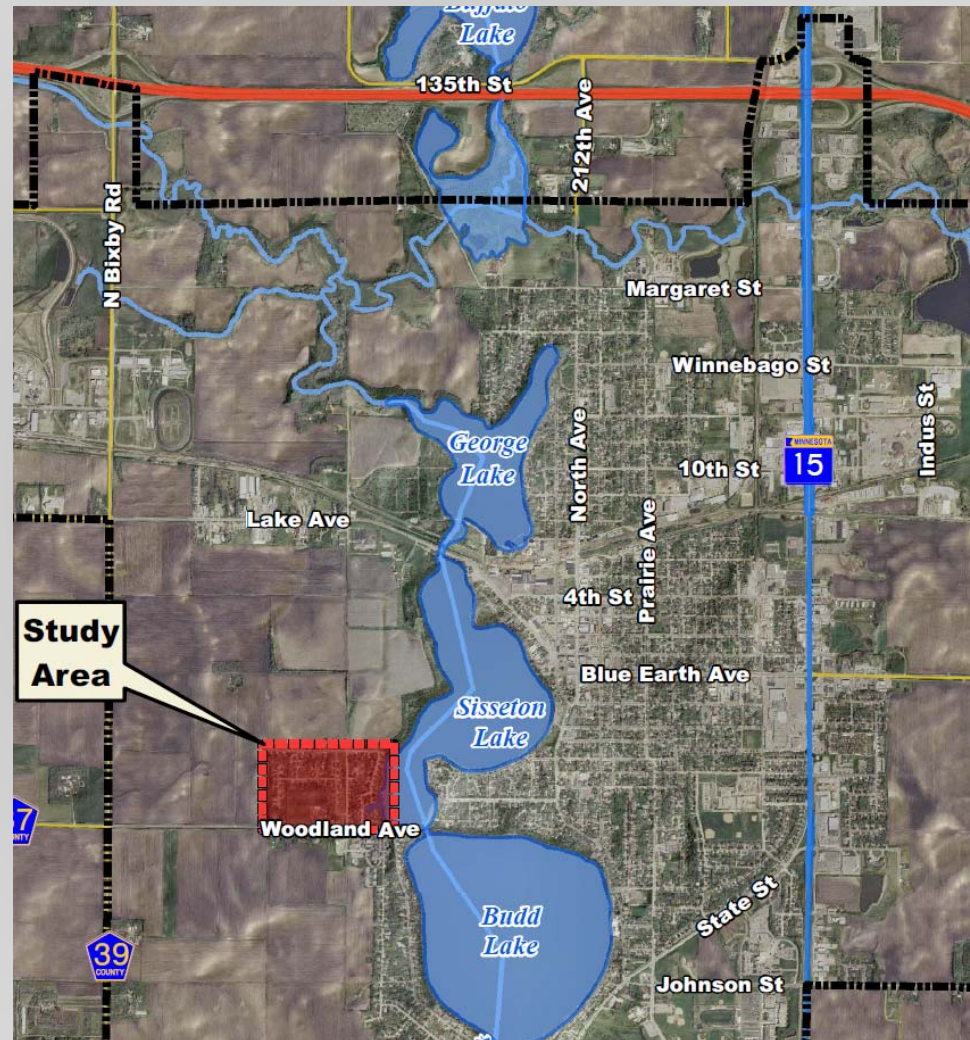


Hengen – Canyon Drive Area Storm Water Study

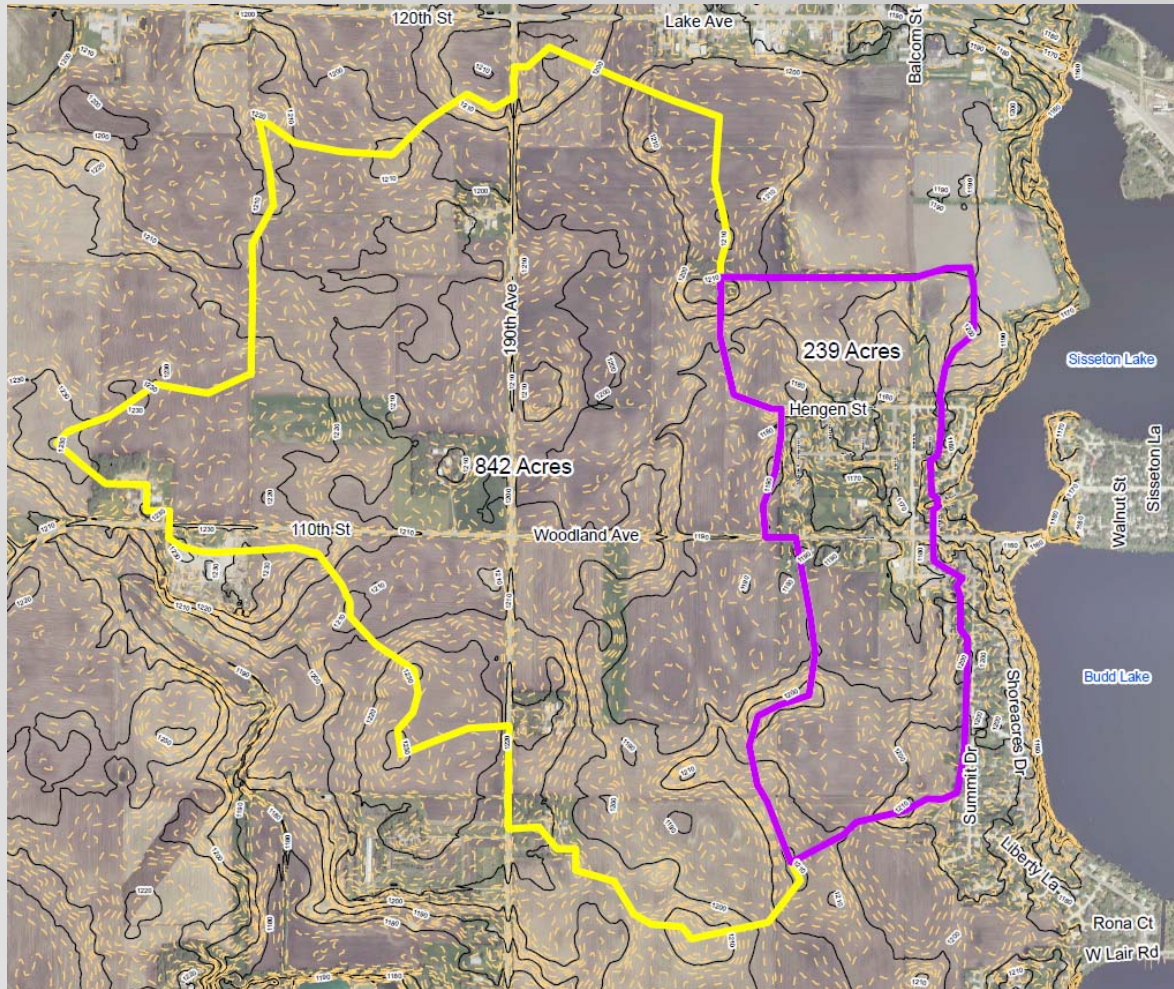
Prepared by
William Douglass
Bolton & Menk, Inc.
March 23, 2015



Study Location



Drainage Area



1081 Acres
Upstream of
Kings Road



Previous Studies

- **1996 Storm Drainage Master Plan**
 - Recommended a 60” outfall from West Hengen Area
 - 10 year design
 - Currently a 42”
 - Recommended a large detention basin upstream
- **2006 Canyon Drive and Hengen Street Basin**
 - Recommended Improving the outfall and adding storage to the system

Climate Change

- **All stormwater modeling prior to last year used SCS TP-40 rainfall values**
 - TP-40 was developed in 1961
 - 54 years old
 - Rains have changed
 - More rain
 - Greater intensity

Atlas 14

- Reevaluated the rainfall intensities

Table 1: Rainfall Depth & Return Period			
Storm Event (yr)	Percent Chance of Occurring	TP 40 Depth (in.)	Atlas-14 Depth (in.)
2	50%	2.9	2.9
5	20%	3.7	3.7
10	10%	4.4	4.4
25	4%	5.0	5.5
50	2%	5.6	6.5
100	1%	6.2	7.6

