



City of Golden Valley  
7800 Golden Valley Road • Golden Valley, MN 55427  
(763) 593-8030



# FEASIBILITY Report

January 21, 2013

## Briarwood/Dawnview Water Quality Improvement Project

City of Golden Valley  
Hennepin County, Minnesota

*WSB Project No. 2032-04*



701 Xenia Avenue South, Suite 300  
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# **FEASIBILITY REPORT**

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## **BRIARWOOD/DAWNVIEW WATER QUALITY IMPROVEMENT PROJECT**

**For:**

**City of Golden Valley**

**March 7, 2013**

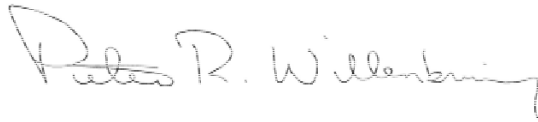
**Prepared By:**

**WSB & Associates, Inc.  
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## CERTIFICATION

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



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Pete Willenbring, P.E.

Reg. No. 15998

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## SECTION I

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### I. INTRODUCTION, BACKGROUND, AND PURPOSE

This feasibility study evaluates options to improve the quality of water discharged into Bassett Creek from a 184 acre subwatershed. This subwatershed is generally located east of Highway 100 and north of Duluth Street in the City of Golden Valley (see **Figure 1**).

The City of Golden Valley and the Bassett Creek Watershed Management Commission (BCWMC) have completed a preliminary review of stormwater runoff treatment opportunities in this subwatershed. They have identified a parcel currently owned by the City at the south end of the subwatershed that could be suitable for this purpose. This report presents the results of an investigation into potential options available to treat stormwater runoff from this subwatershed, utilizing the identified open space.

The remaining sections of this report outline the procedures and methods followed to identify the available alternatives and estimate of costs, and provide a recommended improvement alternative to achieve the goals of the study. Additional information on the topography, soils, land use, land cover, and other information is included on **Figures 1-8** and **Tables 1-6**.

## SECTION II

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### II. PROCEDURES AND METHODS FOLLOWED

As part of the development of this feasibility report, the following activities were undertaken:

#### 1. Background Information

As part of this activity, a meeting was held with City staff to obtain background information on the project and more fully develop the objectives and potential concerns related to implementation. Elevations, floodplain location, wetland locations, storm sewer locations, soils, and other information we obtained from the City's geographic information database.

#### 2. Wetland Delineation Survey

A preliminary wetland delineation and survey of wetland types in the project area was completed. This information was gathered to identify areas that may not be suitable for construction of improvements. Additionally, the extent to which mitigation may be needed was determined. Please be advised that the wetland delineation completed as part of this activity could not be verified or approved by permitting agencies due to the time of year the work was completed. However, the approximate wetland boundaries that were defined should be suitable for feasibility report purposes.

#### 3. Identify Improvement Options

Based on a review and analysis of the information provided by the City staff, background information, and results of the wetland delineations five options for potential improvements were identified along with a preliminary estimate of cost.

#### 4. Select Recommended Improvement Option

Upon review of identified options, City staff provided input on the options they found the most beneficial. Based on this discussion, the most cost effective feasible alternative was selected and a more refined design was completed.

#### 5. Estimated Benefits and Costs

Pollutant reduction estimates for ponding and raingarden were based on P8 modeling and PondNet modeling. Pollutant removal for treatment manholes were based on typical rates defined by the manufacturer. Cost estimates were based on site conditions and recent costs for type improvements.

## SECTION III

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### III. ALTERNATIVES CONSIDERED AND COST ESTIMATES

Five alternatives are identified to improve the quality of water discharged from the Briarwood/Dawnview watershed. These options are outlined below:

#### **Option 1: Construct Stormwater Treatment Manholes**

Construct low-flow diversion structures and grit chamber manholes at three locations to remove coarse sediment and floatables from stormwater runoff prior to discharging into Bassett Creek (*Figure 4*).

