Shingle Creek Watershed Management Commission

West Mississippi Watershed Management Commission

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A meeting of the joint Technical Advisory Committee (TAC) of the Shingle Creek and West Mississippi Watershed Management Commissions is scheduled for 8:30 a.m., Friday, June 21, 2019, at Crystal City Hall, 4141 Douglas Drive North, Crystal, MN.

A G E N D A

Meeting docs (*) will be posted on the website at
http://www.shinglecreek.org/tac-meetings.html

1. Call to Order.
   a. Roll Call.
   b. Approve Agenda.*
   c. Approve Minutes of Last Meeting.*
2. Proposed Minor Plan Amendment for Capital Equipment.*
3. Minneapolis Subwatershed Assessment.*
4. Refreshed *10 Things You Can Do* brochure – 50/city will be available at the meeting.
5. Recent Fish Kills.*
6. Lake No-Wake Declarations.
7. Next TAC meeting is scheduled for _______.
8. Adjournment.

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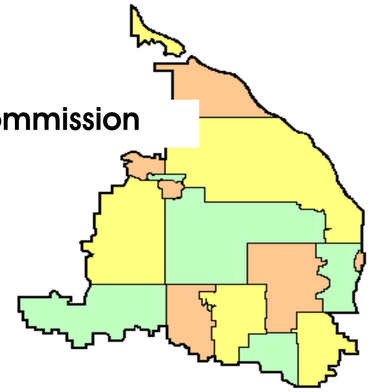
*in meeting packet ** available at the meeting



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MINUTES

May 30, 2019

A meeting of the Technical Advisory Committee (TAC) of the Shingle Creek and West Mississippi Watershed Management Commissions was called to order by Chairman Richard McCoy at 8:34 a.m., Thursday, May 30, 2019, at Crystal City Hall, 4141 Douglas Drive North, Crystal, MN.

Present were: Andrew Hogg, Brooklyn Center; Mitchell Robinson, Brooklyn Park; Derek Asche, Maple Grove; Megan Hedstrom, New Hope; Ben Scharenbroich, Plymouth; Richard McCoy, Robbinsdale; Ed Matthiesen and Diane Spector, Wenck Associates, Inc.; and Judie Anderson, JASS.

Also present: Bernie Weber, New Hope; Tyler Johnson, Stantec, New Hope; Alex Larson, Plymouth; and Marta Roser, Robbinsdale.

Not represented: Champlin, Crystal, Minneapolis, and Osseo.

I. Motion by Asche, second by Scharenbroich to **approve the agenda*** as revised. *Motion carried unanimously.*

II. Motion by Asche, second by Scharenbroich to **approve the minutes***of the April 25, 2019 meeting. *Motion carried unanimously.*

III. 2020 Operating Budgets.*

Staff queried how the Commissioners might explain future budgets to their cities as the Commissions seek to fund activities that were not in their purview when the member assessment cap was instituted in 2004. The increased activities of the Commissions, such as the Twin Lake Carp Project, will effectively put the member assessments above the self-imposed cap. In past years, the Commissions' success in securing grant funding for many of such projects has helped them to maintain member assessments at or below the cap. This scenario is not likely to continue as more projects are identified in addition to the "routine" activities of the Commissions.

Staff was directed to prepare a draft 2021 budget that would include these innovative projects and activities.

IV. Wetland Buffer Flexibility.*

At the last TAC meeting there was some discussion about providing flexibility for wetland buffer widths where technical considerations make it difficult to meet the 20-foot wide minimum. The language below is from Rule I Buffer Strips, Provision 6.

6. ALTERNATE BUFFER STRIPS.

(a) Because of unique physical characteristics of a specific parcel, narrower buffer strips may be necessary to allow a reasonable use of the parcel, based on an assessment of:
  (1) The size of the parcel.
  (2) Existing roads and utilities on the parcel.
  (3) The percentage of the parcel covered by watercourses or wetlands.
  (4) The configuration of the watercourses or wetlands on the parcel.

(5) The quality of the affected watercourses and wetlands.
(6) Any undue hardship that would arise from not allowing the alternative buffer strip.

The use of alternative buffer strips will be evaluated as part of the review of a stormwater management plan under these Rules. Where alternative buffer strip standards are approved, the width of the buffer strips shall be established by the Commission based on a minimum width of 10 feet. Alternative buffer strips must be in keeping with the spirit and intent of this Rule.

This language satisfies the concerns raised by the members.

V. CIP Capital Equipment Language.*

A. Staff's May 29, 2019 memo provides background information regarding CIPs (capital projects and programs). In recent years, volume and pollutant-loading BMPs have expanded to include nonstructural practices such as street sweeping, soil amendment, reforestation, native plantings, and - for reducing chloride from road salt - pre-wetting and brining. Nonstructural practices also include certain internal load reducing actions such as alum treatments, management of excessive rough fish populations, and control of invasive aquatic vegetation that is negatively influencing water quality and biotic integrity. These nonstructural practices may be as effective at reducing pollutant loading, mitigating runoff volumes, and enhancing biotic integrity as structural BMPs. However, it is unclear whether those nonstructural practices fit the meaning of "capital project" as defined in Minnesota Rules 8410, whereby BWSR establishes the rules by which it will interpret and enforce the statutes set forth in Chapter 103B governing Water Planning and Project Implementation.

While 103B.231 of the Statutes does not define "capital improvement," Rule 8410.0020 Subp. 3. states that "'Capital improvement'" means a **physical improvement** that has an extended useful life. A capital improvement is **not** directed toward **maintenance** of an in-place system during its life expectancy. *(**Emphasis** added.)*

This seems to be in conflict with Rule 8410.0105 Subp. 2. which states that "Each plan must consider the feasibility of implementing structural solutions for attaining the goals defined under part 8410.0080 that cannot be resolved by nonstructural, preventative actions. Each plan must include a table for a **capital improvement program that identifies structural and nonstructural alternatives** that would lessen capital expenditures and sets forth, by year, details of each contemplated capital improvement that includes the need, schedule, estimated cost, and funding source." *(**Emphasis** added.)*

The conflict is that a "capital improvement" is defined as a physical improvement - a structural solution - whereas a "capital improvement program" is defined as both structural and nonstructural solutions. At issue is whether the authority under §103B.251 to "…certify for payment by the county as provided in this section all or any part of the cost of a capital improvement contained in the capital improvement program of the plan" extends to nonstructural solutions.

B. The Shingle Creek Commission received a request from the City of Plymouth to add the purchase of a regenerative air sweeper to the CIP as a phosphorus and sediment load reduction BMP, and to share 25% of the cost of its purchase. The City commits to funding the remaining 75% from other sources and to staff and maintain the equipment. The sweeper would be used to perform more intensive street sweeping of the city, especially in the directly-connected untreated areas discharging directly to lakes, streams, and wetlands. Weekly sweeping with a regenerative air sweeper has been shown by the Center for Watershed Protection to reduce TSS loading by up to 31% and TP loading by up to 8%. The annual load of nutrient and sediment removal through street sweeping can often exceed the annual load removed by structural practices such as rain gardens or biofiltration basins.

Staff has been in discussions with the Commissions' attorney who has, in turn, consulted with the Hennepin County Attorney's office, Hennepin County Environment and Energy staff, and the Board of Water and Soil Resources (BWSR). Staff has also consulted with the Commissions' independent auditor. At issue:

1. Are there certain types of nonstructural practices that [members] can agree are clearly similar in nature to structural BMPs in that they are primarily load or volume-reducing practices and not ongoing maintenance?

2. Can [members] agree that these nonstructural practices may be included in capital improvement programs and could be considered for cost-share funding using the authority under §103B.251 for payment using the county's levy authority?

The TAC had previously discussed question 1 and agreed that, with certain qualifications and stipulations, some nonstructural practices could be so considered. Hennepin County and BWSR agree, and BWSR notes that the "capital improvement" definition in 8410 hasn't kept up with the advances in various technologies and practices. The auditor notes that there is no GASB standard that would limit how the Commissions define "capital improvement." BWSR, Hennepin County staff, and Hennepin County Attorney's office also agree that nonstructural practices that meet the conditions in #1 would be eligible for levy certification under §103B.251.

C. Neither the Commissions' Cost Share Policy for Capital Improvement Projects adopted in 2007 nor the subsequent Third Generation Plan defines "capital improvement" for the purposes of cost sharing by levy. It is clear in the guidance developed in implementing the policy that 1) funds may not be used for BMPs to meet Commission requirements; 2) funds may be used to "upsize" a BMP above and beyond those requirements; 3) maintenance projects are not eligible.

If the TAC desires to move forward with amending the Management Plan to revise the Cost Share Policy, some explicit definitions should be established, either in the Plan itself or in the guidance document. The following are some potential requirements for discussion:

1. Capital improvements must be for water quality or ecological integrity improvement, and must be for improvement above and beyond what would be required to meet Commission rules or common practice. Only the cost of "upsizing" a BMP above and beyond is eligible.

2. Routine maintenance activities are not eligible.

3. The effectiveness of the proposed nonstructural improvement must be supported by literature or academic/practitioner experience and documentation.

4. The applicant must agree to document the effectiveness of the BMP and report those results to the Commissions for at least five years.

5. The standard Commission/Member Cooperative Agreement will be executed prior to BMP implementation.

Members directed Staff to begin developing a cost share policy relating to nonstructural practices along with a concomitant Minor Plan Amendment.

VI. New Hope Cost Share Appplication.*

The Shingle Creek Commission has received a Cost-Share Program application for an Underground Storm Water System for the New Hope Civic Center Park. The City is proposing an underground stormwater retention and treatment tank for the west portion of the site, adjacent to the proposed theater and skate park. The inline tank will treat runoff from a 7.4-acre area comprised of Zealand Avenue and surrounding residential areas that drain to the project site. The project cost is estimated to be $108,000; the City is requesting $50,000 cost-share from the Commission. It is Staff's recommendation that $25,000 of that amount be taken from the Cost-Share Program and the other $25,000 be taken from the BWSR Watershed-based Funding Grant.

Motion by Scharenbroich, second by Hogg to recommend to the Commission approval of this project based on Staff's recommendation. *Motion carried unanimously.*

VII. Magda and Meadow Lakes TMDL 5-Year Review.*

A. Staff have completed a draft of the Meadow and Magda Lakes TMDL 5-Year Review. Both of these lakes are small, shallow "neighborhood" lakes with small lakesheds. Both were designated Impaired Waters for excess nutrients in 2002 and TMDLs were completed in 2010. Lake Magda outlets to Eagle Creek through storm sewer, while Meadow Lake outlets to Bass Creek through storm sewer. Since 2010 Staff have collected additional water quality, aquatic vegetation, fish, and sediment core data, and have updated the P8 and lake response models to include BMPs completed since that time. Staff's May 23, 2019 memo provides an overview of that report and recommendations for the coming ten years.

B. Lake Management Plan, Meadow Lake.* The Shingle Creek Commission has received a request from the City of New Hope to develop a lake management plan for Meadow Lake and to apply for a Clean Water Fund grant to assist in the funding of a potential drawdown and alum treatment for the lake. Estimated cost to develop the management plan is $150,000 - $200,000.

Motion by Hedstrom, second by Scharenbroich to recommend to the Commission approval of this request. *Motion carried unanimously.* The project would be added to the CIP to make it eligible for grant funding.

VIII. Cedar Island Lake Subwatershed Assessment.*

The City of Plymouth has made a request to the Shingle Creek Commission to perform a subwatershed assessment (SWA) for Cedar Island Lake. Data compiled from the 5-year TMDL review, which was completed in 2018, should facilitate development of the SWA.

Motion by Scharenbroich, second by Hedstrom to recommend to the Commission approval of this request up to $15,000. *Motion carried unanimously.*

IX. Other Business.

A. Matthiesen provided an update of the **Becker Park** and **Twin Lake Carp** projects.

B. McCoy reported that Robbinsdale has received a DNR permit to **pump water out of Crystal Lake** into the Twin Lake chain to alleviate flooding conditions.

C. The **next meeting** of the Technical Advisory Committee is scheduled for 8:30 a.m., Friday, June 21, 2019, Crystal City Hall.

D. The meeting was adjourned at 9:53 a.m.

Respectfully submitted,

Judie A. Anderson/Recording Secretary

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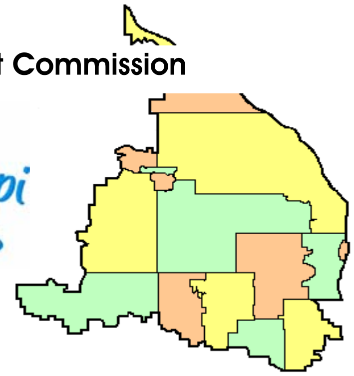

Shingle Creek and West Mississippi Watershed Management Commissions
CIP Cost Share Policy
D R A F T 6/20/19

The Shingle Creek and West Mississippi Watershed Management Commissions share the cost of watershed-priority capital improvements and demonstration projects through the Commissions' Capital Improvements Program (CIP). High-priority watershed capital improvements are those activities that go above and beyond general or routine city management activities to provide a significant improvement to the water resources in the watershed. This Cost Share Policy establishes the basis for and amount of Commission contribution to qualifying projects.

