



Stormwater Project Plan for Stormwater Facilities in Areas Tributary to the Mississippi River

Prepared for
City of Inver Grove Heights
City Project 2016-01

February 2016

Stormwater Project Plan for Stormwater Facilities in Areas Tributary to the Mississippi River

February 2016

Contents

Executive Summary.....	ES-1
1.0 Introduction	1
1.1 Project Area and Project Need	1
1.2 Water Quality Modeling.....	4
1.3 Best Management Practices	7
1.3.1 Wet Extended Detention Basin	7
1.3.2 Dry Extended Detention Basin	8
1.3.3 Infiltration Basin	8
1.3.4 Streetside Bioinfiltration Basin (Rainwater Garden).....	8
1.3.5 Iron-enhanced Sand Filter	8
1.3.6 Spent Lime Reactor.....	9
1.4 Maintenance Plan	9
2.0 Skyline Village Subwatershed	10
2.1 Project Area.....	10
2.2 Subprojects	12
2.2.1 78 th and Concord Wet Extended Detention Basin	12
2.2.1.1 Project Location	12
2.2.1.2 Alternatives Considered.....	12
2.2.1.3 Estimated Pollutant Reduction.....	12
2.2.1.4 Estimated Construction Costs	12
2.2.1.5 Estimated Equipment Replacement Costs.....	13
2.2.2 Delano Circle Rainwater Gardens.....	16
2.2.2.1 Project Location	16
2.2.2.2 Alternatives Considered.....	16
2.2.2.3 Estimated Pollutant Reduction.....	16
2.2.2.4 Estimated Construction Costs	16

2.2.2.5	Estimated Equipment Replacement Costs.....	16
3.0	South Grove Subwatershed	18
3.1	Project Area.....	18
3.2	Subprojects	20
3.2.1	Dawn-Concord Dry Extended Detention Basin and Wet Extended Detention Basin	20
3.2.1.1	Project Location	20
3.2.1.2	Alternatives Considered.....	20
3.2.1.3	Estimated Pollutant Reduction.....	20
3.2.1.4	Estimated Construction Costs	21
3.2.2	Dickman Trail Storm Sewer Improvements.....	25
3.2.2.1	Project Location	25
3.2.2.2	Alternatives Considered.....	25
3.2.2.3	Estimated Pollutant Reduction.....	25
3.2.2.4	Estimated Construction Costs	25
3.2.3	River Road Wet Extended Detention Basin.....	28
3.2.3.1	Project Location	28
3.2.3.2	Alternatives Considered.....	28
3.2.3.3	Estimated Pollutant Reduction.....	28
3.2.3.4	Estimated Construction Costs	28
3.2.4	7125 Concord Infiltration Basins	31
3.2.4.1	Project Location	31
3.2.4.2	Alternatives Considered.....	31
3.2.4.3	Estimated Pollutant Reduction.....	31
3.2.4.4	Estimated Construction Costs	31
4.0	Old Village Subwatershed	34
4.1	Project Area.....	34
4.2	Subprojects	36
4.2.1	Dawn Way Rainwater Gardens.....	36
4.2.1.1	Project Location	36
4.2.1.2	Alternatives Considered.....	36
4.2.1.3	Estimated Pollutant Reduction.....	36
4.2.1.4	Estimated Construction Costs	36
4.2.2	64 th Street and Concord Avenue Stormwater Management Basins.....	38
4.2.2.1	Project Location	38

4.2.2.2	Alternatives Considered.....	38
4.2.2.3	Estimated Pollutant Reduction.....	38
4.2.2.4	Estimated Construction Costs	38
4.2.2.5	Estimated Construction Costs	41
4.2.3	65 th Street and Doffing Avenue Wet Extended Detention Basin.....	42
4.2.3.1	Project Location	42
4.2.3.2	Alternatives Considered.....	42
4.2.3.3	Estimated Pollutant Reduction.....	42
4.2.3.4	Estimated Construction Costs	42
4.2.3.5	Estimated Construction Costs	44
4.2.4	Dickman Industrial Park Wet Extended Detention Basins.....	45
4.2.4.1	Project Location	45
4.2.4.2	Alternatives Considered.....	45
4.2.4.3	Estimated Pollutant Reduction.....	45
4.2.4.4	Estimated Construction Costs	45
4.2.4.5	Estimated Construction Costs	48
4.2.5	64 th and Crosby Wet Extended Detention Basin.....	49
4.2.5.1	Project Location	49
4.2.5.2	Alternatives Considered.....	49
4.2.5.3	Estimated Pollutant Reduction.....	49
4.2.5.4	Estimated Construction Costs	49
4.2.5.5	Estimated Construction Costs	51
5.0	Summary	52

List of Tables

Table ES-1. Proposed Stormwater BMP Projects.....	ES-2
Table 1-1. Project Descriptions and Implementation Plan Numbers	3
Table 1-2. Land Use and Impervious Surface Classifications	7
Table 3-1. Dawn-Concord Wet Extended Detention Basin Preliminary Opinion of Cost.....	23
Table 3-2. Dawn-Concord Dry Extended Detention Basin Preliminary Opinion of Cost	24
Table 3-3. Concord-Dickman Ravine Dry Extended Detention Basin Preliminary Opinion of Cost	27
Table 3-4. River Road Wet Extended Detention Basin Preliminary Opinion of Cost.....	30
Table 3-5. 7125 Concord Infiltration Basins Preliminary Opinion of Cost	33
Table 4-1. 64 th and Concord Wet Extended Detention Basin Preliminary Opinion of Cost	41
Table 4-2. 65 th Street and Doffing Wet Extended Detention Basin Preliminary Opinion of Cost	44
Table 4-3. Dickman Industrial Park Wet Extended Detention Basin Preliminary Opinion of Cost.....	48
Table 4-4. 64 th and Crosby Wet Extended Detention Basin Preliminary Opinion of Cost	51
Table 5-1. TSS Removal and Cost Comparison for Evaluated BMPs	53

List of Figures

Figure ES-1. Project Area.....	ES-3
Figure 1-1. Project Area	2
Figure 1-2. SSURGO Hydrologic Soil Group	5
Figure 1-3. Met Council 2010 Land Use	6
Figure 2-1. Skyline Village Subwatershed	11
Figure 2-2. 78 th and Concord Wet Extended Detention Basin Location	14
Figure 2-3. 78 th and Concord Wet Extended Detention Basin Concept Design	15
Figure 2-4. Delano Circle Rainwater Gardens Project Location	17
Figure 3-1. South Grove Subwatershed	19
Figure 3-2. Dawn-Concord Ravine Project Locations	22
Figure 3-3. Dickman Trail Storm Sewer Improvements Project Location	26
Figure 3-4. River Road Wet Extended Detention Basin Project Location	29
Figure 3-5. 7125 Concord Infiltration Basins	32
Figure 4-1. Old Village Subwatershed	35
Figure 4-2. Dawn Way Rainwater Gardens Project Location	37
Figure 4-3. 64 th and Concord Wet Extended Detention Basin Project Location	39
Figure 4-4. Heritage Park Concept Plan.....	40
Figure 4-5. 65 th and Doffing Wet Extended Detention Basin Project Location	43
Figure 4-6. Dickman Industrial Park Wet Extended Detention Basins Project Location	46
Figure 4-7. Dickman Industrial Park Preliminary Concept Plan	47
Figure 4-8. 64 th and Crosby Wet Extended Detention Basins Project Location	50

List of Appendices, Attachments, or Exhibits

Appendix A. Table 5.1 from the *City of Inver Grove Heights Third Generation Water Resources Management Plan*

Attachment A. *City of Inver Grove Heights Pollutant Load Analyses: South Grove Subwatershed, Skyline Village Subwatershed, Old Village Subwatershed*

Attachment B. *City of Inver Grove Heights Third Generation Water Resources Management Plan*

Certifications

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

Karen L. Chandler

Karen Chandler PE #: 19252

February 3, 2016

Date

Executive Summary

The portion of the Mississippi River that borders the City of Inver Grove Heights (City) is currently listed on the Minnesota Pollution Control Agency's (MPCA's) 2014 Impaired Waters List for turbidity—a measure of the water's cloudiness. High turbidity is caused by excessive concentrations of suspended solid particles in the water. One contributor to turbidity is discharge from municipal separate storm sewer systems (MS4).

The Clean Water Act of 1972 outlines a comprehensive process for assessing water quality impairments, known as the Total Maximum Daily Load (TMDL) process. In this process, surface waters identified as impaired (exceeding state standards for certain pollutants), are subject to a TMDL study. The goal of the study is to determine the maximum loads of point and nonpoint sources of pollution that can be allowed to enter a water body without exceeding water quality standards.

The City's MS4 system, which discharges to the Mississippi River, has been identified in the MPCA's *South Metro Mississippi River Total Suspended Solids Total Maximum Load* draft report as a source of pollution, contributing to turbidity. The report also assigns a corresponding wasteload allocation (WLA) to the City of 154 pounds of TSS per acre. If the TMDL study is approved by the U.S. Environmental Protection Agency, the City must meet that standard.

The assignment of a WLA by an approved TMDL would make the City eligible for funding to implement and construct stormwater best management practices (BMPs) that would reduce the amount of TSS discharged through the storm sewers into the Mississippi River. Two State of Minnesota (State) sources of funding are:

- The Intended Use Plan (IUP), which provides low-interest loans for managing stormwater.
- The Point Source Implementation Grant (PSIG) program, which provides up to 50 percent grant funding for stormwater projects necessary to meet WLA requirements.

To qualify for these programs, the City's engineer submitted an application for placement on the State's project priority list (PPL). The March 2015 application included a number of projects in the City's *Third Generation Water Resources Management Plan* (3rd Gen WRMP, December 2014). The City has been placed on the 2016 PPL, which totals 293 projects prioritized by an application scoring system. The City's application ranks 155th overall (fourth among stormwater project applicants). Once on the list, projects remain eligible to receive funding for a 5-year period.

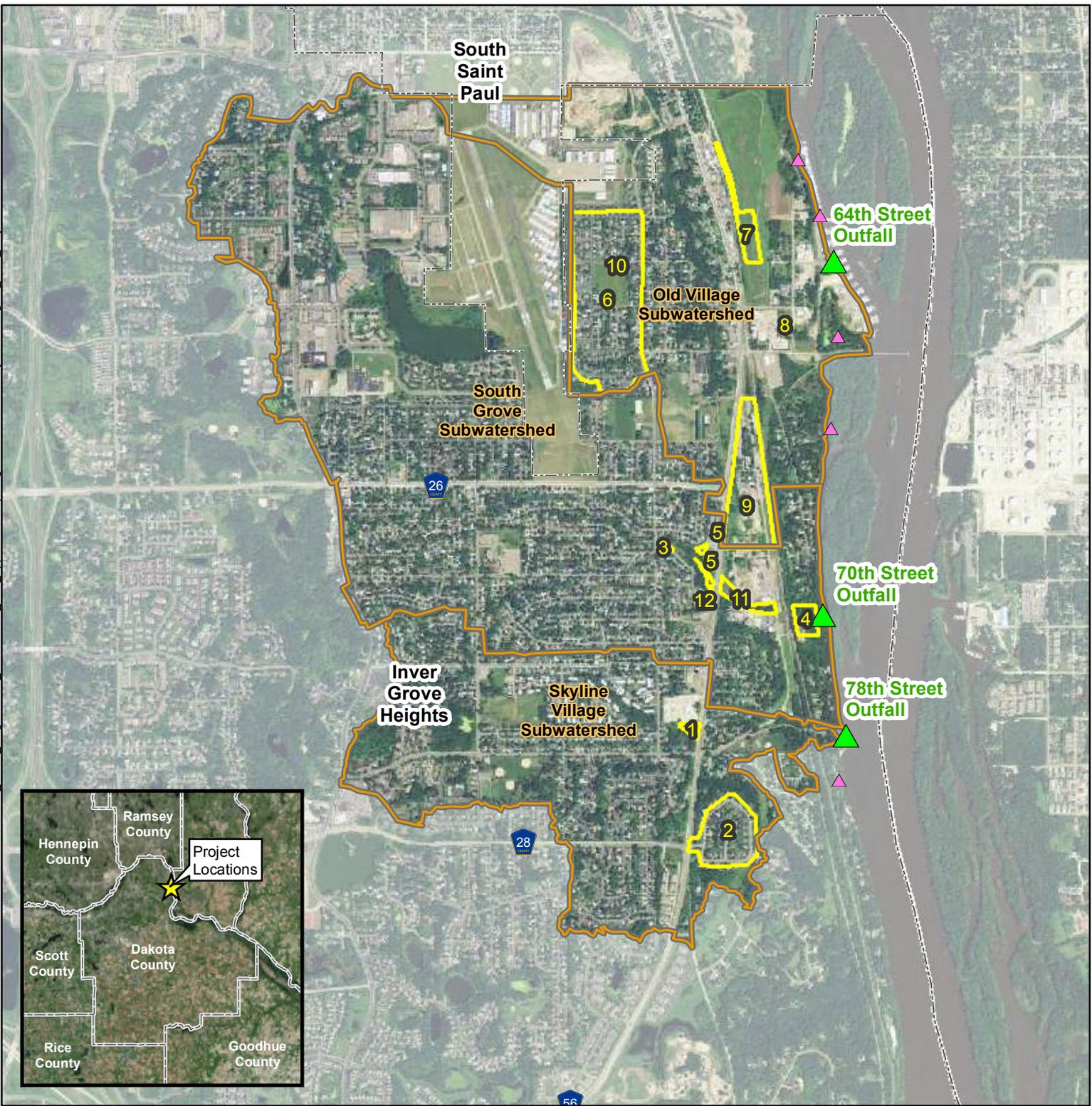
The City's next step toward receiving IUP or PSIG funding is to adopt a Stormwater Project Plan by resolution of the City Council and submit it to the MPCA. The plan, presented in this report, describes the proposed project in more detail, including the project area and need, estimated costs, and benefits. To apply for IUP funding, federal regulations require the City to submit supplementary information, including an Environmental Informational Worksheet (EIW). A draft EIW has been prepared in the event that the City desires to apply for IUP loans.

This Stormwater Project Plan describes 12 potential stormwater BMP projects within the City. These proposed BMPs are listed as “subprojects,” and would be completed over a 5-year period, assuming that appropriate match funding is available. The proposed subprojects are located within subwatersheds that drain to Mississippi River outfalls; if constructed, they will reduce the stormwater runoff volume, pollutant loads, and peak discharge rates of the outfalls to the river. Table ES-1 lists the proposed projects and cross references them to Table 5-1 of the City’s 3rd Gen WRMP. Figure ES-1 shows the project area, including the City’s subwatersheds and the Mississippi River outfalls.

Table ES-1. Proposed Stormwater BMP Projects

Project Number	Project Name	Item Number in 3 rd Gen WRMP	TP Reduction (lbs/yr)	TSS Reduction (lbs/yr)	Estimated Construction Cost (1) (\$)
1	78 th and Concord Wet Extended Detention Basin	53	9	3,400	\$ 400,000
2	Delano Circle Rainwater Gardens	56	2	850	\$ 27,600
3	Dawn-Concord Ravine Wet Extended Detention Basin	55	10	7,050	\$ 250,000
4	River Road Wet Extended Detention Basin	39	50	36,300	\$ 900,000
5	7125 Concord Infiltration Basins	56	5	1,570	\$ 160,000
6	Dawn Way Rainwater Gardens	56	7	2,820	\$ 92,000
7	64 th and Concord Wet Extended Detention Basins	39, 54	17	10,500	\$ 380,000
8	65 th and Doffing Wet Extended Detention Basin	54	6	3,500	\$ 140,000
9	Dickman Industrial Park Wet Extended Detention Basins	52	17	8,300	\$ 240,000
10	64 th and Crosby Wet Extended Detention Basin	56	5	1,500	\$ 200,000 (2)
11	Dickman Trail Storm Sewer Improvements	55	< 1	120	\$ 210,000
12	Dawn-Concord Ravine Dry Extended Detention Basin	55	< 1	120	\$ 220,000

(1) Cost estimates do not include potential cost of contaminated soils or shallow bedrock that may be encountered at site.
(2) Construction cost will be shared between the City and the site’s developer. The amount listed represents only the City’s portion of the cost.



Outfall Discharge Location

-  Major Outfall
-  Minor Outfall
-  Proposed Project Locations
-  Subwatersheds
-  Municipal Boundary
-  County Boundaries



1 inch = 2000 feet

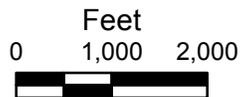


FIGURE ES-1

PROJECT AREA
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

1.0 Introduction

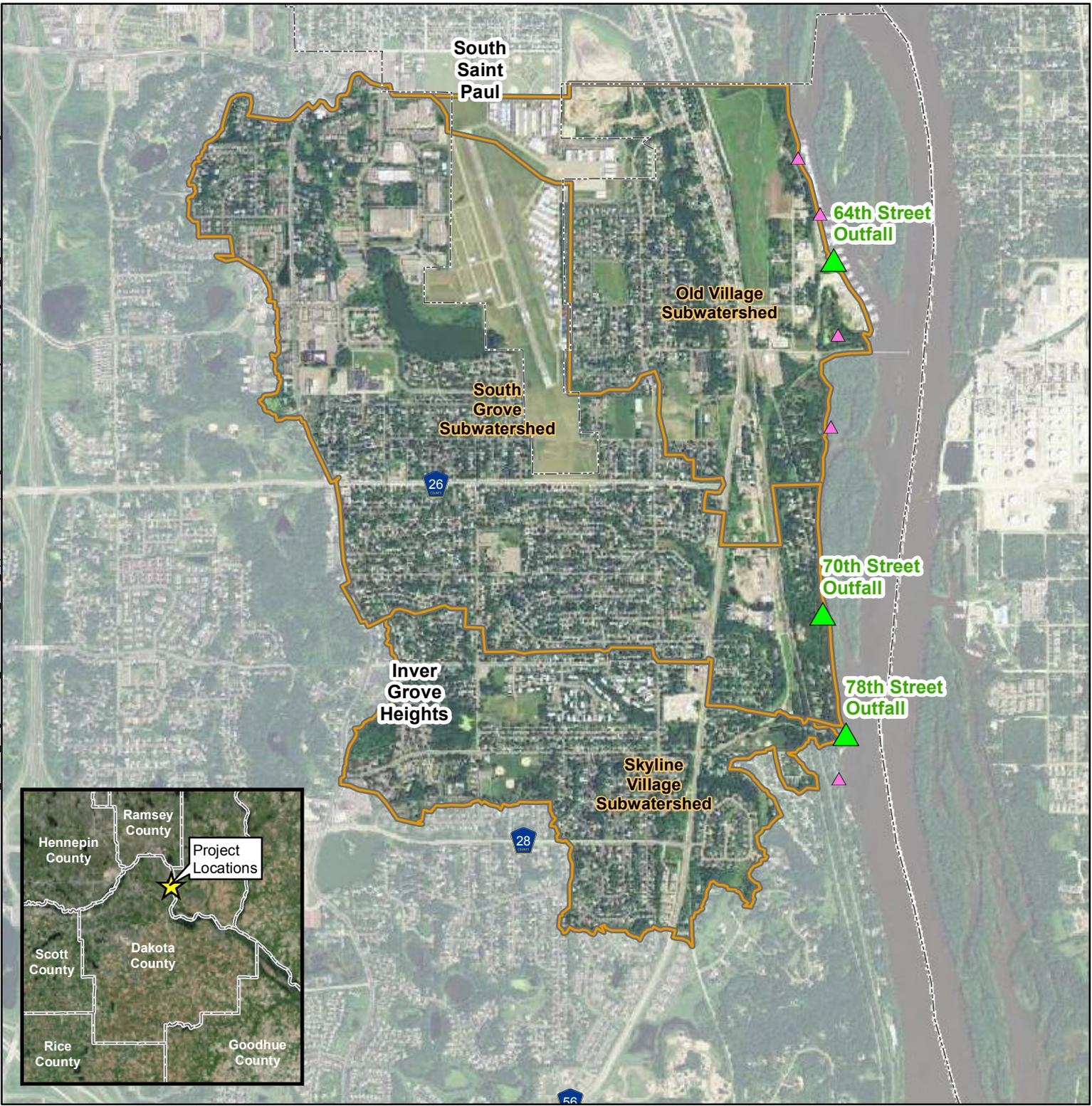
1.1 Project Area and Project Need

The proposed projects described in this study are located within the City's Old Village, South Grove, and Skyline Village subwatersheds (Figure 1-1). These subwatersheds encompass approximately 1,950 acres of mostly-developed land that drain to the Mississippi River. The Mississippi River, from river mile 844 at St. Paul to river mile 780 in upper Lake Pepin, is currently listed on the Minnesota Pollution Control Agency's (MPCA's) 2014 Impaired Waters List for turbidity. Consequently, the City is included as a Regulated MS4 for the *South Metro Mississippi River Total Suspended Solids Total Maximum Daily Load* (draft, 2012). The draft TMDL report specifies a target TSS load of 154 pounds per acre per year for MS4s that are in a watershed subject to a reduction. The EPA is currently reviewing this draft TMDL report, and the City anticipates EPA approval in early 2016. It is anticipated that the city will receive its Waste Load Allocation (WLA) in 2016.

