Stormwater Infiltration and Wellhead Protection: Policy to Practice

April 22, 2014 – MGWA

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Stormwater Management (according to Calvin)

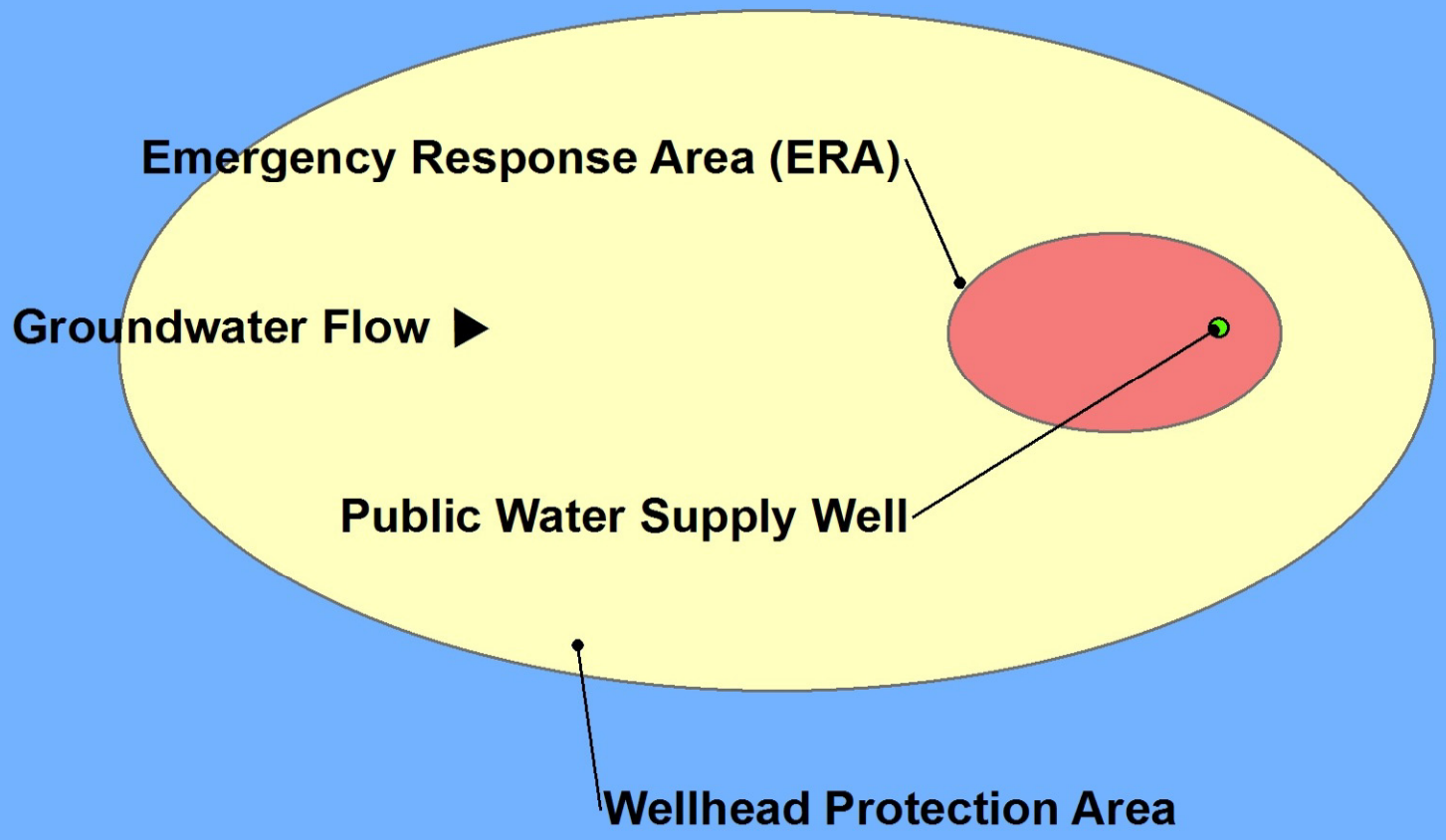
SDWA Framework

- Authority delegated to MDH
- Regulatory focus/authority: finished water
- Drinking Water Protection Section
  - Multiple barrier approach

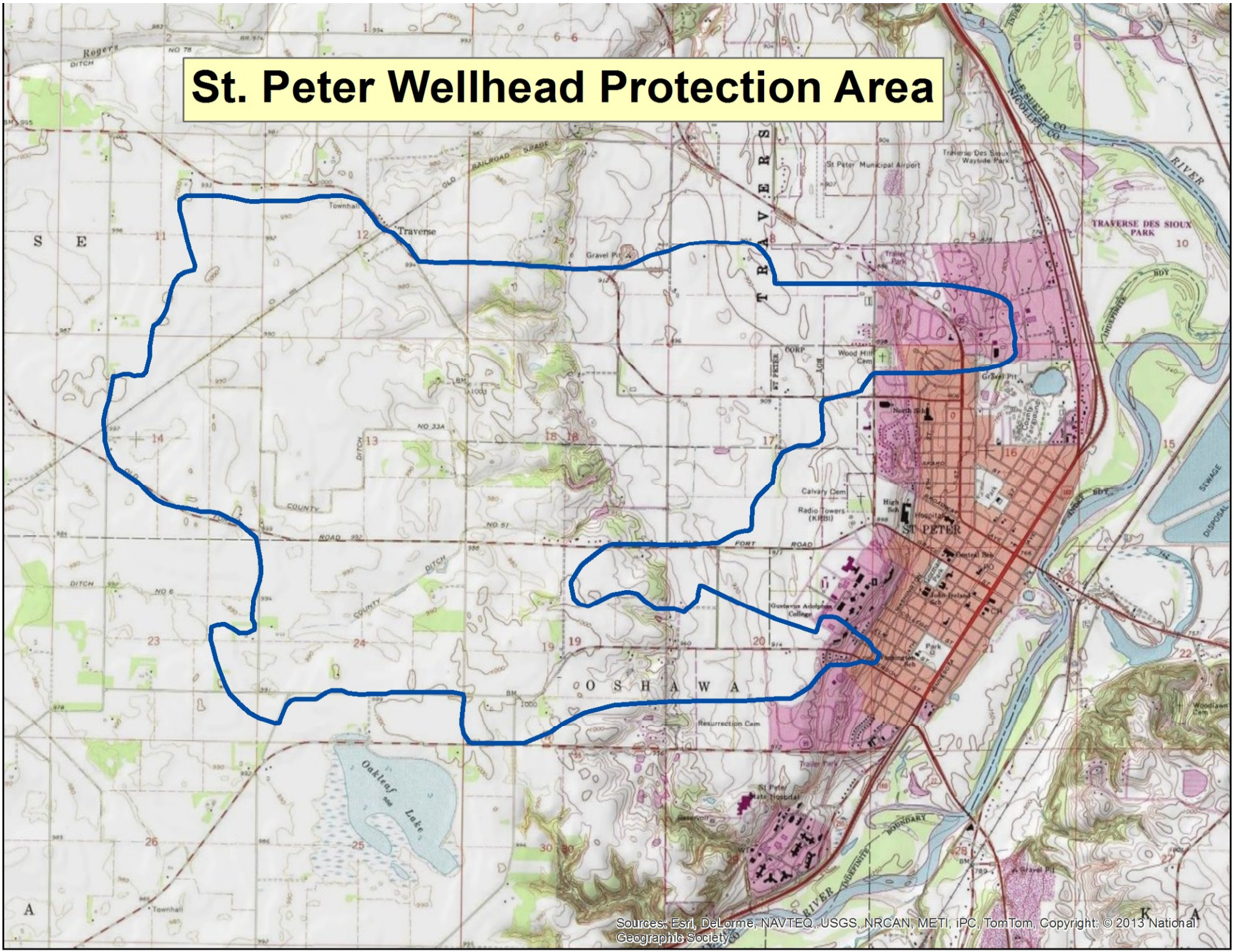
Source Water Protection

- ‘Source’ means resource
- Focus: natural environment
- Safeguard drinking water supplies through managing potential sources of contamination
- Emphasizes protection and prevention