Capital Improvements

High priority activities that result in Wasteload Allocation reductions toward a TMDL, help solve a regional flooding problem, or are otherwise determined by the Technical Advisory Committee (TAC) and Commissions to be high priority are eligible to receive up to 25 percent of the final improvement cost in Commission cost-share, funded by the county ad valorem tax levied on all property in the watershed. The balance of the improvement cost, less any grant or other funds received, must be funded by the local government(s) participating in or benefiting from the improvement. *The Commissions' minimum share is $50,000. There is no maximum share; the maximum is limited by the amount the Commission is willing/able to certify as a levy.*

Eligible improvements include both structural and nonstructural activities. Routine maintenance or localized improvements are not eligible for cost share. Thus, a local street flooding issue is not of watershed priority, but a local flooding issue that creates significant erosion and sedimentation impacting a downstream resource may be a watershed priority. Capital equipment that has been demonstrated to reduce loading of TMDL pollutants such as TP, TSS, or chloride, may be eligible if: 1) the equipment is new or an upgrade and not simply a replacement of existing equipment; 2) the equipment is to allow the member city to undertake a new load-reducing activity; and 3) use of the equipment for this load reductions must be supported by academic or governmental research. Examples of equipment purchase that may be eligible include equipment to begin or expand pre-wetting or anti-icing, or adding or upgrading to a regenerative air street sweeper. Only the incremental cost of such an upgrade would be eligible for cost share.

The Commissions have developed a set of criteria by which proposed activities may be scored, with only those that pass screening questions advancing to a prioritization stage by the Technical Advisory Committee (TAC). Prioritization will be based on cost effectiveness, amount of improvement achieved, and regional significance.

Activities of Watershed-Wide Benefit

The capital cost of activities addressing TMDL Load Allocation reductions and projects of watershed-side benefit may be funded 100 percent by the ad valorem tax levy. Examples of these types of activities include:

- Lake Internal Load Reduction Actions
  - Alum treatments
  - Rough fish management
  - With Hennepin County and DNR concurrence, initial, whole-lake invasive aquatic vegetation management treatments performed for water quality, excluding those for recreation, aesthetics, or navigation
- Stream Internal Load Reduction Activities
  - Channel narrowing or creation of a low-flow channel to reduce sediment oxygen demand
  - Projects to increase DO at wetland outlets
- Non-TMDL Parameters (actions required by TMDLs not associated with a pollutant for which a numerical reduction of improvement can be specified)
  - Restoration or enhancement of in-stream habitat
  - Increases in channel roughness to enhance DO
  - Removal or bypass of barriers to connectivity
  - Streambank restoration below the top of the bank
- Other Watershed Benefiting Improvements as Recommended by the TAC

Guidelines

1. Capital improvements must be for water quality or ecological integrity improvement, and must be for improvement above and beyond what would be required to meet Commission rules or common practice. Only the cost of "upsizing" a BMP above and beyond is eligible.
2. Routine maintenance activities are not eligible.
3. The effectiveness of any proposed nonstructural improvements must be supported by literature or academic/practitioner experience and documentation.
4. The applicant must agree to document the effectiveness of any proposed nonstructural improvements and report those results to the Commissions for at least five years.
5. The standard Commission/Member Cooperative Agreement will executed prior to BMP implementation. This Agreement will specify the type and adequacy of effectiveness reporting.

WENCK File #1240-0187
June 2019

Minneapolis Subwatershed Assessment

Photo

Photo

Photo

Photo

Prepared for:

Shingle Creek Watershed Management Commission

Customer Address
Address Line 1
Address Line 2
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WENCK
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Exceptional outcomes.

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APPENDICES

Executive Summary

The Shingle Creek Watershed Management Commission and the City of Minneapolis are interested in identifying pollutant load reduction opportunities for that part of the City of Minneapolis within the watershed. This subwatershed assessment targets total suspended solid (TSS) and total phosphorus (TP) reductions.

The assessment area discharges into receiving waters Ryan Lake, Crystal Lake, and Shingle Creek. Crystal Lake and Shingle Creek are Impaired Waters. Ryan Lake has recently been removed from the state's list of Impaired Waters due to improved water quality and is now a Protection Water. Currently the assessment area generates an estimated total load of 520,876 lbs of TSS and 1,834 lbs of TP annually. Priority areas for load reduction were identified based on City's knowledge, pipeshed loadings per acreage, land use, parcel ownership and road construction plans. Implementation of these BMPs not only focuses on pollutant load reduction, but also aims to provide aesthetic value for the area.

Land use in the study area is largely residential, with some commercial/industrial and institutional uses. The density of the development leaves very limited space for large stormwater infrastructures. Due to space limitation, it was typically not possible to design the stormwater BMPs to treat the first 1.1 inches of runoff from drainage area impervious surfaces.

Common stormwater BMPs considered in this exercise were stormwater ponds, tree trenches, raingardens, and iron-enhanced sand filters. There is limited soil data in the area, so significant infiltration practices were generally not considered. In addition, favorable locations in proximity to Shingle Creek may have high groundwater tables that also would prevent the use of infiltration.

Section 4 of this report provides detailed information for each identified BMP, including location, drainage area, initial investment cost, 30-year lifecycle cost, cost benefit for pollutant removal, and potential retrofit or alternatives to provide multiple benefits and increase aesthetic value.

1.0 Introduction

1.1 BACKGROUND

The Study Area was the entirety of that part of the city of Minneapolis within the Shingle Creek watershed. The Shingle Creek watershed is 44 square miles in size and encompasses parts of nine cities in Hennepin County, Minnesota (Figure 1-1). Shingle Creek is eleven miles long, and discharges into the Mississippi River in Minneapolis, just north of the Camden Bridge over the river. The land use in the Study Area is mostly residential, making up 56% of the total area. There are several main pour points; Crystal Lake, Ryan Lake, and Shingle Creek receive stormwater runoff from the Study Area.

All three water bodies are or were listed on the state's 303(d) list of Impaired Waters. Crystal Lake (AUID: 27-0034-00) was listed for nutrient impairment in 2002. Ryan Lake was also listed for excess nutrients but was delisted in 2014 due to improved water quality. Shingle Creek (AUID: 07010206-506) is impaired for chloride, dissolved oxygen, *E.coli*, and biotic integrity (macroinvertebrates). A significant stressor to aquatic life in Shingle Creek is sediment oxygen demand that originates from nutrient inputs from the watershed.

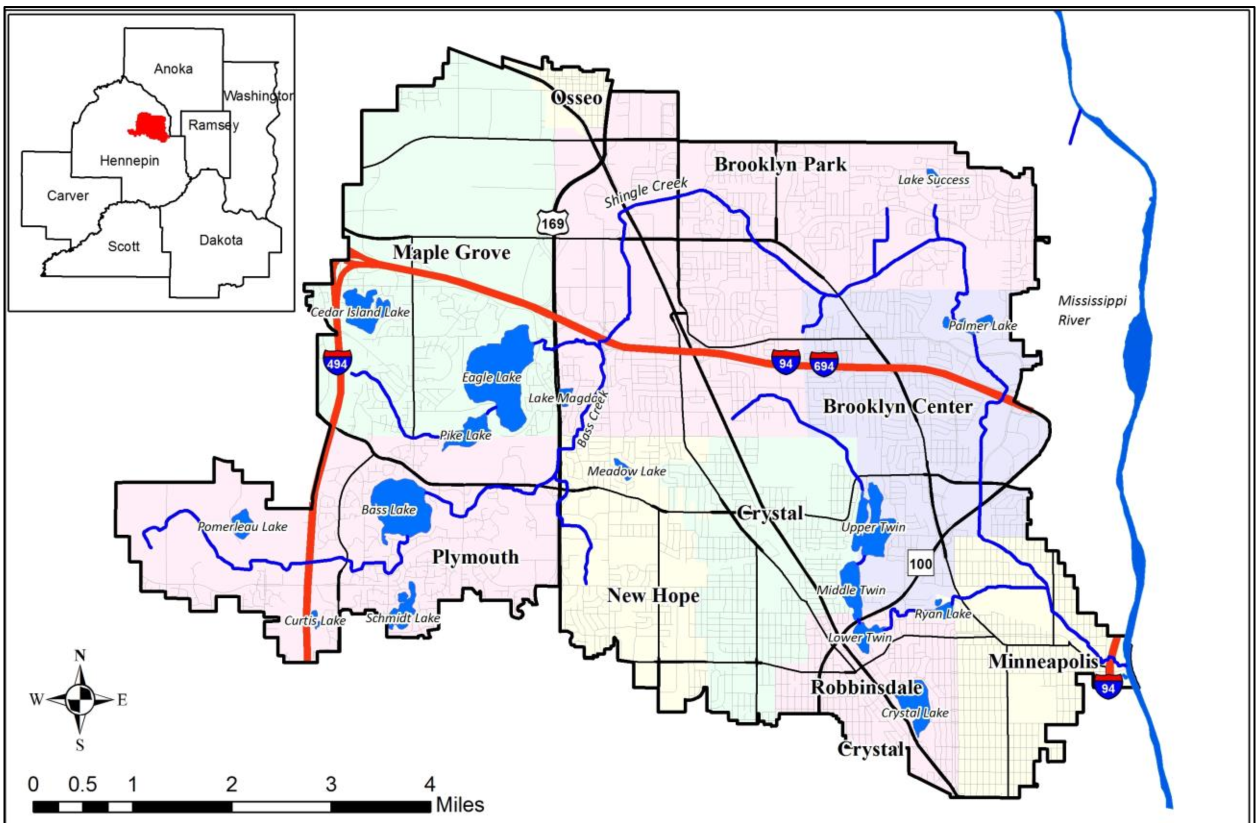

Figure 1-1. Location of the Shingle Creek watershed.

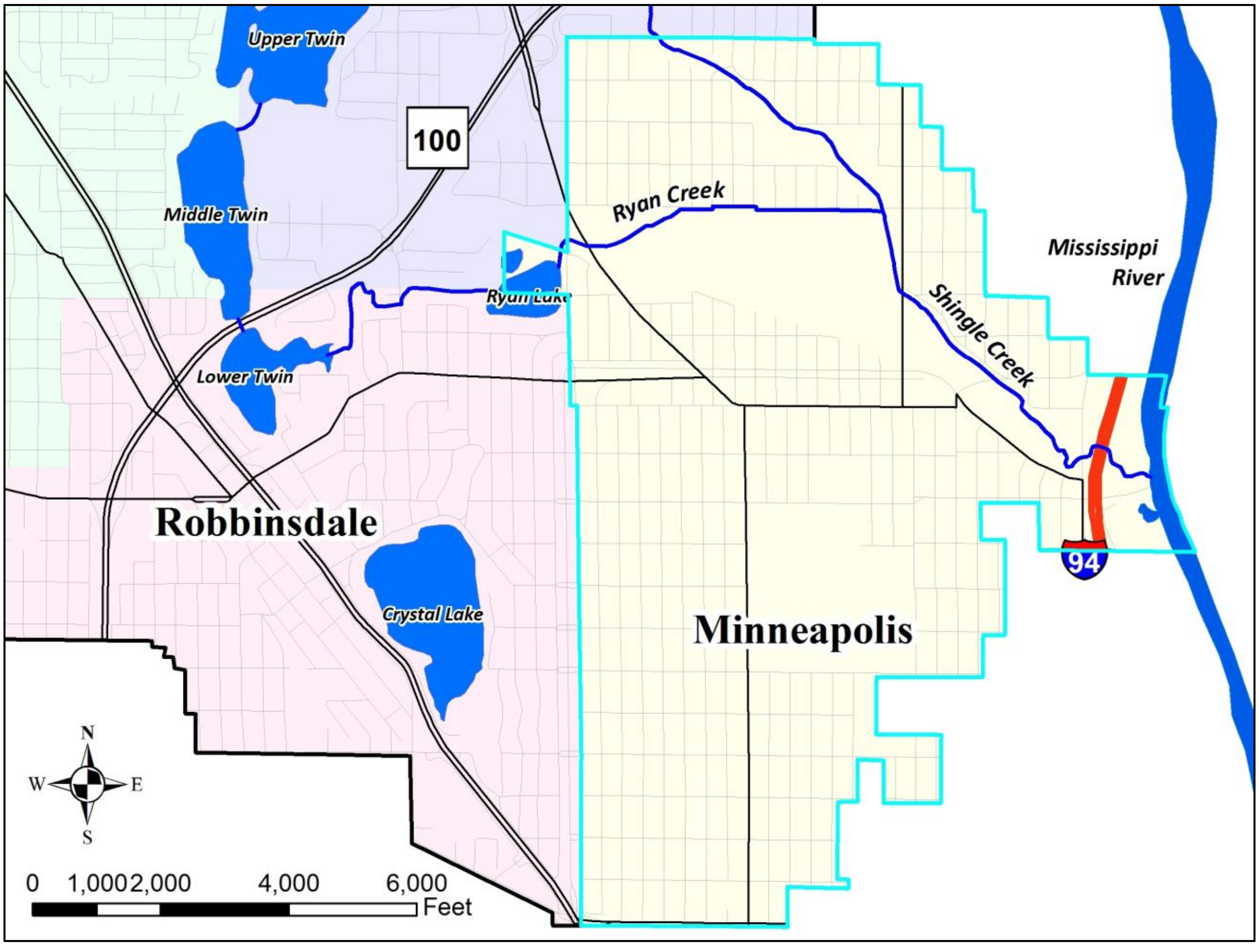

Figure 1-2. Study Area and vicinity.

The purpose of this subwatershed assessment was to identify feasible and cost-effective stormwater best management practices (BMPs) for the subwatersheds that had the potential to be contributing higher loads of pollutants. Because Minneapolis is highly urbanized and the space for constructing new BMPs is limited, most of the proposed BMPs in this report are either a retrofit to an existing structure or can be completed with planned road reconstruction.

2.0 Methods

2.1 SITE ASSESSMENT

Each subwatershed was evaluated using GIS and aerial photo (Google Earth) interpretation. Evaluation criteria included impervious area, soil hydrologic group, existing storm sewer, catch basins, existing stormwater management practices, and 10-year road construction plan. Modeled subwatershed total phosphorus (TP) and total suspended solids (TSS) loading were also used to determine the need for pollutant management. Areas with high unit loading and lack of stormwater BMPs were prioritized. Existing stormwater management practices were preferable for retrofit considerations.