At the request of the City, the Dakota County Soil and Water Conservation District (SWCD) completed the *City of Inver Grove Heights Pollutant Load Analyses* report for the Old Village, South Grove, and Skyline Village subwatersheds (2011). These subwatersheds were selected for analysis because they contained urbanized areas that were developed prior to stormwater treatment requirements and discharged largely-untreated runoff to the Mississippi River under their current conditions. The SWCD estimated each subwatershed's current pollutant loads and evaluated potential locations for retrofit BMPs.

The SWCD's report showed that the overall estimated annual load per acre for volume, total suspended solids (TSS) and total phosphorus (TP) were similar between the three subwatersheds, and the estimated subcatchment loads within each subwatershed were also comparable due to the fairly uniform distribution of land uses and soil hydrologic groups. The report showed that water quality could be improved if stormwater retrofits were installed to reduce pollutant loads, and recommended five BMPs in subcatchments where the City indicated match funding would be available to secure potential future cost share grants. Three of the BMPs – a bio-retention cell in the South Grove subwatershed at 69th Street and Craig Court, street-side rainwater gardens in the South Grove subwatershed, and street-side rainwater gardens in the Skyline Village subwatershed – have since been constructed.

On March 5, 2015, City staff and Minnesota Department of Natural Resources (MDNR) staff met with representatives from the "Friends of Pool Two" (FPT) organization at the MDNR offices in Saint Paul, to hear concerns that the FPT had regarding the amount of sediment that entered the Mississippi River at the outfalls within the City. City staff presented several potential stormwater BMP projects within the Old Village, South Grove, and Skyline Village watersheds, and the FPT in turn suggested additional BMP projects to treat stormwater before it is discharged into the Mississippi River. FPT supported all projects presented in this report to reduce the sediment load to the river. FPT suggested that projects which reduce sediment plumes from the outfall from Dickman Trail were a high priority. FPT also suggested a channel improvement project in the Mississippi River near the outfall from Dickman Trail; however, that project is outside the City's jurisdiction and is not included in this Report. The United States Army Corps of Engineers and MDNR have jurisdiction within the waters of the state.



Outfall Discharge Location

-  Major Outfall
-  Minor Outfall
-  Subwatersheds
-  Municipal Boundary
-  County Boundaries



1 inch = 2000 feet

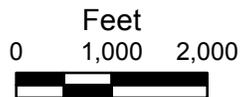


FIGURE 1-1

PROJECT AREA
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

The potential projects evaluated in this study include the remaining two projects recommended by the SWCD's pollutant load analysis and several additional projects, including projects that the City considers to be high priority and has targeted for implementation in its *Third Generation Water Resources Management Plan* (3rd Gen WRMP, December, 2014).

Table 1-1. Project Descriptions and Implementation Plan Numbers

Stormwater Project Plan Number	Project Name	Item Number from 3rd Gen WRMP	Subwatershed
1	78 th and Concord Wet Extended Detention Basin	53	Skyline Village
2	Delano Circle Rainwater Gardens	56	Skyline Village
3	Dawn-Concord Ravine Wet Extended Detention Basin	55	South Grove
4	River Road Wet Extended Detention Basin	39	South Grove
5	7125 Concord Infiltration Basins	56	South Grove
6	Dawn Way Rainwater Gardens	56	Old Village
7	64 th and Concord Wet Extended Detention Basins	39, 54	Old Village
8	65 th and Doffing Wet Extended Detention Basin	54	Old Village
9	Dickman Industrial Park Wet Extended Detention Basins	52	Old Village
10	64 th and Crosby Wet Extended Detention Basin	56	Old Village
11	Dickman Trail Storm Sewer Improvements	55	South Grove
12	Dawn-Concord Ravine Dry Extended Detention Basin	55	South Grove

These projects will help to meet three important goals listed in the 3rd Gen WRMP:

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

2. Improve the quality of stormwater runoff reaching the Mississippi River by reducing nonpoint source pollution (including sediment) carried as stormwater runoff.
3. Reduce volumes of stormwater runoff and the amount of impervious surfaces in the developed parts of the City.

The 3rd Gen WRMP and the *Pollutant Load Analyses for the South Grove, Skyline Village, and Old Village subwatersheds* report are included on a CD attached to this study.

1.2 Water Quality Modeling

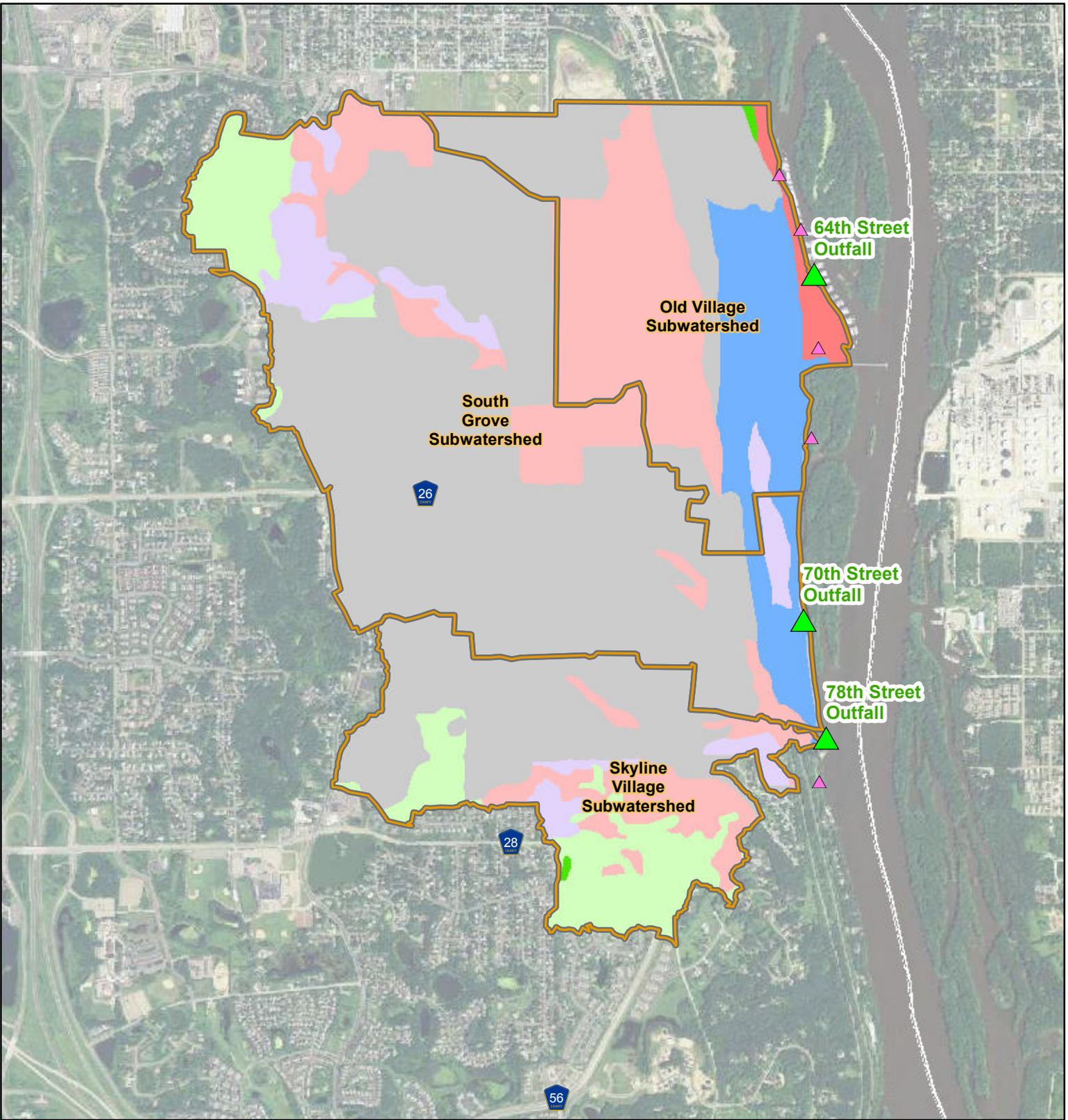
The P8 water quality modeling software program was used to estimate existing pollutant loads for the project area. Hydrologic inputs for the P8 model include hydrologic soil group (HSG), impervious surface percentage, temperature, and rainfall. Hydraulic inputs included stage-storage curves for surface water storage areas and pipe diameter information for pond outlets.

HSG parameters were calculated from the statewide Soil Survey Geographic database (SSURGO) using ArcGIS (Figure 1-2). Large portions of the study area are classified as "Urban land-Chetek complex, 1 to 15 percent slopes", which has no HSG designation. This soil class was assumed to be HSG B for the P8 model, similar to the "Chetek sandy loam, 3 to 8 percent slopes" soil class.

Impervious surface percentages were calculated from the Metropolitan Council 2010 land use dataset using ArcGIS (Figure 1-3). Total impervious and directly connected impervious percentages for each land use were assigned based on relationships developed for previous modeling projects. Land use categories and their corresponding impervious percentages are shown in Table 1-2.

Hourly rainfall depths and daily high and low temperatures were obtained for the National Weather Service monitoring station at the Minneapolis-St. Paul Airport. The time period from January 1, 2001 through December 31, 2010 was used for the existing conditions and proposed conditions simulations, corresponding to the most recent ten years included in the current 30-year climate normals.

Stage-storage curves were calculated using the most-current Dakota County LiDAR dataset. Pond outlet pipe diameters were obtained from City storm sewer data where they were available, and estimated where they were not available.



Outfall Discharge Location

-  Major Outfall
-  Minor Outfall
-  Subwatersheds
- Hydrologic Group**
-  A

-  A/D
-  Unclassified (Assumed B)
-  B
-  C
-  C/D
-  D
-  County Boundaries



1 inch = 2,000 feet

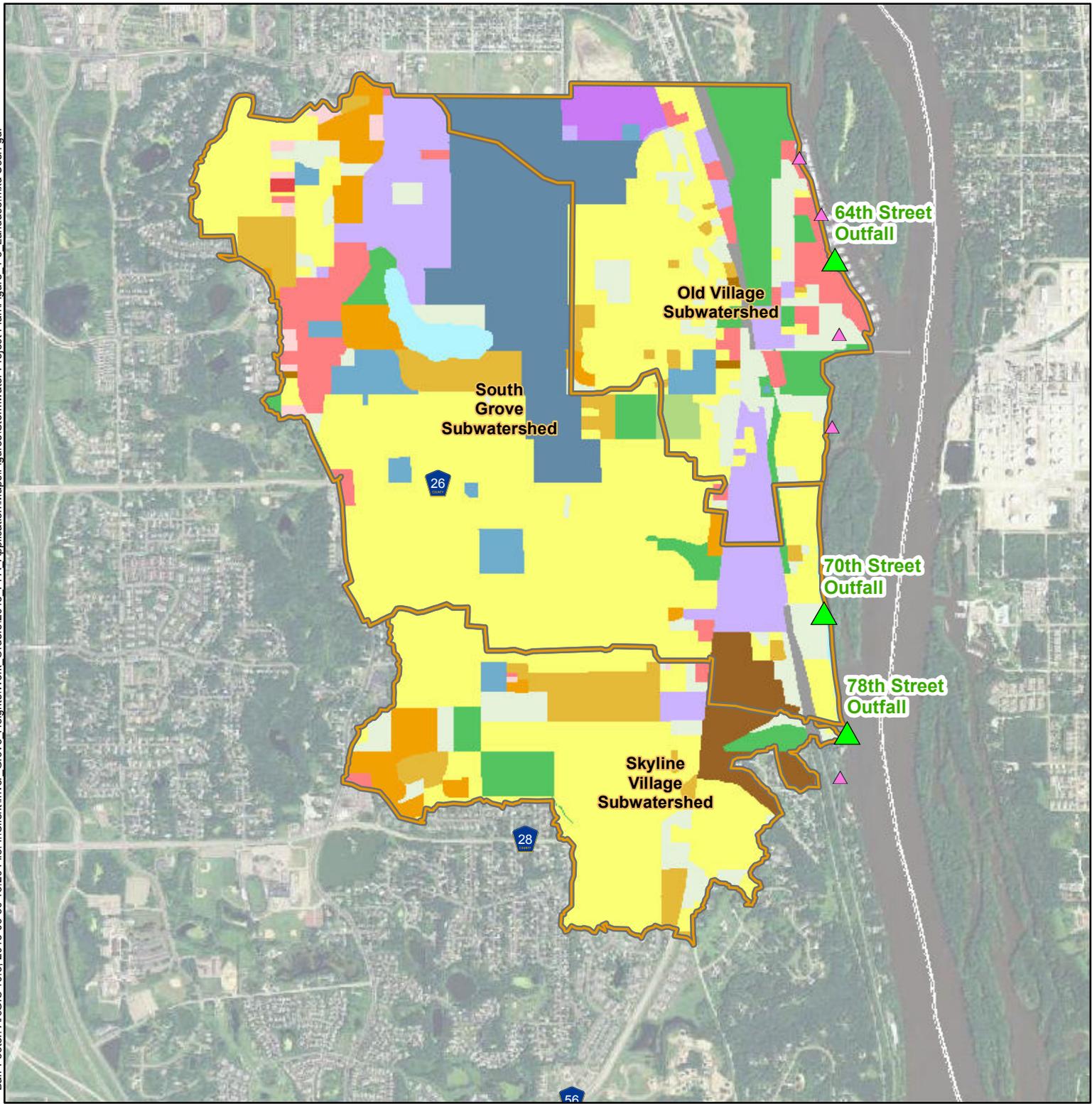
Feet

0 1,000 2,000




FIGURE 1-2

**SSURGO HYDROLOGIC
SOIL GROUP**
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN



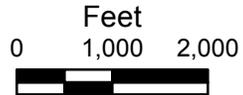
- | | | | |
|--|--|--|---|
|  Single Family Detached |  Mixed Use Residential |  Park, Recreational or Preserve |  Major Outfall |
|  Manufactured Housing Park |  Mixed Use Commercial and Other |  Railway |  Minor Outfall |
|  Single Family Attached |  Industrial and Utility |  Airport |  Subwatersheds |
|  Multifamily |  Extractive |  Agricultural | |
|  Office |  Institutional |  Undeveloped | |
|  Retail and Other Commercial | |  Water | |



FIGURE 1-3



1 inch = 2000 feet



MET COUNCIL 2010 LAND USE
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

Table 1-2. Land Use and Impervious Surface Classifications

Description	Total Impervious Percentage (%)	Directly Connected Impervious Percentage (%)
Extractive	2	0
Park, Recreational, or Preserve	2	0
Undeveloped	2	0
Agricultural	5	0
Single Family Attached	25	16
Single Family Detached	25	16
Manufactured Housing Parks	38	30
Institutional	40	35
Airport	50	35
Railway	65	45
Industrial and Utility	72	70
Office	72	70
Mixed Use Residential	75	65
Multifamily	75	65
Mixed Use Commercial	85	80
Retail and Other Commercial	85	80
Open Water	100	0

1.3 Best Management Practices

1.3.1 Wet Extended Detention Basin

Wet extended detention basins (sometimes called “NURP ponds” when designed to the standards outlined by the Nationwide Urban Runoff Program) are impoundments that have a permanent pool of water and also have the capacity to hold runoff and release it at lower discharge rates than the incoming flows. Wet extended detention basins treat stormwater runoff by trapping suspended solids and any of the pollutants associated with the sediment (e.g. heavy metals, nutrients, hydrocarbons). They have also been credited with reducing the amount of bacteria and oxygen-demanding substances as runoff flows through the pond. When properly designed, they can remove 80 to 95 percent of total suspended solids

and 40 to 60 percent of total phosphorus (MPCA, 1989). While quite effective in removing sediment and associated phosphorus, water quality treatment ponds do not remove dissolved phosphorus.

1.3.2 Dry Extended Detention Basin

Dry extended detention basins are constructed basins that provide temporary storage for stormwater runoff but have no permanent pool. They provide runoff rate control, reducing impacts on storm sewer infrastructure, but do not reduce suspended sediment concentrations due to the tendency of subsequent runoff events to re-suspend trapped sediment.

1.3.3 Infiltration Basin

Infiltration basins capture and temporarily store stormwater before allowing it to infiltrate into the soil. They can be designed as a BMP at the upstream end of a subwatershed so that excess volume is routed into downstream storm sewer infrastructure or as an off-line BMP where the water quality volume is diverted from storm sewers to the basin. Infiltration basins function as water quality BMPs by filtering water through the soil before it reaches groundwater or adjoining surface water, and as water quantity BMPs by removing volume from surface runoff. Infiltration basins are effective BMPs for removing dissolved phosphorus.

1.3.4 Streetside Bioinfiltration Basin (Rainwater Garden)

Rainwater gardens are bio-retention BMPs that are a form of infiltration basin. They collect stormwater runoff from nearby impervious areas and store it in a shallow, vegetated depression where it can be taken up by the vegetation or infiltrated through the soil. Rainwater gardens can be designed to redirect excess volume to the storm sewer through an overflow outlet or simply allow it to flow past the rainwater garden to existing catch-basins. Where soils have fast infiltration rates (hydrologic group A and B soils) rainwater gardens reduce the volume of stormwater runoff through infiltration as well as reducing the concentration of pollutants such as TSS and TP, including dissolved phosphorus. Where soils have limited infiltration capacity (hydrologic group C and D soils), the rainwater garden can be equipped with an underdrain system that allows the rainwater garden to filter runoff through the soil, removing particulates before returning the treated water to the storm sewer system.

1.3.5 Iron-enhanced Sand Filter

Iron-enhanced sand filters are filtration BMPs that incorporate filtration media mixed with iron. The sand removes particulates such as TSS from stormwater while the iron removes several dissolved constituents, including phosphate. The iron must remain in an oxidized state for optimal performance; therefore, iron-enhanced sand filters must be installed where the water passing through them is oxygenated and must be allowed to dry out regularly. Iron-enhanced sand filters can be incorporated into other BMPs to improve their pollutant removal. For example, a filtration bench can be incorporated into the banks of a wet extended detention basin to treat a portion of the basin's live storage volume.

1.3.6 Spent Lime Reactor

Spent lime reactors are BMPs that remove phosphate from stormwater through binding to calcium carbonate, a cheaply-obtained byproduct of the drinking water treatment process. Because only a short contact time (5 to 10 minutes) is required for the chemical reaction to bind phosphorus to the calcium in lime, a relatively small BMP footprint can be used to treat a significant flow-rate and volume of water. Additionally, the spent-lime material has a significant phosphorus binding capacity and an estimated hypothetical lifespan of 100+ years (unconfirmed as yet by field testing).

1.4 Maintenance Plan

The City is responsible for maintaining its stormwater system as described in its NPDES Phase II MS4 permit SWPPP. Activities include regular inspection of the City's structural pollution control devices (SPCD) and inspecting all outfalls, sediment basins, and ponds every five years. Annually, all pond, outfall, and SPCD inspections records are reviewed to determine if maintenance, repair, or replacement is needed. Additional details regarding the City's stormwater system maintenance plan can be found in Table 5.1 and Appendix B of the City's 3rd Gen WRMP (attached).

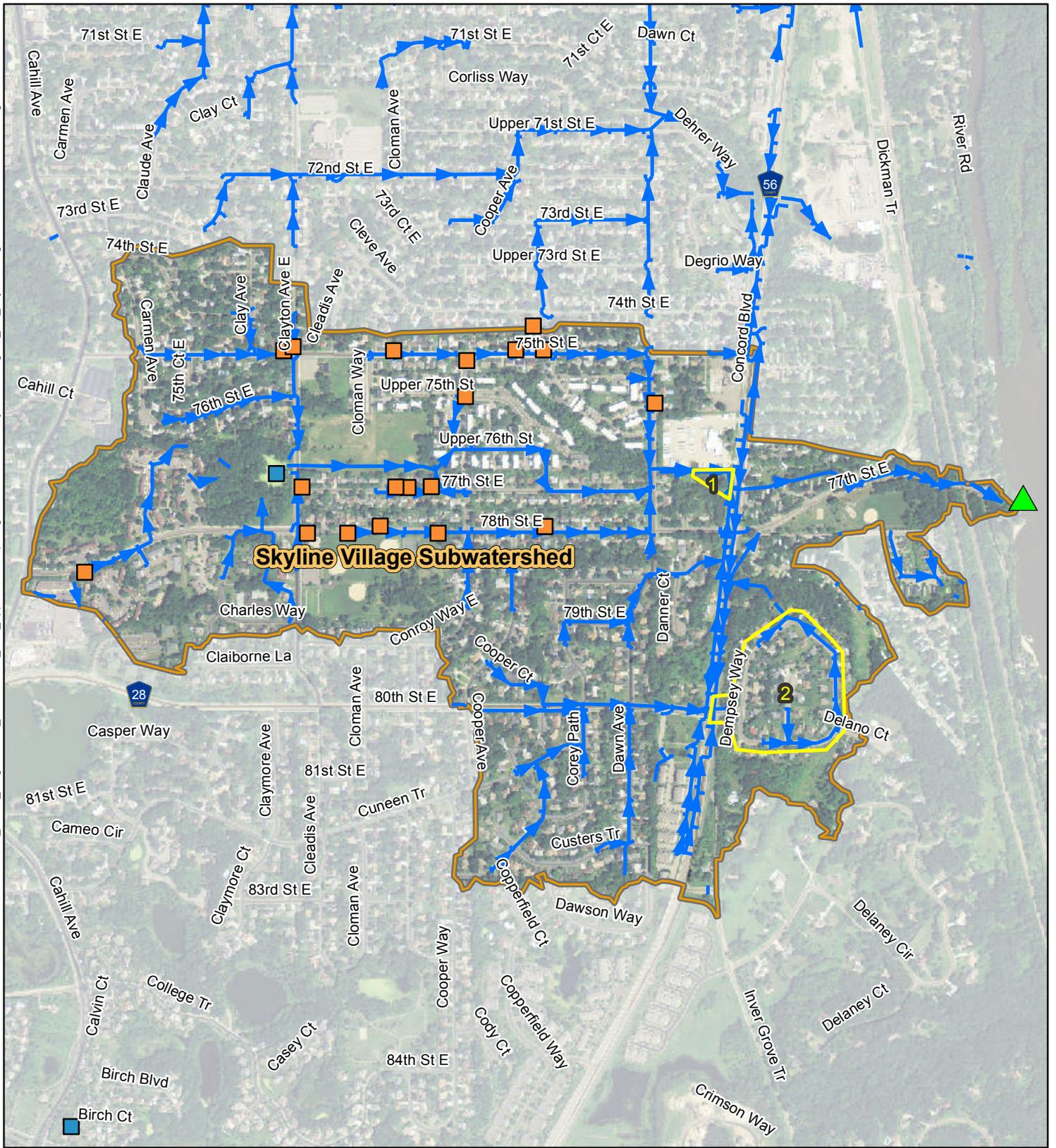
Iron-enhanced sand filters would be inspected on an annual basis to verify that inlets and outlets are functioning correctly. The filtration media would be replaced as needed when it has reached its useful life as determined by testing. Spent lime reactors would be inspected annually to verify that inlets and outlets are functioning correctly. The spent-lime media would be mixed annually to maintain its porosity and hydraulic conductivity, and additional spent-lime media would be added as needed to maintain the design depth and contact time.

