53RD PLACE NORTH
BROOKDALE CENTER
ERICON DRIVE
55TH AVENUE NORTH
TWIN LAKE BOULEVARD EAST
OAK STREET
51ST AVENUE NORTH
DREW AVENUE NORTH
50TH AVENUE NORTH
LAKEBREEZE AVENUE NORTH
LAKESIDE AVENUE NORTH
49TH AVENUE NORTH
CP RAIL RAILROAD
48TH AVENUE NORTH
47TH AVENUE NORTH
53RD AVENUE NORTH
RUSSELL AVENUE NORTH
QUEEN AVENUE NORTH
PENN AVENUE NORTH
LOGAN AVENUE NORTH
KNOX AVENUE NORTH
JAMES AVENUE NORTH
IRVING AVENUE NORTH
GIRARD AVENUE NORTH
FREMONT AVENUE NORTH
EMERSON AVENUE NORTH
DUPONT AVENUE NORTH
COLFAX AVENUE NORTH
BRYANT AVENUE NORTH
ALDRICH AVENUE NORTH
CAMDEN AVENUE NORTH
LYNDALE AVENUE NORTH
4TH STREET NORTH
5TH STREET NORTH
HUMBOLDT AVENUE NORTH
PARKWAY CIRCLE
67TH AVENUE NORTH
FREEWAY BOULEVARD
JAMES CIRCLE NORTH
63RD LANE NORTH
SUMMIT DRIVE
INTERSTATE 694
73RD AVENUE NORTH
NEWTON AVENUE NORTH
OLIVER AVENUE NORTH
MORGAN AVENUE NORTH
AMY LANE
70TH AVENUE NORTH
IRVING LANE NORTH
EMERSON LANE
69TH AVENUE NORTH
DALLAS ROAD
RIVERDALE ROAD
WILLOW LANE NORTH
WEST RIVER ROAD
CAMDEN DRIVE
STATE HIGHWAY 252
RIVERVIEW LANE
MINNESOTA 252
MINNESOTA 100
94
694

Legend

- Storm Sewer
- National Wetland Inventory
- Ponds
- Sumps, Treatment Structures, Rain Gardens
- Brooklyn Center Boundary