Locations suited for BMP implementation were further evaluated to determine the appropriate BMP to be implemented. The BMP selection was based on availability of land, storm sewer location, predicted runoff volume and pollutant export, and existing stormwater structures. Due to the space limitation, in most cases the practices were not able to be sized to treat 1" of runoff from impervious surfaces.

Figure 2-1 shows the pipesheds/subwatersheds delineated in the City's XPSWMM pipeshed model, Crystal Lake and Ryan Lake drainage areas, park board parcels, and future road construction plans.

2.2 MODELING

The P8 Urban Catchment Model was used to estimate the current conditions runoff volume, TSS loads and TP loads by subwatershed, and the removal efficiency of any proposed stormwater BMP. The model uses an hourly precipitation and daily temperature record at the Minneapolis- St. Paul International Airport for the period 2007 to 2016.

Information in the P8 model was imported from XPSWMM model provided by the city. The XPSWMM model contains detailed information of minor pipesheds, existing manholes, existing stormwater infrastructure, and storm sewer flow direction. Major pipesheds were delineated for use in P8.

To model existing stormwater infrastructures, the stage and area curve was directly entered from XPSWMM into P8 to capture small changes in the volume and capacity of the BMP. For each proposed BMP or retrofit, a HydroCAD model was used to estimate the sizing and generate stage and area curve for P8 input.

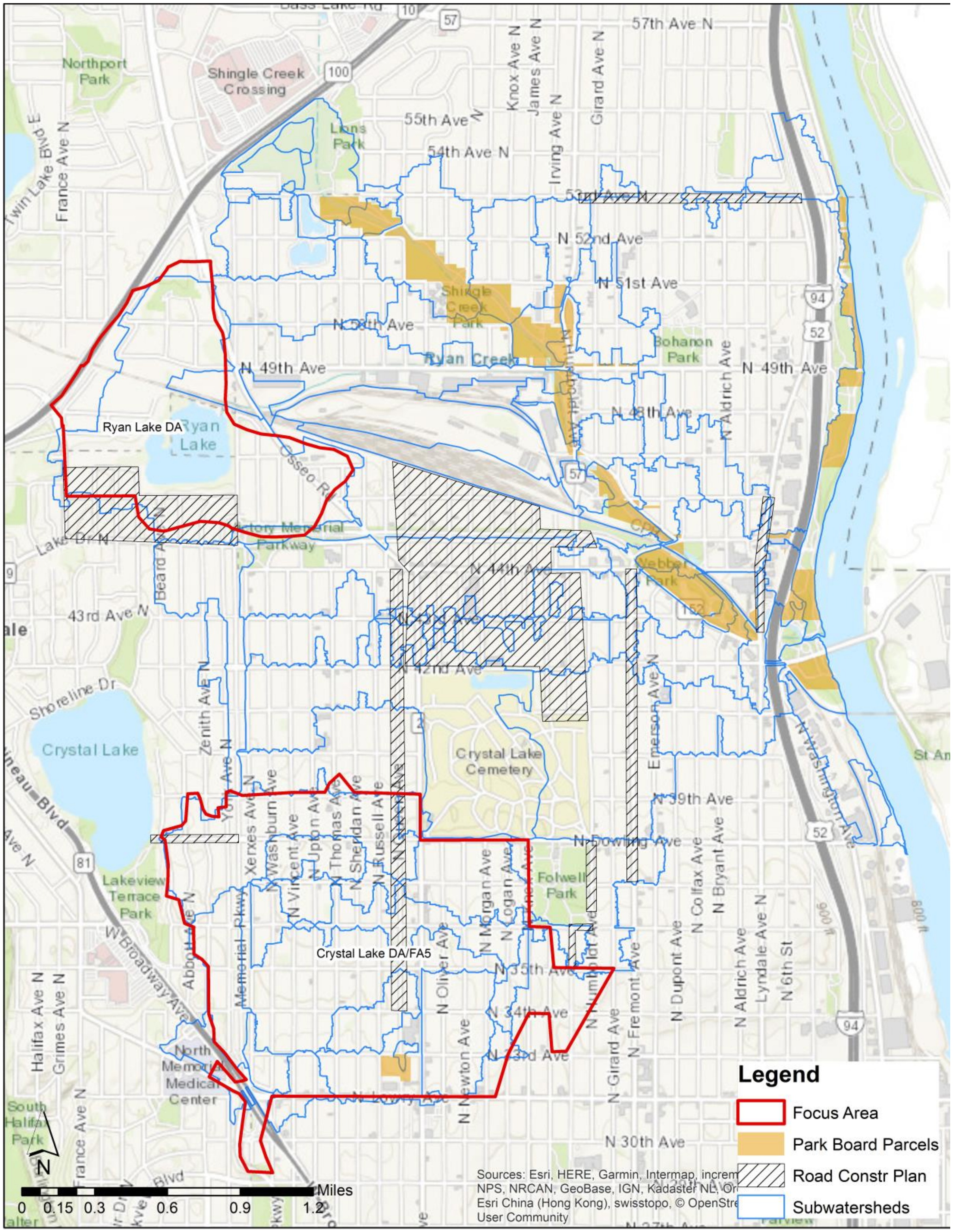

Figure 2-1. Overview map showing the Study Area.

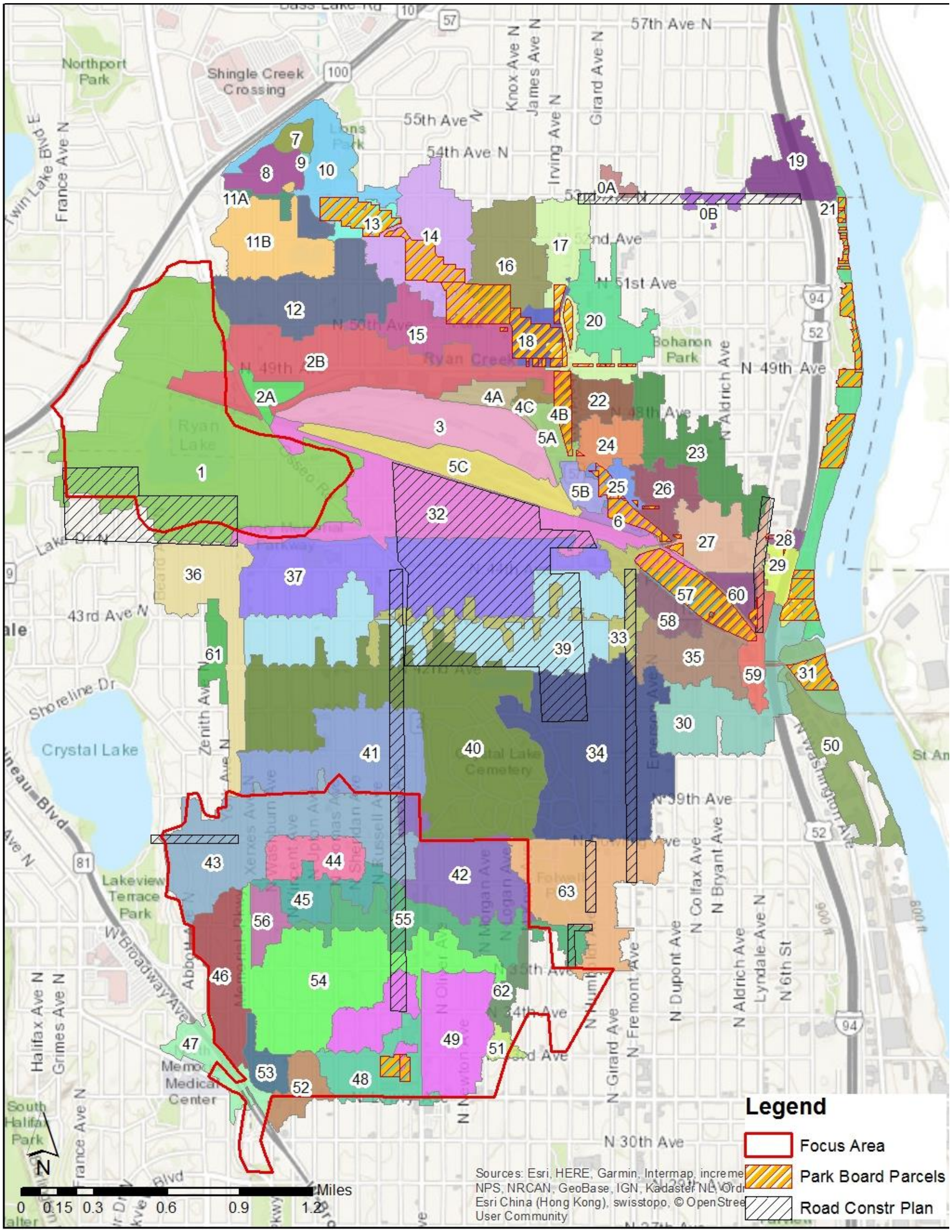

Figure 2-2. Major pipesheds used in P8 model.

2.3 EXISTING CONDITIONS

The P8 model estimated that the land in the Study Area generates a total of 520,876 pounds of TSS/year and a total of 1,834 pounds of TP/year. Table 2-1 shows the estimated annual total load and load per acre for each of the three subwatersheds within the Study Area. Figure 2-3 and Figure 2-4 show the inflow TSS and TP for each subwatershed. The color scheme was determined based on the distribution of all areal loadings. The middle two categories are loading rates between the75th and 25th percentile. Although existing stormwater infrastructure is providing pollutant removal capacity, each subwatershed was evaluated based on the pre-treated loading.

Table 2-1. Existing conditions P8 model estimated loading.

Drainage Area	TSS		TP	
	Lbs/ Year	Lbs/ Year/ Acre	Lbs/ Year	Lbs /Year /Acre
Ryan Lake		191		0.68
Crystal Lake		196		0.69
Shingle Creek				
Total Study Area	1,834	219	520,876	0.77

The model estimates that the Ryan Lake and Crystal Lake drainage areas are in comparatively good condition, exporting at less than the average of the entire Study Area and below the Minnesota Stormwater Manual average for low density residential of 1.1 pound/acre/year. However, there are a few of the minor drainage areas with slightly higher export rates that could be prioritized for localized treatment. Section 4.7 later in this report outlined area for neighborhood projects to mitigate those higher loadings.

Along Shingle Creek, there are a few industrial and commercial areas with significantly high TSS and TP loadings, both more than 1.5 times higher than the average. These areas are highly impervious and lack space for additional treatment infrastructures. A few stormwater ponds have been constructed in the areas.

2.4 LIMITATIONS AND ASSUMPTIONS

Potential BMP and retrofit locations shown in this report were evaluated based on limited information. Further investigation of the topography, soil, utilities, and local plans will be needed prior to implementation. Design parameter assumptions used for cost estimation were listed in each BMP section below. The design infiltration rate was selected based on engineered soil. Actual infiltration rates should be determined based on geotechnical information and infiltration test post grading.

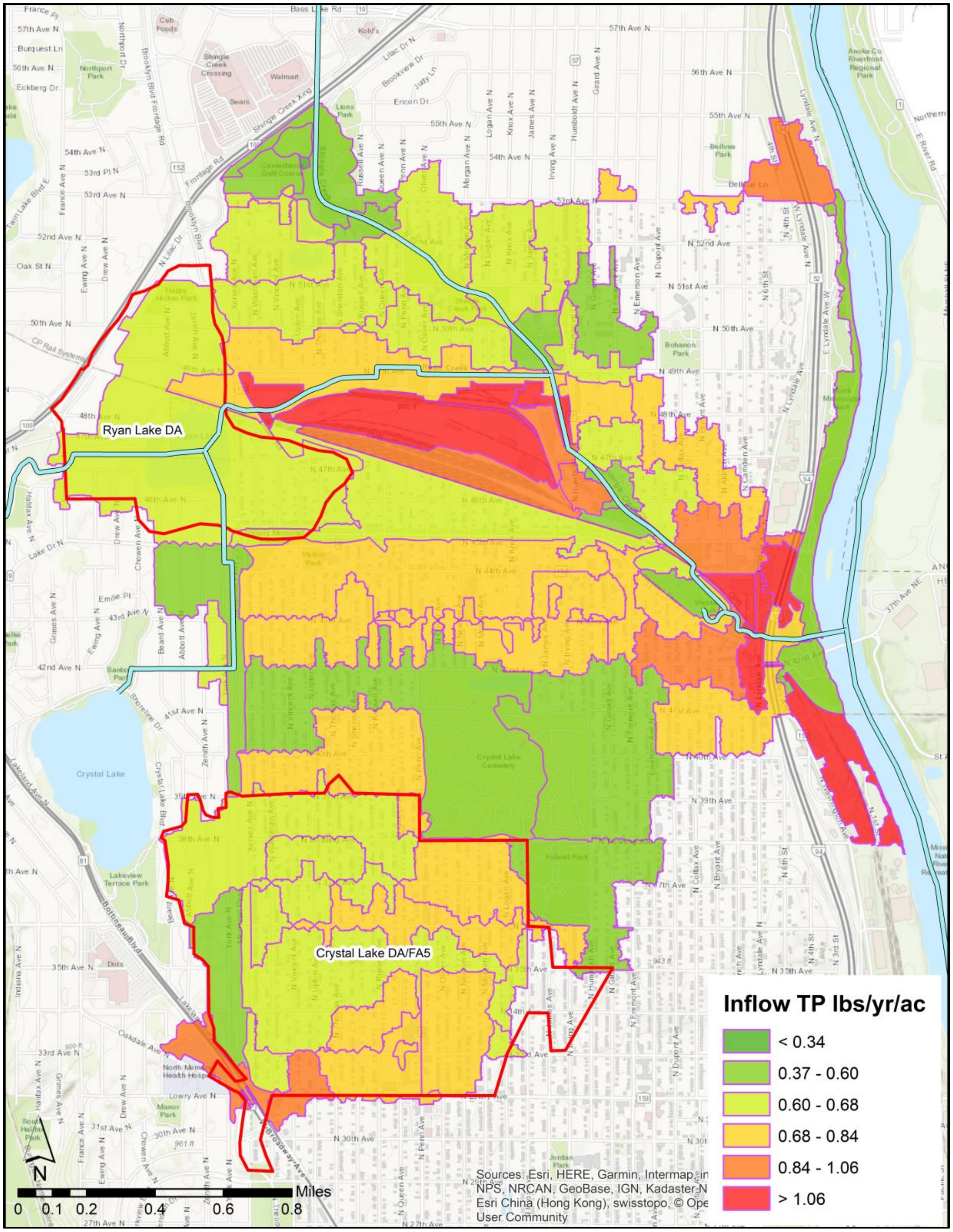

Figure 2-3. Subwatershed TP export in lbs/yr/ac.