Schematic of Wellhead Protection Area
(map view)



St. Peter Wellhead Protection Area



Stormwater Quality

- Varies considerably based on source area
- Organic compounds:
  - VOCs, pesticides, hydrocarbons
- Metals
- Nutrients (nitrogen, phosphorous)
- Pathogens: viruses, bacteria, protozoa (*e.g.*, cryptosporidium, giardia), others

What's acceptable?

World Health Organization (WHO) (1993):
"…water intended for consumption, for preparing food and drink, or for personal hygiene should thus contain no agents pathogenic for humans."

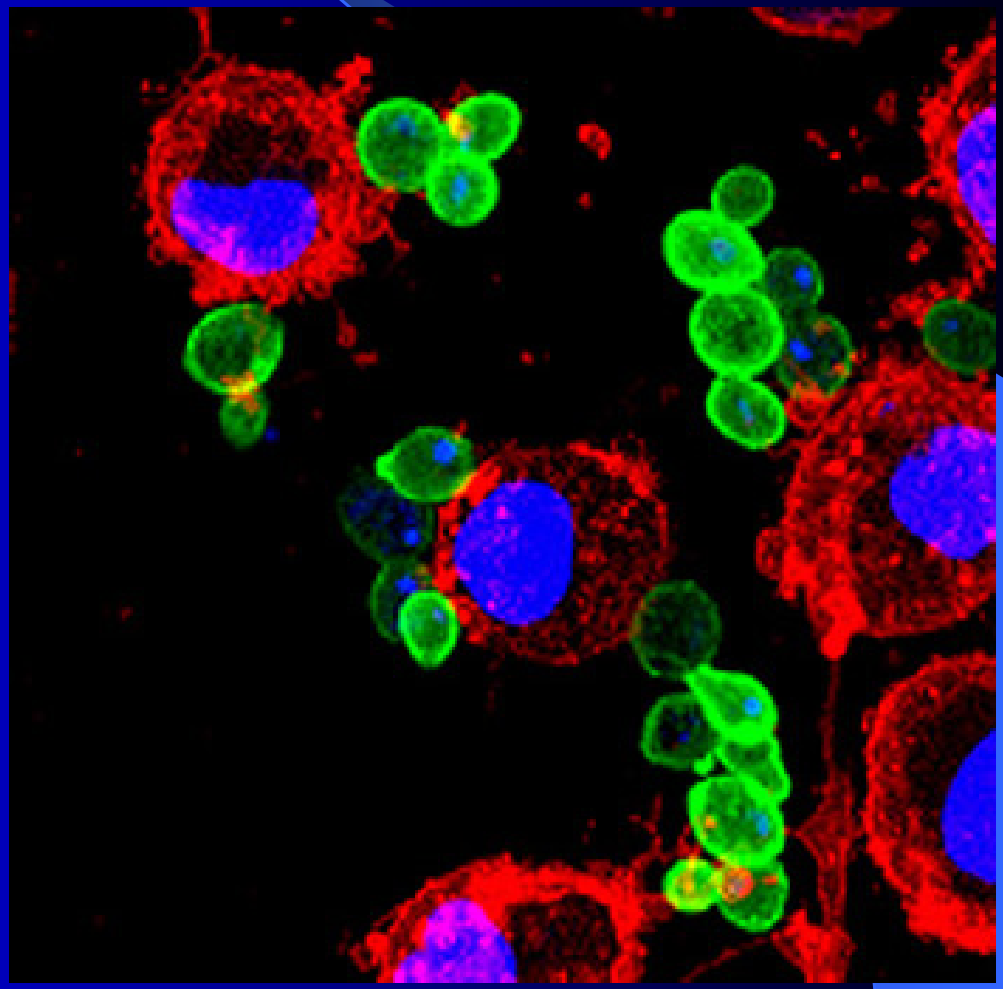
EPA:
MCLGs: Zero for all pathogens

Examples

- Norovirus outbreak, May 2007, Egg Harbor, Wisconsin
- E. Coli, Rushford, Minnesota, August 2007, PWS system contamination
- South Bass Island, OH, 2004, multiple etiologies, over 1000 made ill
- E. Coli (O157:H7), 2000, Walkerton, Ontario, 7 fatalities

Avoiding Pathogens

- 1 year viability
- Isolation
  - Travel time
  - Geologic protection
  - Well construction
- Removal/treatment
- Understanding sources