Subwatersheds

- MISSISSIPPI RIVER
- SHINGLE CREEK
- TWIN LAKES AND RYAN LAKE

Watershed Management Organizations

- SHINGLE CREEK
- WEST MISSISSIPPI

K:\011247-000\GIS\MAPS\FIGURE4_SUBWATERSHEDSMAP.MXD DATE: THURSDAY, AUGUST 02, 2018

BROOKLYN CENTER AT THE CENTER

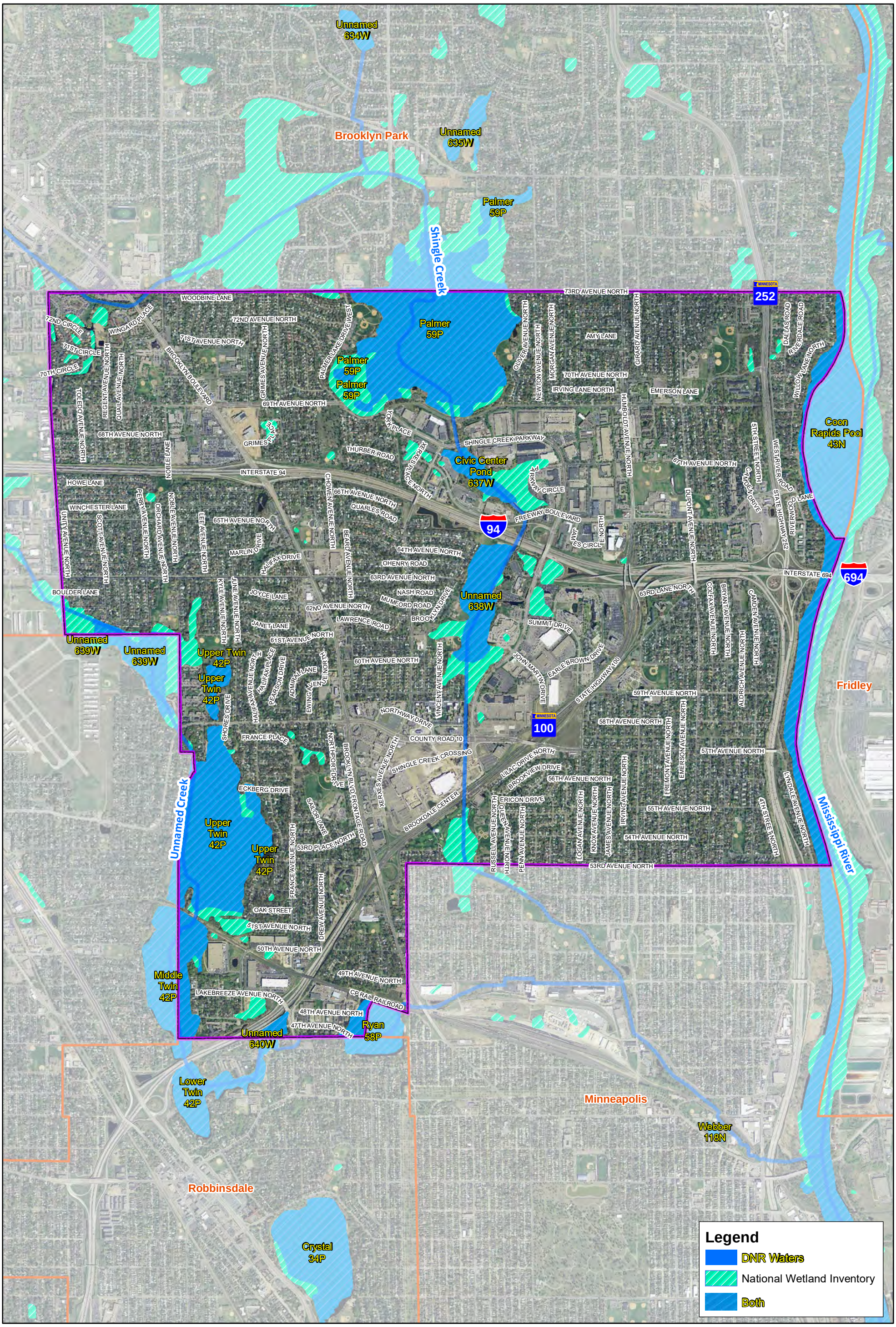
Surface Water MANAGEMENT PLAN

FIGURE 4: Subwatershed Map

1 inch = 2,000 feet

July 2018