Outlined below are the approximate benefits of the improvement along with its estimated cost:

- Anticipated to remove 20-30% of total suspended solids loading to Bassett Creek from the 184 acre tributary area (8,000 pounds).
- Anticipated to remove 2-5% of the total phosphorus loading to Bassett Creek from the 184 acre tributary area (2 pounds).
- Anticipated to have no significant benefit to reduce peak runoff rates or reduce runoff volume directed to Bassett Creek.
- Cost to construct three structural treatment system manholes is approximately \$403,000 see *Table 1* for a detailed cost breakdown.

The primary disadvantages to this option are the significant cost and the ongoing maintenance that would be required to remove the accumulated sediment from the treatment manholes. Treatment manholes are typically designed for much smaller tributary areas; therefore additional maintenance will be warranted for this system.

The advantage to this option is no additional land footprint is required and there is an anticipated significant decrease in total suspended solids.

#### **Option 2: Construct Raingarden**

Construct a shallow raingarden (*Figure 5*).

Outlined below are the approximate benefits of the improvement along with its estimated cost:

- Anticipated to remove 93% of the total suspended solids from 5 acre tributary drainage area (2 pounds).
- Anticipated to remove 93% of the total phosphorus from 5 acre drainage area (2 pounds).
- Anticipated to remove 2.0 acre-feet of stormwater runoff volume from 5 acre drainage area annually.

## SECTION III

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- Cost to construct raingarden is approximately \$105,000 see **Table 2** for a detailed cost breakdown.

Although the rain garden has predicted high removal rates, the tributary area is small, only 2.7% of the total watershed.

### **Option 3: Construct stormwater retention and treatment pond with dead pool storage.**

Construct a retention and treatment pond (**Figure 6**).

Outlined below are the approximate benefits of the improvement along with its estimated cost:

- Anticipated to remove 53% of the total suspended solids from the 184 subwatershed (21,600 pounds).
- Anticipated to remove 27% of the total phosphorus from runoff generated from 184 acre subwatershed (35 pounds).
- Anticipated to remove 1.0 acre-foot of stormwater runoff volume through evaporation and seepage on an annual basis.
- Cost to construct stormwater retention and treatment pond is approximately \$188,000 see **Table 3** for a detailed cost breakdown and **Table 4** for estimated pond areas and volumes.

The advantage to the retention pond is the high total suspended solids and total phosphorus removal percentages. Maintenance frequency is also greatly reduced in comparison to option 1. The disadvantage to this option is the additional land area that is required.

The approximate high water level of the proposed pond is 845.0. Based on the LiDAR data, the low property east of the pond appears to be at elevation 846.0. It will be necessary to survey this property prior to constructing the pond to verify adequate freeboard is provided.

### **Option 4: Construct iron-enhanced filtration system.**

Construct a gravity-fed, enhanced filtration system (**Figure 7**).

Outlined below are the approximate benefits of the improvement along with its estimated cost:

- Anticipated to remove 30% of the total suspended solids (8000 lbs) generated from 184 acre subwatershed.



## SECTION III

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- Anticipated to remove 20% of the total phosphorus (26 lbs) from runoff generated from 184 acre subwatershed.
- Anticipated to remove 0.2 acre-foot of stormwater runoff volume through evaporation and seepage on an annual basis.
- Cost to construct the iron enhanced filter is approximately \$178,000 see **Table 5** for a detailed cost breakdown.

Several issues outlined below may limit the effectiveness of an iron-enhanced filtration system at this location:

- The large area tributary to this feature could clog the filter media in a short period of time. The drainage area discharging to this location (184-acres) far exceeds the maximum drainage area for filtration systems (5-acres) that is outlined in Minnesota Stormwater Manual. Additionally, there is no pretreatment provided upstream of the filter system, which is recommended, in particular for such a large drainage area.
- Iron-enhanced filters must be periodically exposed to oxygen in order to retain phosphorus beyond what would be removed by a non-enhanced filter. If groundwater or other sustained (base) flows are directed to the iron-enhanced filter, it will not be effective. Given the large tributary area of 184-acres, there is a high risk that a base flow could exist. This could negatively affect or eliminate the benefits of the iron-enhanced filter.