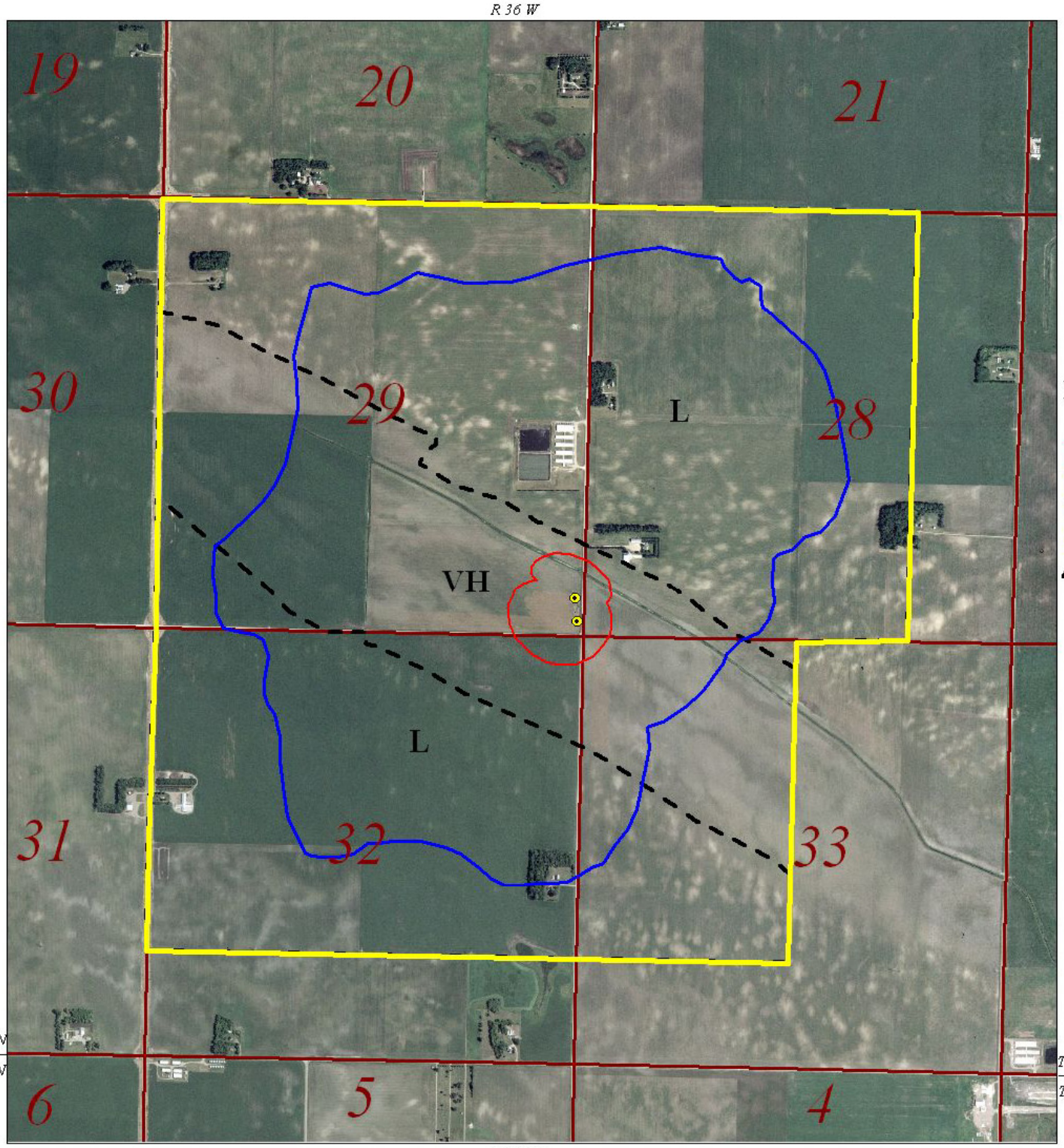


MDH Guidance on Infiltration of Stormwater in Vulnerable WHPAs

- Advisory, not mandatory
- For PWS/municipal staff
- Process is stepwise (6 steps)
- Flow chart is available

Summary of MDH Guidance

1. Avoid stormwater infiltration in ERAs (1-yr ToT WHPAs)



Renville North

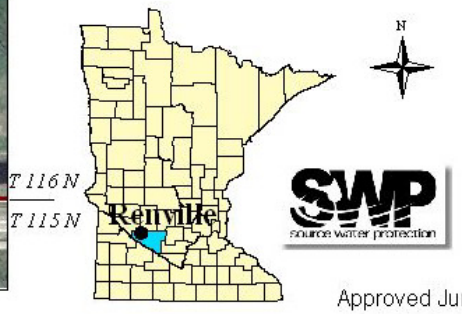
Drinking Water Supply Management Area (DWSMA) MN-00478 10 year Time of Travel

Public Water Supply Well

- **Primary**
- **Emergency Response Area**
- **Wellhead Protection Area (WHPA)**
- **DWSMA**
- **DWSMA Vulnerability Boundary**

VH = Very High Vulnerability
L = Low Vulnerability

0.3 0 0.3 Miles



SWP source water protection

MINNESOTA MDH DEPARTMENT of HEALTH

Approved June 25, 2009

Summary of MDH Guidance

1. Avoid stormwater infiltration in ERAs (1-yr ToT WHPAs)
2. Avoid infiltration in WHPAs in settings dominated by fractured/solution-enhanced aquifer conditions

Summary of MDH Guidance

1. Avoid infiltration in ERAs (1-yr ToT WHPAs)
2. Avoid infiltration in WHPAs in settings dominated by fractured/solution-enhanced aquifer conditions
3. Consider land uses

Different Source Areas Yield Different Contaminants

Conclusions

- Infiltration is a good stormwater management tool
- Use common sense in siting infiltration devices, especially in wellhead protection areas
- Groundwater and Surface Water = One Resource

Municipal Implementation of Wellhead Protection Guidance

- Current Regulatory Environment
- MDH Infiltration Guidance
- Case Study: Cottage Grove
  - Wellhead Protection Concerns
  - Project Examples

Current Regulatory Environment

Prohibit the Use of Infiltration:

a) Where industrial facilities are not authorized to infiltrate industrial stormwater under an NPDES/SDS Industrial Stormwater Permit issued by the Agency

b) Where vehicle fueling and maintenance occur

c) With less than three (3) feet of separation distance from the bottom of the infiltration system to the elevation of the seasonally saturated soils or the top of bedrock

d) Where high levels of contaminants in soil or groundwater will be mobilized by the infiltrating stormwater

[MS4 Permit Part III.D.5.a.(3).(a).1)]

Current Regulatory Environment

Restrict the Use of Infiltration…without higher engineering review, sufficient to…prevent adverse impacts to groundwater:

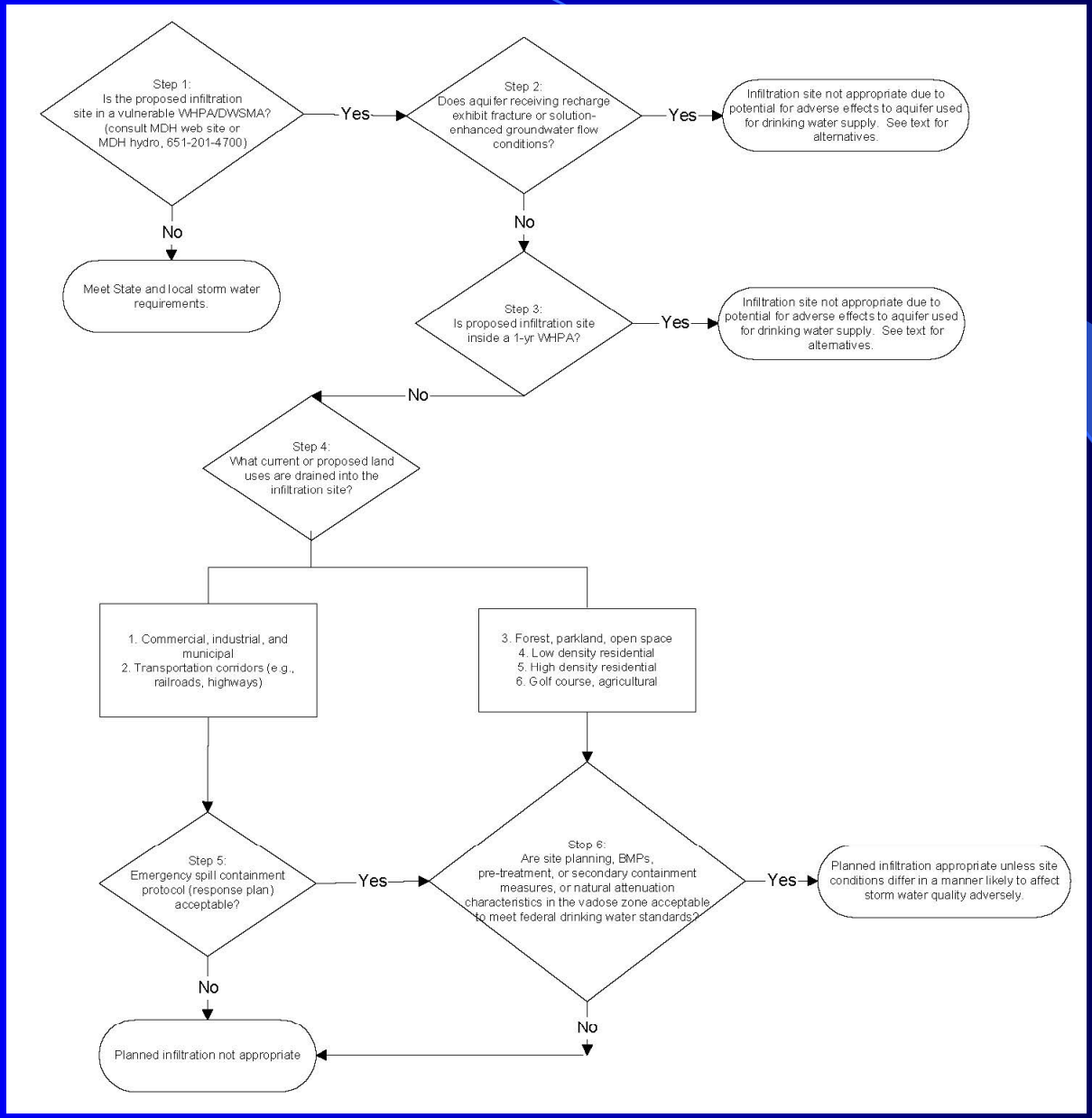
a) With predominately Hydrologic Soil Group D (clay) soils
b) Within 1,000 feet up-gradient, or 100 feet down-gradient of active karst features
c) Within a Drinking Water Supply Management Area (DWSMA) as defined in Minn. R. 4720.5100, subp. 13
d) Where soil infiltration rates are more than 8.3 inches per hour