N



K:\1011247-000\GIS\MAPS\FIGURE5_NWI&DNR.MXD DATE: THURSDAY, AUGUST 02, 2018

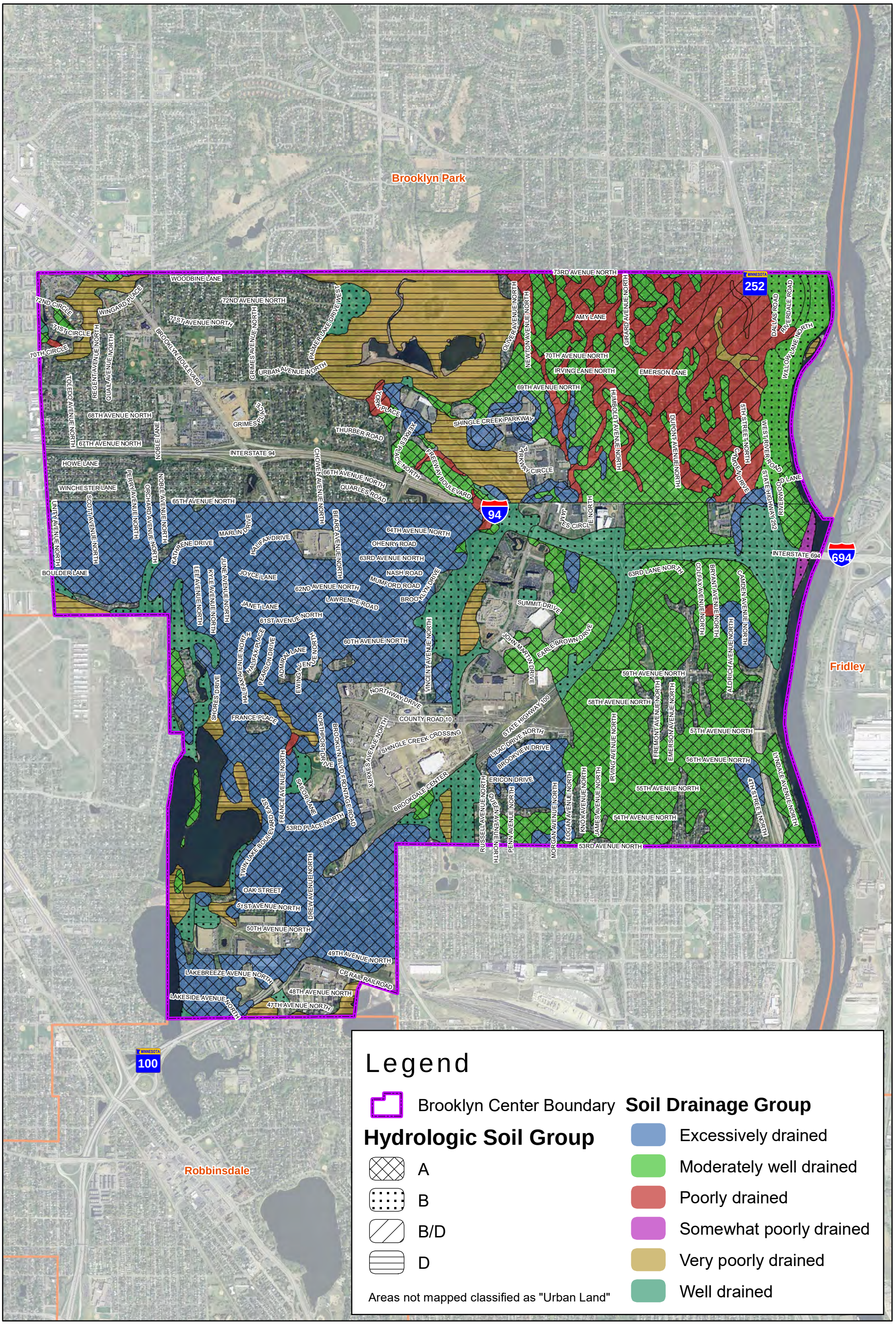
Surface Water MANAGEMENT PLAN

FIGURE 5: NWI & DNR Public Waters Map

Data Source: MnDNR, 2014 and USFWS, 2013

1 inch = 2,000 feet

July 2018



Legend

Brooklyn Center Boundary

Hydrologic Soil Group

- A
- B
- B/D
- D

Areas not mapped classified as "Urban Land"