2.0 Skyline Village Subwatershed

2.1 Project Area

The Skyline Village subwatershed encompasses approximately 430 acres of mostly-developed land. Stormwater runoff from the portion of the Skyline Village subwatershed west of Concord Boulevard is collected by storm sewer laterals that feed into a single trunk line at Dawn Avenue, which then passes under Concord Boulevard and conveys flow eastward to the 77th Street outfall at the Mississippi River (Figure 2-1). Land use in the Skyline Village subwatershed is primarily single-family residential with some parkland and multi-family residential land use. Existing stormwater treatment facilities include a regional pond located just west of Clayton Avenue that provides stormwater treatment for approximately 112 acres in the upper portion of the subwatershed, and a number of street-side rainwater gardens that were constructed with assistance from the City during recent street reconstruction and resurfacing projects (Figure 2-1). Stormwater runoff to the storm sewer system from the subwatershed area east of the Clayton Avenue pond is largely untreated and therefore carries high concentrations of TSS to the Mississippi River.

The storm sewer trunk line directly upstream of the 77th Street outfall has been damaged by the high flow rates of stormwater common to this area. Leaks from the damaged pipe have caused erosion in the soil surrounding the pipe, contributing to the problem of excessive sediment in stormwater discharged to the Mississippi River. Reductions in runoff flow rate and runoff volume from the Skyline Village subwatershed are needed to ensure that the system, once repaired, will maintain its integrity.



-  Proposed Project Locations
- Existing Stormwater BMPs**
-  Basin
-  Dry Pond
-  Filtration
-  Infiltration/Recharge
-  Underground System

-  77th Street Outfall
-  Existing Storm Sewer
-  Skyline Village Subwatershed
-  City of Inver Grove Heights



1 inch = 1000 feet
 Feet
 0 1,000




FIGURE 2-1

SKYLINE VILLAGE SUBWATERSHED
 Stormwater Project Plan
 City of Inver Grove Heights
 Dakota County, MN

2.2 Subprojects

2.2.1 78th and Concord Wet Extended Detention Basin

2.2.1.1 Project Location

The proposed project is located on a City-owned parcel of undeveloped land northwest of the intersection of 78th Street East and Concord Boulevard (Figure 2-2). Under existing conditions the project site is a depression that receives direct runoff from a 5.5-acre subcatchment. A 48-inch diameter storm sewer trunk line carrying stormwater runoff from approximately 242 acres of the Skyline Village subwatershed runs along the north side of the project site. This project is Item 53 in the City's 3rd Gen WRMP, Table 5.1.

2.2.1.2 Alternatives Considered

BMP alternatives considered for this site included an infiltration basin or a wet extended detention basin. The 2011 SWCD report showed that the infiltration basin alternative could provide water quality treatment for 10 acres of contributing area at an estimated cost of \$347,000, while the wet extended detention basin alternative could provide water quality treatment for 25 acres of contributing area at an estimated cost of \$373,000. The detention basin alternative was recommended based on its greater cost-effectiveness.

The proposed project would consist of a stormwater management basin constructed to the National Urban Runoff Program (NURP) standards. The pond would have a permanent pool of 1.0 acre-feet, which would provide water quality treatment for 25 acres of upland drainage area. The pond would receive stormwater runoff from the existing direct watershed and from the nearby 48-inch diameter storm sewer trunk line. Because the contributing area for the storm sewer trunk line exceeds that which can be efficiently treated by the pond, a diversion structure would be constructed at the trunk line that would allow flows up to the pond's design inflow rate to enter the west end of the pond, while higher flows would remain in the storm sewer and bypass the pond. An iron-enhanced sand filter would be incorporated into the basin to enhance dissolved TP removal. TSS would settle in the pond, and treated water would be returned to the storm sewer trunk line via an outlet structure at the east end of the pond. Figure 2-3 shows the preliminary design drawing for the 78th and Concord wet extended detention basin.

2.2.1.3 Estimated Pollutant Reduction

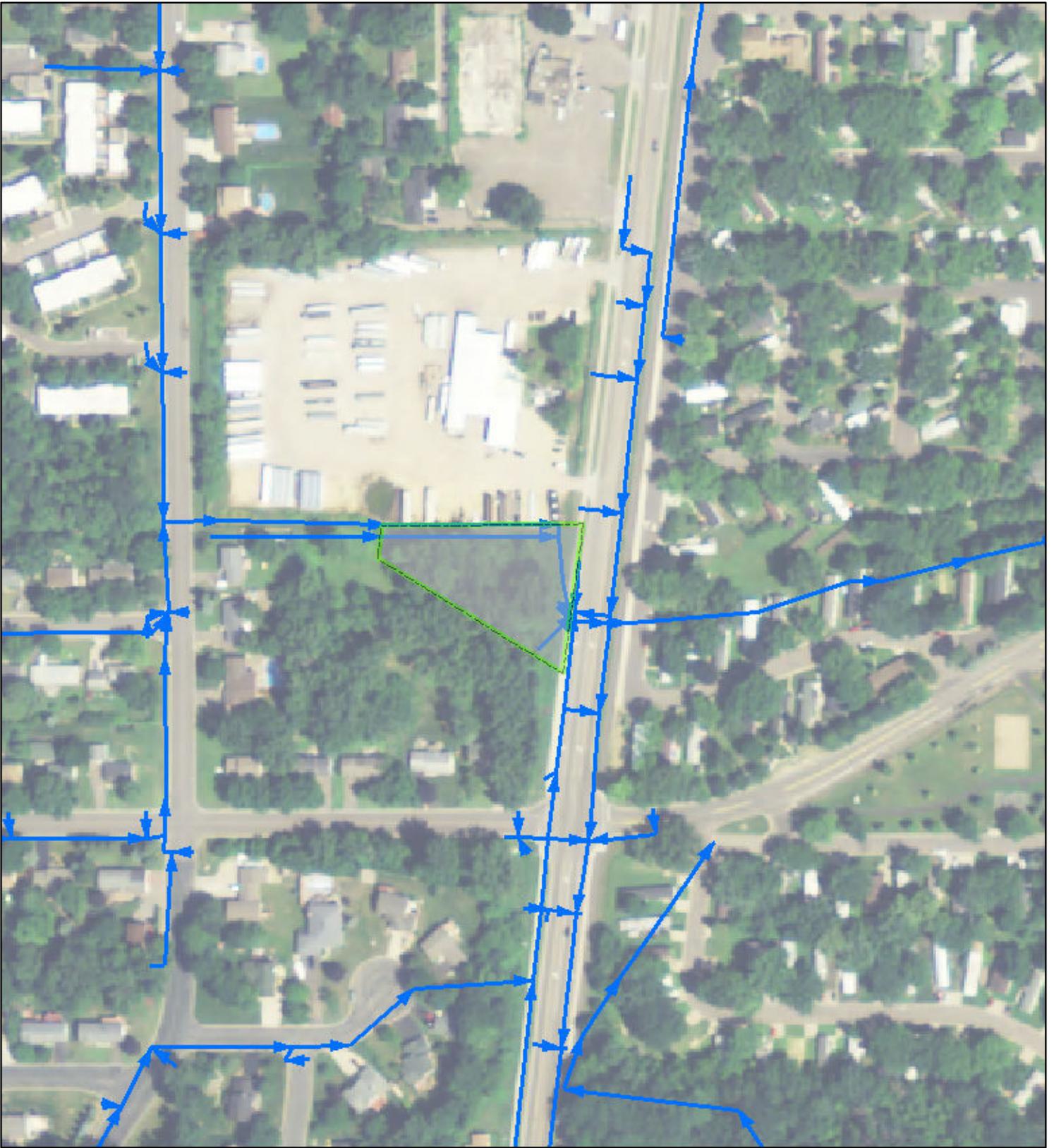
The SWCD report estimated pollutant reductions using the WinSLAMM version 9.4.0 pollutant load model. Based on that analysis, the proposed pond would reduce annual TSS loading by approximately 3,400 pounds per year and TP by approximately 9.4 pounds per year, reducing the Skyline Watershed TSS wasteload by 7.9 pounds per acre.

2.2.1.4 Estimated Construction Costs

The proposed project has an estimated construction cost of \$400,000, based on the current design plans. This cost does not include testing for or remediation of any contaminated soils or high elevation of bedrock, either or both of which may be present at the project site. Soil testing will be required before the project reaches final design.

2.2.1.5 Estimated Equipment Replacement Costs

The lifespan of iron-enhanced sand filtration systems is currently estimated to be 25 years. After this time the media would need to be replaced, at a cost of approximately \$30,000 (2015 dollars).



-  Proposed Project Footprint
-  Existing Storm Sewer
-  City of Inver Grove Heights



1 inch = 200 feet

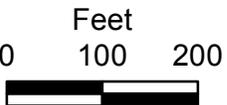
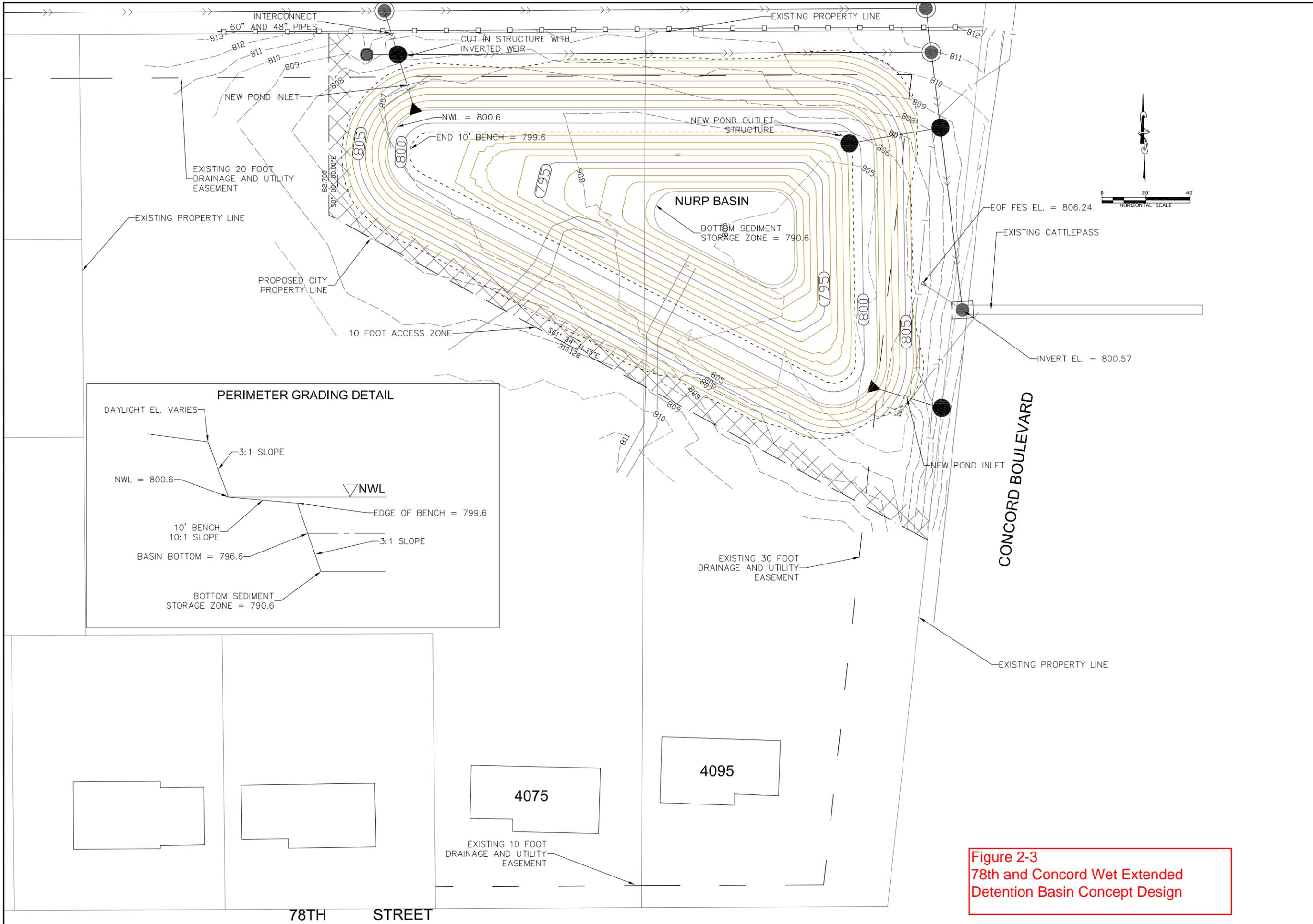


FIGURE 2-2

78TH AND CONCORD WET EXTENDED
DETENTION BASIN LOCATION
(SKYLINE VILLAGE SUBWATERSHED)
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

Z:\PublicWorks\Engineering\PROJECTS_PUBLIC\2011_PROJECTS\2011-02_ConcordBioretentionBasin\CAD\Designs\ConcordPondAlt3.dwg



2.2.2 Delano Circle Rainwater Gardens

2.2.2.1 Project Location

The proposed project is located in a neighborhood of approximately 17.5 acres surrounding Delano Circle, east of the intersection of 80th Street East and Concord Boulevard, within the Skyline Village Subwatershed (Figure 2-4). A portion of the neighborhood drains westward to the Concord Boulevard trunk storm sewer while the remainder drains northward along the east side of Concord before being conveyed east to the 77th Street outfall. According to the City's current CIP plan, which is modified from time to time to meet changing priorities and budgets, the streets in this neighborhood are scheduled to be resurfaced during 2017. This project is applicable to Item 56 in the City's 3rd Gen WRMP, Table 5.1.

2.2.2.2 Alternatives Considered

As part of its regularly scheduled pavement maintenance program, the City of Inver Grove Heights solicits landowners who are willing to have a rainwater garden constructed on their property. Rainwater gardens are particularly suitable as "retrofit" BMPs which can be constructed in previously-developed commercial and residential areas. The rainwater garden consists of a shallow, vegetated depression excavated adjacent to the rebuilt street, with curb cutouts to funnel runoff from the street to the rainwater garden. Based on landowner response to similar projects within the city, it is estimated that approximately six rainwater gardens would be constructed in the project area.

2.2.2.3 Estimated Pollutant Reduction

The SWCD report estimated pollutant reductions using the WinSLAMM version 9.4.0 pollutant load model. Based on that analysis, an average rainwater garden would reduce TSS by 141 pounds per year, TP by 0.34 pounds per year, and runoff volume by 0.15 acre-feet per year. The combined annual pollutant reduction for six rainwater gardens is 846 pounds per year of TSS and 2 pounds per year of TP, reducing the Skyline Watershed TSS wasteload by 0.25 pounds per acre.

2.2.2.4 Estimated Construction Costs

The Dakota County SWCD estimated construction costs at approximately \$4,600 per rainwater garden. The estimated construction cost for six rainwater gardens in the Delano Circle neighborhood is \$27,600.

2.2.2.5 Estimated Equipment Replacement Costs

Rainwater gardens constructed through this program would function as passive bio-filtration systems, requiring no additional mechanical equipment. The curb cutout inlets to each rainwater garden would be replaced during the next scheduled street reconstruction project for this area.



-  Proposed Project Area
-  Existing Storm Sewer
-  City of Inver Grove Heights



1 inch = 200 feet
Feet
0 100 200



FIGURE 2-4

DELANO CIRCLE RAINWATER GARDENS
PROJECT LOCATION
(SKYLINE VILLAGE SUBWATERSHED)
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

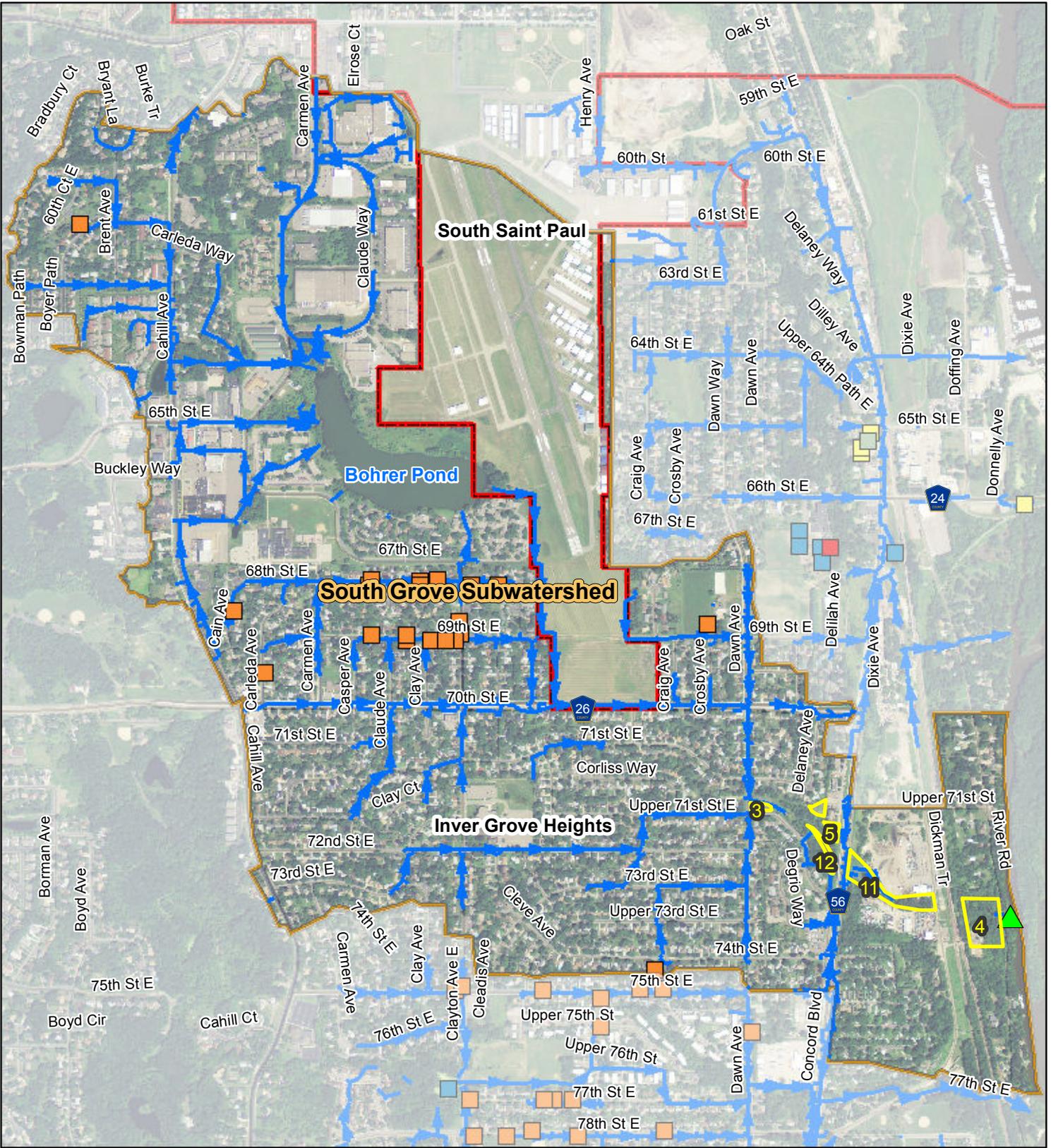
3.0 South Grove Subwatershed

3.1 Project Area

The South Grove subwatershed encompasses approximately 1,015 acres of mostly-developed land in Inver Grove Heights and South Saint Paul (Figure 3-1). The basin is primarily single family residential with some commercial developments in the northwest, and Fleming Field airport in South St. Paul. Bohrer Pond (DNR #19-34P), a City-designated lake, is the major water body in the basin.