[MS4 Permit Part III.D.5.a.(3).(a).2)]

Current Regulatory Environment

- NPDES Construction Stormwater Permit
- Watershed Management Organization requirements
- Municipal Wellhead Protection Plans

MDH Infiltration Guidance Flow Chart



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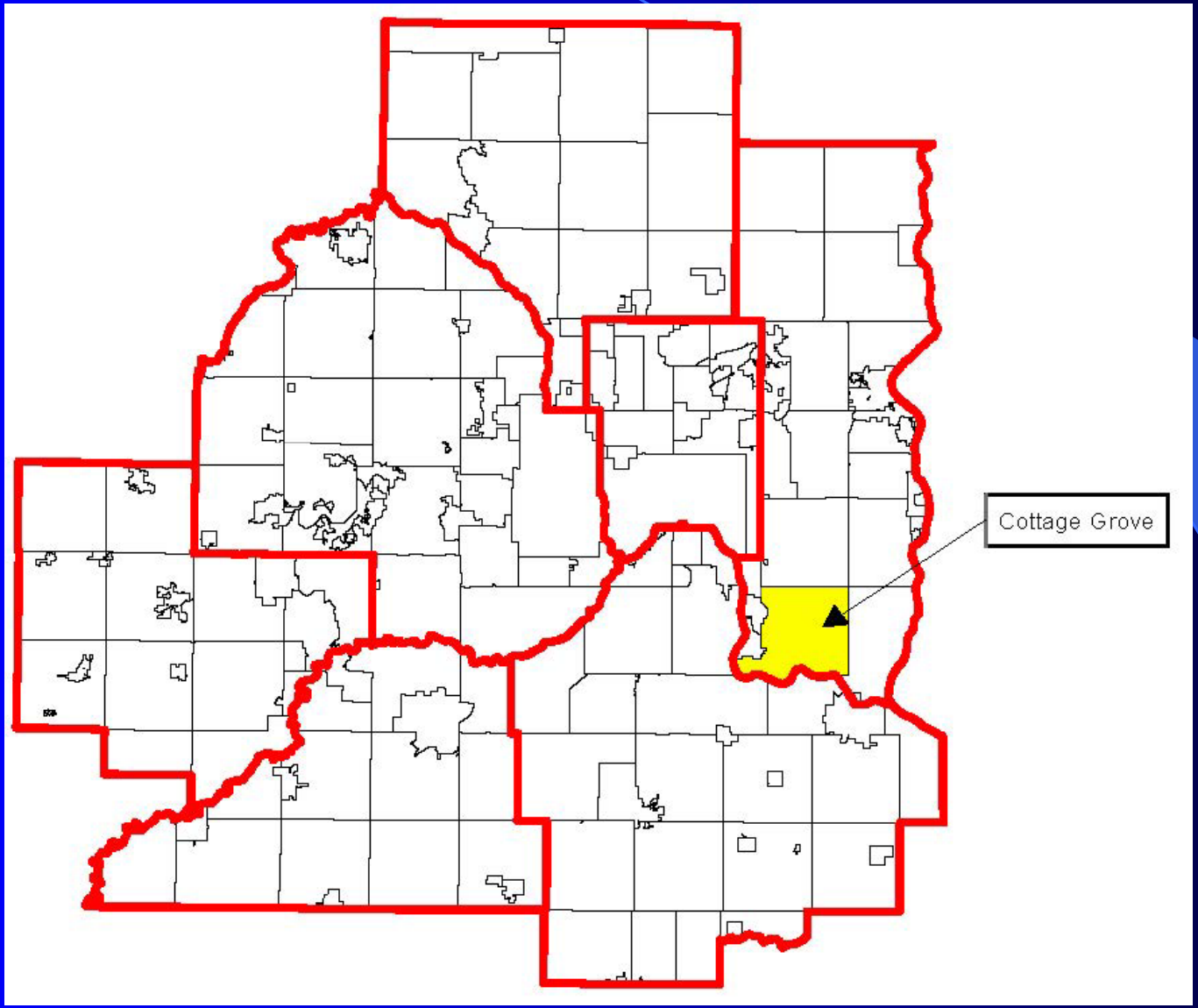
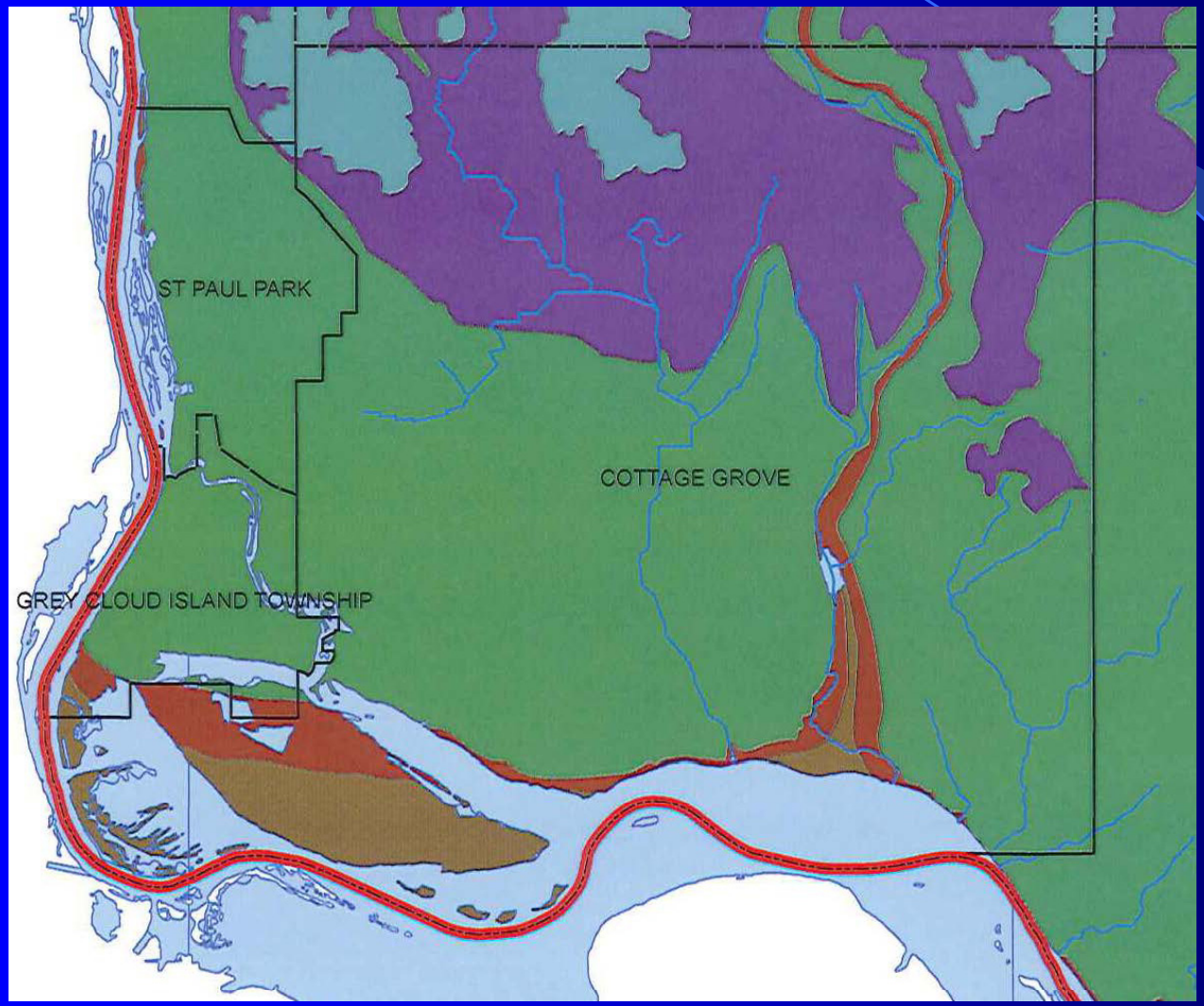
Cottage Grove Location Map