Soil Drainage Group

- Excessively drained
- Moderately well drained
- Poorly drained
- Somewhat poorly drained
- Very poorly drained
- Well drained

K:\011247-000\GIS\MAPS\FIGURE6_SOILSMAP.MXD DATE: THURSDAY, AUGUST 02, 2018

BROOKLYN CENTER AT THE CENTER

Surface Water MANAGEMENT PLAN

FIGURE 6: Soils Map

Data Source: NRCS Natural Resource Conservation Service, 2008

1 inch = 2,000 feet

July 2018

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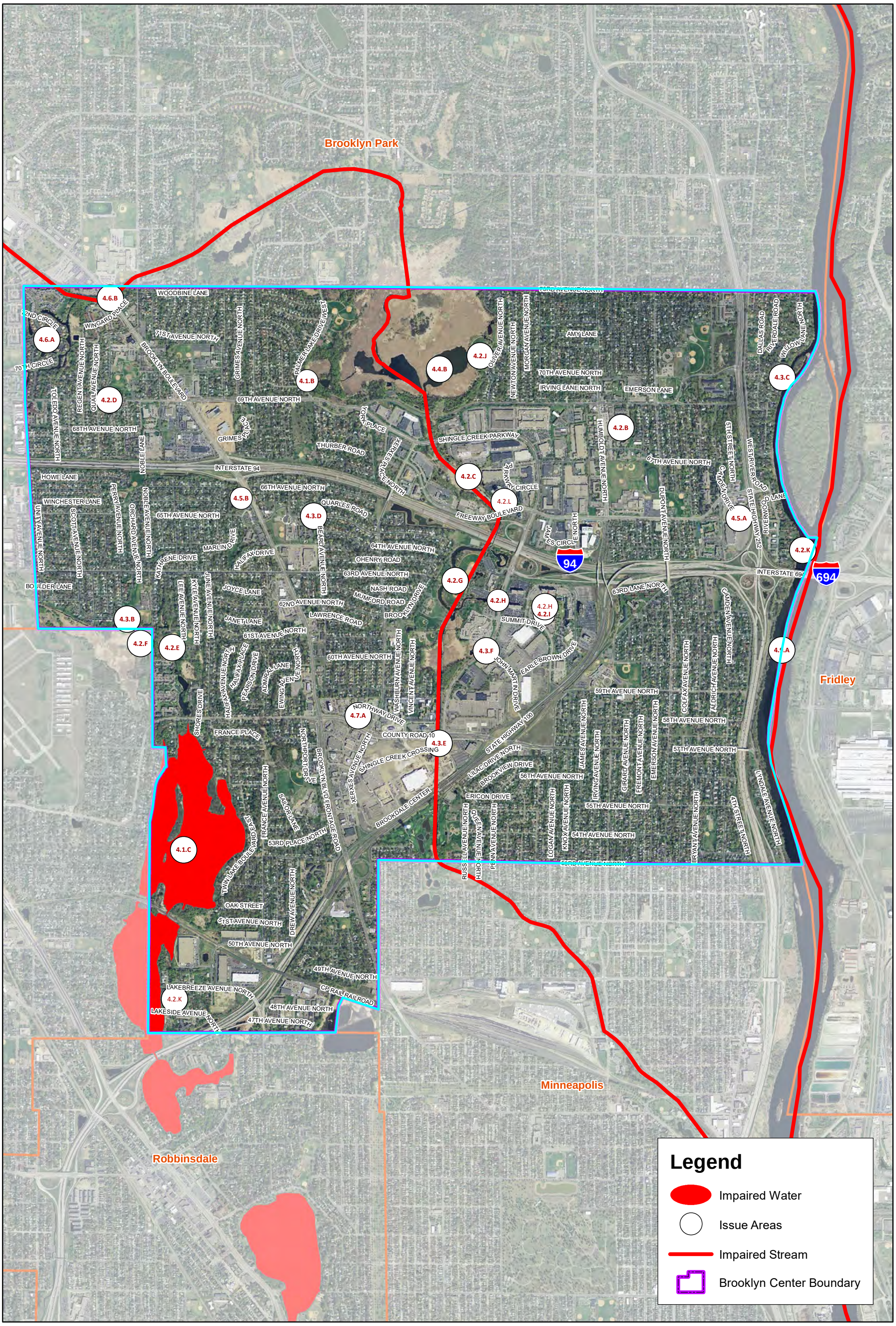