### **Option 5: Construct stormwater retention and treatment pond with dead pool storage and iron-enhanced filtration system.**

Construct a retention and treatment pond as outlined in Option 3, but replace portion of pond with a gravity-fed, enhanced filtration system (**Figure 8**). A berm separating the filtration system from the pond and a drintile system placed under the filter media would be constructed to facilitate drainage through the filter. Feeding the filter system with a pump would add approximately \$40,000 to the option's costs, and was not considered due to cost constraints.

Outlined below are the approximate benefits of the improvement along with its estimated cost:

- Anticipated to remove 70% of the total suspended solids (29,600 lbs) generated from 184 acre subwatershed.
- Anticipated to remove 55% of the total phosphorus (94 lbs) from runoff generated from 18 -acre subwatershed.
- Anticipated to remove 1.0 acre-foot of stormwater runoff volume through evaporation and seepage on an annual basis.
- Cost to construct the pond with an iron enhanced filter is approximately \$235,000 see **Table 6** for a detailed cost breakdown.

### **SECTION III**

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Similar to option 4, tributary area and sustained base flows are drawbacks to this option. Since runoff would be treated by a pond prior to filtration, it is reasonable to expect that a larger drainage area could be treated by this filter. Nonetheless, it is unlikely that the filter could function for more than a few years if the entire 184-acre area is treated by the filter.

## SECTION IV

### IV. RECOMMENDATION

A summary of the options is provided in the following table.

Option	Description	Cost (\$)	Estimated TSS Removal (lb/yr)	Cost/TSS Pound Removed	Estimated TP Removal (lb/yr)	Cost/TP Pound Removed (\$)
1	Stormwater Treatment Manholes	403,000	8,000	50	2	\$ 201,500.00
2	Raingarden	105,000	2	52,500	2	\$ 52,500.00
3	Treatment Pond	188,000	21,600	9	35	\$ 5,371.43
4	Iron Enhanced Filters	178,000	8,000	22	26	\$ 6,846.15
5	Pond with Iron Enhanced Filters	235,000	29,600	8	94	\$ 2,500.00

Based on a review of the alternatives considered and an understanding that \$180,000 has been allocated to construct a water quality improvement project for this watershed,

**Option 3** has been selected as the recommended alternative for the following reasons:

1. Has the potential to remove the greatest amount of total phosphorus and total suspended solids from stormwater runoff within the watershed prior to discharge into Bassett Creek.
2. Improvement costs are consistent with the City's budget of \$180,000, which will be funded by the BCWMC.
3. Has the potential to reduce stormwater runoff volume from the watershed.
4. Will increase floodplain storage within the Bassett Creek floodplain.
5. Will enhance biodiversity in the area.

TABLES

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Briarwood/Dawnview Water Quality Improvement Project  
Feasibility Study  
City of Golden Valley

Table 1  
3/7/2013  
WSB Project No. 2032-04

Estimated Treatment Manholes Engineering Costs		
Item No.	Item Description	Estimated Cost
1	Project Design	\$ 15,000.00
2	Project Permitting	\$ 8,000.00
3	Project Bidding	\$ 5,000.00
4	Construction Observation	\$ 10,000.00
5	15% Contingency	\$ 24,708.00
<b>Total:</b>		<b>\$ 62,708.00</b>

Option 1 - Estimated Treatment Manholes Construction Costs					
Item No.	Item Description	Units	Estimated Unit Price	Estimated Quantity	Estimated Dollar Amount
1	MOBILIZATION	LUMP SUM	\$10,000.00	1	\$10,000.00
2	STORMWATER TREATMENT MANHOLE	EACH	\$100,000.00	3	\$300,000.00
3	BYPASS MANHOLE	EACH	\$2,500.00	3	\$7,500.00
4	RC PIPE SEWER DESIGN 3006 CLASS III	LIN FT	\$100.00	200	\$20,000.00
5	CONNECT TO EXISTING STORM SEWER	EACH	\$1,000.00	3	\$3,000.00
<b>Total:</b>					<b>\$340,500.00</b>