Bedrock Geology



Source: South Washington Watershed District 2007 Watershed Management Plan – Map 8.4

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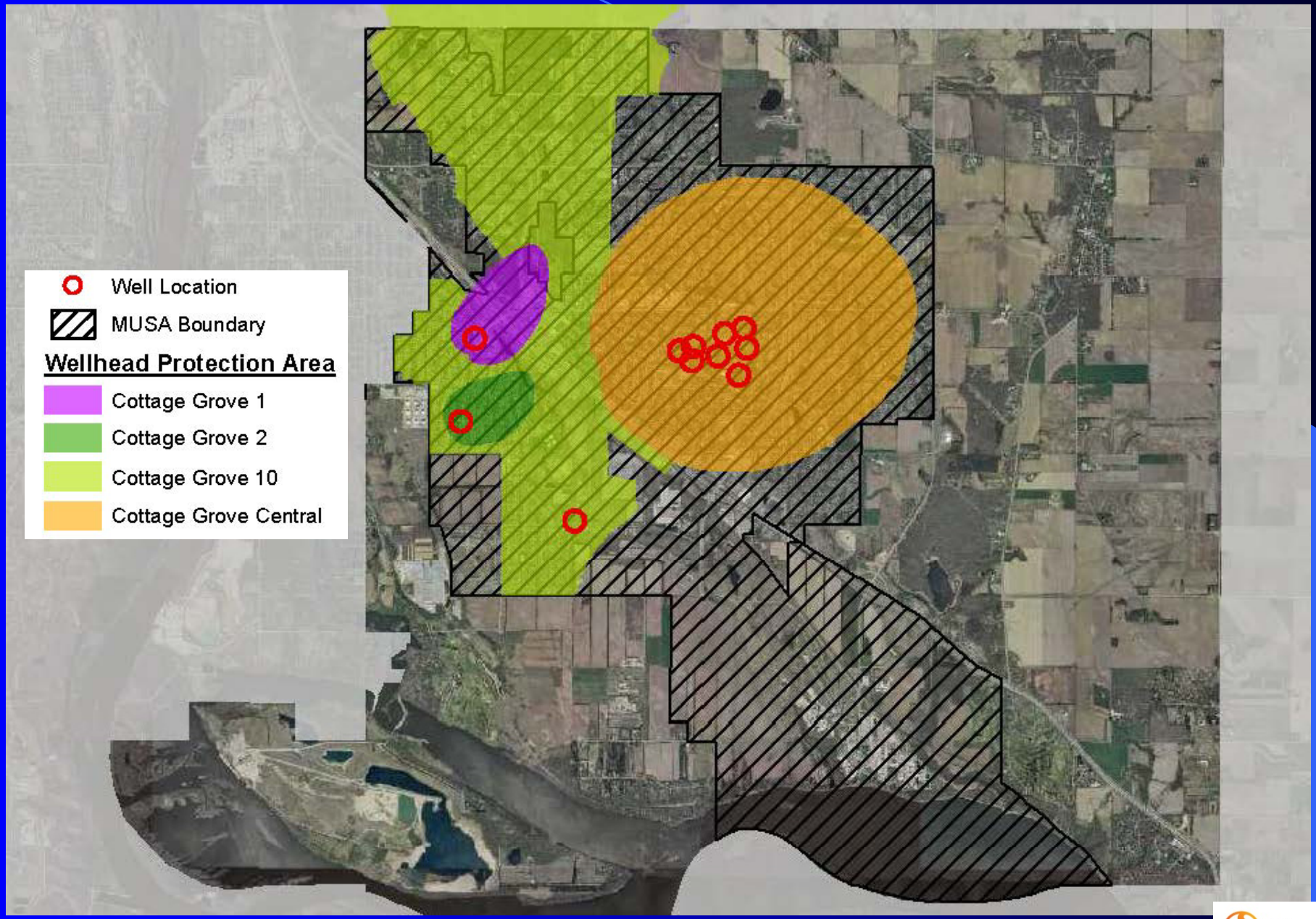
Wellhead Protection Areas