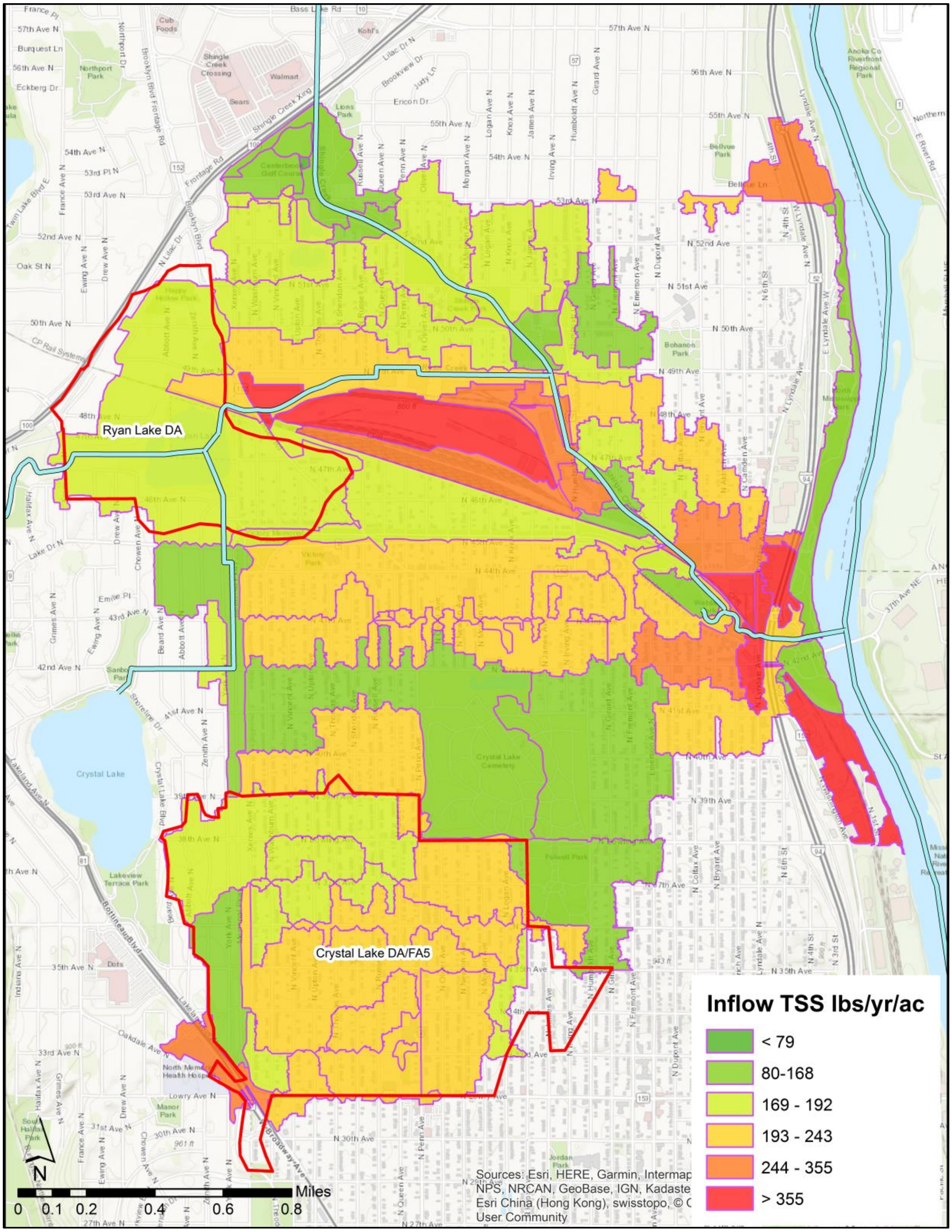

Figure 2-4. Subwatershed TSS export in lbs/yr/ac.

3.0 Stormwater Best Management Practices

3.1 EDUCATION AND OUTREACH

The Shingle Creek and West Mississippi Watershed Management Commissions will continue to provide education and outreach to promote small neighborhood BMPs. The City will work with Metro Blooms to reach out to citizens for implementation of neighborhood projects. The City will also provide opportunity for citizens to learn more about stormwater issues and BMPs for water quality and flood control.

3.2 TREE TRENCH

Tree trenches are underground storage chambers and trees planted in the boulevard. These provide underground storage for stormwater runoff, allowing it to be infiltrated or taken up by trees through transpiration. They are aesthetically pleasing and particularly useful in highly impervious areas. Sidewalks and boulevards are great locations for tree trenches. A fully functioning tree trench system is shown in Figure 3-1 and cross sections are shown in in Figures 3-2 and 3-3.

Trees that are highly efficient in water abstraction are preferable in these uses. Red maple and freeman maple are both recommended for southeast Minnesota deciduous selections by UMN Extension.

Maintenance includes removal of debris and accumulated sediment, replacement of mulch where applicable, inlet and outlet cleaning, and tree inspection. These practices should keep tree trenches in working condition for the lifespan of the tree. Periodic structural maintenance may be required.

Figure 3-1. Tree trenches on the Central Corridor in St. Paul, MN.
Source: Capital Region Watershed District

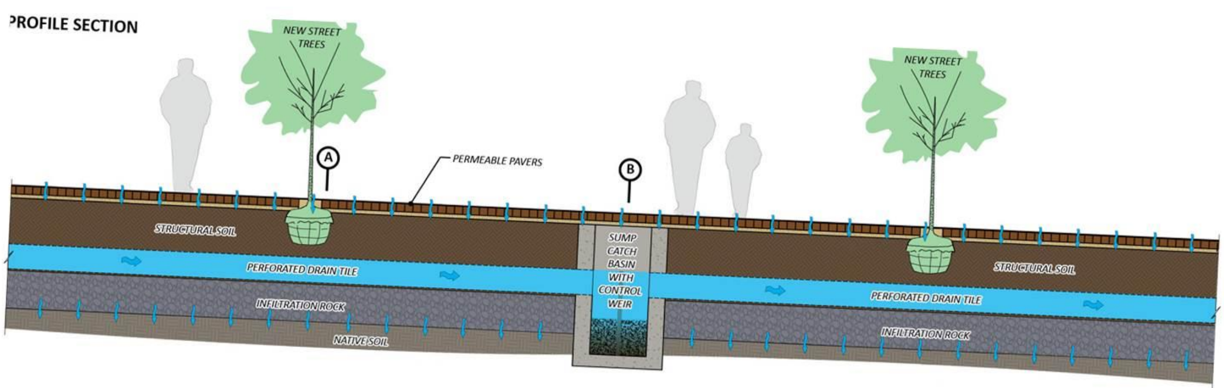

Figure 3-2. Tree trench cross section on the Central Corridor in St. Paul, MN.
Source: Capitol Region Watershed District.

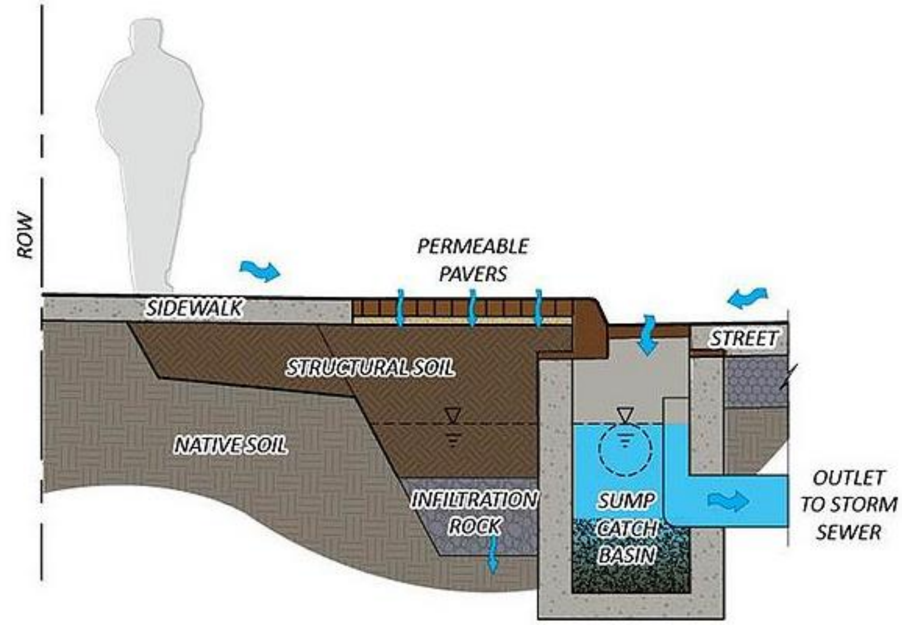

Figure 3-3. Tree trench design detail on the Central Corridor.
Source: Capitol Region Watershed District.

3.3 RAINGARDEN

Rain gardens are a popular neighborhood stormwater BMP practice option. Raingardens are small depression areas adjacent to sidewalks, curb cuts or in the road boulevard. Rain gardens can also be placed near buildings where downspouts concentrate roof runoff. Rain gardens provide a storage volume and promote infiltration. Figure 3-4 shows a well-established rain garden that accepts diverted road runoff and Figure 3-5 shows a typical cross section.

Figure 3-4. A boulevard rain garden across from Schmidt Lake in Plymouth, MN.
Source: Shingle Creek WMC

Many different types of native vegetation can be used in the raingardens, including forbs and grasses, shrubs, and even trees. The species are selected for their ability to adapt to the fluctuating moisture conditions. Stormwater runoff volume exceeding the storage capacity is typically routed to the storm sewer via an overflow. Where underlying soil conditions cannot be improved to provide infiltration, runoff can be filtered through the amended soils in the rain garden and then be collected in an underdrain discharging to storm sewer.

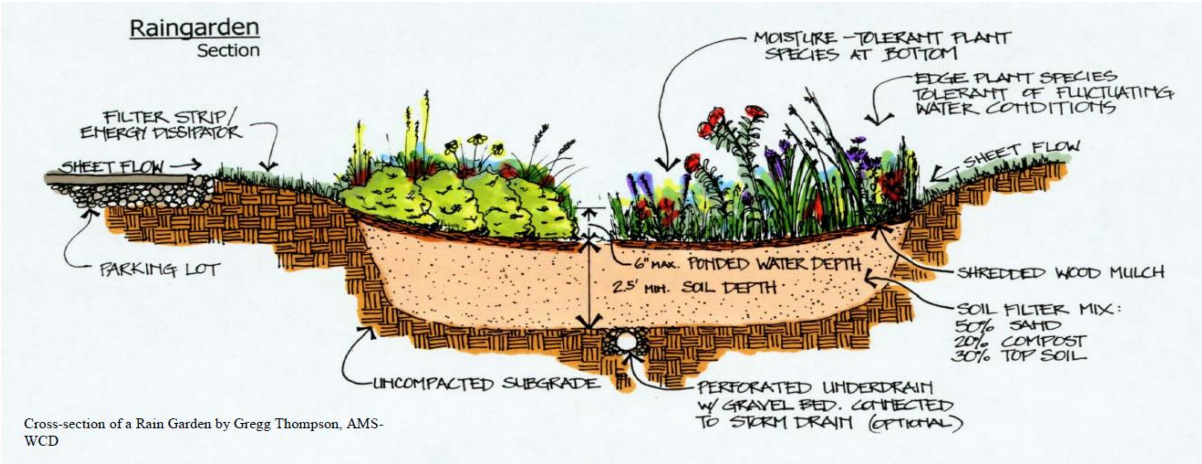

Figure 3-5. A typical raingarden design.
Source: Gregg Thompson, Assoc. of Metro Soil and Water Districts.

3.4 STORMWATER POND

Stormwater ponds collect runoff from the upstream watershed and release it at a controlled rate. Stormwater ponds allows sediments and debris to settle and improves water quality by settling particulate phosphorus. Typically, it is desirable to maintain standing water in stormwater ponds in order to provide treatment (minimum 3 feet, maximum 10 feet). The stormwater pond shown in Figure 3-5 is an existing pond in the West Mississippi Watershed. These ponds are able to remove an average of 84% of TSS and 50% of the TP from stormwater runoff. Pond maintenance includes regular inspection and periodic removal of accumulated sediment.

Figure 3-6. A typical stormwater pond in the West Mississippi watershed.