Total Estimated Project Cost, including 15% Contingency,      **\$403,208.00**

Briarwood/Dawnview Water Quality Improvement Project  
Feasibility Study  
City of Golden Valley

Table 2  
3/7/2013  
WSB Project No. 2032-04

Estimated Raingarden Engineering Costs		
Item No.	Item Description	Estimated Cost
1	Project Design	\$ 15,000.00
2	Project Permitting	\$ 8,000.00
3	Project Bidding	\$ 5,000.00
4	Construction Observation	\$ 10,000.00
5	15% Contingency	\$ 24,708.00
<b>Total:</b>		<b>\$ 62,708.00</b>

Option 2 - Estimated Raingarden Construction Costs					
Item No.	Item Description	Units	Estimated Unit Price	Estimated Quantity	Estimated Dollar Amount
1	MOBILIZATION	LUMP SUM	\$10,000.00	1	\$10,000.00
2	CLEARING & GRUBBING	ACRE	\$6,000.00	1	\$6,000.00
3	EXCAVATION	CU YD	\$10.00	250	\$2,500.00
4	FIELDSTONE RIP RAP CLASS IV	TON	\$65.00	10	\$650.00
5	RC PIPE APRON W/ TRASH GUARD	EACH	\$1,500.00	1	\$1,500.00
6	RC PIPE SEWER DESIGN 3006 CLASS III	LIN FT	\$100.00	175	\$17,500.00
7	CONNECT TO EXISTING STORM SEWER	EACH	\$1,000.00	2	\$2,000.00
8	TURF ESTABLISHMENT AND TREE REPLACEMENT	ACRE	\$2,500.00	0.2	\$500.00
9	TRAIL REPAIR	SQ YD	\$70.00	20	\$1,400.00
<b>Total:</b>					<b>\$42,050.00</b>

Total Estimated Project Cost, including 15% Contingency, \$104,758.00

Briarwood/Dawnview Water Quality Improvement Project  
Feasibility Study  
City of Golden Valley

Table 3  
3/7/2013  
WSB Project No. 2032-04

Estimated Treatment Pond Engineering Costs		
Item No.	Item Description	Estimated Cost
1	Project Design	\$ 15,000.00
2	Project Permitting	\$ 8,000.00
3	Project Bidding	\$ 5,000.00
4	Construction Observation	\$ 10,000.00
5	15% Contingency	\$ 24,708.00
Total:		\$ 62,708.00

Option 3 - Estimated Treatment Pond Construction Costs					
Item No.	Item Description	Units	Estimated Unit Price	Estimated Quantity	Estimated Dollar Amount
1	MOBILIZATION	LUMP SUM	\$10,000.00	1	\$10,000.00
2	CLEARING & GRUBBING	ACRE	\$6,000.00	4	\$24,000.00
3	EXCAVATION	CU YD	\$10.00	5060	\$50,600.00
4	FIELDSTONE RIP RAP CLASS IV	TON	\$65.00	50	\$3,250.00
5	RC PIPE APRON W/ TRASH GUARD	EACH	\$1,500.00	3	\$4,500.00
6	RC PIPE SEWER DESIGN 3006 CLASS III	LIN FT	\$100.00	200	\$20,000.00
7	CONNECT TO EXISTING STORM SEWER	EACH	\$1,000.00	3	\$3,000.00
8	TURF ESTABLISHMENT AND TREE REPLACEMENT	ACRE	\$2,500.00	2	\$5,000.00
9	TRAIL REPAIR	SQ YD	\$70.00	75	\$5,250.00
Total:					\$125,600.00

Total Estimated Project Cost, including 15% Contingency, \$188,308.00

**Briarwood/Dawnview Water Quality Improvement Project**

City of Golden Valley

Table 4

3/7/2013

WSB Project No. 2032-04

<b>Proposed Briarwood Park Pond Area and Volume</b>	
<b>Elevation</b>	<b>Pond area (Sq.Ft.)</b>
845	29025
844	25873
843	22790
842	19843
841	11590
840	10320
839	9110
838	8000
Total Area (Cu.Ft.)	136551
Total Area (Sq.Ft.)	5057
Total Area (Ac.Ft.)	3.1