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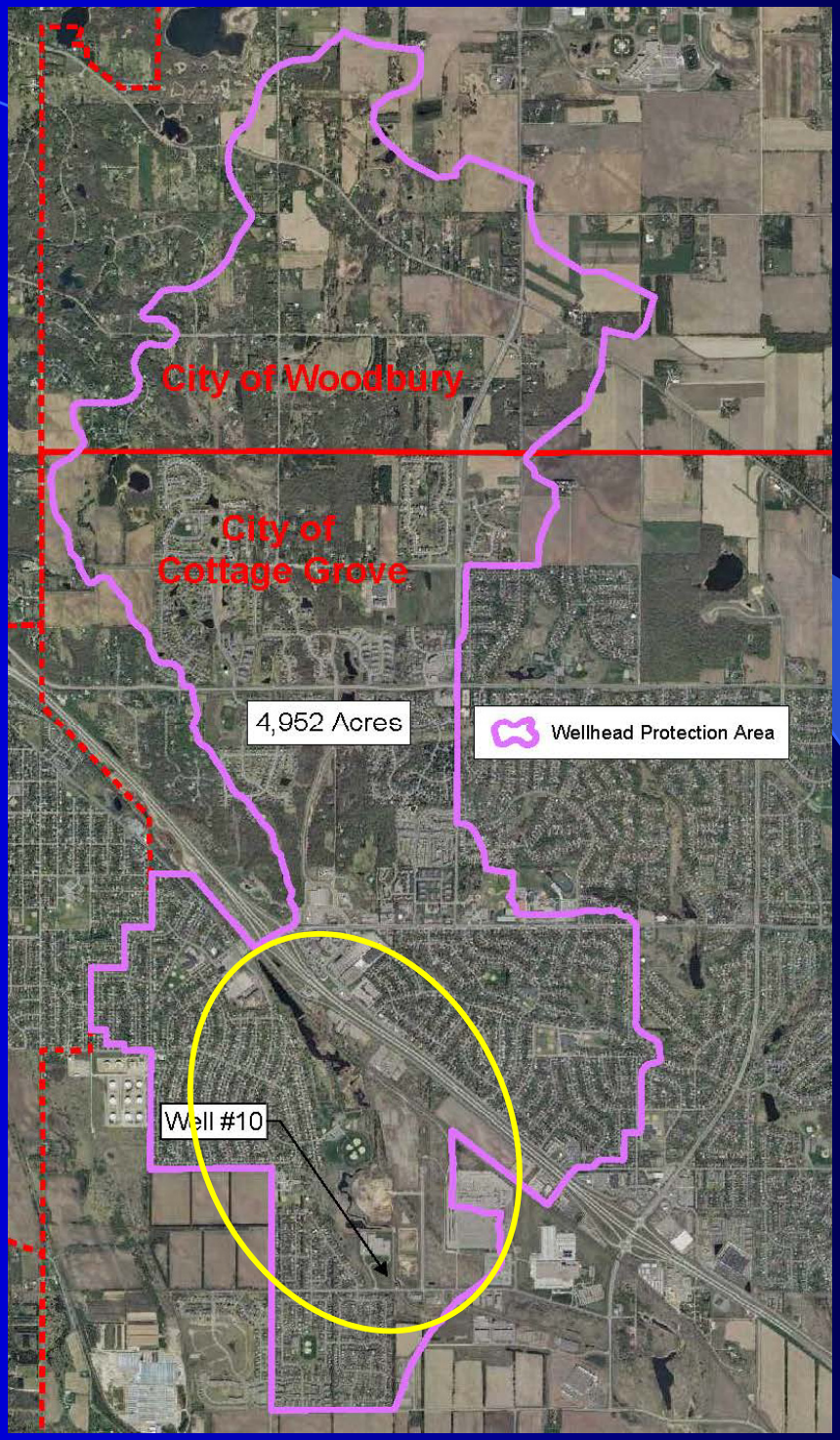
Wellhead Protection Area: Well #10



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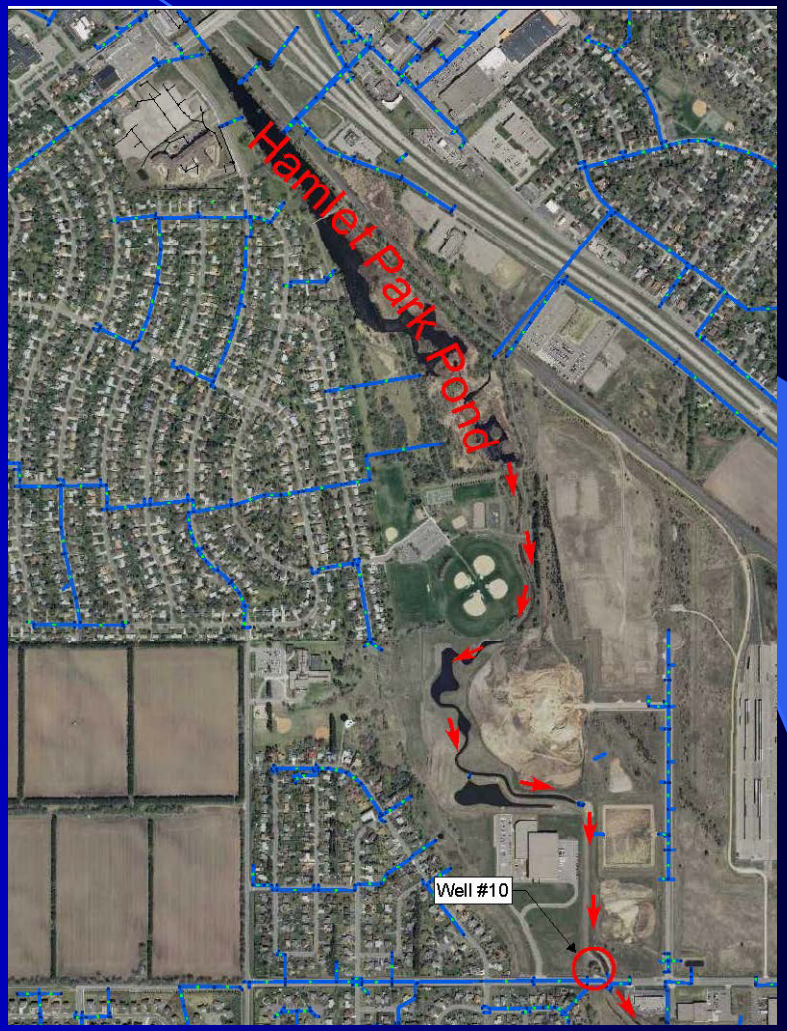
New Pond Construction Project:
Hamlet Park Pond Expansion