Stormwater runoff from approximately 510 acres of The South Grove subwatershed flows to Bohrer Pond. Approximately 75% (380 acres) of the Bohrer Pond drainage lies within the City of Inver Grove Heights; the other 25% (130 acres) lies within the City of South St. Paul. Bohrer Pond drains via a gravity outlet to the 70th Street trunk storm sewer system. The 70th Street storm sewer system conveys stormwater east to Dawn Avenue, then south along Dawn Avenue where it discharges to the Dawn Avenue Ravine. The Dawn Avenue Ravine east of Dawn Avenue was re-graded as part of a 2005 drainage improvement project and riprap was installed to prevent erosion. Runoff re-enters the storm sewer system to pass under Concord Boulevard, then discharges to the Dickman Trail Ravine, flows beneath Dickman Trail and the railroad tracks through a cattle-pass, then flows through a ravine west of River Road before flowing under River Road through a culvert and discharging to the Mississippi River through a culvert at the 70th Street outfall.

Existing stormwater treatment facilities within the South Grove subwatershed include an infiltration basin near the intersection of 69th Street and Craig Court and street side rainwater gardens along 68th Street and 69th Street.



-  Proposed Project Locations
-  70th Street Outfall
-  Existing Storm Sewer
-  Basin
-  Dry Pond
-  South Grove Subwatershed
-  Filtration
-  Infiltration/Recharge
-  City of Inver Grove Heights
-  Underground System

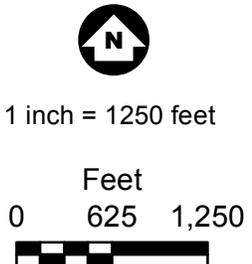


FIGURE 3-1
SOUTH GROVE SUBWATERSHED
 Stormwater Project Plan
 City of Inver Grove Heights
 Dakota County, MN

3.2 Subprojects

3.2.1 Dawn-Concord Dry Extended Detention Basin and Wet Extended Detention Basin

3.2.1.1 Project Location

The proposed projects are located north of Dehrer Way, between Dawn Avenue and Concord Boulevard (Figure 3-2). The Dawn-Concord Ravine drops about 18 feet from Dawn to Concord, at a slope of approximately two percent. Approximately 900 acres of the South Grove watershed is tributary to the ravine. The Dawn-Concord ravine currently functions as a conveyance system for the 70th Street storm sewer system. During 2005 the ravine was re-graded and rip-rap was installed to prevent erosion. While this project stabilized the ravine, it was not intended to improve pollutant removal for runoff originating in the upper watershed. Because the ravine lies in city-owned land, the City has an opportunity to construct additional stormwater BMPs at this location. This project is Item 55 in the City's 3rd Gen WRMP, Table 5.1.

3.2.1.2 Alternatives Considered

Two types of BMPs were evaluated for this location: a wet extended detention basin and a dry extended detention basin. The wet extended basin alternative would be constructed on the southern side of the City-owned property just east of Dawn Avenue, at the upper end of the Dawn-Concord ravine. The proposed pond would capture sediment from approximately 116 acres of the Dawn-Concord Ravine contributing area. The pond's area would be approximately 0.3 acres, with a permanent pool volume of approximately 0.4 acre-feet and a live storage volume of approximately 0.7 acre-feet. The pond outlet would discharge at the head of the Dawn-Concord ravine.

A dry extended detention basin was evaluated at the foot of the Dawn-Concord ravine. A wet extended detention basin is not feasible at this location because the existing topography would restrict maintenance access to the pond and because there is not sufficient area to construct a permanent pool of the appropriate volume and depth for efficient pollutant removal. The dry extended detention alternative would include construction of a berm and restrictive outlet structure at Concord Boulevard. The restrictive outlet would reduce the discharge rate at Concord Boulevard and would improve the performance of future downstream BMPs located between Concord Boulevard and the Mississippi River. Decreasing inflow rates to the downstream BMPs would increase the detention time for a given event, allowing the BMPs to trap smaller particles.

3.2.1.3 Estimated Pollutant Reduction

Pollutant reductions for the Dawn-Concord ravine alternatives were estimated by simulating the proposed pond and its contributing area with the P8 water quality model. Weather conditions for the 10-year period from 2001-2010 were used as inputs for the simulation.

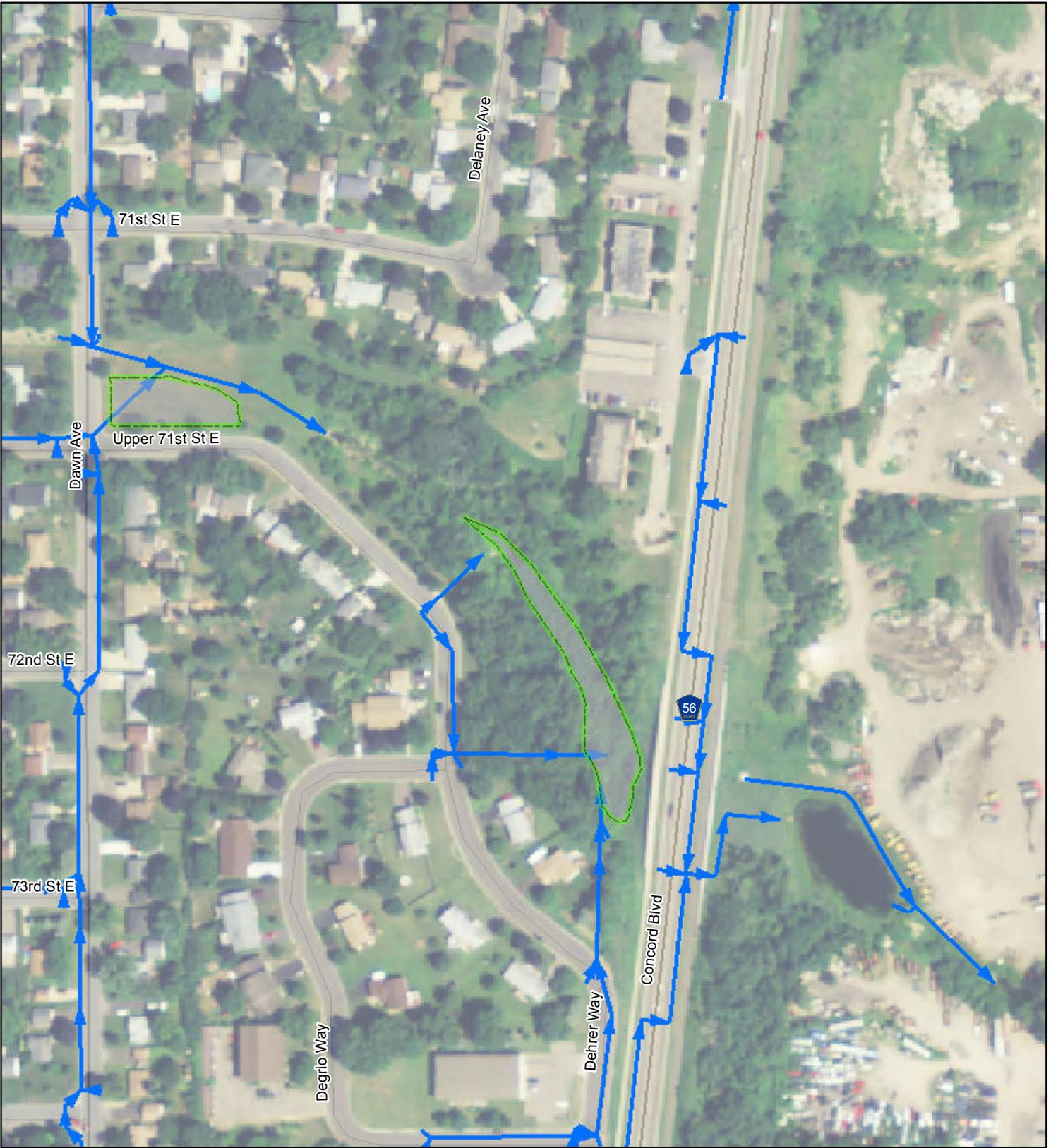
The P8 model showed that the wet extended detention basin alternative trapped 10 pounds per year of TP and 7,050 pounds per year of TSS for the 10-year simulation period. This represents a 56 percent TSS

reduction for the watershed contributing to the proposed pond, and a 6.9 pound per acre (11 percent) TSS reduction for the South Grove subwatershed.

The dry extended detention basin was modeled as a BMP that would not trap pollutants, because sediment that accumulated during one event could be remobilized and washed downstream in the next event. The P8 model showed that the amount of TSS removed by a proposed wet pond downstream near the 70th Street outfall increased by 240 pounds per year (0.2 pounds per acre) when dry extended detention basins alternatives were simulated upstream at the Dawn-Concord ravine and the Concord-Dickman ravine. Phosphorus removal was not significantly improved by addition of the dry basin.

3.2.1.4 Estimated Construction Costs

The estimated construction costs for the Dawn-Concord ravine alternatives are \$250,000 for the wet extended detention basin and \$220,000 for the dry extended detention basin. Cost estimate details are shown in Table 3-1 and Table 3-2, respectively.



-  Proposed Project Footprint
-  Existing Storm Sewer
-  City of Inver Grove Heights



1 inch = 200 feet

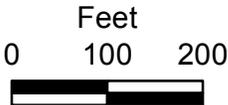


FIGURE 3-2

DAWN-CONCORD RAVINE
PROJECT LOCATIONS
(SOUTH GROVE SUBWATERSHED)
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

Table 3-1. Dawn-Concord Wet Extended Detention Basin Preliminary Opinion of Cost

Item	Unit	Quantity	Unit Cost	Cost	Notes
Mobilization/Demobilization	LS	1	\$ 53,000.00	\$ 53,000.00	1,2
Traffic Control	LS	1	\$ 1,000.00	\$ 1,000.00	1,2
Erosion Control	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Inlet Protection	Each	2	\$ 200.00	\$ 400.00	1,2
Remove and Dispose of Existing Storm Sewer	LF	550	\$ 20.00	\$ 11,000.00	1,2
Sod Removal	SY	1,900	\$ 5.00	\$ 9,500.00	1,2
Excavation	CY	1,800	\$ 15.00	\$ 27,000.00	1,2
Excavation Off-site Disposal	CY	1,800	\$ 15.00	\$ 27,000.00	1,2
Steel Sheet Pile	SF	680	\$ 28.00	\$ 19,000.00	1,2
Grading	SY	1,900	\$ 2.00	\$ 3,800.00	1,2
Turf Re-Establishment (Restoration)	SF	5,000	\$ 1.00	\$ 5,000.00	1,2
48" RCP Storm Sewer (Excavation, Install, Backfill)	LF	120	\$ 189.00	\$ 22,700.00	1,2
48" FES	Each	2	\$ 2,000.00	\$ 4,000.00	1,2
36" RCP Storm Sewer (Excavation, Install, Backfill)	LF	25	\$ 110.00	\$ 2,800.00	1,2
36" FES	Each	1	\$ 1,417.00	\$ 1,400.00	1,2
60" Outlet Structure	Each	1	\$ 10,000.00	\$ 10,000.00	1,2
Riprap	CY	12	\$ 130.00	\$ 1,600.00	1,2
Temporary Fence Installation	LF	500	\$ 8.00	\$ 4,000.00	1,2
Subtotal Construction Cost				\$ 170,000.00	1,3
Contingency (15%)			15%	\$ 30,000.00	1,3
Permitting, Engineering, and Design (15%)			15%	\$ 30,000.00	1,3
Construction Observation (10%)			10%	\$ 20,000.00	1,3
Total Cost				\$ 250,000.00	1,3,4

(1) This is a point estimate for 2015, and could vary due to cost and design changes.

(2) Rounded to the nearest \$100.

(3) Rounded up to the nearest \$10,000.

(4) Estimated total project cost does not include costs of potential contamination at the site

Table 3-2. Dawn-Concord Dry Extended Detention Basin Preliminary Opinion of Cost

Item	Unit	Quantity	Unit Cost	Cost	Notes
Mobilization/Demobilization	LS	1	\$ 22,000.00	\$ 22,000.00	1,2
Erosion Control	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Remove and Dispose of Existing Storm Sewer	LF	160	\$ 20.00	\$ 3,200.00	1,2
Clearing and Grubbing	SY	5,000	\$ 5.00	\$ 25,000.00	1,2
Control of Water	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Construct Berm (off-site borrow)	CY	500	\$ 15.00	\$ 7,500.00	1,2
Aggregate seep material	CY	30	\$ 18.00	\$ 500.00	1,2
Compaction	CY	530	\$ 1.50	\$ 800.00	1,2
Grading	SY	5000	\$ 2.00	\$ 10,000.00	1,2
Turf Re-Establishment (Restoration)	SF	43,560	\$ 1.00	\$ 43,600.00	1,2
60" Outlet Structure	Each	1	\$ 10,000.00	\$ 10,000.00	1,2
18" RCP Storm Sewer (Excavation, Install, Backfill)	LF	25	\$ 43.00	\$ 1,100.00	1,2
48" FES	Each	1	\$ 2,000.00	\$ 2,000.00	1,2
Riprap	CY	12	\$ 130.00	\$ 1,600.00	1,2
Temporary Fence Installation	LF	1,000	\$ 8.00	\$ 8,000.00	1,2
Subtotal Construction Cost				\$ 140,000.00	1,3
Contingency (15%)			15%	\$ 30,000.00	1,3
Permitting, Engineering, and Design (15%)			15%	\$ 30,000.00	1,3
Construction Observation (10%)			10%	\$ 20,000.00	1,3
Total Cost				\$ 220,000.00	1,3,4

(1) This is a point estimate for 2015, and could vary due to cost and design changes.

(2) Rounded to the nearest \$100.

(3) Rounded up to the nearest \$10,000.

(4) Estimated total project cost does not include costs of potential contamination at the site

3.2.2 Dickman Trail Storm Sewer Improvements

3.2.2.1 Project Location

The proposed project is located in the Concord-Dickman ravine, which cuts through an industrial area of the South Grove subwatershed, east of Dehrer Way and between Concord Boulevard and Dickman Trail (Figure 3-3). There is an existing Dakota County wet extended detention basin at the west end of the project area that receives runoff from catch basins located on Concord Boulevard. Approximately 1,000 acres of the South Grove subwatershed is tributary to the ravine. This project is Item 55 in the City's 3rd Gen WRMP, Table 5.1.

3.2.2.2 Alternatives Considered

The existing basin at the upper end of Dickman Trail ravine treats local stormwater runoff from Concord Boulevard. The proposed project would re-grade the area surrounding the existing basin and construct additional stormwater pipe infrastructure to increase the volume of water flowing to the basin. The proposed project would also re-grade the lower portion of the ravine to construct a dry extended-detention basin with a restrictive outlet to decrease flow rates at Dickman Trail. The pond outlet would have an emergency overflow outlet to allow high flows to pass into the existing storm sewer system at Dickman Trail.

3.2.2.3 Estimated Pollutant Reduction

Pollutant reductions for the Concord-Dickman ravine dry extended detention basin were estimated by simulating the proposed pond and its contributing area with the P8 water quality model. Weather conditions for the 10-year period from 2001-2010 were used as inputs for the simulation.

The dry extended detention basin was modeled as a BMP that would not trap pollutants, because sediment that accumulated during one event could be remobilized and washed downstream in the next event. The P8 model showed that the amount of TSS removed by a proposed wet pond downstream near the 70th Street outfall increased by 240 pounds per year (0.2 pounds per acre) when dry extended detention basin alternatives were simulated upstream at the Dawn-Concord ravine and the Concord-Dickman ravine. Removal of TP was not significantly improved by inclusion of the dry basin.

3.2.2.4 Estimated Construction Costs

The estimated construction costs for modifications to the existing wet extended detention basin are unknown at this time due to insufficient project definition. The estimated construction costs for the Concord-Dickman ravine dry detention basin is \$210,000. Cost estimate details are shown in Table 3-3. Note that site testing will likely locate some contamination due to nearby industrial activities. These costs have not been included in estimates because the scope of cleanup is unknown at this time.



-  Proposed Project Footprint
-  Existing Storm Sewer
-  City of Inver Grove Heights

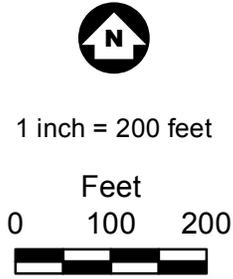


FIGURE 3-3

DICKMAN TRAIL STORM SEWER
IMPROVEMENTS PROJECT LOCATION
(SOUTH GROVE SUBWATERSHED)
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

Table 3-3. Concord-Dickman Ravine Dry Extended Detention Basin Preliminary Opinion of Cost

Item	Unit	Quantity	Unit Cost	Cost	Notes
Mobilization/Demobilization	LS	1	\$ 22,000.00	\$ 22,000.00	1,2
Erosion Control	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Remove and Dispose of Existing Storm Sewer	LF	160	\$ 20.00	\$ 3,200.00	1,2
Clearing and Grubbing	SY	5,000	\$ 5.00	\$ 25,000.00	1,2
Control of Water	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Construct Berm (off-site borrow)	CY	500	\$ 15.00	\$ 7,500.00	1,2
Aggregate seep material	CY	30	\$ 18.00	\$ 500.00	1,2
Compaction	CY	530	\$ 1.50	\$ 800.00	1,2
Grading	SY	5,000	\$ 2.00	\$ 10,000.00	1,2
Turf Re-Establishment (Restoration)	SF	43,560	\$ 1.00	\$ 43,600.00	1,2
60" Outlet Structure	Each	1	\$ 10,000.00	\$ 10,000.00	1,2
18" RCP Storm Sewer (Excavation, Install, Backfill)	LF	25	\$ 43.00	\$ 1,100.00	1,2
48" FES	Each	1	\$ 2,000.00	\$ 2,000.00	1,2
Riprap	CY	12	\$ 130.00	\$ 1,600.00	1,2
Temporary Fence Installation	LF	1,000	\$ 8.00	\$ 8,000.00	1,2
Subtotal Construction Cost				\$ 140,000.00	1,3
Contingency (15%)			15%	\$ 20,000.00	1,3
Permitting, Engineering, and Design (15%)			15%	\$ 30,000.00	1,3
Construction Observation (10%)			10%	\$ 20,000.00	1,3
Total Cost				\$ 210,000.00	1,3, 4

(1) This is a point estimate for 2015, and could vary due to cost and design changes.

(2) Rounded to the nearest \$100.

(3) Rounded up to the nearest \$10,000.

(4) Estimated total project cost does not include costs of potential contamination at the site

3.2.3 River Road Wet Extended Detention Basin

3.2.3.1 Project Location

The proposed project is located on city-owned land between Dickman Trail and River Road, approximately 250 feet upstream of the 70th Street outfall to the Mississippi River (Figure 3-4). A culvert at Dickman Trail conveys stormwater flow to an existing ravine at the project location, which in turn discharges through a culvert at River Road to the 70th Street outfall. This project is applicable to Item 39 in the City's 3rd Gen WRMP, Table 5.1.

3.2.3.2 Alternatives Considered

The existing ravine currently functions as a conveyance system for the 70th Street storm sewer system. Because the ravine lies in city-owned land, the City has an opportunity to construct additional stormwater BMPs. The proposed project would excavate and grade the land around the ravine to create a wet extended detention basin with a permanent pool to capture sediment. The proposed pond's area would be approximately 1.3 acres, with a permanent pool volume of approximately 7.8 acre-feet and a live storage volume of approximately 5.1 acre-feet. The pond outlet would have an emergency overflow outlet to allow high flows to discharge into the existing culvert at River Road.

The proposed project site encompasses an area which is currently used by the City's Public Works Department for maintenance activities. Continued use of this site would likely require the project footprint to be reduced, resulting in a smaller pollutant load reduction and a lower cost.

3.2.3.3 Estimated Pollutant Reduction

Pollutant reductions for the River Road stormwater management basin were estimated by simulating the proposed pond and its contributing area with the P8 water quality model. Weather conditions for the 10-year period from 2001-2010 were used as inputs for the simulation. The basin was modeled both with and without the potential upstream BMPs at the Dawn-Concord and Concord-Dickman ravines.

Due to site constraints, the pond would be undersized to fully treat runoff from its large contributing area at the goal of 85 percent removal of TSS. The P8 model showed that without upstream BMPs, the proposed pond trapped on average approximately 36,300 pounds per year of TSS and 50 pounds per year of TP for the 10-year simulation period. This represents a 54 percent TSS reduction for the watershed contributing to the proposed pond, and a 36 pound per acre (45 percent) TSS reduction for the South Grove subwatershed.

3.2.3.4 Estimated Construction Costs

The estimated construction cost for the River Road wet extended detention basin is \$900,000. Cost estimate details are shown in Table 3-5.