Briarwood/Dawnview Water Quality Improvement Project  
Feasibility Study  
City of Golden Valley

Table 5  
3/7/2013  
WSB Project No. 2032-04

Estimated Iron-Enhanced Filtration System Engineering Costs		
Item No.	Item Description	Estimated Cost
1	Project Design	\$ 15,000.00
2	Project Permitting	\$ 8,000.00
3	Project Bidding	\$ 5,000.00
4	Construction Observation	\$ 10,000.00
5	15% Contingency	\$ 24,708.00
Total:		\$ 62,708.00

Option 4 - Estimated Iron-Enhanced Filtration System Construction Costs					
Item No.	Item Description	Units	Estimated Unit Price	Estimated Quantity	Estimated Dollar Amount
1	MOBILIZATION	LUMP SUM	\$10,000.00	1	\$10,000.00
2	CLEARING & GRUBBING	ACRE	\$6,000.00	2	\$12,000.00
3	EXCAVATION	CU YD	\$10.00	1000	\$10,000.00
4	FIELDSTONE RIP RAP CLASS IV	TON	\$65.00	50	\$3,250.00
5	RC PIPE APRON W/ TRASH GUARD	EACH	\$1,500.00	2	\$3,000.00
6	RC PIPE SEWER DESIGN 3006 CLASS III	LIN FT	\$100.00	200	\$20,000.00
7	CONNECT TO EXISTING STORM SEWER	EACH	\$1,000.00	3	\$3,000.00
8	TURF ESTABLISHMENT AND TREE REPLACEMENT	ACRE	\$2,500.00	2	\$5,000.00
9	TRAIL REPAIR	SQ YD	\$70.00	40	\$2,800.00
10	FILTRATION MEDIA	LS	\$10,000.00	1	\$10,000.00
11	STORM SEWER	LF	\$30.00	1000	\$30,000.00
12	OUTLET STRUCTURE	EACH	\$1,500.00	1	\$1,500.00
13	DRAINTILE SYSTEM	EACH	\$5,000.00	1	\$5,000.00
Total:					\$115,550.00

Total Estimated Project Cost, including 15% Contingency, \$178,258.00

Estimated Treatment Pond with Iron-Enhanced Filtration System Engineering Costs		
Item No.	Item Description	Estimated Cost
1	Project Design	\$ 15,000.00
2	Project Permitting	\$ 8,000.00
3	Project Bidding	\$ 5,000.00
4	Construction Observation	\$ 10,000.00
5	15% Contingency	\$ 24,708.00
Total:		\$ 62,708.00