Current Flow Pattern

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New Development

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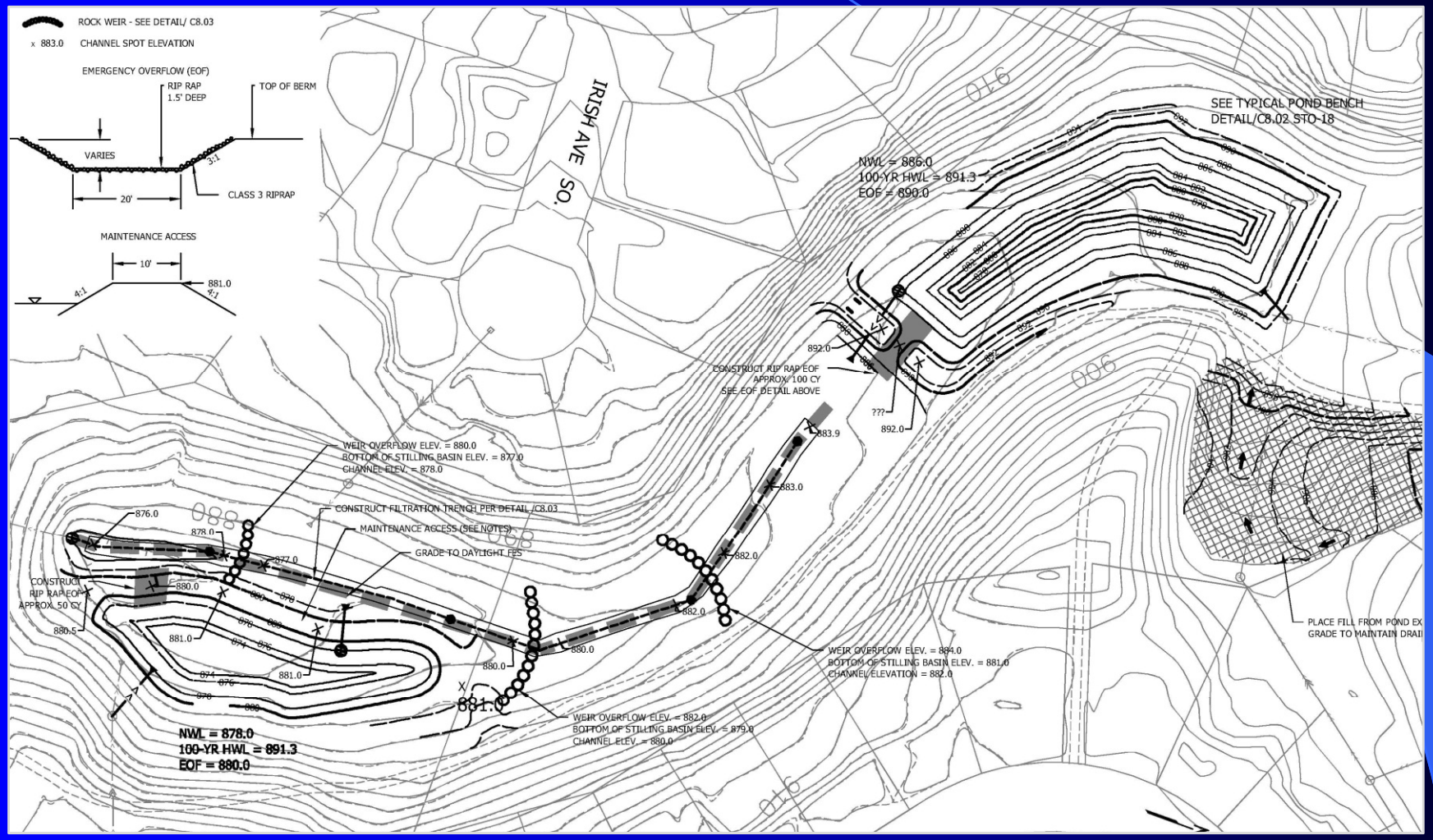
Pond Retrofit Project:
Pond C-P6 Improvements



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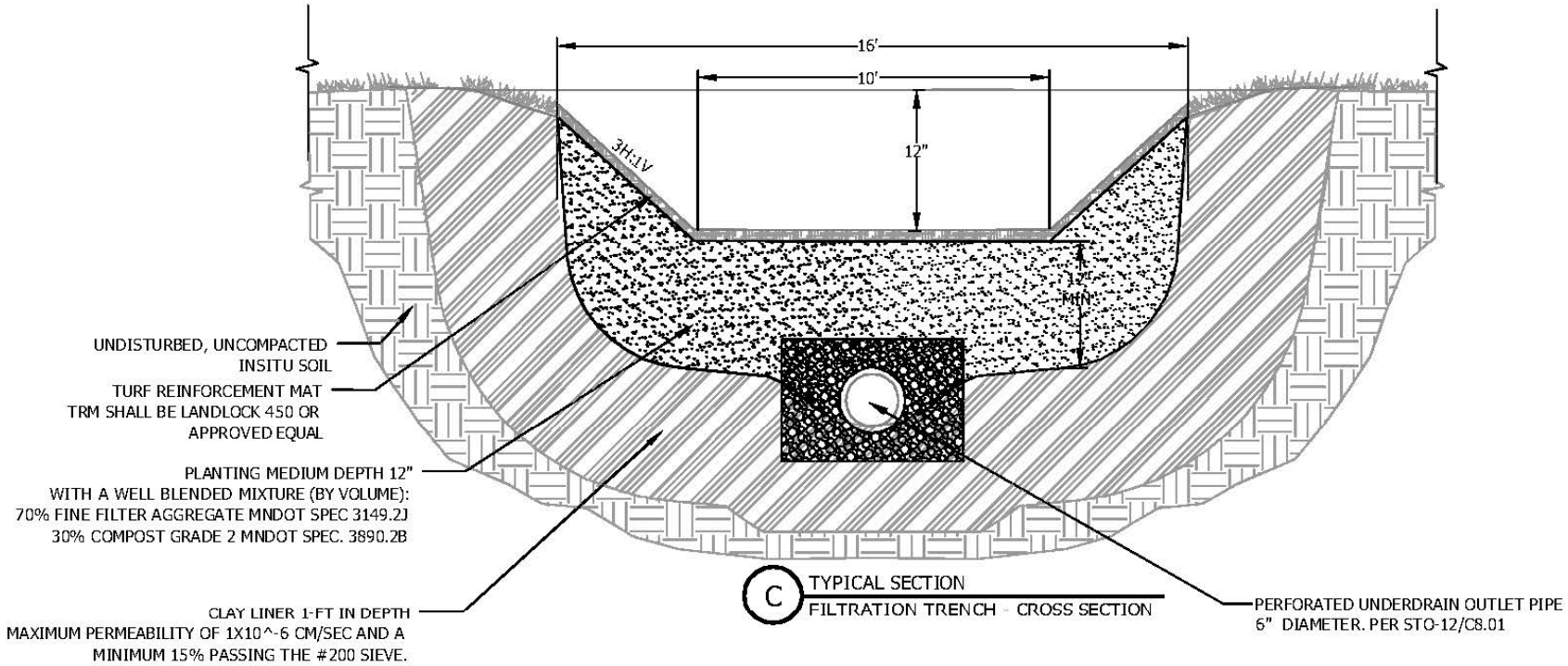
Pond Retrofit Project:
Pond C-P6 Improvements