-  70th Street Outfall
-  Proposed Project Footprint
-  Existing Storm Sewer
-  City of Inver Grove Heights



1 inch = 200 feet

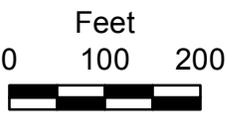


FIGURE 3-4

RIVER ROAD WET EXTENDED
DETENTION BASIN PROJECT LOCATION
(SOUTH GROVE SUBWATERSHED)
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

Table 3-4. River Road Wet Extended Detention Basin Preliminary Opinion of Cost

Item	Unit	Quantity	Unit Cost	Cost	Notes
Mobilization/Demobilization	LS	1	\$ 57,000.00	\$ 57,000.00	1,2
Traffic Control	LS	1	\$ 1,000.00	\$ 1,000.00	1,2
Erosion Control	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Inlet Protection	Each	1	\$ 200.00	\$ 200.00	1,2
Remove and Dispose of Existing Storm Sewer	LF	50	\$ 20.00	\$ 1,000.00	1,2
Clearing and Grubbing	SY	6,300	\$ 5.00	\$ 31,500.00	1,2
Excavation	CY	15,000	\$ 15.00	\$ 225,000.00	1,2
Excavation Off-site Disposal	CY	15,000	\$ 15.00	\$ 225,000.00	1,2
Grading	SY	6,300	\$ 2.00	\$ 12,600.00	1,2
Turf Re-Establishment (Restoration)	SF	20,000	\$ 1.00	\$ 20,000.00	1,2
60" Outlet Structure	Each	1	\$ 10,000.00	\$ 10,000.00	1,2
48" RCP Storm Sewer (Excavation, Install, Backfill)	LF	120	\$ 189.00	\$ 22,680.00	1,2
48" FES	Each	1	\$ 2,000.00	\$ 2,000.00	1,2
Riprap	CY	8	\$ 130.00	\$ 1,040.00	1,2
Temporary Fence Installation	LF	1,000	\$ 8.00	\$ 8,000.00	1,2
Subtotal Construction Cost				\$ 620,000.00	1,3
Contingency (15%)			15%	\$ 100,000.00	1,3
Permitting, Engineering, and Design (15%)			15%	\$ 110,000.00	1,3
Construction Observation (10%)			10%	\$ 70,000.00	1,3
Total Cost				\$ 900,000.00	1,3,4,5

(1) This is a point estimate for 2015, and could vary due to cost and design changes.

(2) Rounded to the nearest \$100.

(3) Rounded up to the nearest \$10,000.

(4) Estimated total project cost does not include costs of potential contamination at the site

3.2.4 7125 Concord Infiltration Basins

3.2.4.1 Project Location

The proposed project is located on city-owned land east of Concord Boulevard, just north of the Concord Ravine (Figure 3-5). This project is Item 56 in the City's 3rd Gen WRMP, Table 5.1.

3.2.4.2 Alternatives Considered

Stormwater from the multi-unit residential buildings to the north flows overland to the south into the adjacent ravine. The proposed project would create two sedimentation and infiltration basins and grade the land to the north to direct flow to the basins. The proposed combined basin area would be 0.6 acres, which would infiltrate approximately 0.5 acre-feet of water. Excess stormwater would overflow to the south into the Concord ravine.

3.2.4.3 Estimated Pollutant Reduction

Pollutant reductions for the River Road stormwater management basin were estimated by simulating the proposed pond and its contributing area with the P8 water quality model. Weather conditions for the 10-year period from 2001-2010 were used as inputs for the simulation.

The proposed infiltration basins trapped on average approximately 1,570 pounds per year of TSS and 5 pounds per year of TP for the 10-year simulation period. This represents a 100 percent TSS reduction for the watershed contributing to the proposed basins, and a 1.5 pound per acre (2 percent) TSS reduction for the South Grove subwatershed.

3.2.4.4 Estimated Construction Costs

The estimated construction cost for the 7125 Concord infiltration basins is \$170,000. This cost does not include testing for or remediation of any contaminated soils or high elevation of bedrock, either or both of which may be present at the project site. Soil testing will be required before the project reaches final design. Cost estimate details are shown in Table 3-5.



-  Proposed Project Footprint
-  Existing Storm Sewer
-  City of Inver Grove Heights

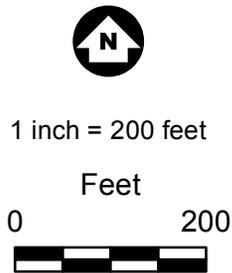


FIGURE 3-5

7125 CONCORD INFILTRATION BASINS
 PROJECT LOCATION
 (SOUTH GROVE SUBWATERSHED)
 Stormwater Project Plan
 City of Inver Grove Heights
 Dakota County, MN

Table 3-5. 7125 Concord Infiltration Basins Preliminary Opinion of Cost

Item	Unit	Quantity	Unit Cost	Cost	Notes
Mobilization/Demobilization	LS	1	\$ 9,100.00	\$ 9,100.00	1,2
Traffic Control	LS	1	\$ 1,000.00	\$ 1,000.00	1,2
Erosion Control	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Inlet Protection	Each	4	\$ 200.00	\$ 800.00	1,2
Excavation	CY	970	\$ 15.00	\$ 14,600.00	1,2
Excavation Off-site Disposal	CY	970	\$ 15.00	\$ 14,600.00	1,2
Grading	SY	2900	\$ 2.00	\$ 5,800.00	1,2
Planting Soil	CY	290	\$ 40.00	\$ 11,600.00	1,2
Plantings	SF	3050	\$ 3.00	\$ 9,200.00	1,2
Turf Re-Establishment (Restoration)	SF	30500	\$ 1.00	\$ 30,500.00	1,2
12" FES	Each	2	\$ 481.00	\$ 1,000.00	1,2
Riprap	CY	4	\$ 130.00	\$ 520.00	1,2
Subtotal Construction Cost				\$ 110,000.00	1,3
Contingency (15%)			15%	\$ 20,000.00	1,3
Permitting, Engineering, and Design (15%)			15%	\$ 20,000.00	1,3
Construction Observation (10%)			10%	\$ 20,000.00	1,3
Total Cost				\$ 170,000.00	1,3,4

(1) This is a point estimate for 2015, and could vary due to cost and design changes.

(2) Rounded to the nearest \$100.

(3) Rounded up to the nearest \$10,000.

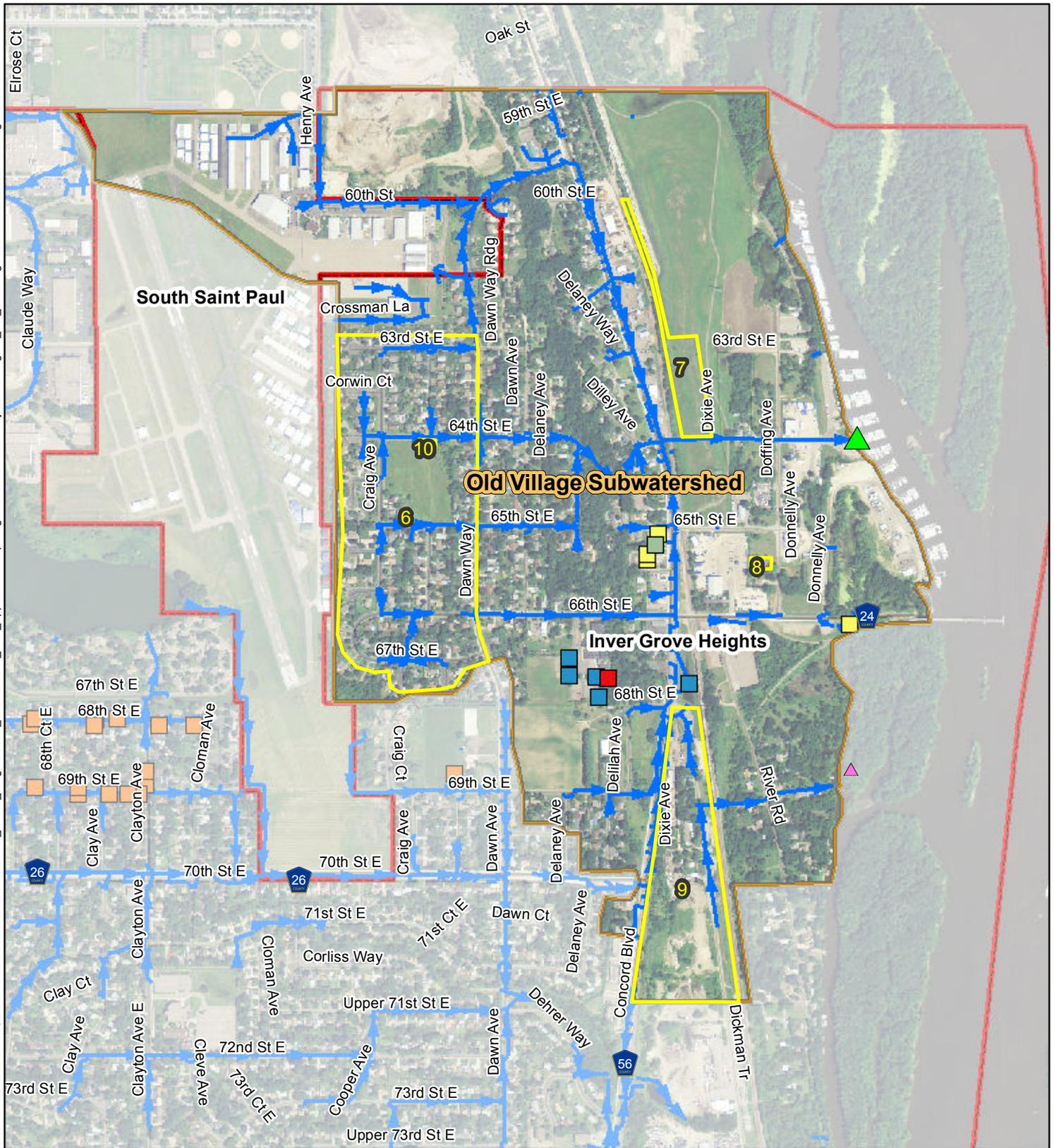
(4) Estimated total project cost does not include costs of potential contamination at the site

4.0 Old Village Subwatershed

4.1 Project Area

The Old Village subwatershed encompasses approximately 470 acres of mostly-developed land. The majority of the Old Village subwatershed west of Concord Boulevard drains to storm sewer laterals that feed into a single trunk line at Concord Avenue and Delilah Avenue, which then passes under Concord Boulevard and conveys flow eastward to the 64th Street outfall at the Mississippi River (Figure 4-1). The land use in the Old Village subwatershed is primarily single-family residential with some parkland and industrial land use.

Existing stormwater treatment facilities include filtration facilities at a commercial development located at 65th Street and Concord Boulevard, and wet extended detention basins located at a multi-family development located at 68th Street and Delilah Avenue.



- | | |
|---|---|
|  Proposed Project Locations |  Outfall Discharge Location |
|  Existing Stormwater BMPs |  Minor Outfall |
|  Basin |  Existing Storm Sewer |
|  Dry Pond |  Old Village Subwatershed |
|  Filtration |  City of Inver Grove Heights |
|  Infiltration/Recharge | |
|  Underground System | |

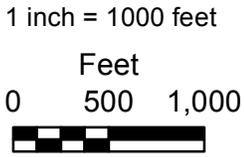


FIGURE 4-1

OLD VILLAGE SUBWATERSHED
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

4.2 Subprojects

4.2.1 Dawn Way Rainwater Gardens

4.2.1.1 Project Location

The proposed project is located in a neighborhood of approximately 60 acres centered around Crosby Avenue and bounded by 63rd Street to the north, 67th Street to the south, Dawn Way to the east, and Craig Avenue to the west (Figure 4-2). The project area drains to several storm sewer laterals that flow east to empty into the 64th Street storm sewer trunk system at Concord Boulevard. According to the City's current CIP plan, which is modified from time to time to meet changing priorities and budgets, the streets in this neighborhood are scheduled to be resurfaced during 2016. This project is applicable to Item 56 in the City's 3rd Gen WRMP, Table 5.1.

4.2.1.2 Alternatives Considered

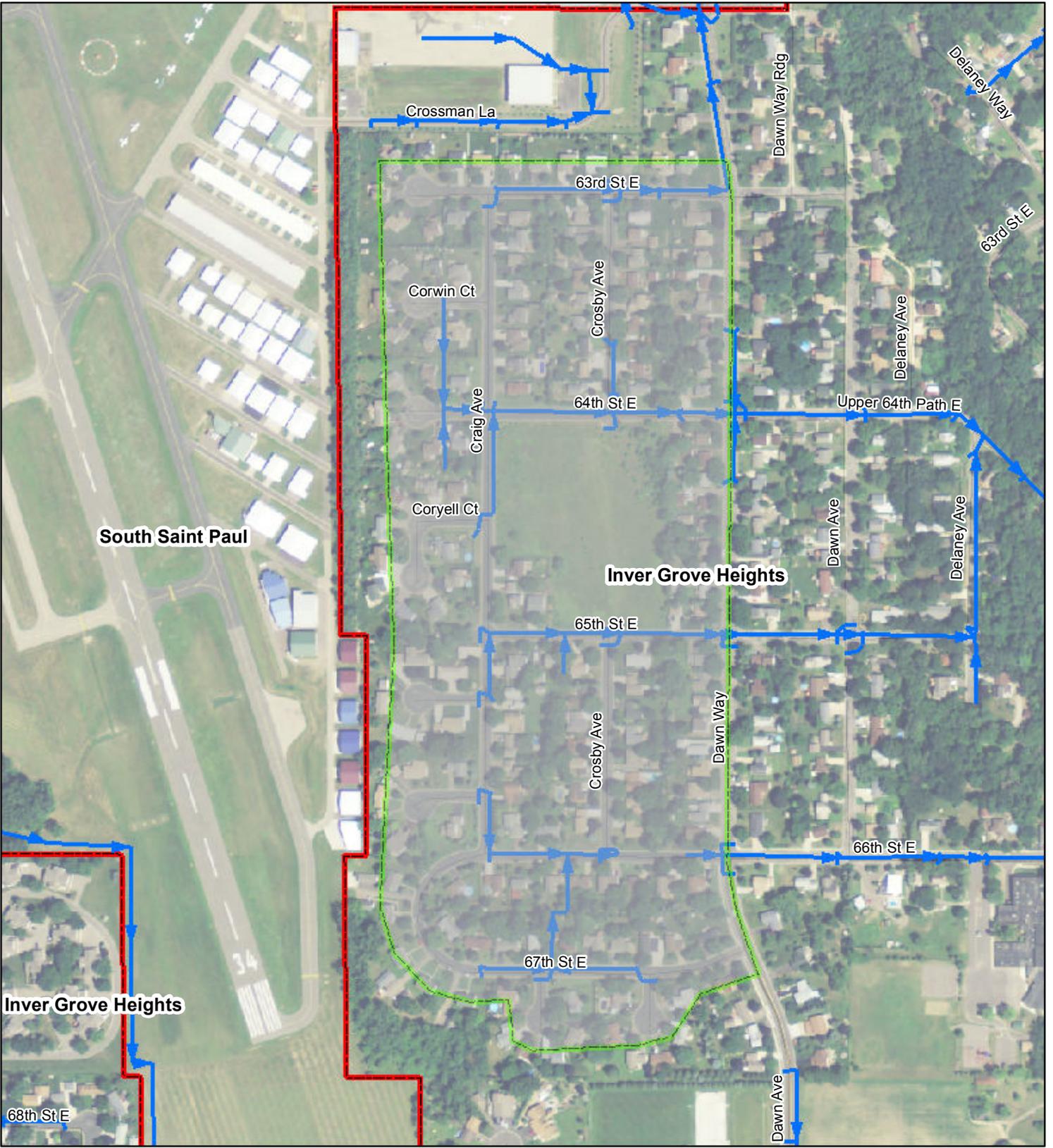
As part of its regularly scheduled pavement maintenance program, the City of Inver Grove Heights solicits landowners who are willing to have a rainwater garden constructed on their property. Rainwater gardens are particularly suitable as "retrofit" BMPs which can be constructed in previously-developed commercial and residential areas. The rainwater garden consists of a shallow, vegetated depression excavated adjacent to the rebuilt street, with curb cutouts to funnel runoff from the street to the rainwater garden. Based on landowner response to similar projects within the city, it is estimated that approximately twenty rainwater gardens would likely be constructed in the project area.

4.2.1.3 Estimated Pollutant Reduction

The Dakota County SWCD estimated pollutant reductions using the WinSLAMM version 9.4.0 pollutant load model. Based on that analysis, an average rainwater garden would reduce TSS by 141 pounds per year, TP by 0.34 pounds per year, and runoff volume by 0.15 acre-feet per year. The combined annual pollutant reduction for twenty rainwater gardens is 2,820 pounds per year of TSS and 7.4 pounds per year of TP, which represents a six pound per acre (four percent) TSS reduction for the Old Village subwatershed.

4.2.1.4 Estimated Construction Costs

The Dakota County SWCD estimated construction costs at approximately \$4,600 per rainwater garden. The estimated construction cost for twenty rainwater gardens in the Dawn Way neighborhood is \$92,000.



-  Proposed Project Location
-  Existing Storm Sewer
-  City of Inver Grove Heights

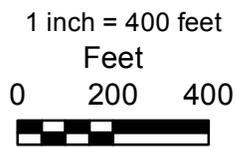


FIGURE 4-2

DAWN WAY RAINWATER GARDENS
PROJECT LOCATION
(OLD VILLAGE SUBWATERSHED)
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

4.2.2 64th Street and Concord Avenue Stormwater Management Basins

4.2.2.1 Project Location

The proposed project is located on a City-owned parcel of undeveloped land northeast of the intersection of 65th Street East and Concord Boulevard (Figure 4-3). A 48-inch diameter storm sewer trunk system runs along Concord Avenue to the west, separated from the site by a narrow band of industrial properties and a railroad line. A 54-inch diameter storm sewer trunk system carrying stormwater runoff from approximately 277 acres of the Old Village subwatershed runs along the south border of the project site before discharging to the Mississippi River at the 64th Street outfall. The project site lies within the City's Heritage Park development site (Figure 4-4). This project is applicable to Item 39 and Item 54 in the City's 3rd Gen WRMP, Table 5.1.

4.2.2.2 Alternatives Considered

The proposed project would be a system of two wet extended detention stormwater basins. The basin system would consist of a wet extended detention forebay of approximately 0.2 acres and a wet extended detention basin of approximately 0.4 acres. Stormwater from approximately 104 acres of the Old Village subwatershed would be rerouted out of the 48-inch Concord storm sewer trunk system, piped under the railroad to a ditch that discharges to the forebay, then routed through the larger second basin. An outlet structure in the second basin would discharge the treated water south to the 54-inch storm sewer trunk system. The system of basins would provide pre-treatment for large particles in the forebay and treatment for smaller particles in the second basin. The basins would be designed to maximize the flow length of stormwater through the system, providing additional detention time for particle settling. The combined area of the basins would be 0.6 acres, and the combined permanent pool and flood pool volumes would be 0.8 acre-feet and 1.2 acre-feet, respectively.

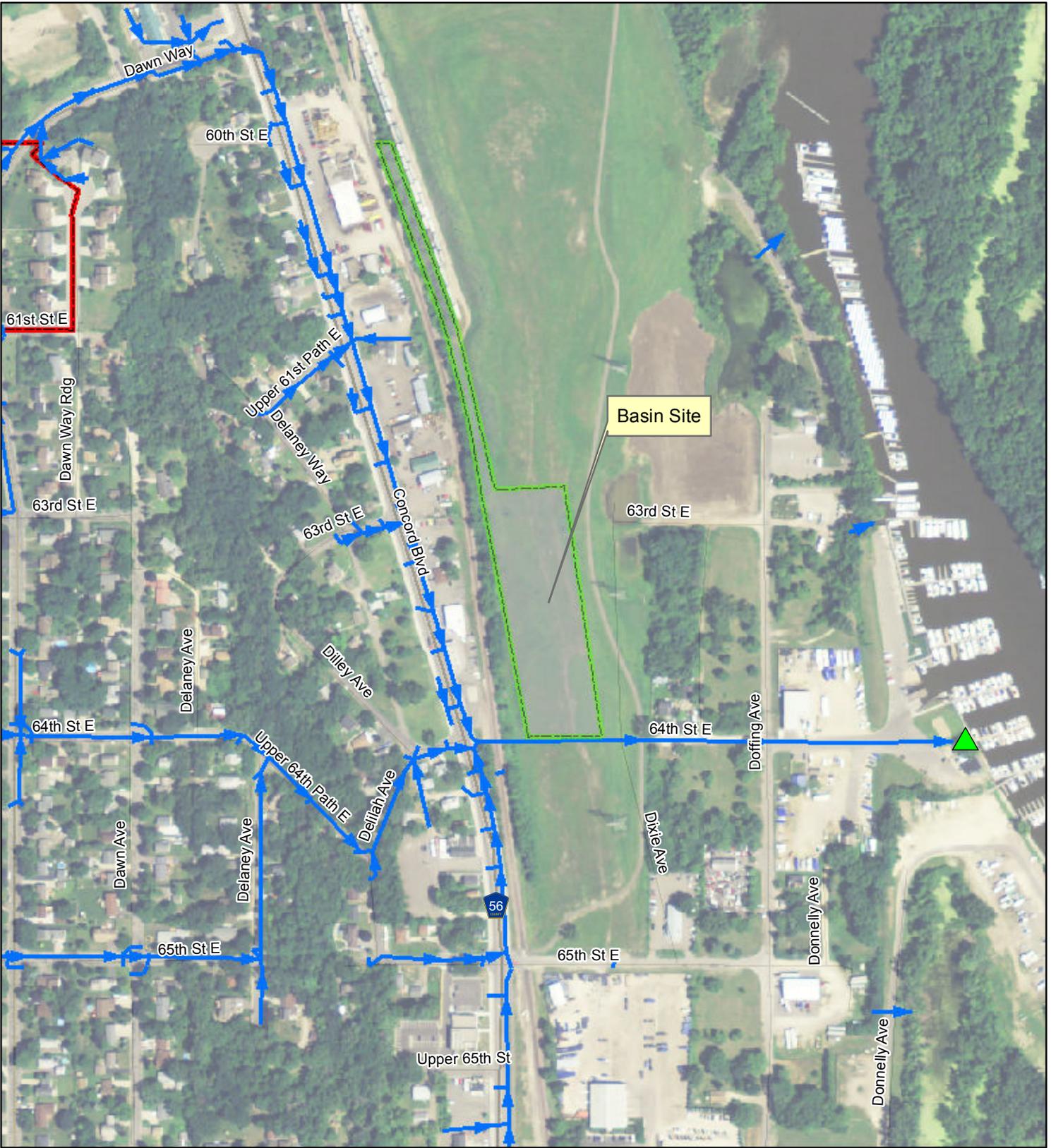
4.2.2.3 Estimated Pollutant Reduction

Pollutant reductions for the 64th and Concord stormwater management basins were estimated by simulating the proposed basins and their contributing area with the P8 water quality model. Weather conditions for the 10-year period from 2001-2010 were used as inputs for the simulation.