3.5 IRON-ENHANCED SAND FILTER

Iron-enhanced sand filters (IESF), also known as Minnesota filters, add iron filings to sand as a filter medium to target dissolved phosphorus removal. Iron filings bind dissolved phosphorus in a strong bond and prevent re-release of the phosphorus back into the pond. The filter is commonly implemented as a retrofit to stormwater pond. IESFs are usually constructed at the normal water level and provide treatment when water level rises. The removal efficiency of the filter changes with age. Research so far shows that on average, IESFs remove 60% of the total phosphorus from stormwater runoff. The filter requires frequent maintenance as the surface is likely to form a crust layer that prevents water from entering the filter. Breaking the surface layer is essential to the functionality and efficiency of the filter. Additional media, such as biochar, can be mixed in with iron-sand to provide multiple water quality benefits.

4.0 Potential BMP Locations

Eight project locations were identified in this study (Figure 4-1). The map also shows Minneapolis Park and Recreation Board (MPRB) parcels in purple. The projects were selected mainly based on public parcels, subwatershed existing loads, and open space available as well as potential for incorporation into other scheduled improvement projects. Project details including location, cost benefit, and load and volume reduction can be found in the sections below.

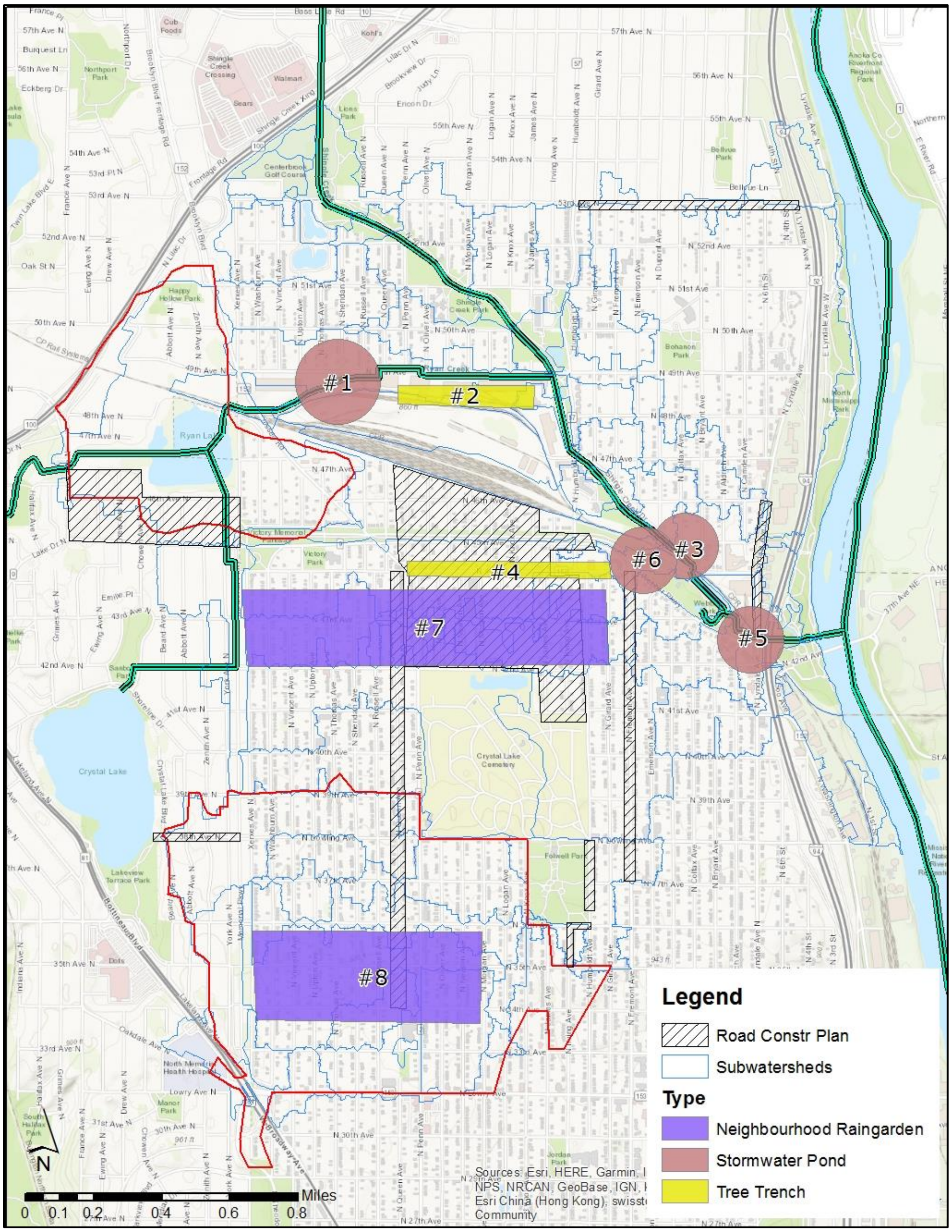

Figure 4-1. Potential project locations in the study area.

4.1 49TH AVENUE POND/STREAM RE-ROUTE

Wenck identified a potential project location south of 49th Avenue N and east of Osseo Road in the Humboldt Industrial Park (Figure 4-2) in subwatershed 2. There is an undeveloped outlot through which Ryan Creek flows, between the CP Rail access drive and an adjacent industrial building. Construction of a stormwater pond in the open space south of the existing channel could provide additional volume for storage and allow settling of suspended sediment and particulate phosphorus. Re-routing the stream as a diversion channel would allow partial treatment of baseflow. By adding a diversion of the storm sewer line, the pond would be able to provide partial treatment of the stormwater coming from the neighborhood to the north as well. The tables below present the design parameters and cost benefit. Figure 4-3 is a more detailed design schematic.

Table 4-1. Design parameters used in cost benefit estimations.

Pond Design Parameters		**Channel Design Parameters**	
Surface area	0.54 acre	Bottom width	3 feet
Dead pool depth	8 feet	Depth	2 feet
Live pool depth	2 feet	Side slope	2:1
Side slope	3:1	Total length	410 feet

Table 4-2. Cost-benefit of 49th Ave pond and stream re-route.

Drainage Area (ac)	47	
Cost	$987,490	
30-yr Lifecycle Cost	$1,790,231	
	TSS	TP
Inflow (lbs/yr)	11,014	38
Inflow (lbs/yr/ac)	234	0.8
Load Reduction (lbs/yr)	8,374	16
Removal Efficiency	76%	43%
Cost Benefit ($/lbs)	118	60,582
30-yr Cost Benefit ($/lbs)	7	3,661

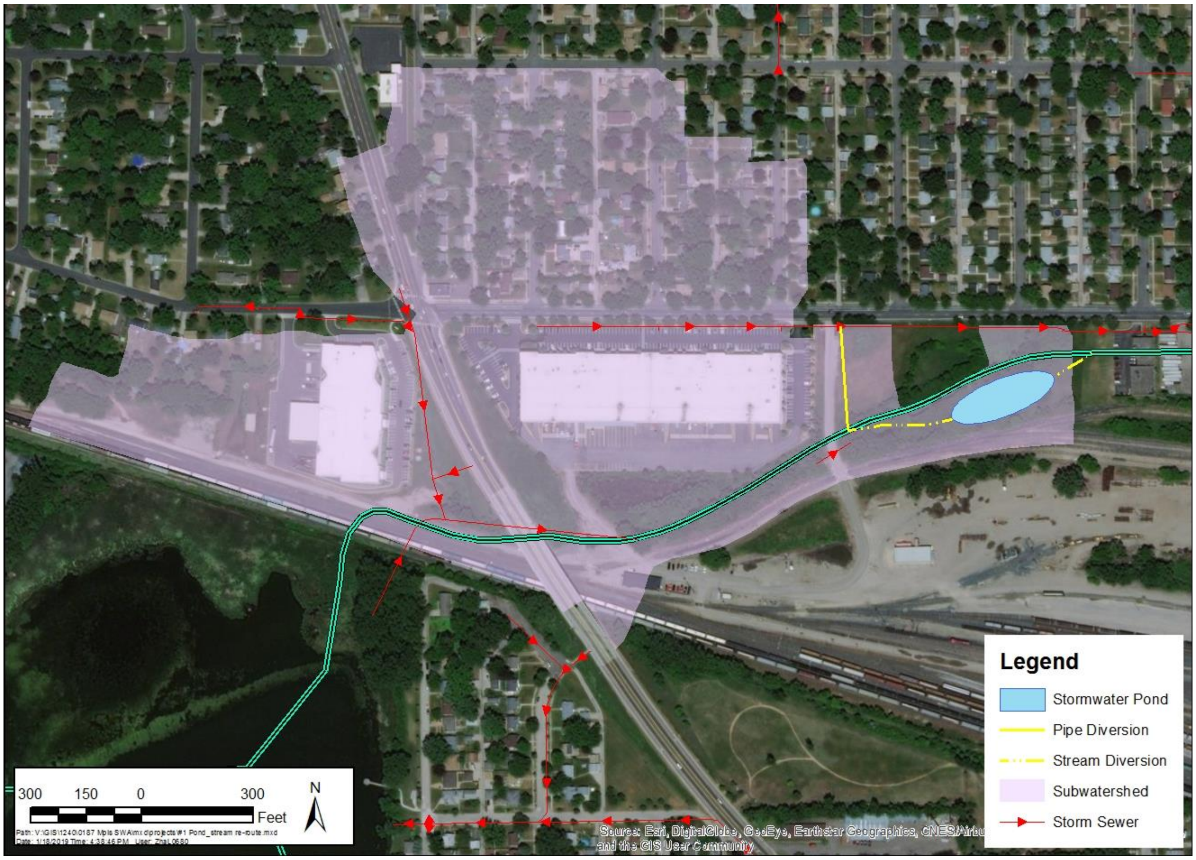

Figure 4-2. 49th Ave pond/stream re-route location map.

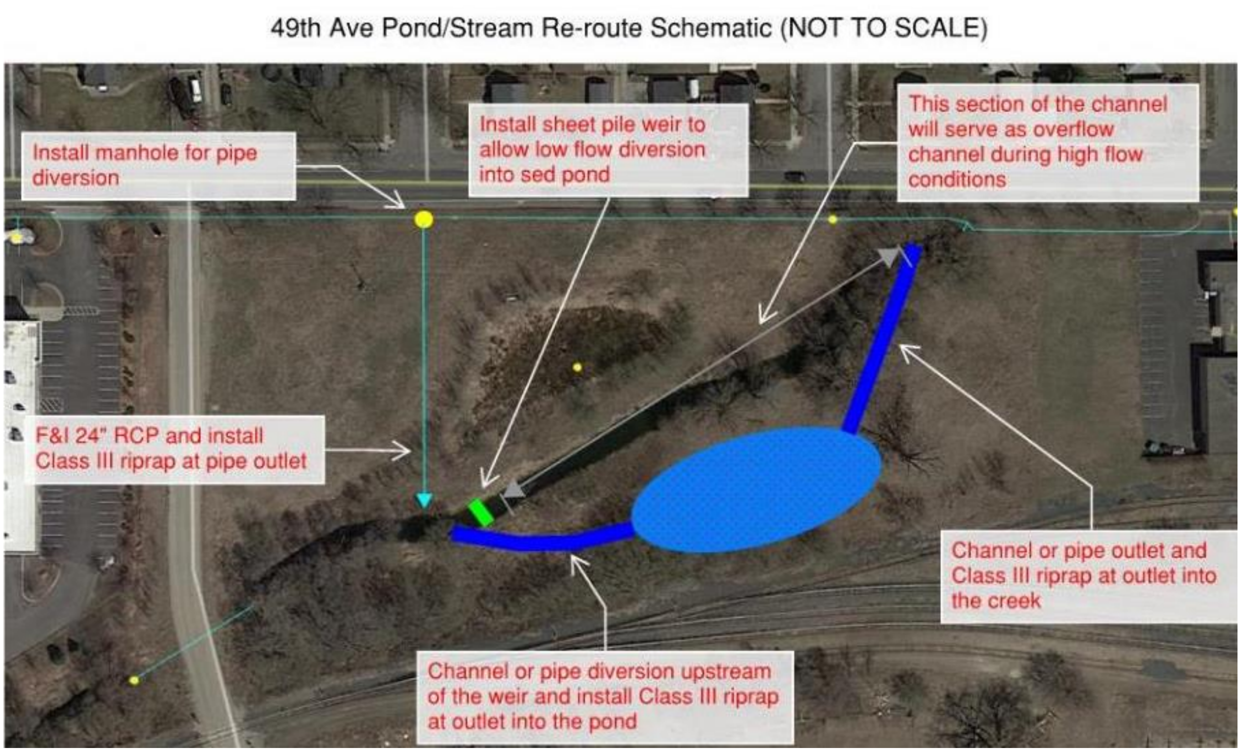

Figure 4-3. 49th Ave pond/stream re-route schematic.

4.2 49TH AVENUE TREE TRENCH

Subwatershed 2 is residential and commercial/industrial. The storm sewer conveys neighborhood runoff and outlets into an existing pond near the creek. The pond is on a park board parcel (Figure 4-4). The City's XPSWMM model indicates that the pond outlets through a wide channel. Due to the size and residence time of the pond, current nutrient removal is insignificant (TSS 23% and TP 3%). Limited options are available at the end of the pipe. To achieve maximum reduction, projects within the drainage area were considered. Tree trenches provide underground storage and promote infiltration and evapotranspiration.