K:\011247-000\GIS\MAPS\FIGURE7_PROBLEMAREASMAP1.MXD DATE: FRIDAY, AUGUST 17, 2018

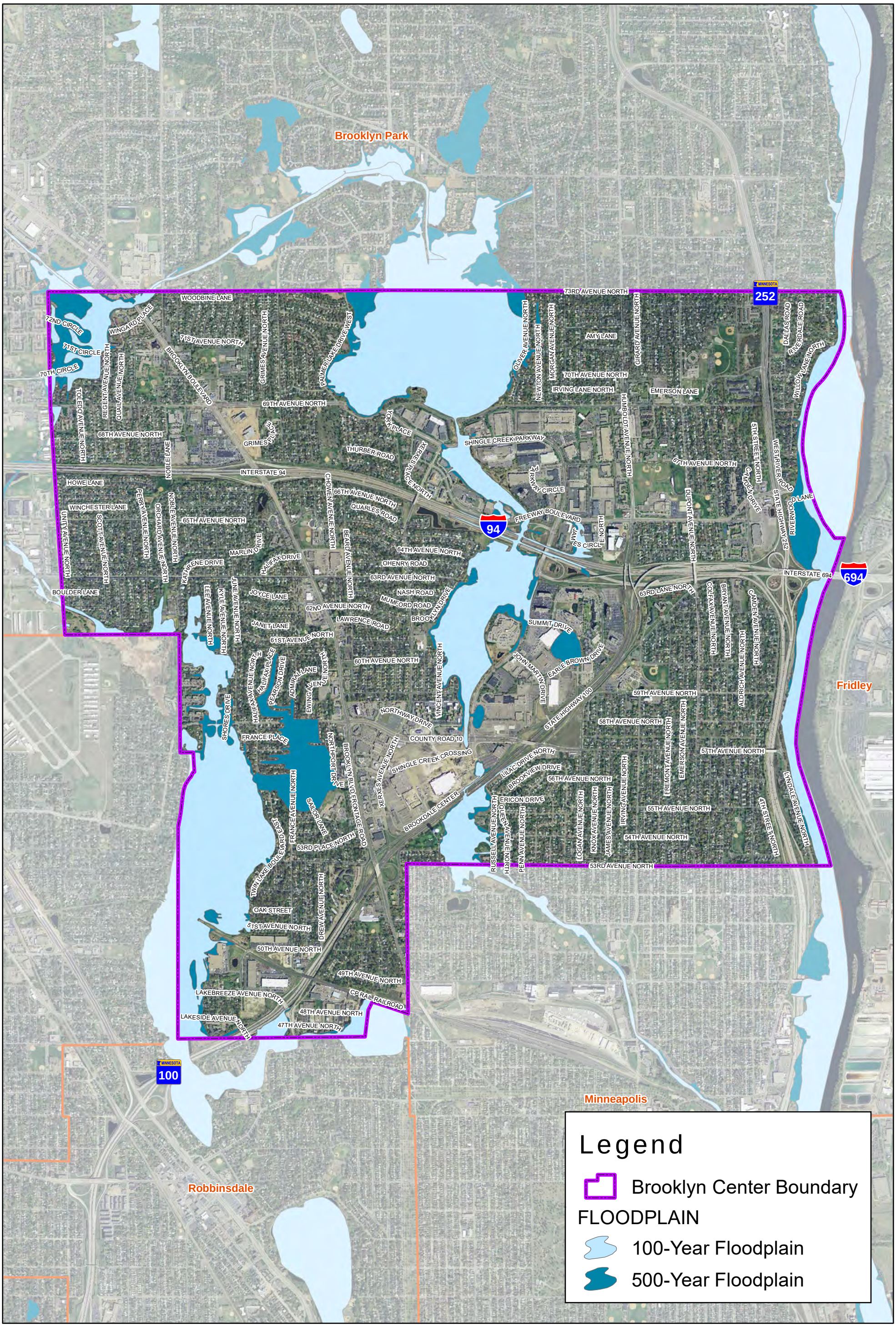
BROOKLYN CENTER AT THE CENTER

Surface Water MANAGEMENT PLAN

FIGURE 7: Issue Areas Map

1 inch = 2,000 feet

July 2018



K:\011247-000\GIS\MAPS\FIGURE8_FLOODPLAIN.MXD DATE: THURSDAY, AUGUST 02, 2018

BROOKLYN CENTER AT THE CENTER

Surface Water MANAGEMENT PLAN

FIGURE 8: Floodplain Map

Data Source: FEMA, 2004

1 inch = 2,000 feet

July 2018

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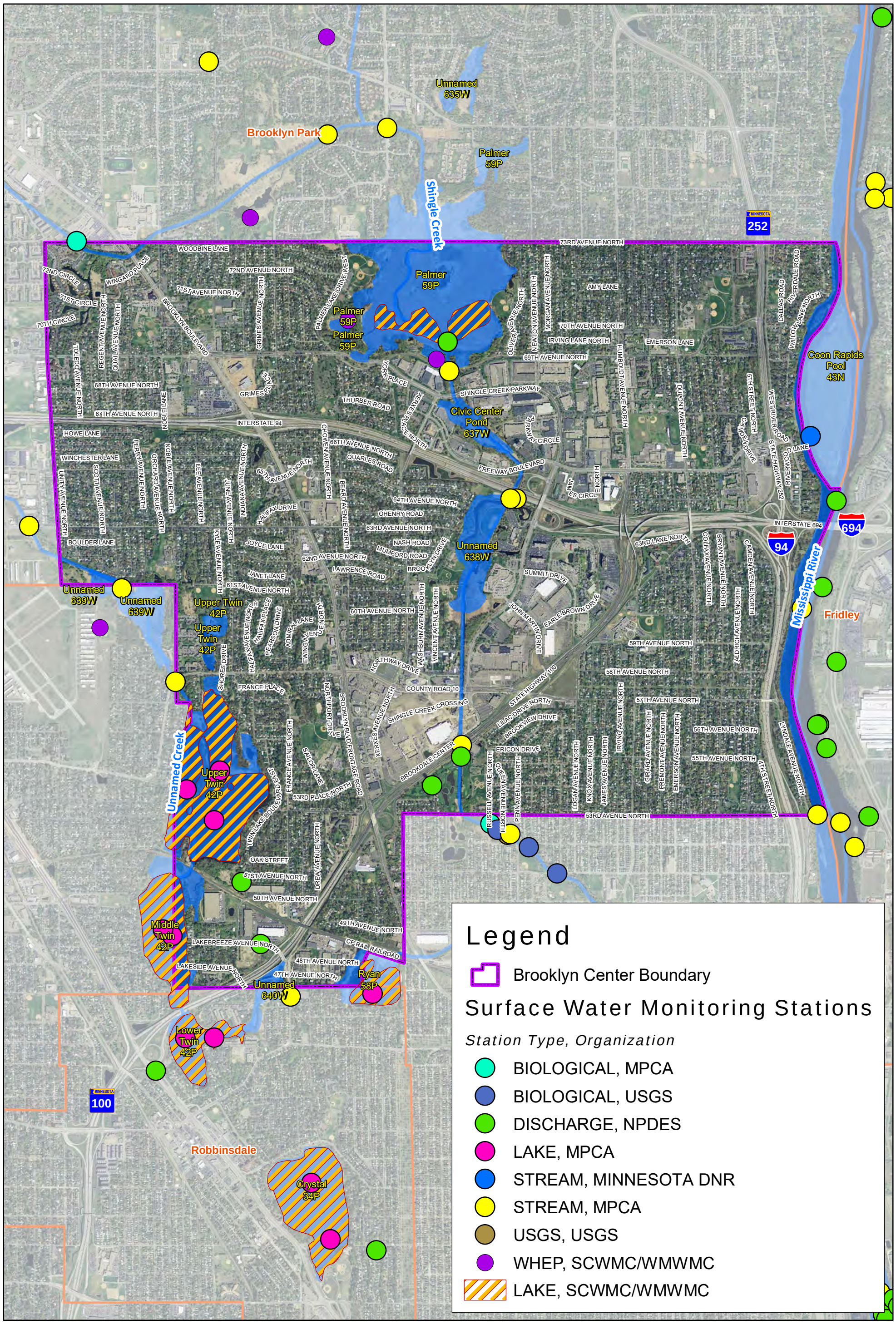