The P8 model showed that the proposed basins trapped on average approximately 10,500 pounds per year of TSS and 17 pounds per year of TP for the 10-year simulation period. This represents a 67 percent reduction of TSS for the watershed contributing to the proposed pond, and a 22.3 pound per acre (27 percent) reduction for the Old Village subwatershed.

4.2.2.4 Estimated Construction Costs

The estimated construction cost for the 64th and Concord wet extended basins is \$380,000. This cost does not include testing for or remediation of any contaminated soils or high elevation of bedrock, either or both of which may be present at the project site. Soil testing will be required before the project reaches final design. Cost estimate details are shown in Table 4-1.



-  64th Street Outfall
-  Proposed Project Footprint
-  Existing Storm Sewer
-  City of Inver Grove Heights

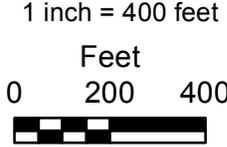
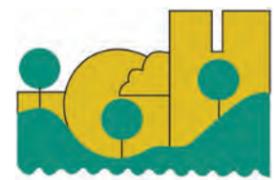
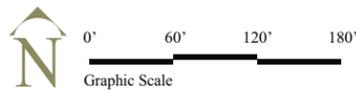


FIGURE 4-3

64TH AND CONCORD WET EXTENDED
DETENTION BASIN PROJECT LOCATION
(OLD VILLAGE SUBWATERSHED)
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN



Heritage Village Park ON THE MISSISSIPPI RIVER

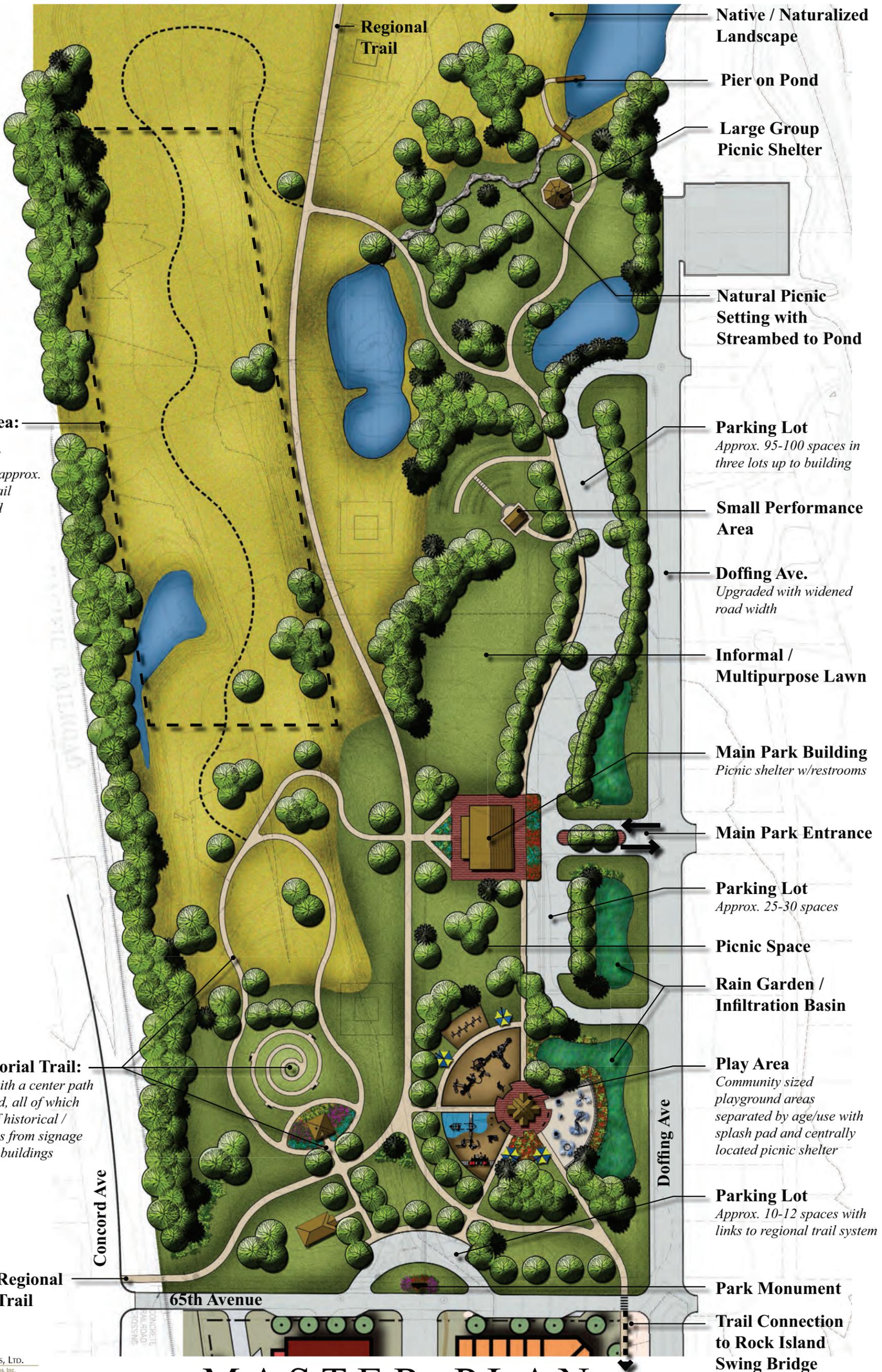


Infiltration Area:
Land set aside for stormwater system/ infiltration basins (approx. 3 acres) - nature trail could possibly wind through this area

Heritage Memorial Trail:
Trail loop system with a center path rotating up a mound, all of which contain a variety of historical / interpretive displays from signage to artifacts or even buildings

Regional Trail

BRAUER & ASSOCIATES, LTD.
A Division of WSB & Associates, Inc.
701 Xenia Avenue South - Suite 300
Minneapolis, MN 55416
Tel: 763-541-4800
Project #1702-230



- Native / Naturalized Landscape**
- Pier on Pond**
- Large Group Picnic Shelter**
- Natural Picnic Setting with Streambed to Pond**
- Parking Lot**
Approx. 95-100 spaces in three lots up to building
- Small Performance Area**
- Doffing Ave.**
Upgraded with widened road width
- Informal / Multipurpose Lawn**
- Main Park Building**
Picnic shelter w/restrooms
- Main Park Entrance**
- Parking Lot**
Approx. 25-30 spaces
- Picnic Space**
- Rain Garden / Infiltration Basin**
- Play Area**
Community sized playground areas separated by age/use with splash pad and centrally located picnic shelter
- Parking Lot**
Approx. 10-12 spaces with links to regional trail system
- Park Monument**
- Trail Connection to Rock Island Swing Bridge**

MASTER PLAN

Figure 4-4
Heritage Park Concept Plan

4.2.2.5 Estimated Construction Costs

Table 4-1. 64th and Concord Wet Extended Detention Basin Preliminary Opinion of Cost

Item	Unit	Quantity	Unit Cost	Cost	Notes
Mobilization/Demobilization	LS	1	\$ 31,000.00	\$ 31,000.00	1,2
Traffic Control	LS	1	\$ 1,000.00	\$ 1,000.00	1,2
Erosion Control	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Inlet Protection	Each	2	\$ 200.00	\$ 400.00	1,2
Sod Removal	SY	3,000	\$ 5.00	\$ 15,000.00	1,2
Clearing and Grubbing	SY	4,800	\$ 5.00	\$ 24,000.00	1,2
Excavation	CY	3,200	\$ 15.00	\$ 48,000.00	1,2
Excavation Off-site Disposal	CY	3,200	\$ 15.00	\$ 48,000.00	1,2
Grading	SY	3,000	\$ 2.00	\$ 6,000.00	1,2
Turf Re-Establishment (Restoration)	SF	10,000	\$ 1.00	\$ 10,000.00	1,2
24" RCP Storm Sewer (Excavation, Install, Backfill)	LF	750	\$ 54.00	\$ 40,500.00	1,2
24" FES	Each	1	\$ 715.00	\$ 715.00	1,2
Connect Storm Sewer to Existing Manhole	Each	1	\$ 2,000.00	\$ 2,000.00	1,2
18" RCP Storm Sewer (Excavation, Install, Backfill)	LF	50	\$ 43.00	\$ 2,150.00	1,2
60" Outlet Structure	Each	1	\$ 10,000.00	\$ 10,000.00	1,2
Riprap	CY	6	\$ 130.00	\$ 780.00	1,2
Temporary Fence Installation	LF	1,200	\$ 8.00	\$ 9,600.00	1,2
Subtotal Construction Cost				\$ 260,000.00	1,3
Contingency (15%)			15%	\$ 40,000.00	1,3
Permitting, Engineering, and Design (15%)			15%	\$ 50,000.00	1,3
Construction Observation (10%)			10%	\$ 30,000.00	1,3
Total Cost				\$ 380,000.00	1,3,4

(1) This is a point estimate for 2015, and could vary due to cost and design changes.

(2) Rounded to the nearest \$100.

(3) Rounded up to the nearest \$10,000.

(4) Estimated total project cost does not include costs of potential contamination at the site

4.2.3 65th Street and Doffing Avenue Wet Extended Detention Basin

4.2.3.1 Project Location

The proposed project is located on a City-owned parcel of undeveloped land southwest of the intersection of 65th Street East and Doffing Avenue (Figure 4-5). The parcel is approximately 0.3 acres and lies adjacent to a 5-acre parking area for a waste management business. Under existing conditions, runoff from the site flows to a swale along 66th Street East, which discharges directly to the Mississippi River. This project is part of item 54 in the City's 3rd Gen WRMP, Table 5.1.

4.2.3.2 Alternatives Considered

The proposed project would consist of a wet extended detention basin that would be designed to treat runoff from its direct watershed of 11.6 acres. The proposed pond's area would be 0.15 acres, with a permanent pool volume of approximately 0.5 acre-feet and a live storage volume of approximately 0.7 acre-feet. The pond would discharge through an outlet structure to the existing swale that flows to the Mississippi River.

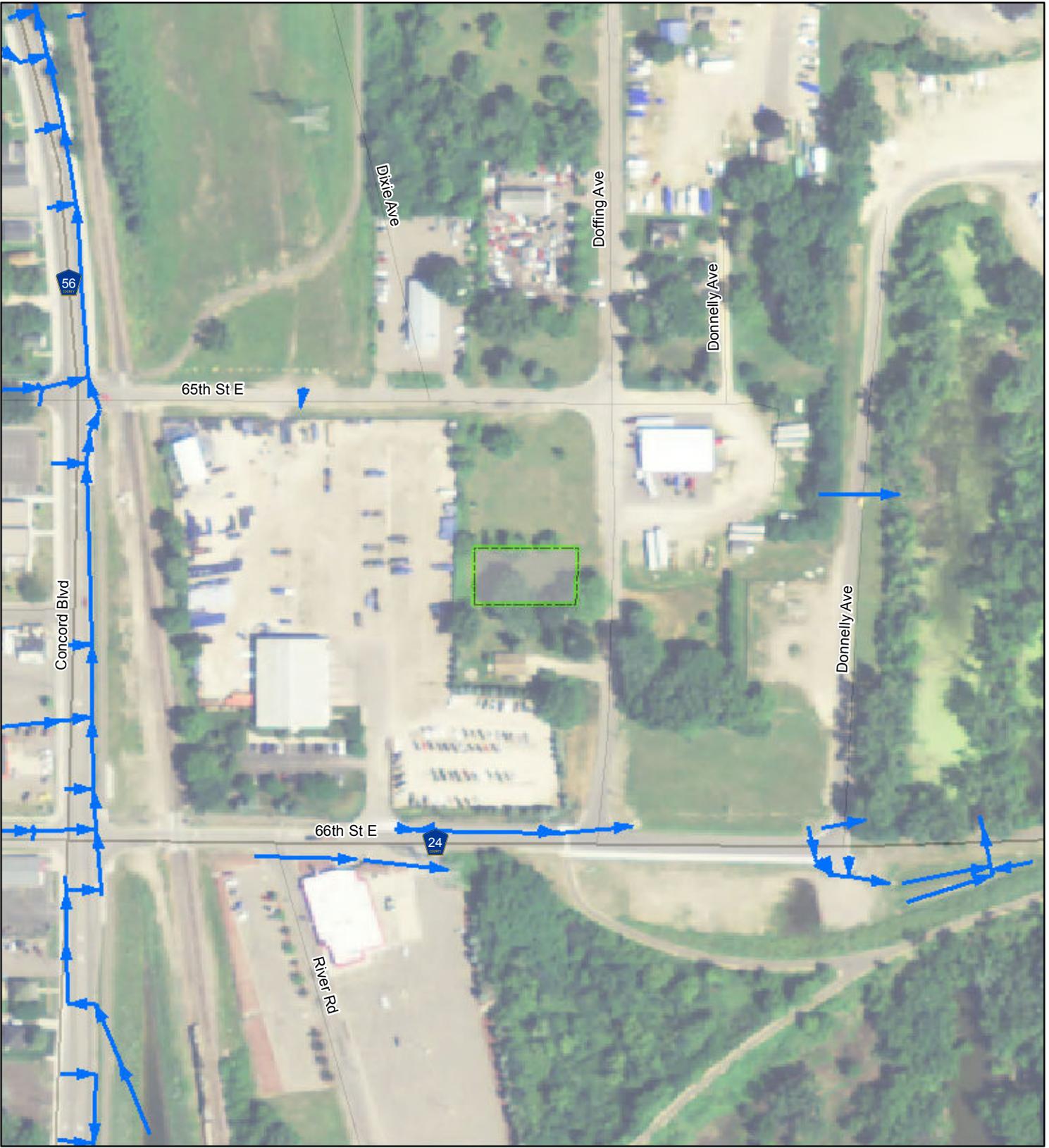
4.2.3.3 Estimated Pollutant Reduction

Pollutant reductions for the 65th and Doffing stormwater management basin were estimated by simulating the proposed basin and its contributing area with the P8 water quality model. Weather conditions for the 10-year period from 2001-2010 were used as inputs for the simulation.

The P8 model showed that the proposed basin trapped on average approximately six pounds per year of TP and 3,500 pounds per year of TSS for the 10-year simulation period. This represents a 69 percent TSS reduction for the watershed contributing to the proposed pond, and a 7.4 pound per acre (5 percent) TSS reduction for the Old Village subwatershed.

4.2.3.4 Estimated Construction Costs

The estimated construction cost for the 65th and Doffing wet extended basin is \$140,000. This cost does not include testing for or remediation of any contaminated soils or high elevation of bedrock, either or both of which may be present at the project site. Soil testing will be required before the project reaches final design. Cost estimate details are shown in Table 4-2.



-  Proposed Project Footprint
-  Existing Storm Sewer
-  City of Inver Grove Heights



1 inch = 200 feet

Feet

0 100 200



FIGURE 4-5

65TH AND DOFFING WET EXTENDED
DETENTION BASIN PROJECT LOCATION
(OLD VILLAGE SUBWATERSHED
Stormwater Project Plan
City of Inver Grove Heights
Dakota County, MN

4.2.3.5 Estimated Construction Costs

Table 4-2. 65th Street and Doffing Wet Extended Detention Basin Preliminary Opinion of Cost

Item	Unit	Quantity	Unit Cost	Cost	Notes
Mobilization/Demobilization	LS	1	\$ 8,000.00	\$ 8,000.00	1,2
Traffic Control	LS	1	\$ 1,000.00	\$ 1,000.00	1,2
Erosion Control	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Inlet Protection	Each	2	\$ 200.00	\$ 400.00	1,2
Sod Removal	SY	726	\$ 5.00	\$ 3,630.00	1,2
Excavation	CY	1,900	\$ 15.00	\$ 28,500.00	1,2
Excavation Off-site Disposal	CY	1,900	\$ 15.00	\$ 28,500.00	1,2
Grading	SY	726	\$ 2.00	\$ 1,452.00	1,2
Turf Re-Establishment (Restoration)	SF	8,800	\$ 1.00	\$ 8,800.00	1,2
18" RCP Storm Sewer (Excavation, Install, Backfill)	LF	25	\$ 43.00	\$ 1,075.00	1,2
18" FES	Each	1	\$ 585.00	\$ 585.00	1,2
Riprap	CY	4	\$ 130.00	\$ 520.00	1,2
Temporary Fence Installation	LF	400	\$ 8.00	\$ 3,200.00	1,2
Subtotal Construction Cost				\$ 90,000.00	1,3
Contingency (15%)			15%	\$ 20,000.00	1,3
Permitting, Engineering, and Design (15%)			15%	\$ 20,000.00	1,3
Construction Observation (10%)			10%	\$ 10,000.00	1,3
Total Cost				\$ 140,000.00	1,3,4

(1) This is a point estimate for 2015, and could vary due to cost and design changes.

(2) Rounded to the nearest \$100.

(3) Rounded up to the nearest \$10,000.

(4) Estimated total project cost does not include costs of potential contamination at the site

4.2.4 Dickman Industrial Park Wet Extended Detention Basins

4.2.4.1 Project Location

The proposed project is located in an industrial area of approximately 25 acres in the southern part of the Old Village subwatershed, between Concord Boulevard and Dickman Trail (Figure 4-6). The City of Inver Grove Heights has begun to acquire property in the area for redevelopment into an industrial park. Figure 4-7 shows the City's preliminary concept plan for the redeveloped industrial park.

There is an existing stormwater management basin at the northern tip of the industrial area that receives runoff from a watershed of approximately 40.2 acres that includes the north end of the industrial site, parts of the Concord Boulevard right-of-way, and a partially developed area north of Concord Boulevard. Approximately 24 acres at the south end of the site currently drains to an existing 30-inch diameter storm sewer pipe that discharges to the Mississippi River between the 64th Street storm sewer outfall and the 70th Street storm sewer outfall. This project is considered a high priority site by the Friends of Pool Two organization and it is Item 52 in the City's 3rd Gen WRMP, Table 5.1.

4.2.4.2 Alternatives Considered

The proposed project would consist of two wet extended detention basins that would treat runoff from the portion of the future industrial park not already served by the existing basin at the north end of the site. The combined permanent pool volume of the two proposed basins would be approximately 1.0 acre-foot. The ponds would receive stormwater runoff from the redeveloped Dickman Industrial Park area, and would discharge treated water to the existing 30-inch diameter storm sewer pipe located east of the site.

Additional stormwater BMPs will likely be constructed at the redeveloped site, including volume-reduction BMPs such as infiltration basins. As the site plan is developed further, the pond sizes may be revised as needed to match the desired treatment volume.