Modeled Existing Conditions



Investigated Options

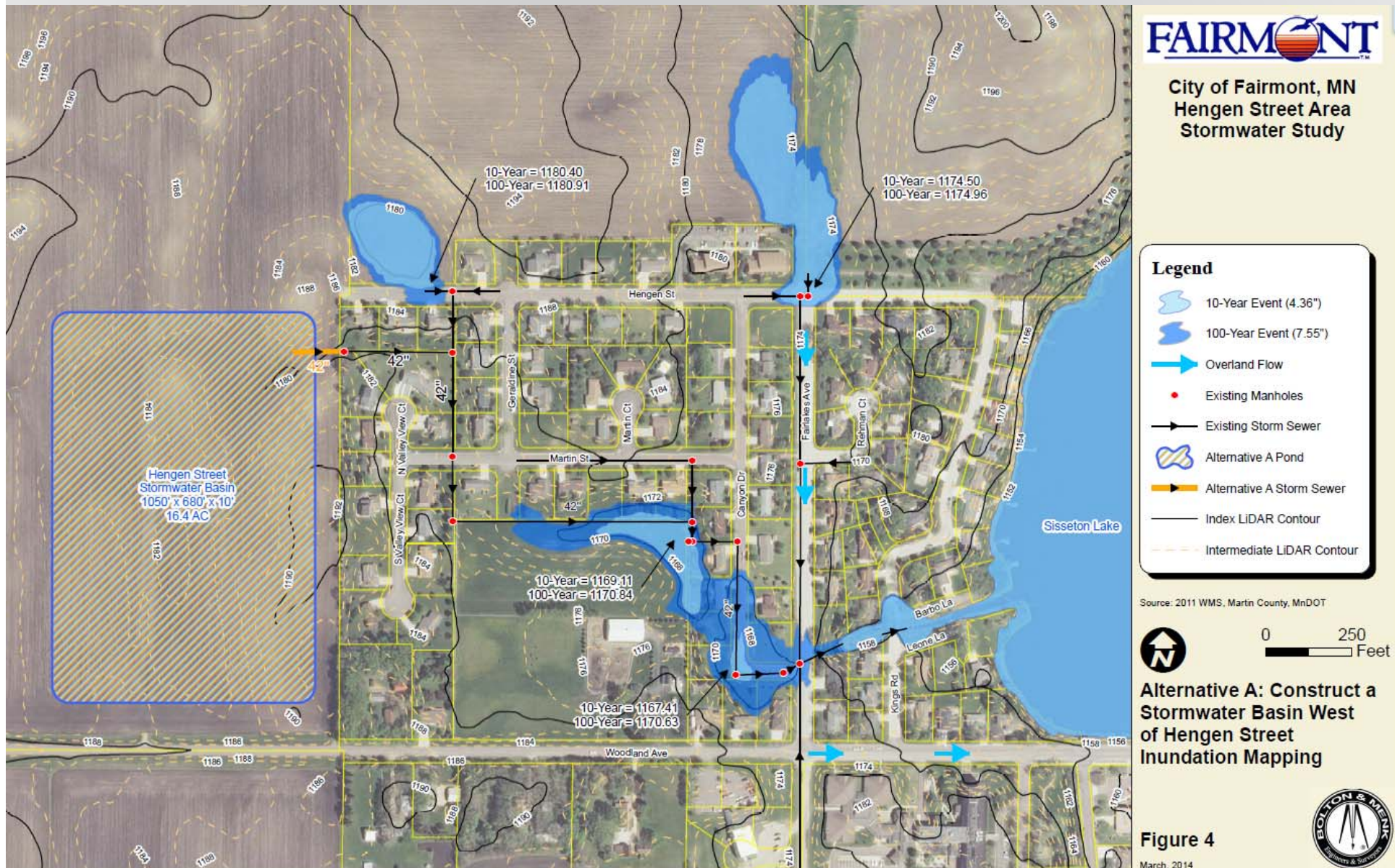
- A. Construct a stormwater basin west of Hengen Street
- B. Construct an secondary outfall north of Hengen Street
- C. Construct a hybrid secondary outfall and smaller basin
- D. Increase Outfall Capacity from Canyon Drive to Lake
- E. Utilize the Canyon Drive lots for a storage basin
- F. Construct a north Fairlakes Avenue stormwater basin
- G. Install berms and tile inlets west of Hengen Street