K:\011247-000\GIS\MAPS\FIGURE9_WQMONITORING.MXD DATE: THURSDAY, AUGUST 02, 2018

BROOKLYN CENTER AT THE CENTER

Surface Water MANAGEMENT PLAN

FIGURE 9: Water Quality Monitoring Map

Data Source: MPCA, 2010

1 inch = 2,000 feet

July 2018

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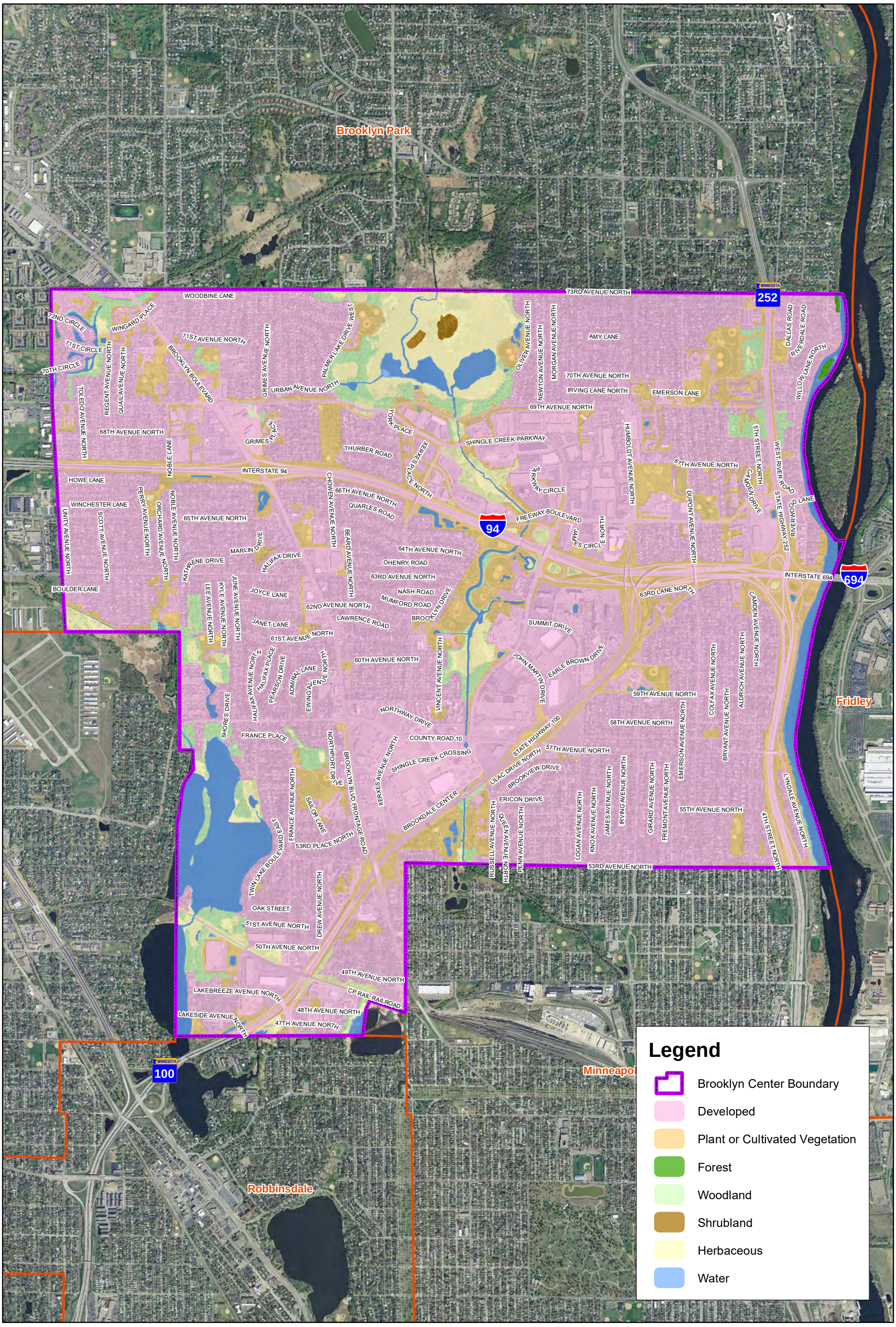

Legend

- Brooklyn Center Boundary
- Developed
- Plant or Cultivated Vegetation
- Forest
- Woodland
- Shrubland
- Herbaceous
- Water

K:\011247-000\GIS\MAPS\FIGURE10_MLCCS.MXD DATE: THURSDAY, AUGUST 02, 2018

Surface Water MANAGEMENT PLAN

FIGURE 10: MLCCS Map

1 inch = 2,000 feet

July 2018

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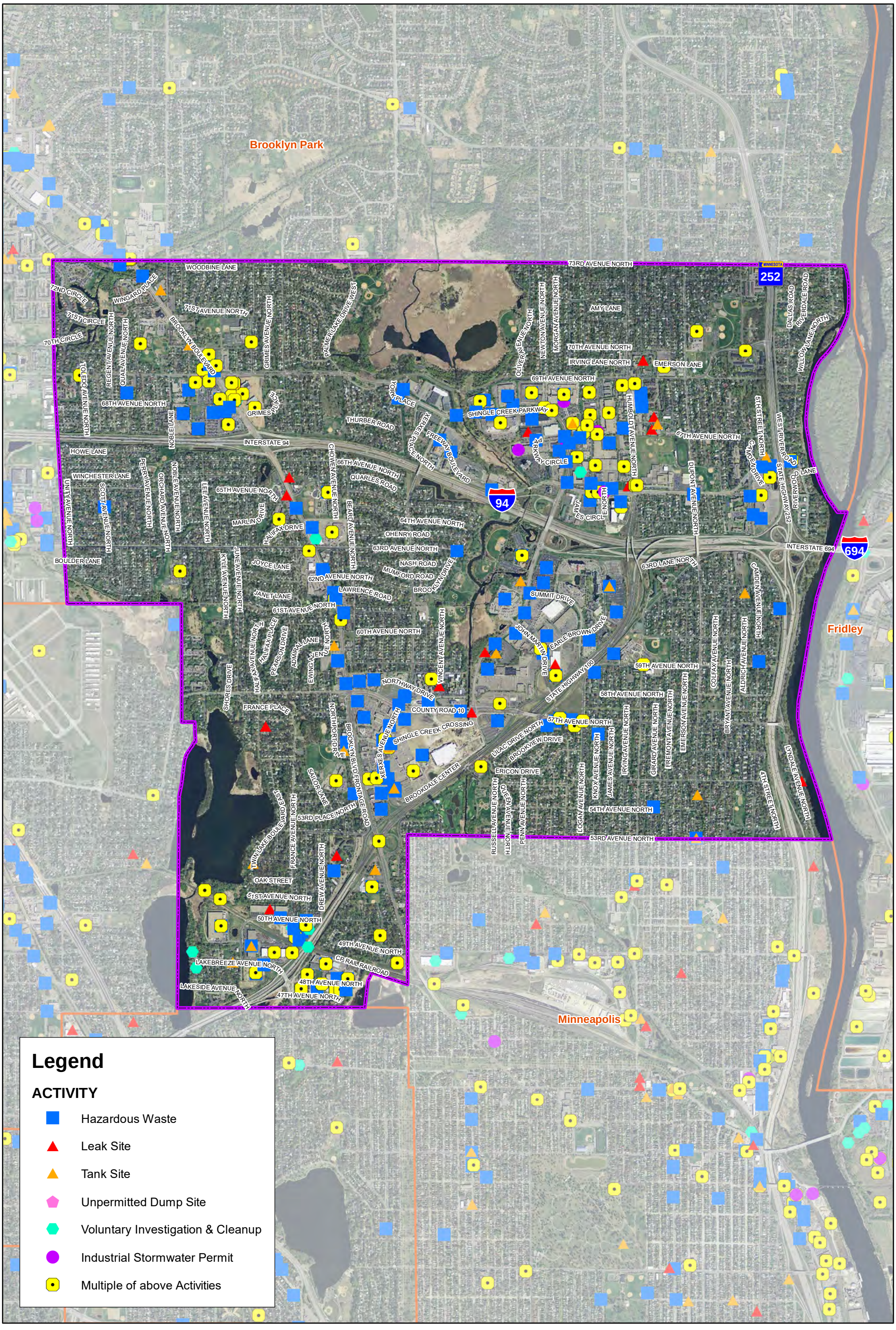