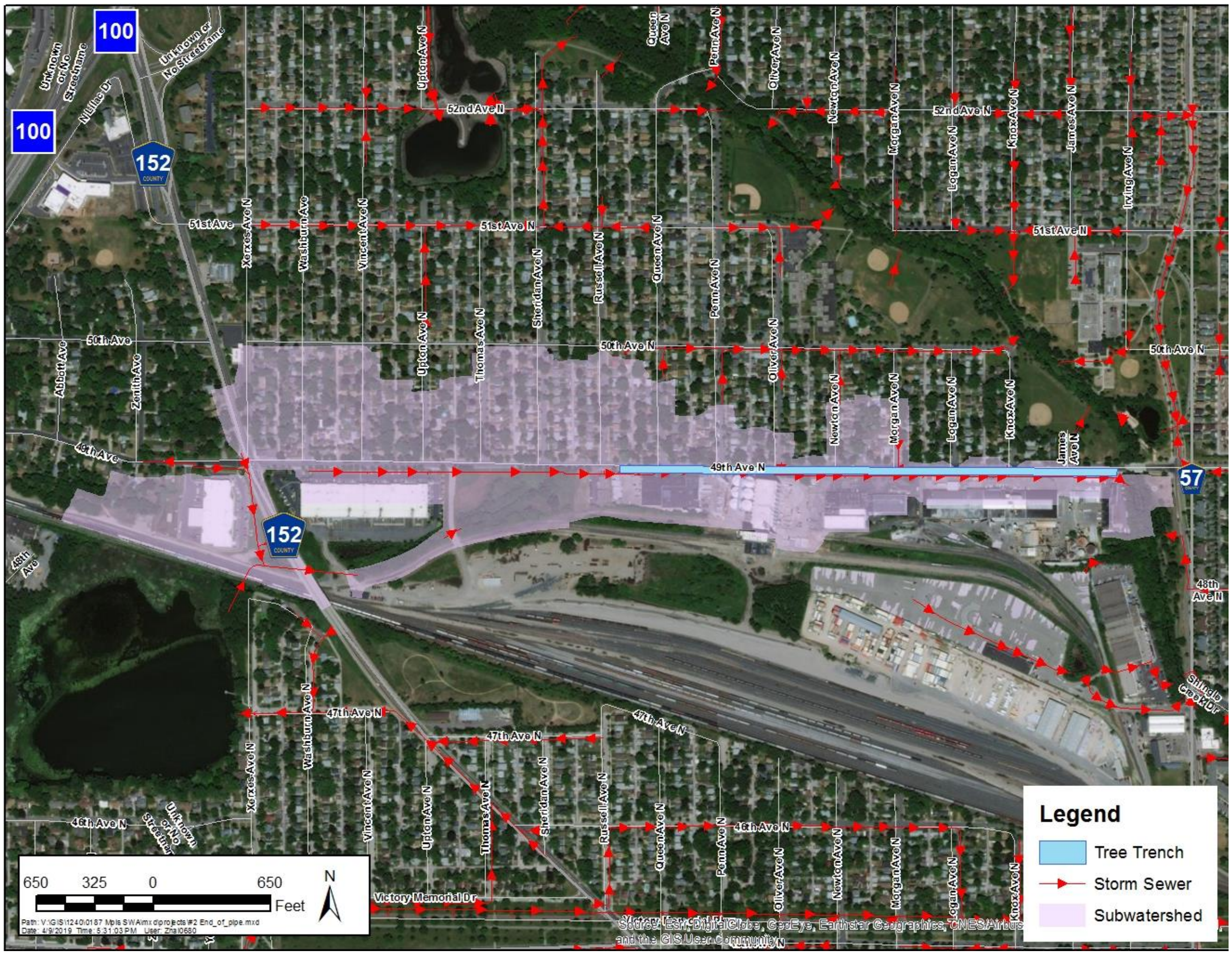

Figure 4-4. 49th Ave tree trench location map.

For the preliminary modeling of the tree trenches, we assumed the total depth of the BMP to be 4 feet, and the void space of the rocks to be 40% and engineered soil to be 10%. The width is 4 feet throughout the whole length. The model assumes that tree trenches will be implemented on half of the distance from about Russell Avenue N east to Shingle Creek, on the south side of the street. Assuming the spacing between trees to be 30 feet, a total of 52 trees were used in the cost estimate. The Minnesota Stormwater Manual provides an overview of several tree trench projects, where the cost per unit varies from $2,600-$8,000. This report used $4,800 per tree as a median number, which is similar to the cost per tree trench on the Central Corridor project in St. Paul.

Table 4-3. Cost benefit of 49th Avenue tree trenches.

Drainage Area (ac)	90	
Cost	$331,200	
30-yr Lifecycle Cost	$876,582	
	TSS	TP
Inflow (lbs/yr)	20,958	73
Inflow (lbs/yr/ac)	234	0.8
Load Reduction (lbs/yr)	9,275	15
Removal Efficiency	44%	20%
Cost Benefit ($/lbs)	36	22,378
30-yr Cost Benefit ($/lbs)	3	1,974

4.3 45TH AVENUE STORMWATER POND

Subwatershed 27 is composed of residential development and commercial area between Colfax and Lyndale Avenues N, between 45th and 46th Avenues (Figure 4-5). Runoff is conveyed by storm sewer pipes and is discharged untreated into Shingle Creek. At the end of the pipe is a triangular area that is open space across the creek from Webber Park. Two of the three parcels are owned by MPRB and one is owned by the City's economic development department. This area is unused for park purposes both currently and in the North Service Area Master Plan, and would be an ideal location for a stormwater pond (Figure 4-5). A SAFL baffle at the inlet of the pond would prevent excessive TSS buildup.

Table 4-4. Design parameters for pond used in cost benefit estimations.

Pond Design Parameters	
Surface area	0.59 acre
Dead pool depth	3 feet
Live pool depth	1 foot
Side slope	3:1

Table 4-5. Cost benefit of 45th Avenue stormwater pond.

Drainage Area (ac)	29	
Cost	$183,007	
30-yr Lifecycle Cost	$484,361	
	TSS	TP
Inflow (lbs/yr)	7,713	27
Inflow (lbs/yr/ac)	265	0.9
Load Reduction (lbs/yr)	6,049	12
Removal Efficiency	78%	44%
Cost Benefit ($/lbs)	30	15,509
30-yr Cost Benefit ($/lbs)	3	1,368

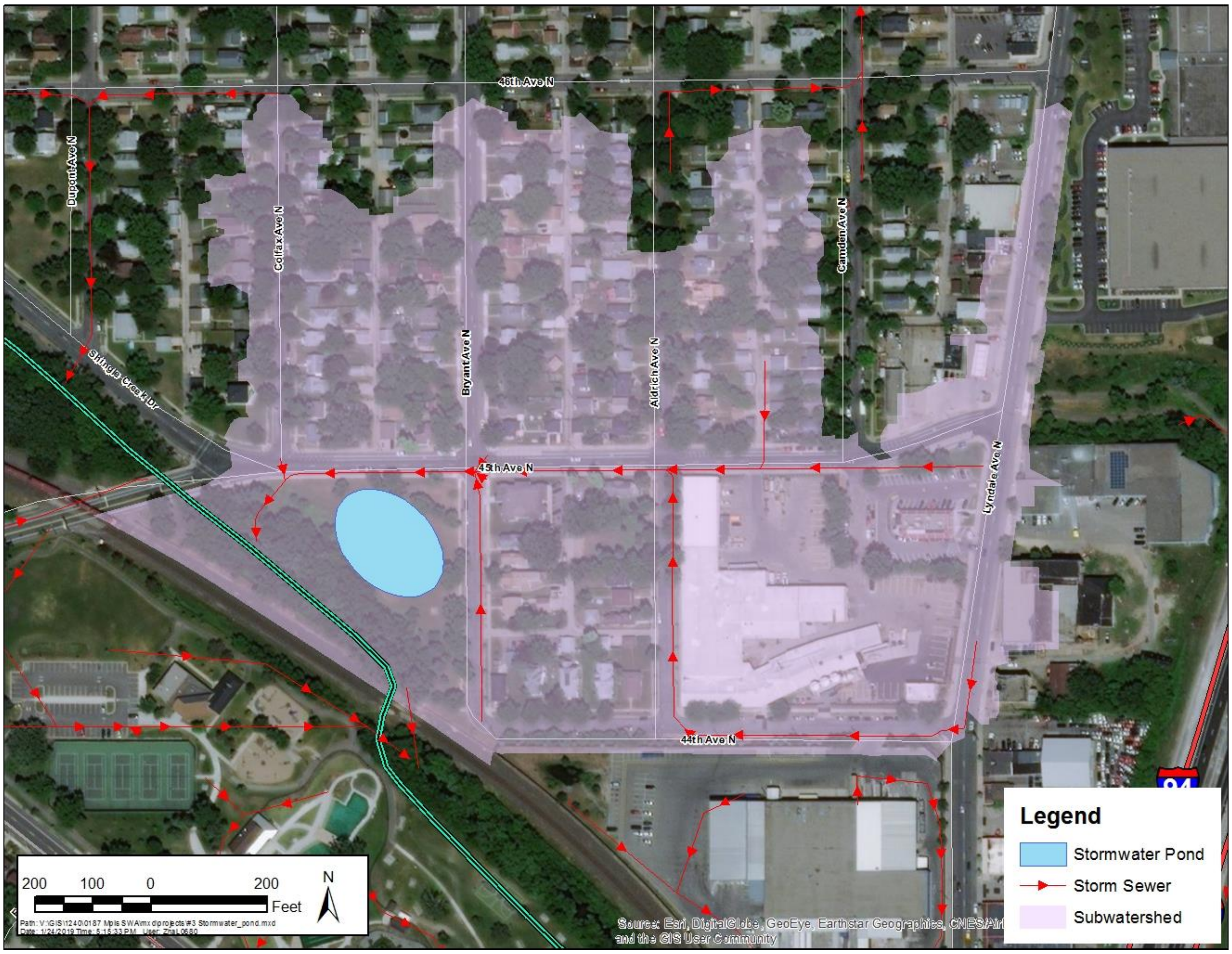

Figure 4-5. 45th Avenue stormwater pond location map.

4.4 44TH AVENUE TREE TRENCHES

Subwatershed 37 is mostly residential, from about Penn Avenue N to about Dupont Avenue N, between 43rd Avenue N and Victory Memorial Drive. Figure 4-6 shows the drainage area and the identified tree trench location. An opportune time to implement the tree trenches is concurrently with the 2020 Webber 44 corridor Hennepin County construction project. Storm sewers from the neighborhoods can be diverted into the tree trench for infiltration and plant uptake.

The same assumptions were used as the 49th Ave tree trench project in section 4.2 above. The total depth of the BMP is assumed to be 4 feet, the void space of the rocks is 40% and engineered soil is 10%. The width is 4 feet throughout the whole length. The total street length marked on the map is 3,145 feet, assuming that tree trenches will be implemented on half of the distance and single side of the street. Given the spacing between trees to be 30 feet, a total of 52 trees were used in the cost estimate. As in section 4.2 above, this report used $4,800 per tree as a base cost estimate.

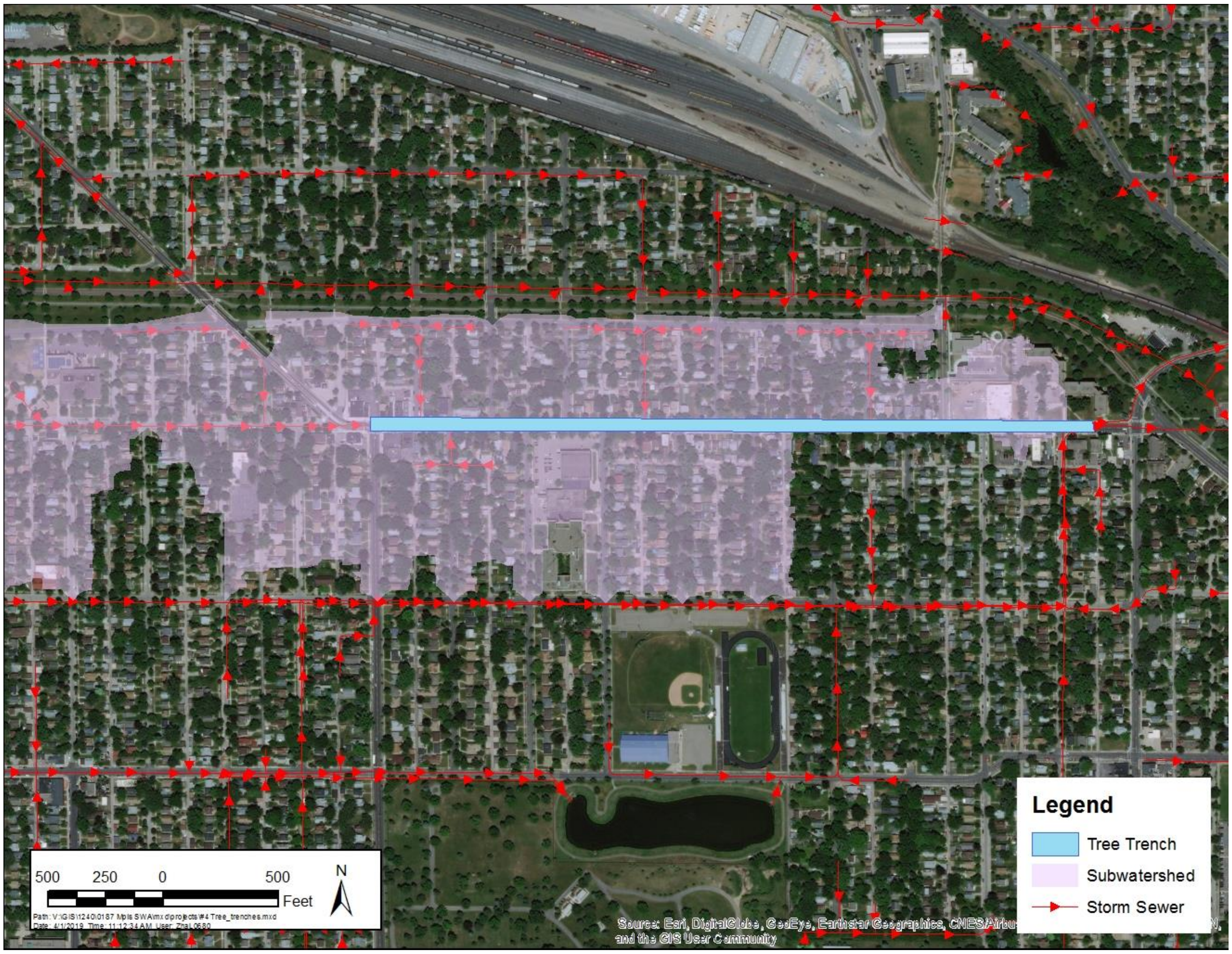

Figure 4-6. 44th Ave tree trench location map.