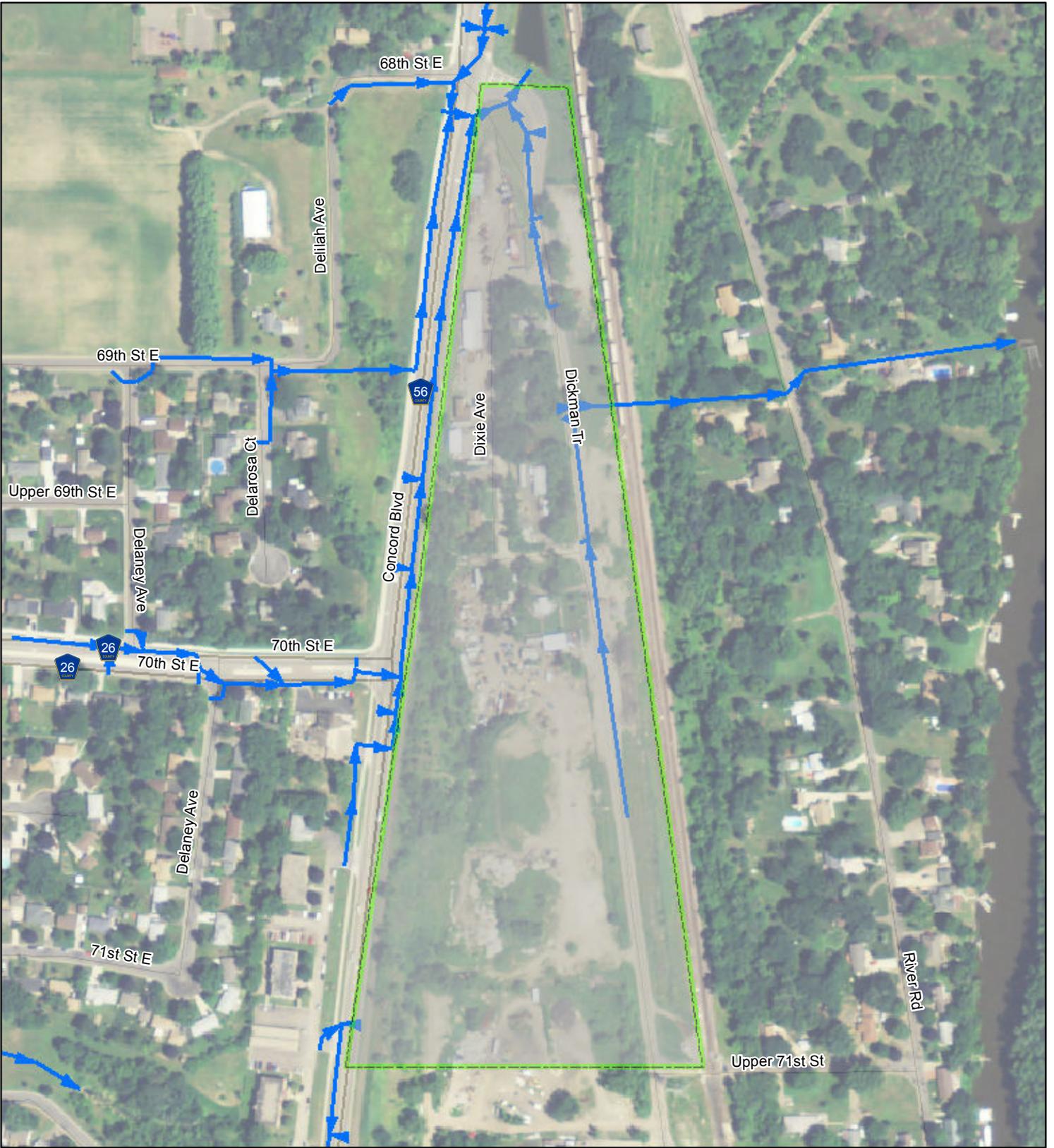
4.2.4.3 Estimated Pollutant Reduction

Pollutant reductions for the Industrial Park stormwater management basins were estimated by simulating the proposed basin and its contributing area with the P8 water quality model. Weather conditions for the 10-year period from 2001-2010 were used as inputs for the simulation.

The P8 model showed that the proposed basins trapped on average approximately 17 pounds per year of TP and approximately 8,300 pounds per year of TSS for the 10-year simulation period. This represents an 82 percent TSS reduction for the watershed contributing to the proposed pond, and a 17.7 pound per acre (12 percent) TSS reduction for the Old Village subwatershed.

4.2.4.4 Estimated Construction Costs

The estimated construction cost for the Dickman Industrial Park wet extended basins is \$230,000. This cost does not include testing for or remediation of any contaminated soils or high elevation of bedrock, either or both of which may be present at the project site. Shallow bedrock is known to be in the area and soil testing will be required before the project reaches final design. Cost estimate details are shown in Table 4-3.



-  Proposed Project Location
-  Existing Storm Sewer
-  City of Inver Grove Heights



1 inch = 300 feet

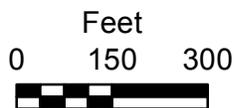


FIGURE 4-6

DICKMAN INDUSTRIAL PARK WET EXTENDED
 DETENTION BASINS PROJECT LOCATION
 (OLD VILLAGE WATERSHED)
 Stormwater Project Plan
 City of Inver Grove Heights
 Dakota County, MN

Dickman Industrial Park (South)

- Multi-Tenant Light Industrial (60,000 Sq. Ft.)
- Multi-Tenant Light Industrial (36,000 Sq. Ft.)
- (3) 1 acre Light Industrial Sites (+/- 14,000 Sq. Ft. for each site)

Dickman Industrial Park (North)

- 2 story Office / Flex (20,000 Sq. Ft.)
- (2) 1 Acre Light Industrial Sites (+/- 30,000 Sq. Ft.)
- Multi-Tenant Light Industrial (40,000 Sq. Ft.)

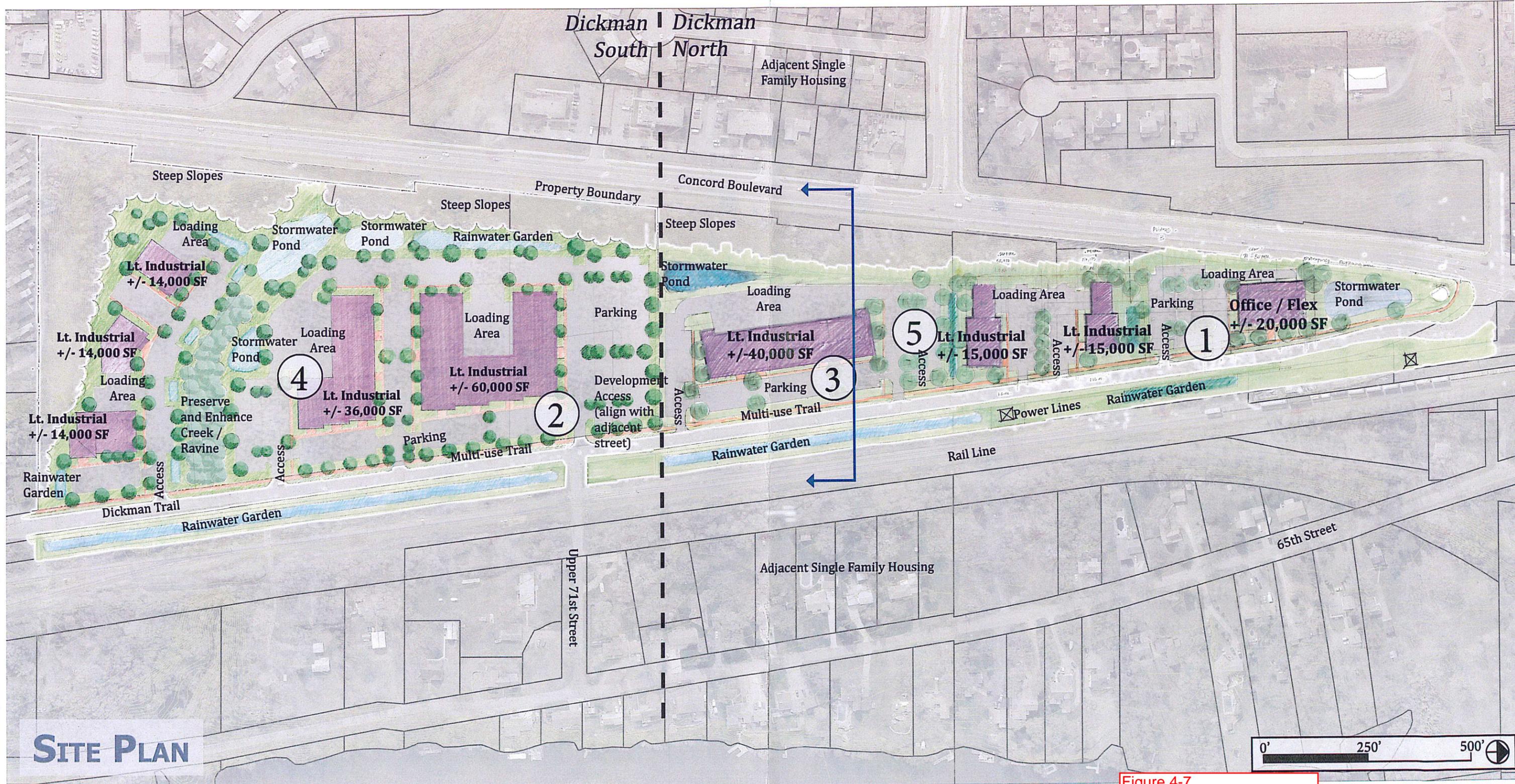


Figure 4-7
Dickman Industrial Park
Preliminary Concept Plan

4.2.4.5 Estimated Construction Costs

Table 4-3. Dickman Industrial Park Wet Extended Detention Basin Preliminary Opinion of Cost

Item	Unit	Quantity	Unit Cost	Cost	Notes
Mobilization/Demobilization	LS	1	\$ 13,900.00	\$ 13,900.00	1,2
Traffic Control	LS	1	\$ 1,000.00	\$ 1,000.00	1,2
Erosion Control	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Inlet Protection	Each	1	\$ 200.00	\$ 200.00	1,2
Excavation	CY	3900	\$ 15.00	\$ 58,500.00	1,2
Excavation Off-site Disposal	CY	3900	\$ 15.00	\$ 58,500.00	1,2
Grading	SY	726	\$ 2.00	\$ 1,452.00	1,2
Turf Re-Establishment (Restoration)	SF	13000	\$ 1.00	\$ 13,000.00	1,2
18" RCP Storm Sewer (Excavation, Install, Backfill)	LF	50	\$ 43.00	\$ 2,150.00	1,2
18" FES	Each	2	\$ 585.00	\$ 1,170.00	1,2
Riprap	CY	4	\$ 130.00	\$ 520.00	1,2
Subtotal Construction Cost				\$ 160,000.00	1,3
Contingency (15%)			15%	\$ 24,000.00	1,3
Permitting, Engineering, and Design (15%)			15%	\$ 27,600.00	1,3
Construction Observation (10%)			10%	\$ 18,400.00	1,3
Total Cost				\$ 230,000.00	1,3,4

(1) This is a point estimate for 2015, and could vary due to cost and design changes.

(2) Rounded to the nearest \$100.

(3) Rounded up to the nearest \$10,000.

(4) Estimated total project cost does not include costs of potential contamination at the site

4.2.5 64th and Crosby Wet Extended Detention Basin

4.2.5.1 Project Location

The proposed project is located within a residential area, south of the intersection of 64th Street and Crosby Avenue, at the northeast corner of a green space of approximately 6.6 acres that is expected to be developed into future single family housing (Figure 4-8). This project is Item 56 in the City's 3rd Gen WRMP, Table 5.1.

4.2.5.2 Alternatives Considered

The proposed project would consist of a wet extended detention basin. The permanent pool volume of the basin would be approximately 1.0 acre-feet. The pond would treat stormwater runoff from the newly developed area and from approximately 18 acres of the area contributing to the storm sewer trunk line along 64th Street.

The developer of new housing in this area will be required to construct stormwater treatment for the new impervious surface created within the development. The City proposes to route water from the existing storm sewer draining the area to the north and west of the proposed pond. The City would pay for the cost of storm sewer modifications to re-route water from the 64th Street storm sewer trunk line and would share in the pond construction cost proportionally to the proportion of stormwater volume contributed to the pond.

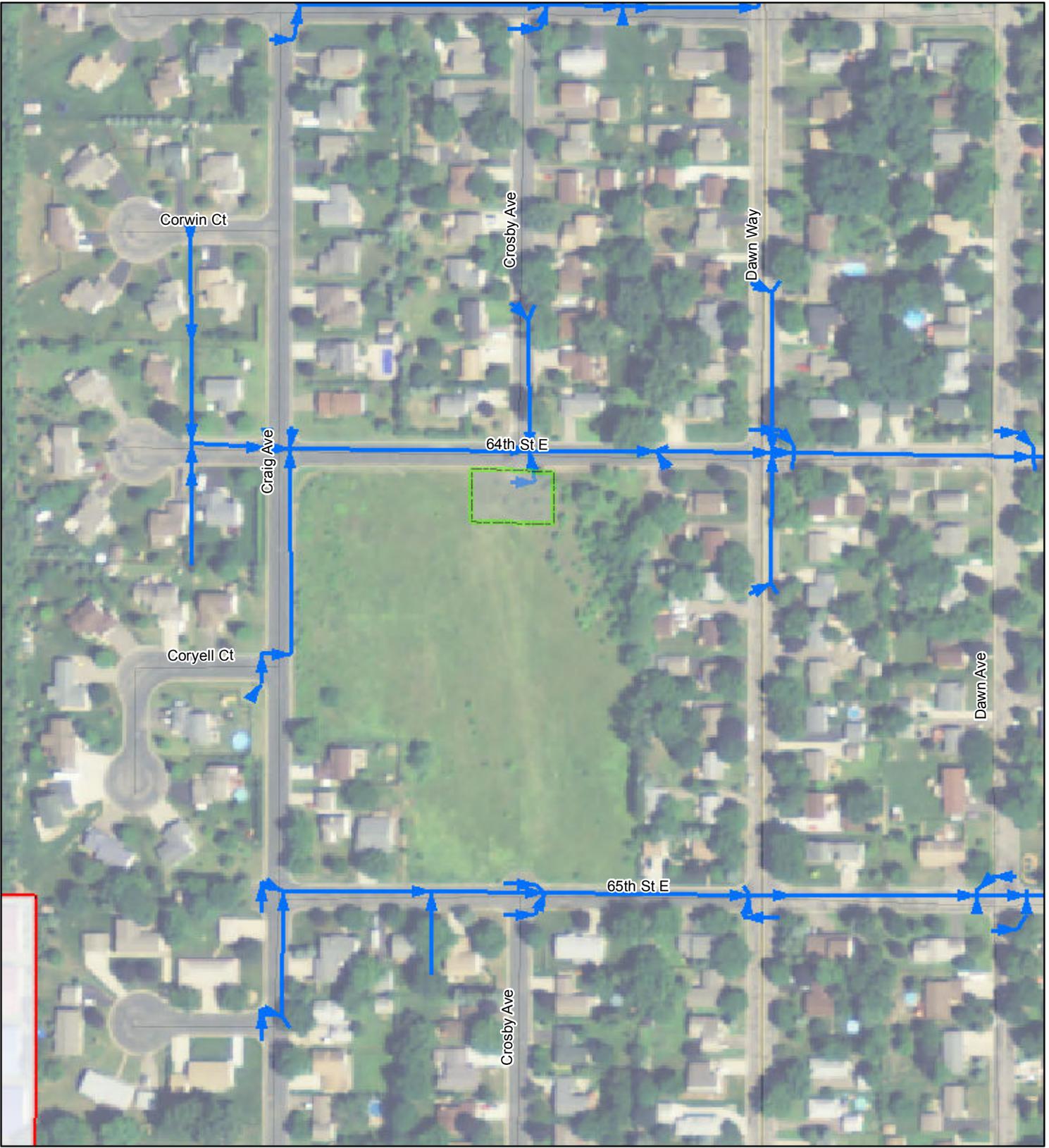
4.2.5.3 Estimated Pollutant Reduction

Pollutant reductions for the stormwater management basin were estimated by simulating the proposed basin and its contributing area with the P8 water quality model. Weather conditions for the 10-year period from 2001-2010 were used as inputs for the simulation.

The P8 model showed that the proposed basins trapped on average approximately five pounds of TP per year and 2,500 pounds per year of TSS for the 10-year simulation period. This represents a 90 percent TSS reduction of TSS for the area contributing to the proposed basin, and a 5.3 pound per acre (nine percent) TSS reduction for the Old Village subwatershed.

4.2.5.4 Estimated Construction Costs

The estimated construction cost for the 64th and Crosby wet extended basin is \$240,000. This cost does not include testing for or remediation of any contaminated soils or high elevation of bedrock, either or both of which may be present at the project site. Soil testing will be required before the project reaches final design. Cost estimate details are shown in Table 4-4.



-  Approximate Project Footprint
-  Existing Storm Sewer
-  City of Inver Grove Heights

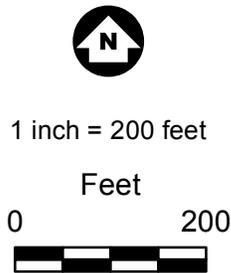


FIGURE 4-8

64TH AND CROSBY WET EXTENDED
DETENTION BASIN PROJECT LOCATION
Stormwater Treatment
Feasibility Study
City of Inver Grove Heights
Dakota County, MN

4.2.5.5 Estimated Construction Costs

Table 4-4. 64th and Crosby Wet Extended Detention Basin Preliminary Opinion of Cost

Item	Unit	Quantity	Unit Cost	Cost	Notes
Mobilization/Demobilization	LS	1	\$ 13,900.00	\$ 13,900.00	1,2
Traffic Control	LS	1	\$ 1,000.00	\$ 1,000.00	1,2
Erosion Control	LS	1	\$ 2,000.00	\$ 2,000.00	1,2
Inlet Protection	Each	1	\$ 200.00	\$ 200.00	1,2
Excavation	CY	3,900	\$ 15.00	\$ 58,500.00	1,2
Excavation Off-site Disposal	CY	3,900	\$ 15.00	\$ 58,500.00	1,2
Grading	SY	726	\$ 2.00	\$ 1,452.00	1,2
Turf Re-Establishment (Restoration)	SF	13,000	\$ 1.00	\$ 13,000.00	1,2
18" RCP Storm Sewer (Excavation, Install, Backfill)	LF	50	\$ 43.00	\$ 2,150.00	1,2
18" FES	Each	2	\$ 585.00	\$ 1,170.00	1,2
Riprap	CY	4	\$ 130.00	\$ 520.00	1,2
Subtotal Construction Cost				\$ 160,000.00	1,3
Contingency (15%)			15%	\$ 30,000.00	1,3
Permitting, Engineering, and Design (15%)			15%	\$ 30,000.00	1,3
Construction Observation (10%)			10%	\$ 20,000.00	1,3
Total Cost				\$ 240,000.00	1,3

(1) This is a point estimate for 2015, and could vary due to cost and design changes.

(2) Rounded to the nearest \$100.

(3) Rounded up to the nearest \$10,000.

(4) Estimated total project cost does not include costs of potential contamination at the site

5.0 Summary

This Stormwater Project Plan describes stormwater BMPs that have the potential to decrease TSS loading from the City of Inver Grove Heights to the Mississippi River. The City has identified several potential sites where land for a BMP has been or could be acquired, or where future public projects will be undertaken that could incorporate retrofit stormwater BMPs into their design. Construction and maintenance costs, pollutant removals, and cost effectiveness for the evaluated projects are compared in Table 5-1.

Some of the projects described in this plan are at the early concept design stage and are subject to change due to factors including conflicts with existing infrastructure, contaminated soils, shallow bedrock, and other unforeseen site limitations. Substantial changes to projects would be communicated to the MPCA by submitting addendums to the Stormwater Project Plan.

Table 5-1. TSS Removal and Cost Comparison for Evaluated BMPs

Project Number	Project Name	Subwatershed	TP Reduction (lbs/yr)	TSS Reduction (lbs/yr)	Construction Cost (6) (\$)	Maintenance Cost (\$/yr)	Lifespan (yrs)	Cost Effectiveness (\$/lb TSS/yr)
1	78 th and Concord Wet Extended Detention Basin	Skyline Village	9	3,400 (1)	\$ 400,000 (1)	\$ 14,000	25	\$ 118
2	Delano Circle Rainwater Gardens (1)	Skyline Village	2	850 (1)	\$ 27,600 (1)	\$ 966	20	\$ 33
3	Dawn-Concord Ravine Wet Extended Detention Basin	South Grove	10	7,050	\$ 250,000	\$ 8,750	35	\$ 35
4	River Road Wet Extended Detention Basin	South Grove	50	36,300 (3)	\$ 900,000	\$ 31,500	35	\$ 25
5	7125 Concord Infiltration Basins	South Grove	5	1,570	\$ 160,000	\$ 5,600	20	\$ 9
6	Dawn Way Rainwater Gardens (1)	Old Village	7	2,820 (1)	\$ 92,000	\$ 3,220	20	\$ 33
7	64 th and Concord Wet Extended Detention Basins	Old Village	17	10,500	\$ 380,000	\$ 13,300	35	\$ 36
8	65 th and Doffing Wet Extended Detention Basin	Old Village	6	3,500	\$ 140,000	\$ 4,900	35	\$ 40
9	Dickman Industrial Park Wet Extended Detention Basins	Old Village	17	8,300	\$ 240,000	\$ 8,400	35	\$ 29
10	64 th and Crosby Wet Extended Detention Basin	Old Village	5	1,500 (4)	\$ 200,000 (5)	\$ 7,000	35	\$ 160
11	Dickman Trail Storm Sewer Improvements (2)	South Grove	< 1	120 (2)	\$ 210,000	\$ 7,350	35	\$ 1,750
12	Dawn-Concord Ravine Dry Extended Detention Basin (2)	South Grove	< 1	120 (2)	\$ 220,000	\$ 7,700	35	\$ 1,833

(1) TSS reduction and cost estimate from the Dakota County SWCD study

(2) TSS reduction is based on increased TSS trapping in the proposed River Road Wet Extended Basin

(3) TSS reduction assumes that no additional upstream BMPs are constructed

(4) TSS reduction is based on stormwater treatment for the existing developed area.