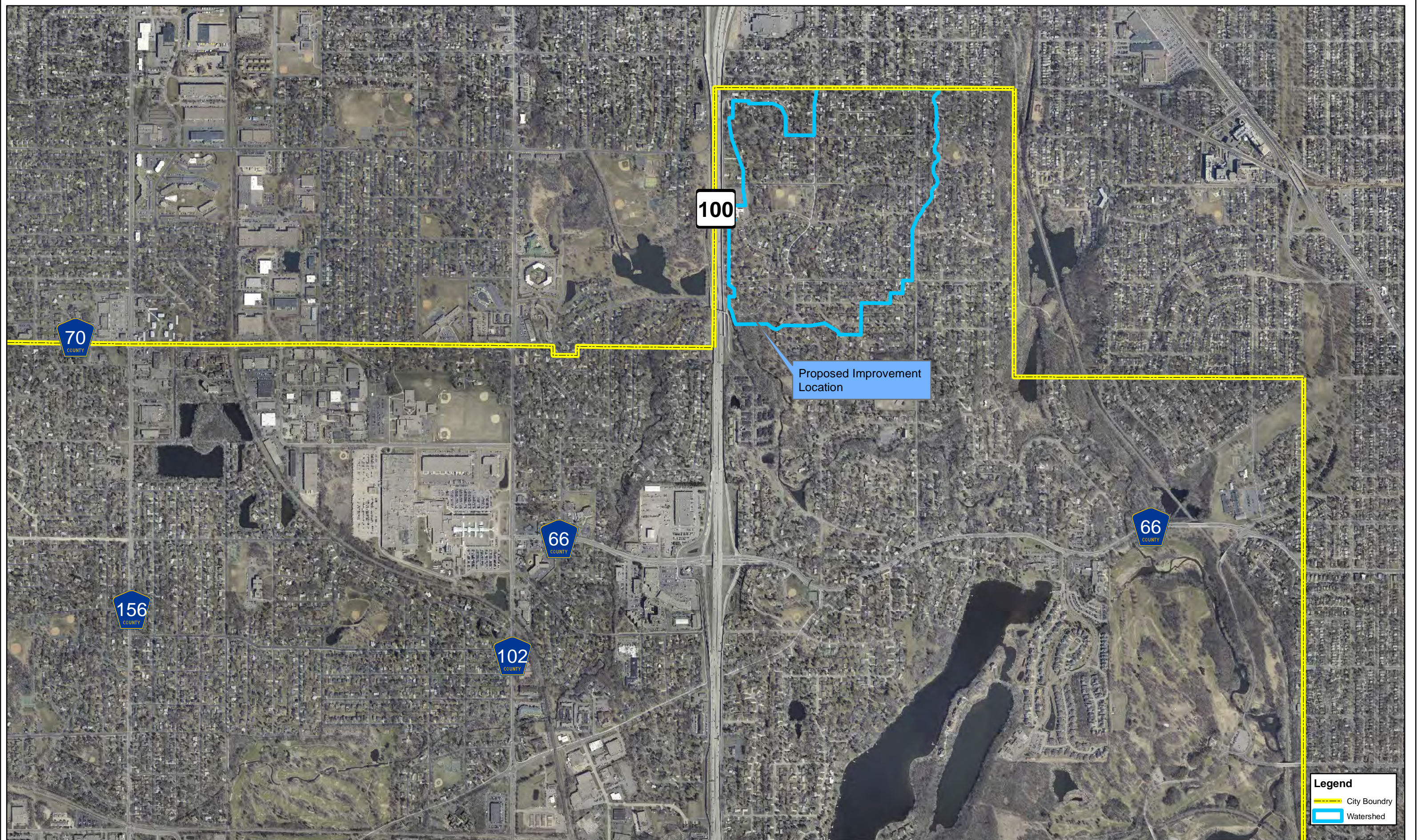
Option 5 - Estimated Treatment Pond with Iron-Enhanced Filtration System Construction Costs					
Item No.	Item Description	Units	Estimated Unit Price	Estimated Quantity	Estimated Dollar Amount
1	MOBILIZATION	LUMP SUM	\$10,000.00	1	\$10,000.00
2	CLEARING & GRUBBING	ACRE	\$6,000.00	4	\$24,000.00
3	EXCAVATION	CU YD	\$10.00	5060	\$50,600.00
4	FIELDSTONE RIP RAP CLASS IV	TON	\$65.00	50	\$3,250.00
5	RC PIPE APRON W/ TRASH GUARD	EACH	\$1,500.00	3	\$4,500.00
6	RC PIPE SEWER DESIGN 3006 CLASS III	LIN FT	\$100.00	200	\$20,000.00
7	CONNECT TO EXISTING STORM SEWER	EACH	\$1,000.00	3	\$3,000.00
8	TURF ESTABLISHMENT AND TREE REPLACEMENT	ACRE	\$2,500.00	2	\$5,000.00
9	TRAIL REPAIR	SQ YD	\$70.00	75	\$5,250.00
10	FILTRATION MEDIA	LS	\$10,000.00	1	\$10,000.00
11	STORM SEWER	LF	\$30.00	1000	\$30,000.00
12	OUTLET STRUCTURE	EACH	\$1,500.00	1	\$1,500.00
13	DRAINTILE SYSTEM	EACH	\$5,000.00	1	\$5,000.00
Total:					\$172,100.00