Table 4-6. Cost benefit of 44th Ave tree trenches.

Drainage Area (ac)	122	
Cost	$374,400	
30-yr Lifecycle Cost	$990,918	
	TSS	TP
Inflow (lbs/yr)	26,197	92
Inflow (lbs/yr/ac)	215	0.8
Load Reduction (lbs/yr)	10,754	16
Removal Efficiency	41%	17%
Cost Benefit ($/lbs)	35	23,547
30-yr Cost Benefit ($/lbs)	3	2,077

4.5 LYNDALE AVENUE STORMWATER POND

Subwatershed 59 is a mix of highway and retail/commercial land use with a small fraction of residential. Figure 4-7 indicates the treatment area and location of the pond. The green space in Webber Park at the corner of Webber Parkway and Lyndale Avenue may be suited for implementation of a stormwater pond. It is sloped (Figures 4-8 and 4-9), but if the slope is too steep, checks can be added to create terraced stormwater ponds. Terraced stormwater ponds maximize the space utilization and are aesthetically pleasing for park area.

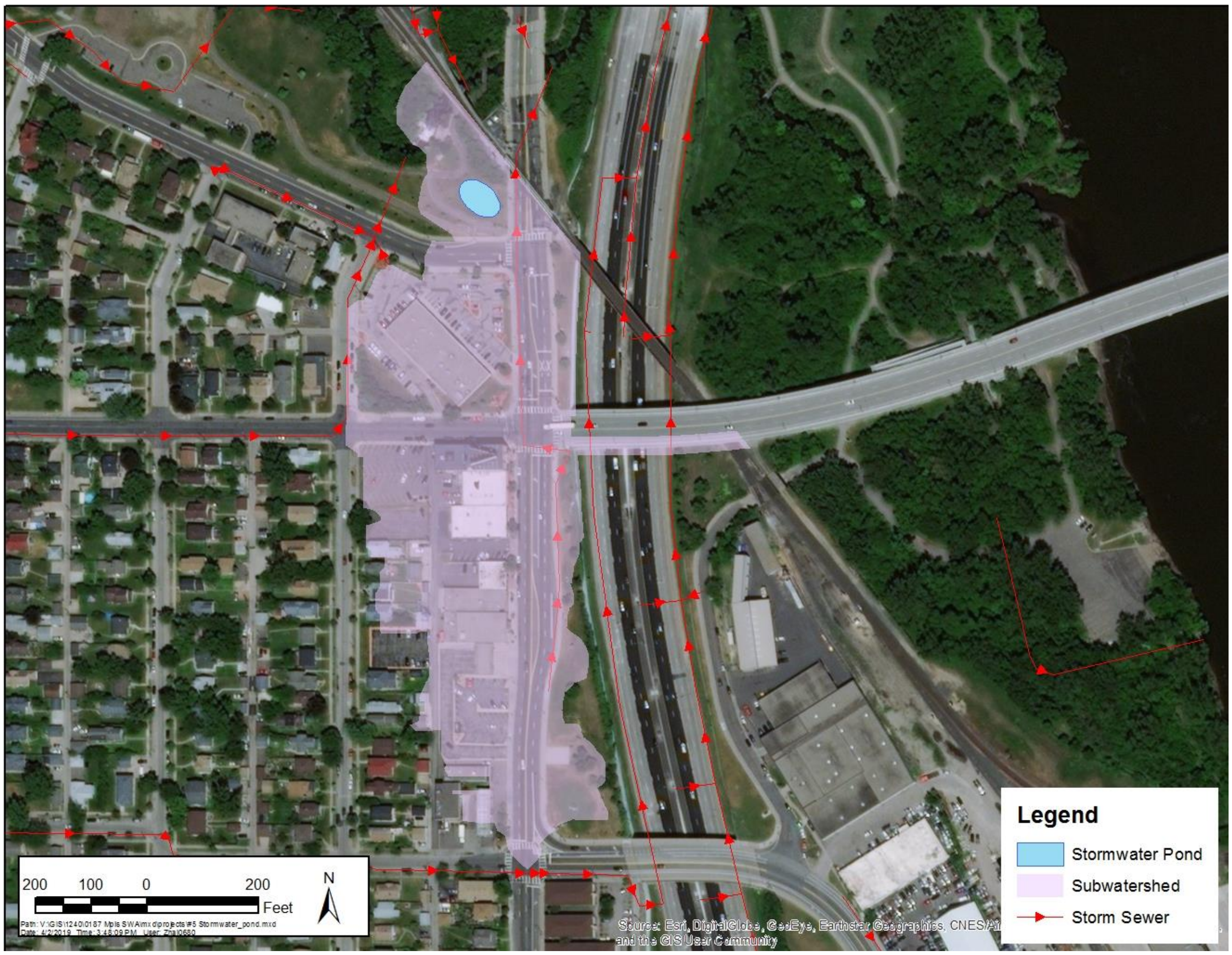

Figure 4-7. Lyndale Ave stormwater pond location map.

Table 4-7. Design parameters for pond used in cost benefit estimations.

Pond Design Parameters	
Surface area	0.081 acre
Dead pool depth	3 feet
Live pool depth	1 foot
Side slope	3:1

Table 4-8. Cost benefit of Lyndale Ave stormwater pond.

Drainage Area (ac)	10	
Cost	$122,976	
30-yr Lifecycle Cost	$325,479	
	TSS	TP
Inflow (lbs/yr)	3,912	13
Inflow (lbs/yr/ac)	408	1.4
Load Reduction (lbs/yr)	2,227	3
Removal Efficiency	57%	25%
Cost Benefit ($/lbs)	55	38,430
30-yr Cost Benefit ($/lbs)	5	3,390

Figure 4-8. Lyndale Avenue pond top of slope.

Figure 4-9. Lyndale Avenue Pond slope.

4.6 WEST WEBBER PARK STORMWATER POND

A potential site for a pond is located on MPRB land at the west end of Webber Park, at the intersection of Webber Parkway and 44th Avenue N. This could provide some treatment for the neighborhood stormwater coming from the area between Victory Memorial Drive and the CP Rail Humboldt Yards. The upcoming Hennepin County Webber 44 project which proposes to reconfigure the intersection would be an ideal time to incorporate treatment. This study evaluated a detention pond, but a bioinfiltration basin may also provide similar treatment using more aesthetically pleasing native plants. A SAFL baffle should be considered to prevent the system being overwhelmed by excessive inflow of TSS.

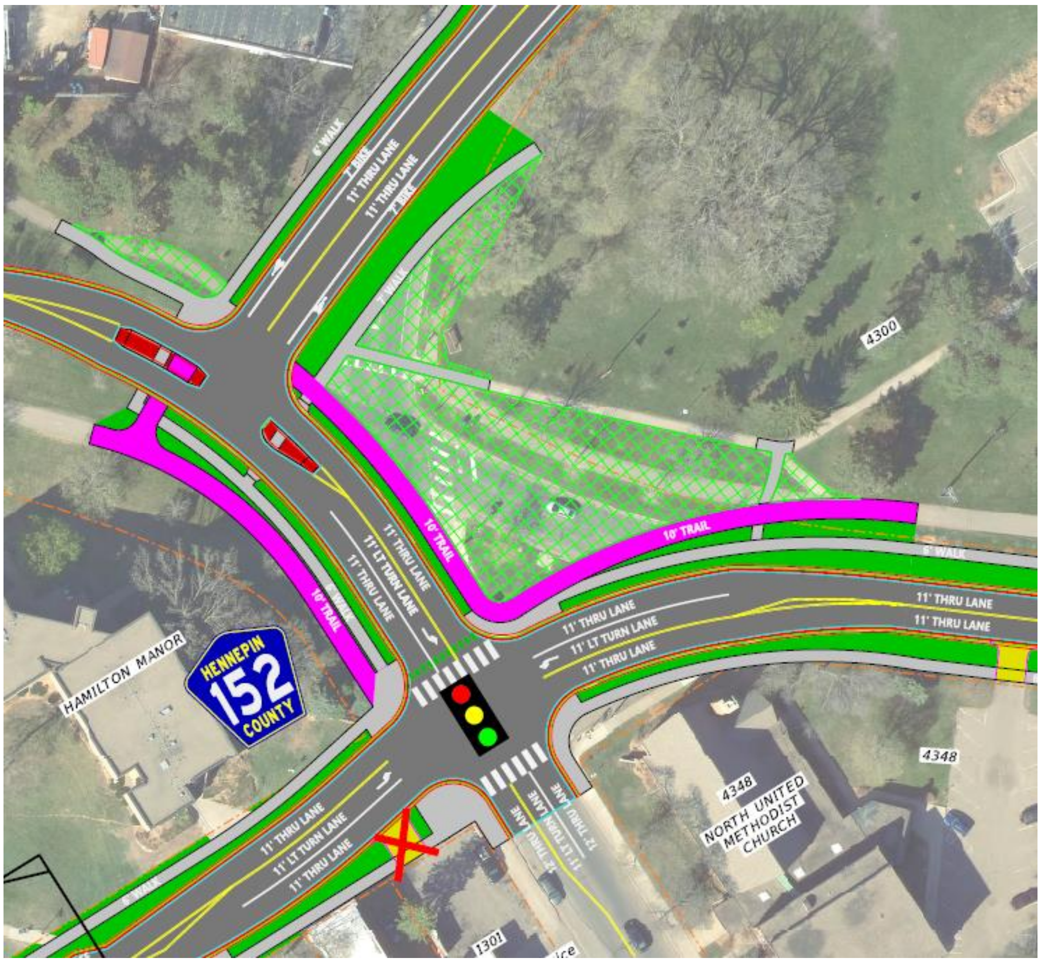

Figure 4-10. Reconfigured Y-intersection will convert pavement to turf.
Source: Hennepin County, Webber 44 project April 2019 layout.

Table 4-9. Design parameters for pond used in cost benefit estimations.

Pond Design Parameters	
Surface area	0.55 acre
Dead pool depth	3 feet
Live pool depth	1 foot
Side slope	3:1

Table 4-10. Cost benefit of west Webber Park stormwater pond..

Drainage Area (ac)	142	
Cost	$150,927	
30-yr Lifecycle Cost	$399,455	
	TSS	TP
Inflow (lbs/yr)	23,447	84
Inflow (lbs/yr/ac)	165	0.6
Load Reduction (lbs/yr)	13,371	21
Removal Efficiency	57%	25%
Cost Benefit ($/lbs)	11	7,187
30-yr Cost Benefit ($/lbs)	1	634

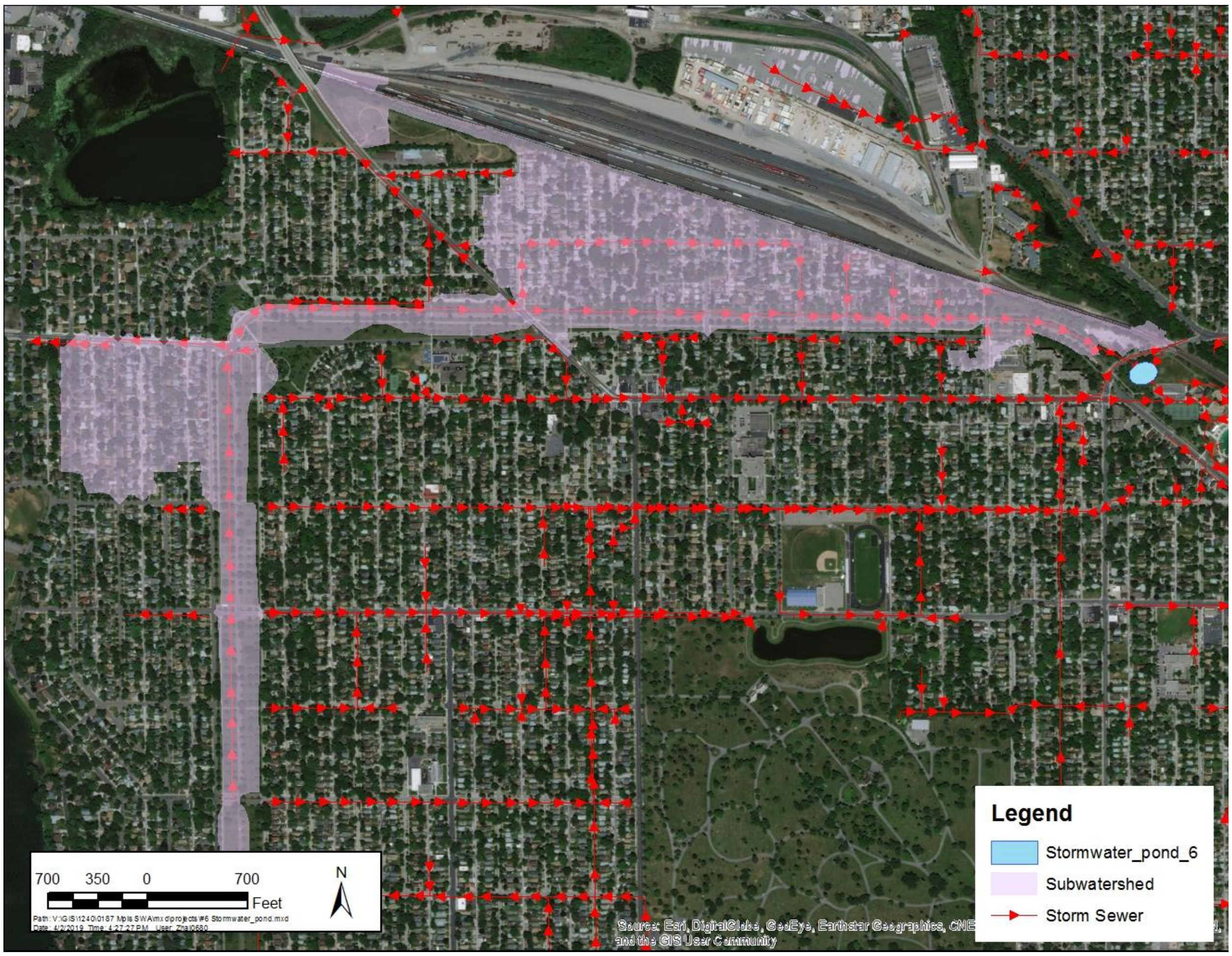

Figure 4-11. West Webber Park stormwater pond location map.