Legend

ACTIVITY

- Hazardous Waste
- Leak Site
- Tank Site
- Unpermitted Dump Site
- Voluntary Investigation & Cleanup
- Industrial Stormwater Permit
- Multiple of above Activities

K:\011247-000\GIS\MAPS\FIGURE11_POLLUTANSOURCES.MXD DATE: THURSDAY, AUGUST 02, 2018

Surface Water MANAGEMENT PLAN

FIGURE 11: Pollutant Sources

Source: Minnesota Pollution Control Agency
"What's in My Neighborhood"

1 inch = 2,000 feet

July 2018

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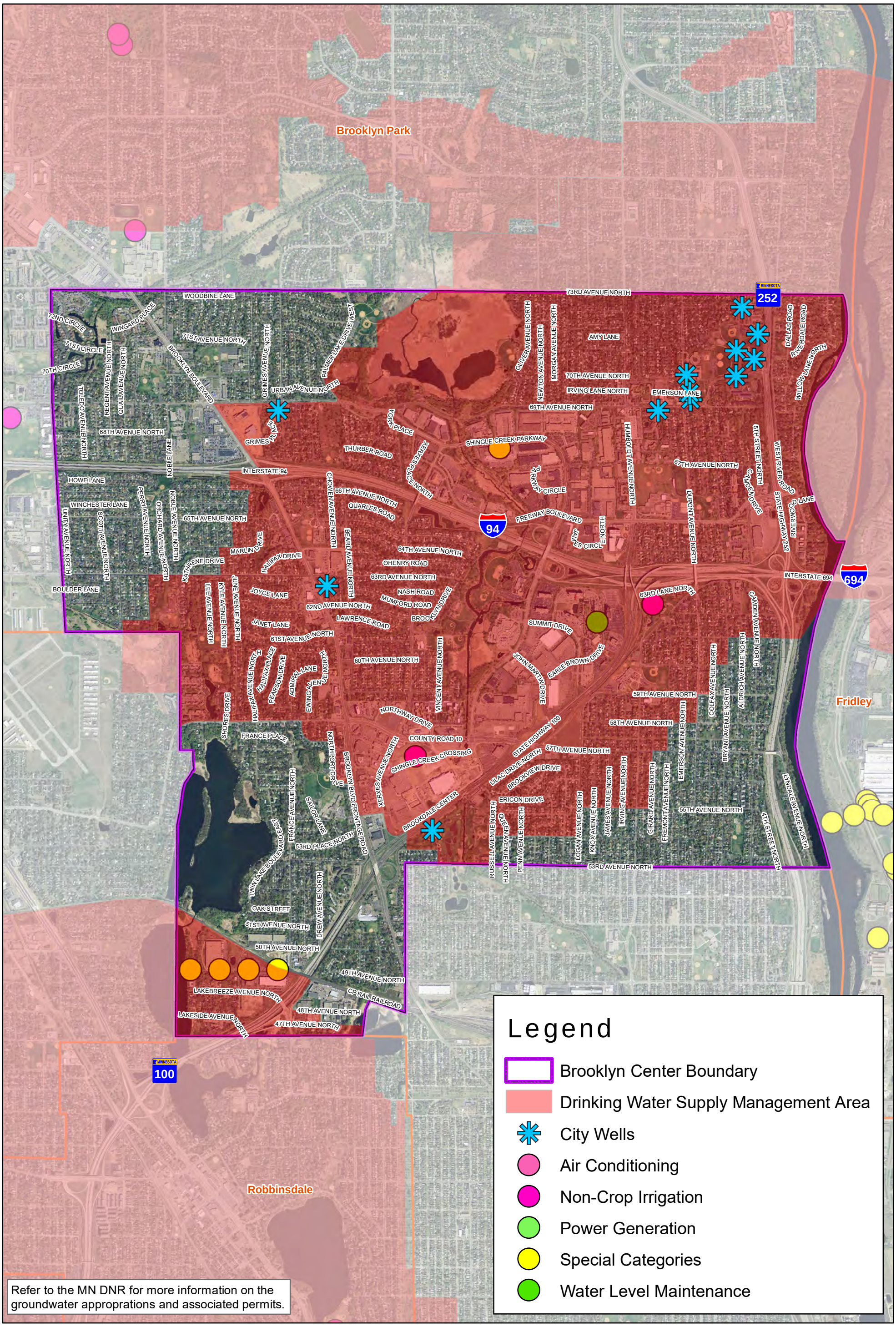