Total Estimated Project Cost, including 15% Contingency, \$234,808.00

# FIGURES

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**Legend**

- City Boundary
- Watershed



**Briarwood/Dawnview Water Quality Improvement Project**  
**Project Location Map**  
**City of Golden Valley, MN**

**Figure 1**

1 inch = 1,164 feet

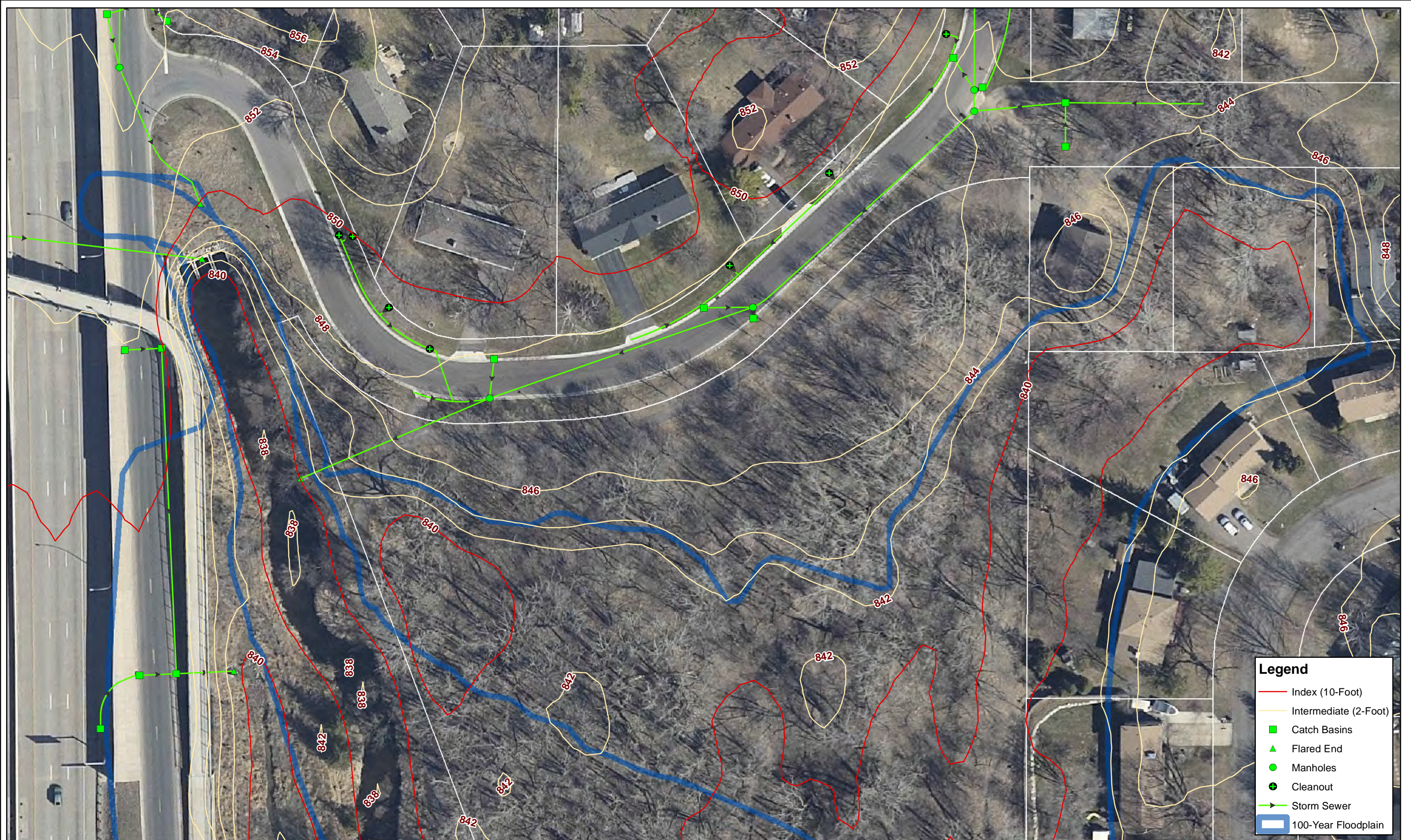
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**Legend**