(5) Construction cost will be shared between the City and the site's developer. The amount listed represents only the City's portion of the cost.

(6) Estimated final cost does not include potential cost of contamination cleanup or bedrock that may be encountered at site.

Appendix A

***Table 5-1 from the City of Inver Grove Heights Third Generation
Water Resources Management Plan***

SECTION V

TABLE 5.1

INVER GROVE HEIGHTS LOCAL WATER MANAGEMENT IMPLEMENTATION PLAN

No.	Project Description	MS4 Permit Requirement	Initial 12 Month Requirement	Annual Requirement	Projects, Programs, & Studies	10 Year Cost Estimate ¹	Possible Funding Sources ³	Proposed Cost By Year ^{1,2}									Comments	
								2014	2015	2016	2017	2018	2019	2020	2021	2022		2023
1	<u>Systems Mapping</u> - Update Stormwater Sewer System Map and basin inventory. The mapping and inventory will be completed within 12 months of the date permit coverage is extended. Once completed, the inventory will be submitted to the MPCA MS4 Permit Program.	✓	✓	✓		\$40,000	General Fund/ Storm Water Utility	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	See SWPPP Application for Reauthorization (Appendix B)
2	<u>Construction Site Stormwater Runoff Control</u> - The City will update regulatory mechanisms to meet or exceed the requirements of MPCA permit to discharge stormwater associated with construction activity, as well as review ordinances to ensure they meet the new construction general permit requirements within 12 months of the date permit coverage is extended.	✓	✓			\$3,500	General Fund/ Storm Water Utility	\$3,500										See SWPPP Application for Reauthorization (Appendix B)
3	<u>BMP Construction Guidance</u> - Develop BMP construction guidance document for developers and contractors within 12 months of the date permit coverage is extended	✓	✓		✓	\$4,500	General Fund/ Storm Water Utility	\$4,500										See SWPPP Application for Reauthorization (Appendix B)
4	<u>Post-construction Stormwater Management</u> - The City will evaluate and update related ordinances and documentation methods to meet the requirements of the MS4 permit within 12 months of the date permit coverage is extended.	✓	✓			\$10,000	General Fund/ Storm Water Utility	\$5,000	\$5,000									See SWPPP Application for Reauthorization (Appendix B)
5	<u>Enforcement Response Procedures</u> - Existing ERP's including NPDES Inspection Form, Erosion and Sediment Control Inspection Report, and a Notice of Erosion Control Requirement for Construction will be updated to meet the permit requirements within 12 months the date permit coverage is extended.	✓	✓			\$4,000	General Fund/ Storm Water Utility	\$4,000										See SWPPP Application for Reauthorization (Appendix B)
6	<u>Public Education and Outreach</u> - The City will complete the following public education and outreach activities to stay compliant with MS4 Permit requirements within 12 months the date permit coverage is extended: -NPDES/MS4/SWPPP related brochures at City Hall -Minimum of two NPDES/MS4/SWPPP public education related articles in the City's Insights newsletter. -Continue annual joint powers agreement with Dakota County Soil and Water Conservation District to educate the public through the DCSWCD Blue Thumb program -Continue annual joint powers agreement with Dakota County Soil and Water Conservation District to educate the public through the City's Raingarden Program in relation to appropriate public improvement projects. -The City will update the website to meet permit requirements within 12 months the date permit coverage is extended -When possible, the City will make presentations to community groups and attend community group meetings. -Other	✓	✓	✓		\$100,000	General Fund/ Storm Water Utility	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	See SWPPP Application for Reauthorization (Appendix B)

SECTION V

No.	Project Description	MS4 Permit Requirement	Initial 12 Month Requirement	Annual Requirement	Projects, Programs, & Studies	10 Year Cost Estimate ¹	Possible Funding Sources ³	Proposed Cost By Year ^{1,2}									Comments	
								2014	2015	2016	2017	2018	2019	2020	2021	2022		2023
7	<u>Annual SWPPP Assessment & Annual Reporting</u> City staff will conduct an annual SWPPP assessment in preparation of each annual report. Proposed SWPPP modifications are subject to Part II.G of the MS4 permit. The final annual report will be posted on the Water Resources webpage. City staff will submit the annual report to the MPCA prior to June 30th for the previous calendar year.	✓	✓	✓		\$20,000	General Fund/ Storm Water Utility	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	See SWPPP Application for Reauthorization (Appendix B)
8	<u>Annual Public Meeting/Event</u> Provide public notice and present the draft MS4 annual report to one public event per year to solicit public input regarding the adequacy of the City's SWPPP. Public input received (oral and written) will be recorded in a record of decision and evaluated by the City's MS4 General Contact. City responses (if relevant) will be made in writing to each commenter. Hold one event per calendar year of the MS4 permit cycle. Maintain web-based online system allowing citizens and businesses to notify City of issues related to stormwater or illicit discharge.	✓		✓		\$35,000	General Fund/ Storm Water Utility	\$3,500	\$3,500	\$3,500	\$3,500	\$3,500	\$3,500	\$3,500	\$3,500	\$3,500	\$3,500	See SWPPP Application for Reauthorization (Appendix B)
9	<u>Online Availability of the Stormwater Pollution Prevent Plan (SWPPP) Program Document</u> - The City will make the SWPPP and 2013 annual report available on the Water Resources webpage within 12 months from the date the MS4 permit coverage is extended to the City.	✓	✓	✓		\$5,000	Storm Water Utility	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	See SWPPP Application for Reauthorization (Appendix B)
10	<u>IDDE Program</u> - The City will review and update the written procedures of the following within 12 months the date permit coverage is extended: - Identification of priority areas likely to have illicit discharges as described in the permit - Timely response to known, suspected, and reported illicit discharges - Investigating, locating and eliminating the source of illicit discharges - ERPs for eliminating the illicit discharges and needed corrective actions - Record keeping as required by the MS4 permit	✓	✓	✓		\$16,500	General Fund/ Storm Water Utility	\$3,000	\$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)
11	<u>Construction Site Stormwater Runoff Control</u> - The City will update regulatory mechanisms to meet or exceed the requirements of MPCA permit to discharge stormwater associated with construction activity, as well as review ordinances to ensure they meet the new construction general permit requirements within 12 months of the date permit coverage is extended.	✓	✓			\$3,500	General Fund/ Storm Water Utility	\$3,500										See SWPPP Application for Reauthorization (Appendix B)
12	<u>IDDE Community Reporting</u> - The City's IT department will update request system on City webpage to include a link to report illicit discharges. To be completed within 12 months from the date MS4 permit coverage is extended.	✓	✓			\$1,000	General Fund/ Storm Water Utility	\$1,000										See SWPPP Application for Reauthorization (Appendix B)

SECTION V

No.	Project Description	MS4 Permit Requirement	Initial 12 Month Requirement	Annual Requirement	Projects, Programs, & Studies	10 Year Cost Estimate ¹	Possible Funding Sources ³	Proposed Cost By Year ^{1,2}									Comments	
								2014	2015	2016	2017	2018	2019	2020	2021	2022		2023
13	<u>Employee Training</u> - Continue to host a minimum of one staff training event per year to discuss illicit discharge recognition and reporting. City staff will develop an annual training schedule, record the employee names, topics covered, and date of each event, annually through the end of the MS4 permit cycle.	✓	✓	✓		\$10,000	General Fund/ Storm Water Utility	\$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)
14	<u>Sanitary Sewer/Stormsewer Televis</u> e - The City will, as needed, hire a consultant to televise sections of the sewer system to find illicit connection in the system.				✓	\$50,000	General Fund/ Storm Water Utility	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	See SWPPP Application for Reauthorization (Appendix B)
15	<u>IDDE Priority Inspection Map</u> - Develop map to identify high-priority outfalls and high-risk establishments. To be completed within 12 months from the date MS4 permit coverage is extended.	✓	✓			\$3,000	General Fund/ Storm Water Utility	\$3,000										See SWPPP Application for Reauthorization (Appendix B)
16	<u>Pollution Prevention</u> - The City will develop spill prevention and control plans for municipal facilities by the end of year 1 of the MS4 permit cycle. Educational materials will be distributed to each municipal facility by the end of year 2.	✓	✓			\$2,500	General Fund/ Storm Water Utility	\$2,500										See SWPPP Application for Reauthorization (Appendix B)
17	<u>Pollution Prevention</u> - The City will continue to develop facilities inventory to include potential pollutants and will create a map of all identified facilities within 12 months of the date permit coverage is extended.	✓	✓			\$2,500	General Fund/ Storm Water Utility	\$2,500										See SWPPP Application for Reauthorization (Appendix B)
18	<u>Pollution Prevention</u> - Increase inspection frequency of maintenance yard. Once weekly and after all rain events utilize a checklist for the inspection that documents findings and allows staff to compare to previous inspections. Inspection frequency to be evaluated after year 1.	✓	✓	✓		\$25,000	General Fund/ Storm Water Utility	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	See SWPPP Application for Reauthorization (Appendix B)
19	<u>Pollution Prevention</u> - Annual staff training on fertilizer application, pesticide/herbicide application, and mowing discharge.	✓	✓	✓		\$5,000	General Fund/ Storm Water Utility	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	See SWPPP Application for Reauthorization (Appendix B)
20	<u>Pollution Prevention</u> - Annual training focused on automotive maintenance program (automotive inspections and washing), spill cleanup training, hazardous materials training, building leak prevention and inspection training.	✓	✓	✓		\$5,000	General Fund/ Storm Water Utility	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	See SWPPP Application for Reauthorization (Appendix B)
21	<u>Pollution Prevention</u> - Annual training on parking lot and street cleaning, storm drain systems cleaning, road salt materials management.	✓	✓	✓		\$5,000	General Fund/ Storm Water Utility	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	See SWPPP Application for Reauthorization (Appendix B)
22	<u>Pond Assessment Procedures & Schedule</u> - City will develop procedures for determining TSS and TP treatment effectiveness of City owned ponds used for treatment of stormwater and develop a prioritized inspection and maintenance schedule.	✓	✓		✓	\$52,000	General Fund/ Storm Water Utility	\$10,000	\$10,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	See SWPPP Application for Reauthorization (Appendix B)

SECTION V

No.	Project Description	MS4 Permit Requirement	Initial 12 Month Requirement	Annual Requirement	Projects, Programs, & Studies	10 Year Cost Estimate ¹	Possible Funding Sources ³	Proposed Cost By Year ^{1,2}									Comments
								2014	2015	2016	2017	2018	2019	2020	2021	2022	
23	<u>Wellhead Protection</u> - The City is conducting a wellhead protection study and will address and MS4 permit issues related to wellhead protection within 12 months of the completion of the study.	✓			✓	\$2,000	General Fund/ Storm Water Utility		\$2,000								See SWPPP Application for Reauthorization (Appendix B)
24	<u>Construction Site Stormwater Runoff Control</u> - The City will develop or review the following within 12 months the date permit coverage is extended: - Develop written procedures for site plan reviews - Develop notification system for owners and operators proposing construction activity to apply for and obtain coverage under the MPCA's construction activity permit -Develop written procedures for receipt and consideration of reports of noncompliance or other stormwater related information -Develop written procedures for conducting site ESC inspections - Update the City's grading, land alteration, building, and ROW permits and construction site stormwater runoff ordinance to meet MPCA General Permit requirements - Develop written procedures to track and archive all plan review and inspection documents	✓	✓			\$10,000	General Fund/ Storm Water Utility	\$5,000	\$5,000								See SWPPP Application for Reauthorization (Appendix B)
25	<u>Construction Site Inspections</u> - Ensure at least 10% of inspections conducted annually are performed at sites deemed as high priority inspection sites. Inspection procedures will be evaluated for the first year and changes implemented within 24 months of the date permit coverage is extended.	✓	✓	✓		\$600,000	General Fund/ Storm Water Utility / Developers Agreement	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	See SWPPP Application for Reauthorization (Appendix B)
26	<u>Street Sweeping</u> - The City will continue to conduct street sweeping operations of all public streets a minimum of twice annually (record the sweeping route and date per occurrence). Review and revise (as needed) street sweeping operations (including schedule, equipments, and disposal), stormwater quality priority areas, and routes annually through the end of the MS4 permit cycle.	✓		✓		\$1,500,000	General Fund/ Storm Water Utility	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	See SWPPP Application for Reauthorization (Appendix B)
27	<u>Structural Stormwater BMP, Outfall, and Pond Inspections</u> - Continue inspection of structural pollution control devices on a regular basis and inspect all outfalls, sediment basins, and ponds every 5 years.	✓	✓	✓		\$250,000	General Fund/ Storm Water Utility	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	See SWPPP Application for Reauthorization (Appendix B)
28	<u>Review Inspection Reports</u> - Annually, review all pond, outfall, and SPCD inspection records to determine if maintenance, repair, or replacement is needed. Include a description of the findings and any maintenance, repair, or replacement as a result of the inspection findings. Evaluate each SPCD's inspection frequency and adjust as needed per MS4 Permit Part III.D.6.e(1.). Evaluate and update inspection records annually through the end of the MS4 permit cycle (July 31, 2018)	✓	✓	✓		\$50,000	General Fund/ Storm Water Utility	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	See SWPPP Application for Reauthorization (Appendix B)

SECTION V

No.	Project Description	MS4 Permit Requirement	Initial 12 Month Requirement	Annual Requirement	Projects, Programs, & Studies	10 Year Cost Estimate ¹	Possible Funding Sources ³	Proposed Cost By Year ^{1,2}									Comments
								2014	2015	2016	2017	2018	2019	2020	2021	2022	
29	<u>Storm Drain Cleaning</u> - The City will continue to clean sump manholes and SPCDs annually. The City will document the number of structures cleaned each year.	✓		✓		\$150,000	General Fund/ Storm Water Utility	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	See SWPPP Application for Reauthorization (Appendix B)
30	<u>Employee Training</u> - Continue to host a minimum of one staff training event per year to discuss stormwater related topics. City staff will develop an annual training schedule, record the employee names, topics covered, and date of each event, annually through the end of the MS4 permit cycle.	✓	✓	✓		\$10,000	General Fund/ Storm Water Utility	\$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)
31	<u>Road Salt Application Review</u> - The City will continue to evaluate current practices of road salt applications, alternative products, calibration of equipment, inspection of vehicles, staff training. This includes documenting salt applied each year. The City will continue to annually evaluate and implement this program throughout the MS4 permit cycle.	✓		✓		\$20,000	General Fund/ Storm Water Utility	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	See SWPPP Application for Reauthorization (Appendix B)
32	<u>Pond Sediment Excavation and Removal Projects</u> - The City will develop a reporting component for pond sediment removal projects within 12 months from the date MS4 permit coverage is extended to the City. Reporting will consist of documenting the date, pond ID, project limits/construction plans, volume of sediment removed, test results (if any), and disposal location. Begin report in 2015.	✓	✓			\$4,000	General Fund/ Storm Water Utility	\$4,000									See SWPPP Application for Reauthorization (Appendix B)
33	<u>Stockpiles, Storage and Material Handling Area Inspections</u> - Conduct quarterly written inspections of all stockpile, storage and material handling areas (per the 2014 facility inventory), through the end of the MS4 permit cycle.	✓	✓	✓		\$25,000	General Fund/ Storm Water Utility	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	See SWPPP Application for Reauthorization (Appendix B)
34	<u>Site Plan Review</u> - Every applicant for a City permit to allow land-disturbing activities must submit a project specific stormwater management plan (if applicable) and/or erosion control plan to the City	✓				\$500,000	General Fund/ Developer's Agreement	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	See SWPPP Application for Reauthorization (Appendix B)
35	<u>Park and Open Space Training Program</u> - City to develop and conduct training program	✓	✓	✓		\$6,500	General Fund/ Storm Water Utility	\$2,000	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	See SWPPP Application for Reauthorization (Appendix B)
36	<u>Fleet and Building Maintenance Training Program</u> - City to develop and conduct training program	✓	✓	✓		\$6,500	General Fund/ Storm Water Utility	\$2,000	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	See SWPPP Application for Reauthorization (Appendix B)
37	<u>Develop Sprill Prevention and Control Plan</u> - City will develop program for municipal facilities.	✓	✓			\$3,000	General Fund/ Storm Water Utility	\$3,000									See SWPPP Application for Reauthorization (Appendix B)
38	<u>Annual Progress Report to WMO</u> - The City will provide an update to the WMOs outlining implementation program progress and other important information.				✓	\$2,500	General Fund/ Storm Water Utility	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	
39	<u>BMP, Outfall, and Pond Maintenance</u> - Based on inspection results, maintenance will be performed.				✓	\$1,500,000	General Fund/ Storm Water Utility	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	

SECTION V

No.	Project Description	MS4 Permit Requirement	Initial 12 Month Requirement	Annual Requirement	Projects, Programs, & Studies	10 Year Cost Estimate ¹	Possible Funding Sources ³	Proposed Cost By Year ^{1,2}									Comments
								2014	2015	2016	2017	2018	2019	2020	2021	2022	
40	Northwest Area drainage improvements: ponding, storm sewer and rain gardens.				✓	\$3,000,000	Northwest Area Fees / Developers Agreement	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	
41	Seidls Lake Outlet - Stormwater lift station and storm sewer to address water quality and erosion concerns..				✓	\$250,000	Storm Water Utility/ Stormwater Special Tax			\$250,000							
42	Valley Park Drainage Basin Outlet: stormwater lift station and storm sewer - connect to 70th Street system				✓	\$500,000	Storm Water Utility/ Stormwater Special Tax									\$500,000	
43	Atlas 14 Risk Assessment - Updated City wide modeling for Atlas 14				✓	\$115,000	General Fund / Storm Water Utility/		\$65,000	\$25,000	\$25,000						
44	Wetland inventory and assessment				✓	\$100,000	General Fund/ Storm Water Utility	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	
45	Miscellaneous updates to existing hydrologic models				✓	\$100,000	General Fund/ Storm Water Utility	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	
46	XP SWMM snowmelt modeling and report (including map and tables) - other unmodeled areas (e.g., Albavar Path, Rosemount, portions of Babcock Trail drainage basins)				✓	\$56,000	General Fund/ Storm Water Utility					\$56,000					
47	Revise Water Resources Management Plan				✓	\$200,000	General Fund/ Storm Water Utility									\$200,000	
48	Golf Course Pond—feasibility study to address shoreline erosion issues				✓	\$10,000	General Fund/ Storm Water Utility					\$10,000					
49	Water Quality Monitoring - Simley Lake, Dickman Lake, Ohmans Lake, and/or others as necessary.				✓	\$30,000	General Fund/ Storm Water Utility					\$10,000		\$10,000		\$10,000	
50	Dawn Way and 59th Street Capacity Issues				✓	\$359,000	General Fund/ Storm Water Utility					\$359,000					
51	Develop Wetland Ordinance				✓	\$30,000	General Fund/ Storm Water Utility		\$30,000								
52	Dixie Avenue and Dickman Trail Stormwater Basin Construction and Storm Sewer Improvements				✓	\$450,000	Developers Agreement/ Grants				\$450,000						
53	78th and Concord Blvd Stormwater Management Basin Construction and Storm Sewer Improvements				✓	\$400,000	General Fund/ Storm Water Utility/Grants			\$400,000							
54	64th Street/Doffing Avenue Storm Sewer Improvements				✓	\$600,000	Developers Agreement/ General Fund/ Storm Water Utility/Grants						\$600,000				

SECTION V

No.	Project Description	MS4 Permit Requirement	Initial 12 Month Requirement	Annual Requirement	Projects, Programs, & Studies	10 Year Cost Estimate ¹	Possible Funding Sources ³	Proposed Cost By Year ^{1,2}									Comments	
								2014	2015	2016	2017	2018	2019	2020	2021	2022		2023
55	Concord Blvd/77th Street/Dickman Trail Storm Sewer Improvements				✓	\$350,000	Developers Agreement/ General Fund/ Storm Water Utility/Grants			\$350,000								
56	Local/Misc. Drainage Improvements				✓	\$500,000	Developers Agreement/ General Fund/ Storm Water Utility/Grants	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	
TOTAL						\$9,762,500		\$919,250	\$980,250	\$1,892,250	\$1,342,250	\$933,250	\$1,236,250	\$1,467,250	\$877,250	\$867,250	\$1,577,250	

¹ Cost estimates are preliminary and subject to review and revision as engineer's reports are completed and more information becomes available. Table reflects 2014 costs and do not account for inflation. Costs generally include labor, equipment, materials, and all other costs necessary to complete each activity. For City completed activities, staff time is included in the cost. Some of the costs outlined above may be included in other operational costs budgeted by the City.

² 10 Year cost projections are based upon 2 MS4 Permit Cycles with year 1 program updates occurring again in 2019

³ 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

Attachments on CD Media

Attachment A

***City of Inver Grove Heights Pollutant Load Analyses:
South Grove Subwatershed, Skyline Village Subwatershed,
Old Village Subwatershed***

Attachment B

***City of Inver Grove Heights Third Generation
Water Resources Management Plan***