K:\011247-000\GIS\MAPS\FIGURE12_GWAPPROPRIATIONS.MXD DATE: FRIDAY, AUGUST 17, 2018

BROOKLYN CENTER AT THE CENTER

Surface Water MANAGEMENT PLAN

FIGURE 12: Goundwater Appropriations

Data Source: MnDNR, 2014

1 inch = 2,000 feet

July 2018

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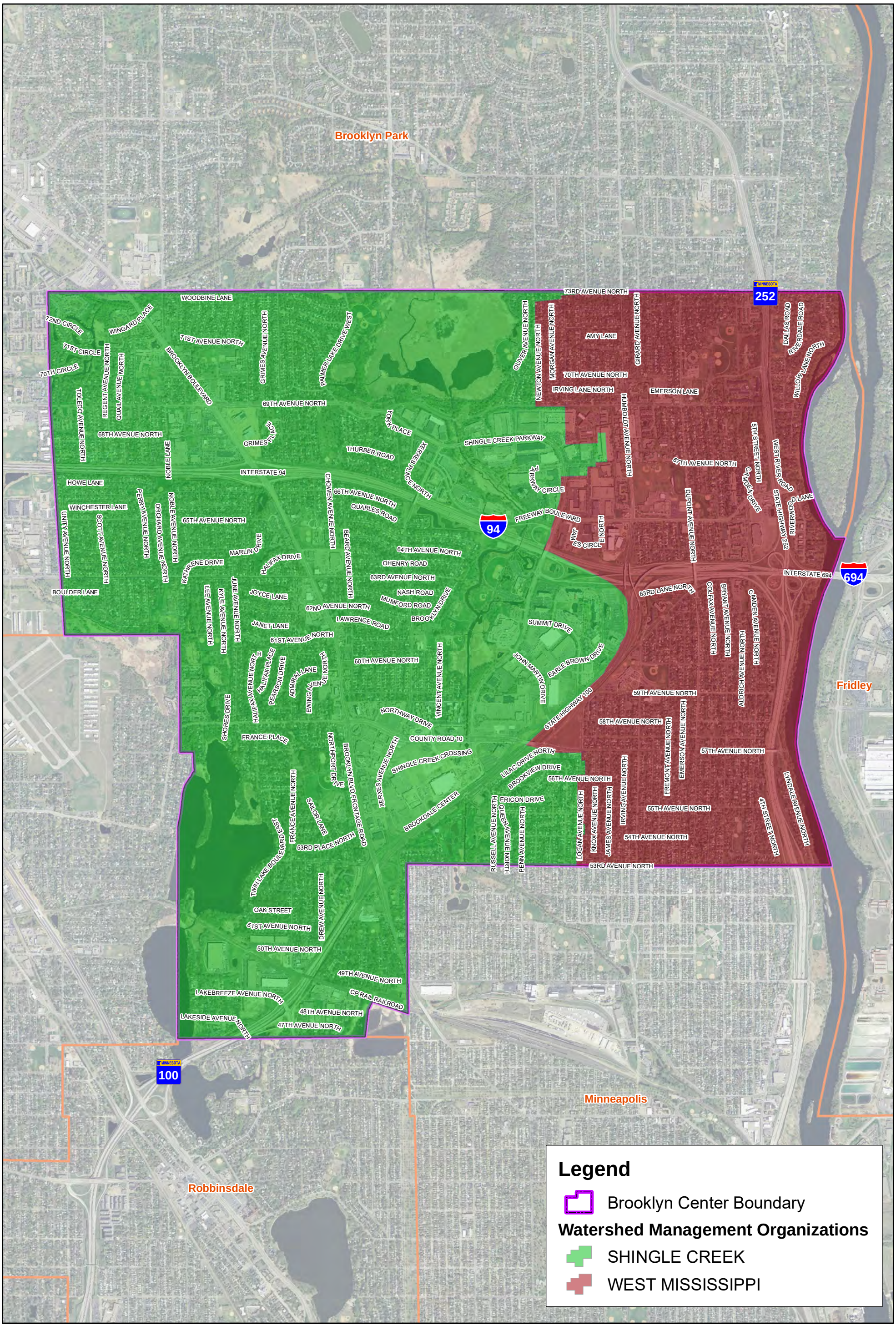

K:\011247-000\GIS\MAPS\FIGURE 13_WMOBOUNDARIES.MXD DATE: THURSDAY, AUGUST 02, 2018

BROOKLYN CENTER AT THE CENTER

Surface Water MANAGEMENT PLAN

FIGURE 13: WMO Boundaries

Data Source: MPCA Minnesota Pollution Control Agency 2010

1 inch = 2,000 feet

July 2018

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