Opinions of Probable Cost

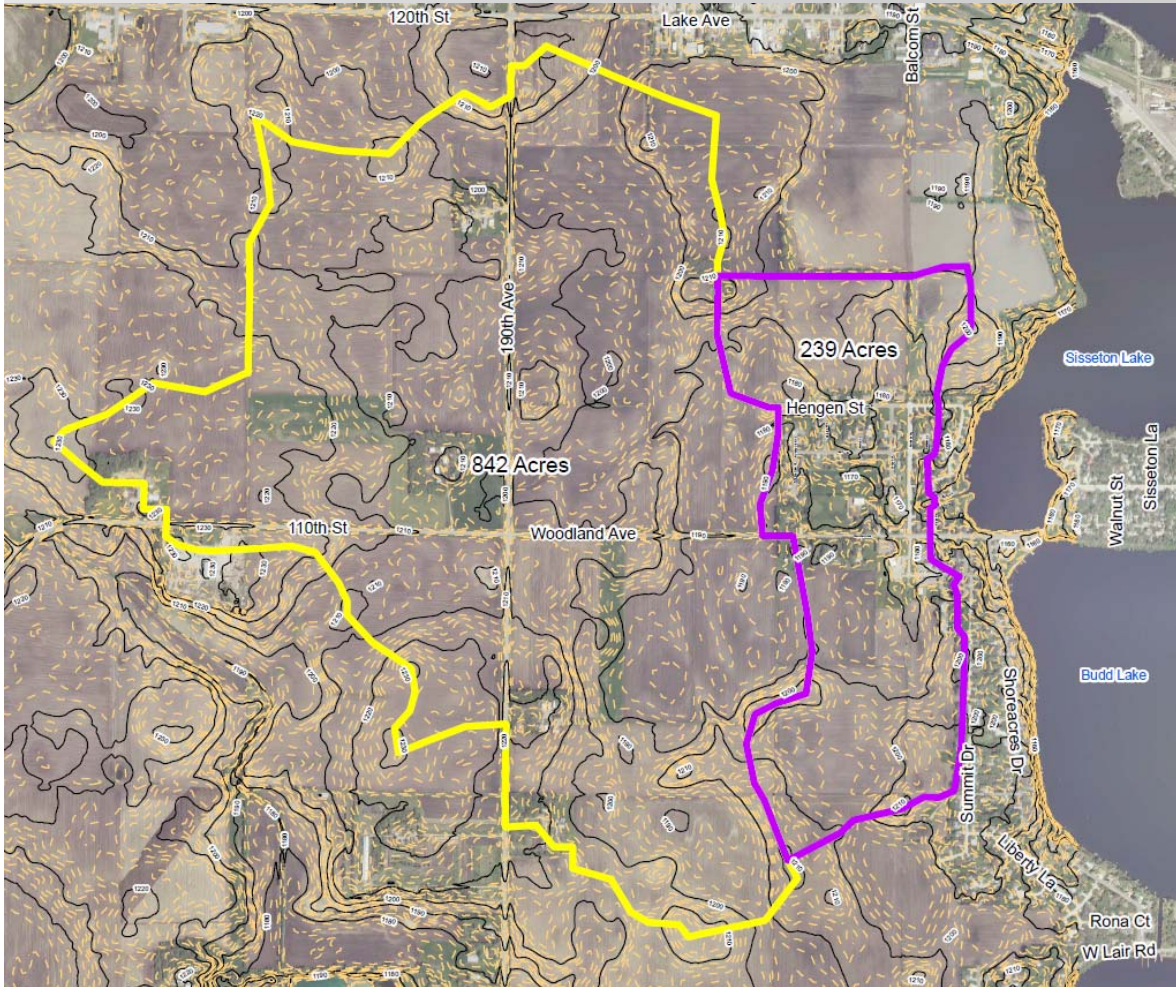
- Itemized prices not included in this report
- Costs include land acquisition
- Land acquisition costs need to be negotiated
 - Not based on our estimates

Alt. A: 16.4-Acre W. Hengen Pond

\$2.32 Million



Drainage Area



239 acres
bypasses the
West Hengen
Pond.