- Index (10-Foot)
- Intermediate (2-Foot)
- Catch Basins
- ▲ Flared End
- Manholes
- ✕ Cleanout
- Storm Sewer
- ▭ 100-Year Floodplain

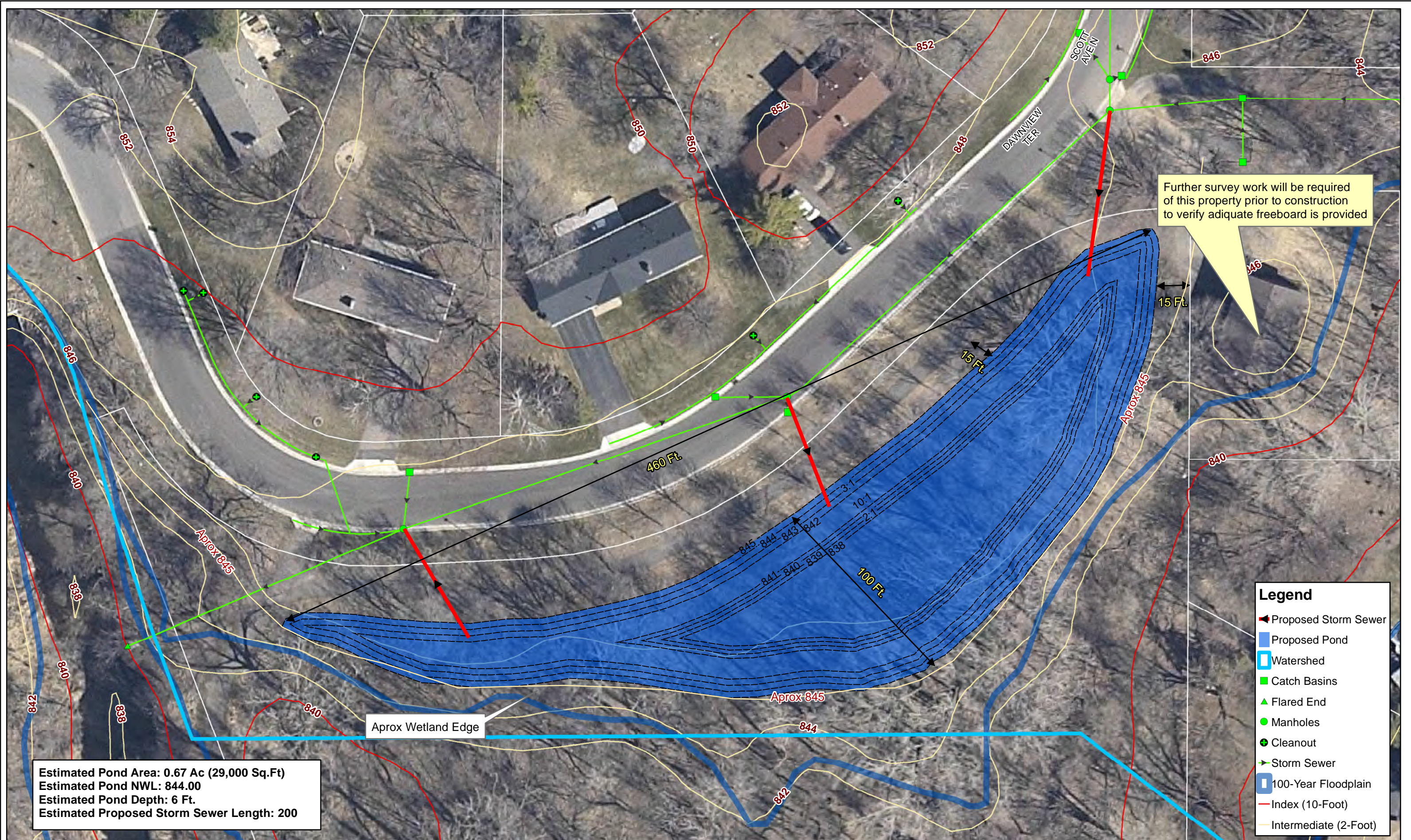
















### Figure 7





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### Figure 8

1 inch = 41 feet