4.7 NEIGHORHOOD RAIN GARDENS

Two general locations with dense residential development (Project #6 and #7) were identified for voluntary neighborhood projects. One of the most common potential neighborhood projects is rain gardens. No specific locations were identified in this report. The cost benefit was provided on a per unit basis. The average property size in the area is

0.15 acres. The assumption was made that the raingarden will treat half of the property area. By measuring on aerial imagery, the average surface area of the raingarden was determined to be 250 square feet. The table below summaries on a per raingarden basis.

Table 4-11. Cost benefit of each raingarden installed.

Drainage Area (ac)	0.075	
Cost	$4,972	
30-yr Lifecycle Cost	$13,159	
	TSS	TP
Inflow (lbs/yr)	15	0.1
Inflow (lbs/yr/ac)	201	1.3
Load Reduction (lbs/yr)	15	0.1
Removal Efficiency	100%	97%
Cost Benefit ($/lbs)	329	49,717
30-yr Cost Benefit ($/lbs)	29	4,386

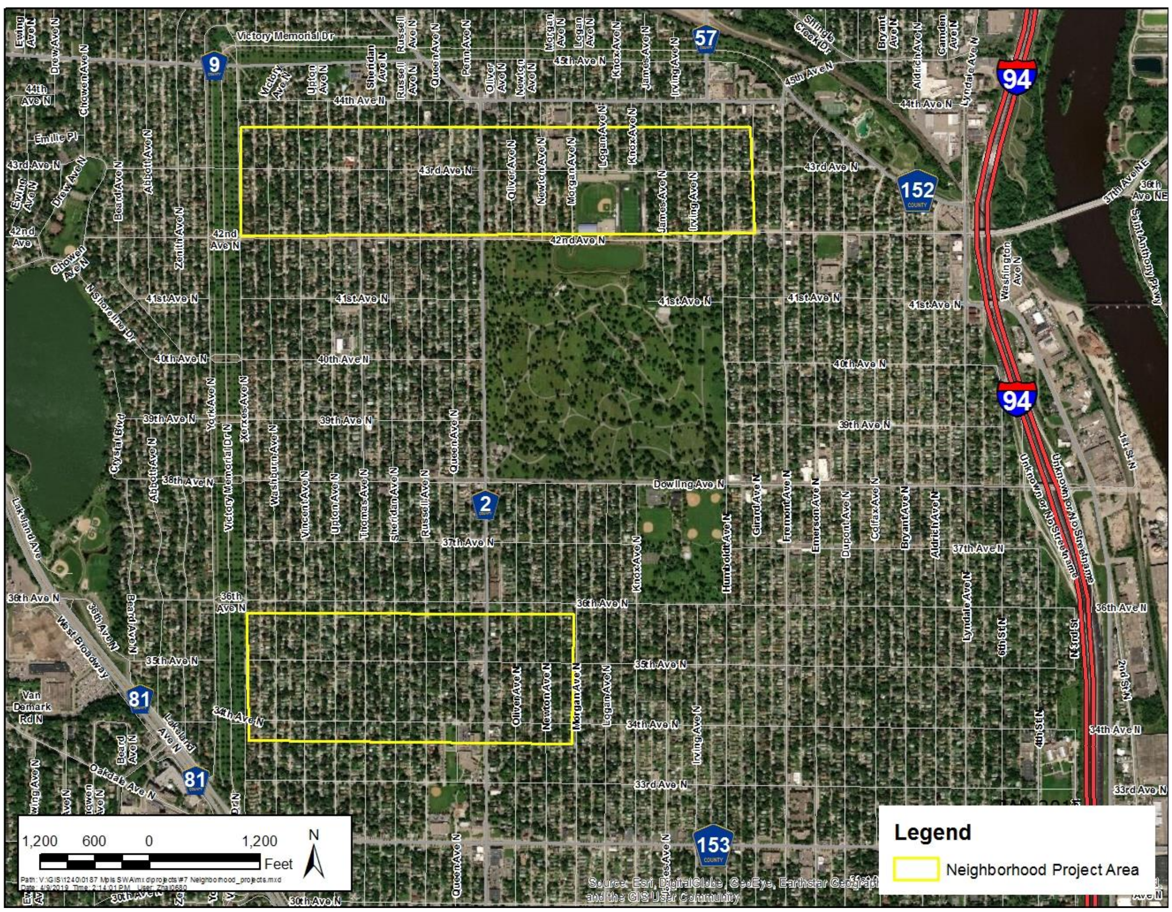

Figure 4-12. Priority neighborhoods for raingarden implementation.

5.0 Conclusion

The identification of the BMPs in the above section targets above average and mostly within the upper 25th percentile of aerial TSS and TP loading subwatersheds. We also considered feasibility, such as whether the project can be incorporated into future city or county road construction work; or, if the project can be placed onto a public owned parcel. The design parameters listed in the report relied heavily on assumptions. Feasibility study and additional analysis is necessary prior to implementation of any BMP proposed.

The City of Minneapolis and Shingle Creek Watershed Management Commission will work with Metro Bloom to provide education and promote neighborhood projects.

Table 5-1. Summary of identified projects, costs, and removals.

Project	Description	Annual Load Reduction (lbs)		Cost		Cost per lb TP	
		TP	TSS	Initial	Lifecycle	Initial	Lifecycle
1	49th Ave Pond/stream Reroute	16	8,374	$987,490	$1,790,231	$60,582	$3,661
2	49th Ave Tree Trenches	15	9,275	331,200	876,582	22,378	1,974
3	45th Ave Pond	12	6,049	183,007	484,361	15,509	1,368
4	44th Ave Tree Trenches	16	10,754	374,400	990,918	23,547	2,077
5	Lyndale Pond	3	2,227	122,976	325,479	38,430	3,390
6	West Webber Pond	21	13,371	150,927	399,455	7,187	634
7	Neighborhood Rain Gardens*	0.1	15	4,972	13,159	49,717	4,386

* Each 250 square foot boulevard rain garden

Appendix A

WENCK

Responsive partner.
Exceptional outcomes.

7

Capture rain water

Capture and clean rain water and recharge groundwater. Plant a rain garden, which collects rain water runoff, lets it soak into the ground, and filters out excess nutrients and other pollutants. Pollinators can benefit, too. You could also install a rain barrel, which captures rainwater from the roof of your house or garage to use in your garden. Or you can redirect downspouts to flow into your yard instead of running off into the street.

8

Replace turf with native plants

Pledge to plant for pollinators and clean water. Trade some of your turf for native plants or choose a turfgrass alternative, which require less mowing and watering. Native plants provide pollinator habitat, are drought resistant, and their deep roots bring rain down into our ground water. Less mowing also improves air quality. Check local ordinances for maintenance requirements.

9

Un-pave the way

Choose pervious paving for walks, patios, and driveways. Paving stones and porous pavement let water soak into the ground, recharging groundwater and keeping runoff out of the street. Next time you have a pavement project, visit our website to explore options.

10

Conserve water

Reduce water use. Water your lawn only when it's needed during dry periods. Water about one inch a week (including rain fall). Water early in the morning to reduce evaporation. Conserve water by sweeping, rather than hosing off, driveways and sidewalks. Install WaterSense fixtures inside and outside and maintain them regularly.

Hennepin County
Environment and Energy

hennepin.us/dropoffs
environment@hennepin.us
612-348-3777

34-406-05-19

West Metro Water Alliance

www.westmetrowateralliance.org

Hennepin

10 things you can do to protect Minnesota's lakes, rivers, and streams

Your streets connect to our lakes and rivers

Hennepin

Photo credit: Dawn Pape

We all play a role in improving water quality in Minnesota

No matter where you live, our choices are powerful because water moves. The raindrops that fall on our streets flow through storm drains that empty directly into our lakes, creeks, rivers, and wetlands. Raindrops pick up chemicals, pollutants, and debris that they touch along the way. Every point in a raindrop's path is an opportunity to improve our water quality.

The 10 actions in this brochure can help our waters immensely. Take on a few of these actions at your home and share them with others. You can also look for volunteer opportunities through your city, watershed organization, or county to have a greater impact on water quality in your community.

Every positive choice and voice helps improve our waterways, wildlife habitats and the beautiful, fun waters where we Minnesotans relax and play.

1

Salt sparingly

Shovel first, minimize salt use, sweep up excess. Just one teaspoon of salt permanently contaminates five gallons of fresh water. Shovel snow first, apply salt only to ice patches, use as little salt as possible, and sweep up leftover salt when ice is gone. Remember: More isn't better, and sodium chloride, the most common deicer, stops working below 15°F.

2

Keep streets clear of leaves and grass clippings

Sweep, rake, mulch or compost. Stormwater runoff carries leaves and grass clippings from streets into lakes and streams, where their nutrients cause destructive algae blooms. Use these nutrients to your benefit. Use them as mulch for weed suppression, or make them into compost to use as fertilizer. This protects water quality—and saves money!

3

Kick the chemicals

Lawn and garden chemicals can harm pollinators and wash into the street's storm drains that connect directly into nearby lakes and streams. Encourage the growth of healthy lawns and gardens. Pull weeds by hand or use spot treatment for weeds. If you have a weed or pest problem, consult the University of Minnesota Extension website for advice. Get a soil test before applying fertilizers. If you apply fertilizer, sweep up excess from pavement. Remember, a need for chemical treatments is an option of last resort.

4

Mow high

Mow your grass to a height of 3 inches. Keeping your grass a little longer helps roots grow deeper into the soil, suppresses weeds, and requires less watering. If you do water, do so in the morning and ensure sprinklers only aim at the grass and the plants.

5

Scoop the poop

Pick up after pets. When pet waste is left behind, rain water washes it into lakes and streams. Pet waste contains bacteria, such as *E. Coli*, that can cause illness in people, pets, and wildlife. Pet waste also contains nutrients that cause destructive algae blooms in lakes and streams.

6

Adopt a storm drain

Keep drains free of leaves, grass clippings, and litter. Water entering a storm drain is carried directly to the nearest water body carrying leaves, grass, soil, litter and anything else it picks up along the way. This clogs stormwater infrastructure, contributes to street flooding, harms wildlife, and pollutes our waters. Remember, nothing but rain down the drain! Learn more and get resources at **www.adopt-a-drain.org**.

Shingle Creek Watershed Management Commission

3235 Fernbrook Lane N • Plymouth, MN 55447
Phone (763) 553-1144 • Fax (763) 553-9326

www.shinglecreek.org

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For Immediate Release
June 19, 2019

Spring 2019 Reports Of Fish Kills, High Water, And Green Algal Surface Mats

Lake users in the Shingle Creek watershed and elsewhere in the Metro Area have noted late spring fish kills and growth of mats of filamentous algae in their lakes. The likely cause of these phenomena is our unusual spring weather this year. This spring started with record-setting snow melt followed by cool, rainy weather. Spring sprang suddenly with warm temperatures and a series of sunny, cloudless days. This unusual weather pattern resulted in a large pulse of nutrients being flushed from the watershed into lakes, followed by a sudden warming of the nutrient-rich waters.

The timing of all this coincided with fish spawning and the early days of submerged aquatic vegetation growth. With vegetation growth not yet fully underway, all those extra nutrients were instead taken up by filamentous algae. This algae has become very abundant on several lakes and floated to the surface. This algal growth also uses up large amounts of oxygen dissolved in the shallow waters. Fish that moved into the lake shallows looking for spawning grounds were then faced with depleted oxygen on top of the stress of spawning. For many fish the conditions were too stressful and they did not survive.

3235 Fernbrook Lane N • Plymouth, MN 55447
Phone (763) 553-1144 • Fax (763) 553-9326

www.shinglecreek.org

Watershed staff have consulted with both the DNR East and West Metro Area Fisheries Supervisors who agreed with this assessment of spring conditions. They also added that it is typical of a natural fish disease (*Columnaris*) to cause added stress in the spring, which may have also contributed to fish kills in many area lakes. Though this year produced the perfect storm of events -- high waters, surface algae mats, and fish kills – this is not expected to have long-lasting effects. There are thousands more fish within the lakes to replenish populations, the submerged vegetation will continue to grow, the surface algae will die back, and the water levels will continue to fall as spring dries out into summer.

# # #