More impervious
area and steeper
slopes contribute
to faster runoff
and flash flooding.

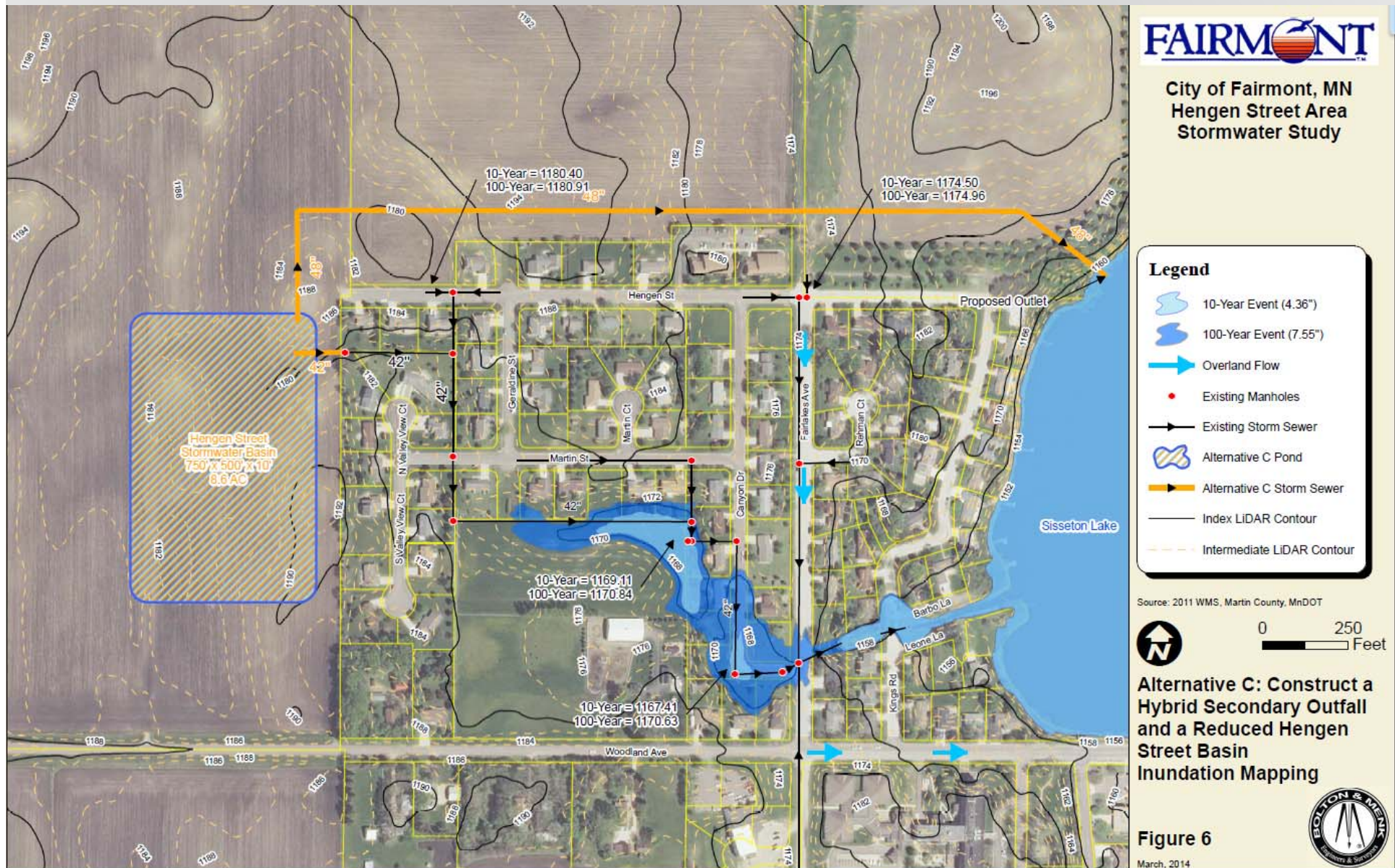
Alt. B: 96" North Diversion Pipe

\$3.55 Million

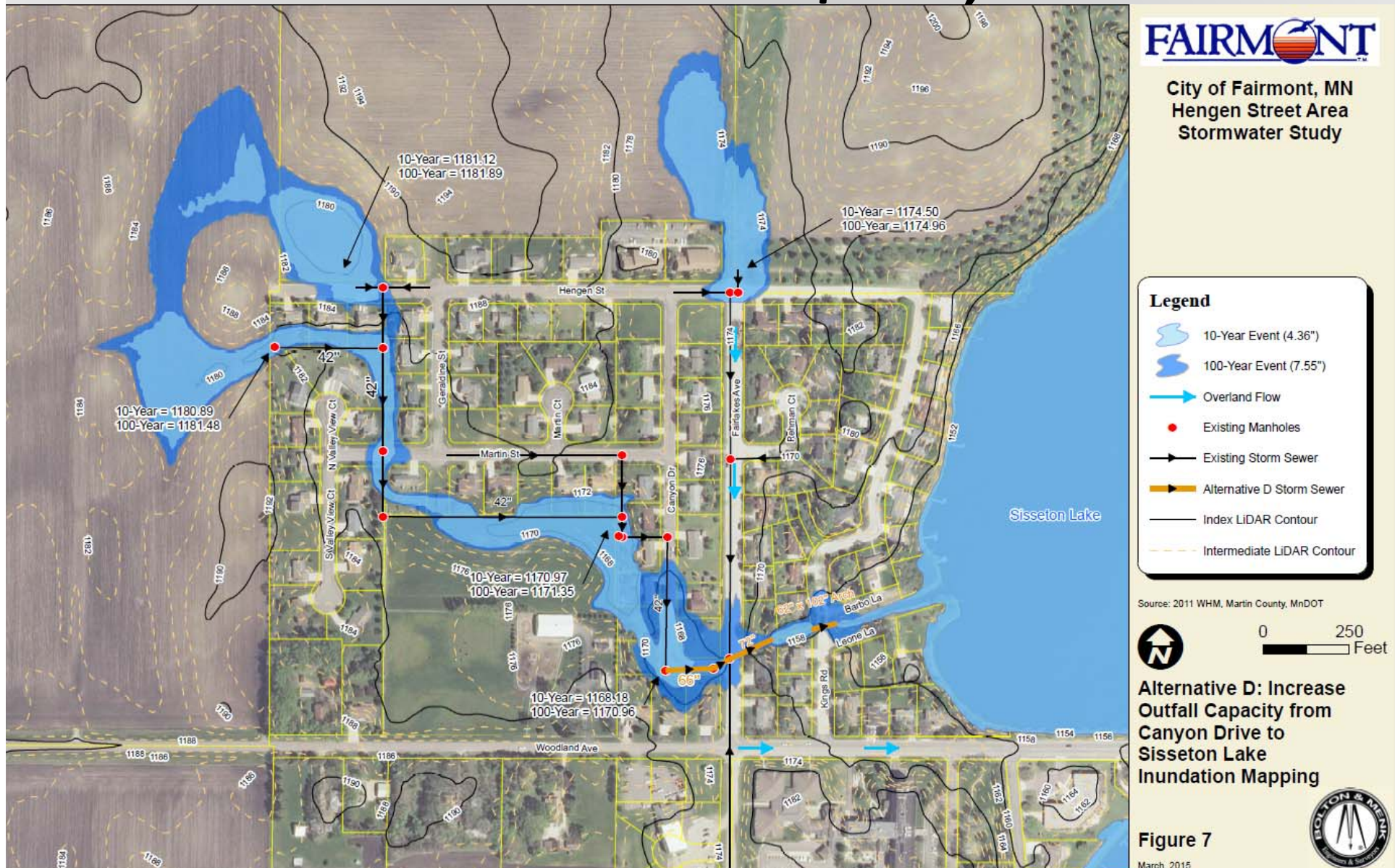


Alt C: 48" Diversion & 8.6-Acre Pond

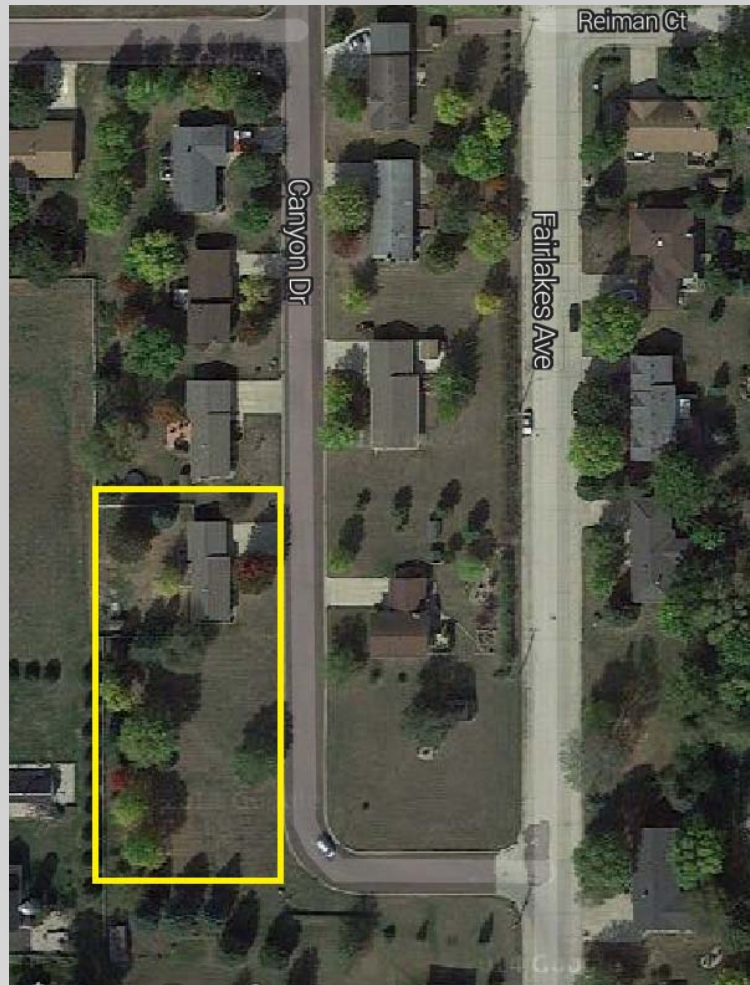
\$1.83 Million



Alt. D: Improve Outfall from Canyon Dr. to Sisseton - \$584,000



Alt E: Use Vacant Canyon Drive Lots for Detention - \$328,000



Some benefit in tandem with other projects.

Water Quality treatment opportunities

Alt. F: North Fairlakes Avenue Basin

- Serves only 47 acres of 1081 acre watershed
- Not enough impact
- Needed if development continues to the north



Alt G: Berming in Upstream Agricultural Fields

- Significant storage needed
- Still at least 239 acres bypassing storage
- Best case scenario is hydraulically similar to Alternative A
- Must be excavated to eliminate dam break safety issues
- If bermed, raised ponding levels will increase downstream pipe flow
 - Same way a higher water tower increases pressure



Recommended Improvements

- 1. Improve Outfall from Canyon Drive to Lake**
 - Alternative D \$585,000
- 2. Use flood prone lots on Canyon Drive for Detention storage**
 - Alternative E \$328,000
- 3. Excavate a 8.3-acre detention basin west of Hengen**
 - Reduced Alternative A \$1,720,000

Total \$2.63 Million



Recommended Improvements



Recommended Improvements

- Can be separated into separate construction phases
- Each phase contributes to comprehensive benefit
- Full benefit not realized until all phases are completed

Water Quality Recommendations

1. Skimmer Structure on all ponds

- Reduces the opportunity for clogging of outlets
- Eliminates debris flowing into Sisseton Lake

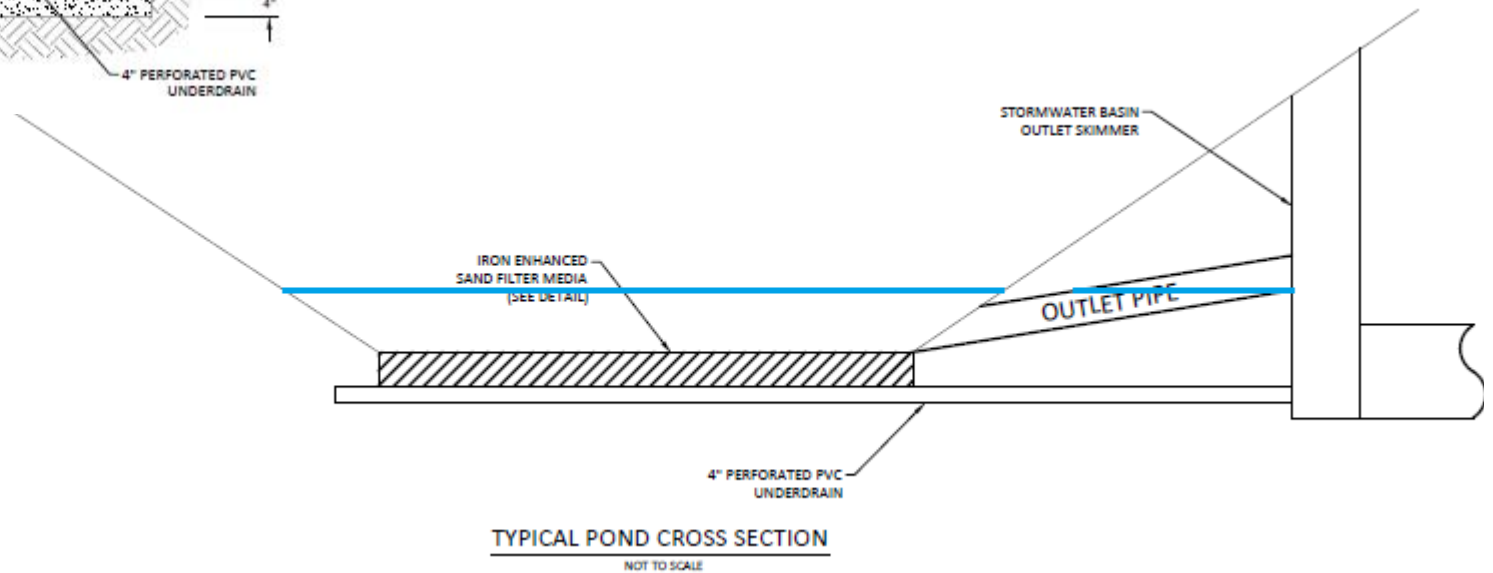
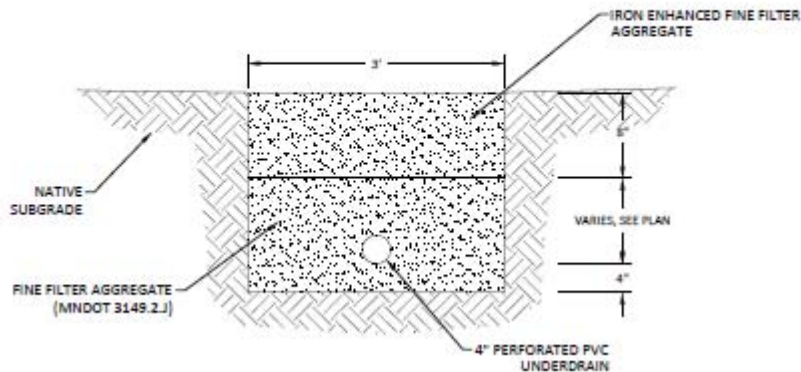
2. Iron Infused sand filter in Canyon Drive Pond

- Removes soluble Phosphorus
- Helps to meet MS4 & TMDL permitting requirements
- Not recommended until Upstream basin is built

3. May be eligible for Clean Water funding



Water Quality Recommendations



Cost Summary

Alt A: 16.4-acre basin west of Hengen Street	- \$2.32 Million
Alt B: 96" outfall north of Hengen Street	- \$3.55 Million
Alt C: 48" diversion & 8.6-acre basin	- \$1.83 Million
Alt D: Improve Outfall from Canyon to Lake	- \$584,000
Alt E: Detention on Vacant Canyon Dr. Lots	- \$328,000
Alt F: Detention at north end of Fairlakes Av.	- N/A
Alt G: Install berms and inlets west of Hengen	- N/A
Recommended Alternative (Total Phases)	- \$2.63 Million



Questions????

William R. Douglass

Principal

Water Resources Group Manager

Bolton & Menk, Inc.