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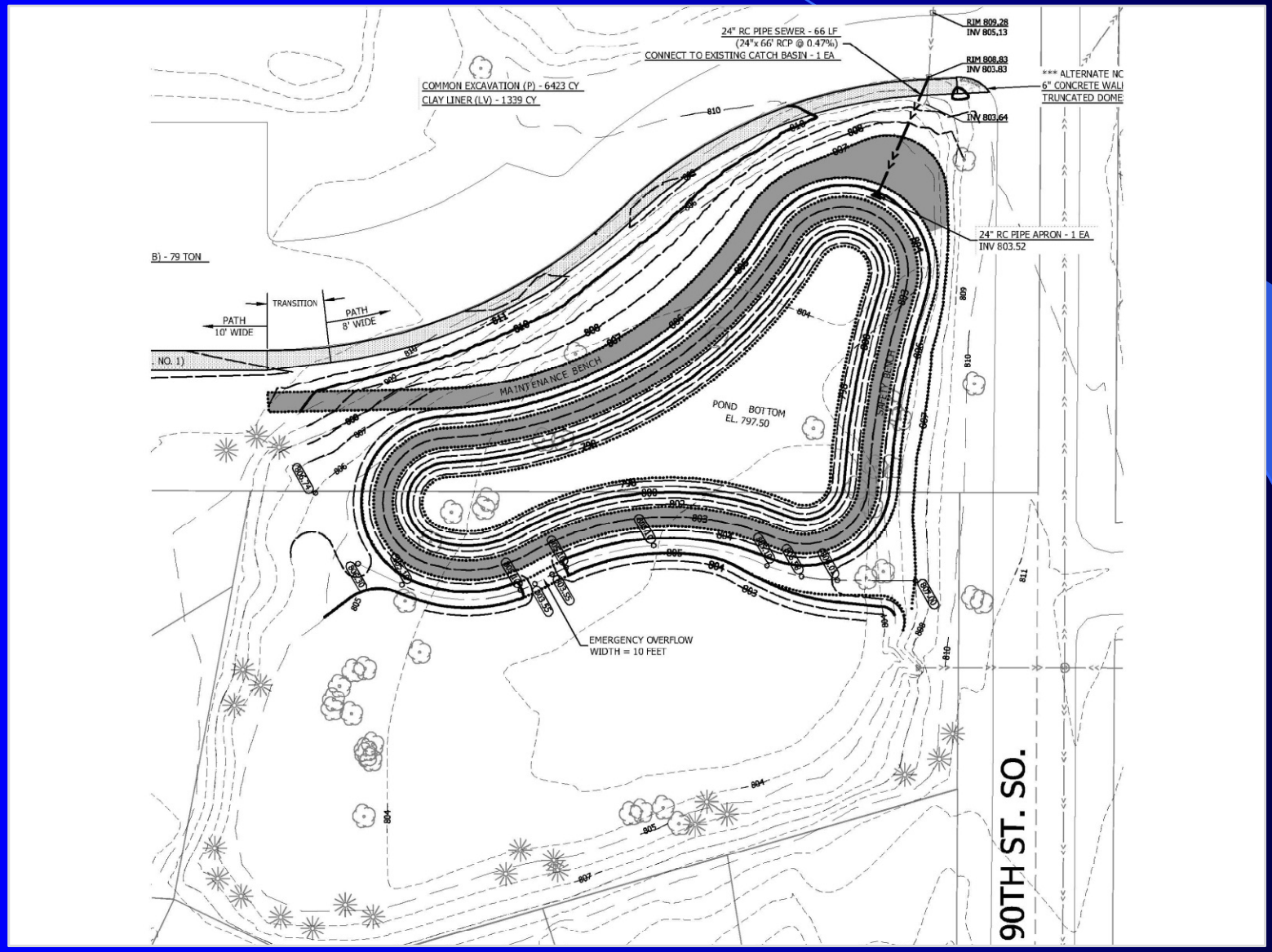
Pond Retrofit Project:
Woodridge Park Pond Improvements



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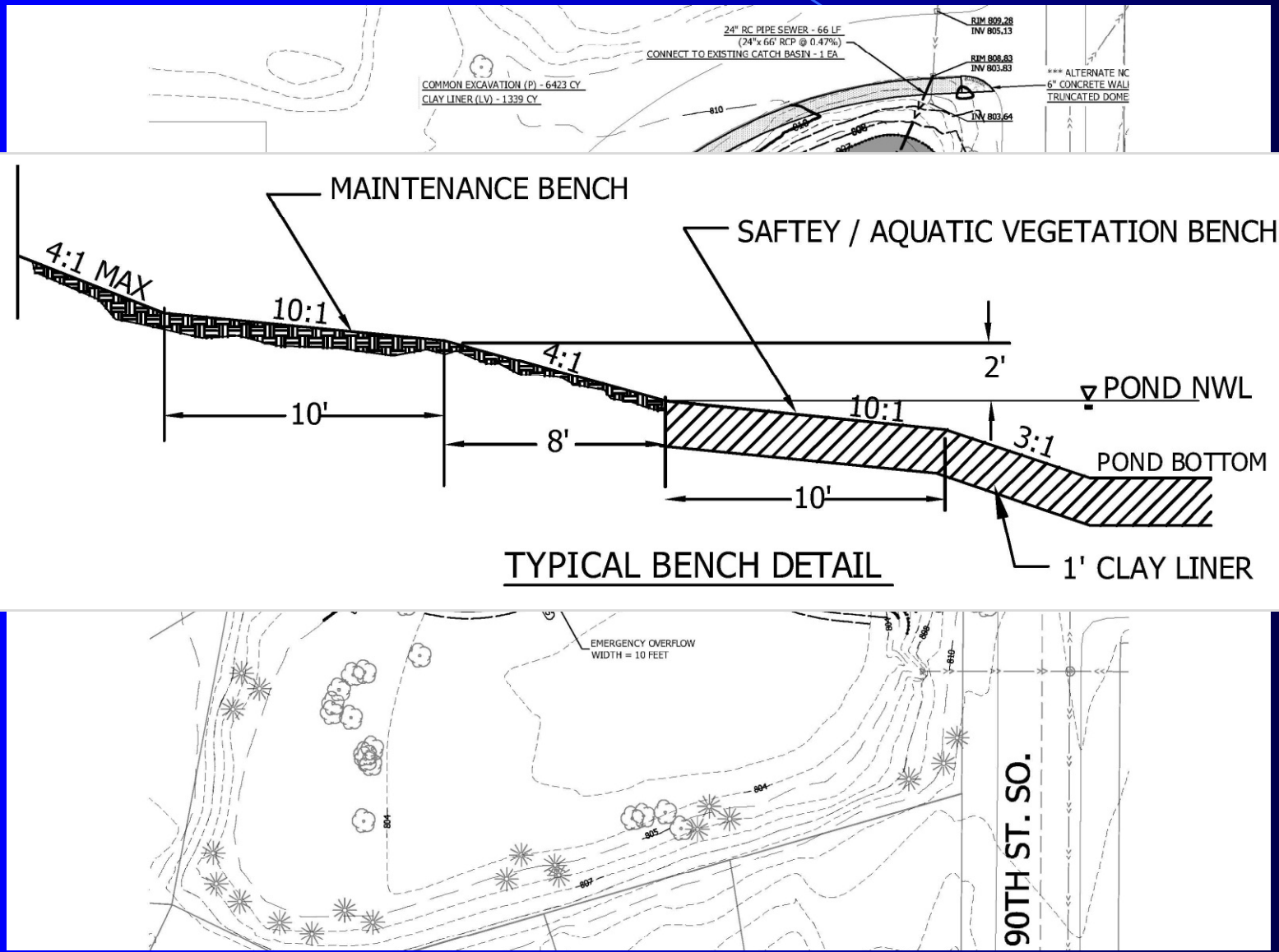
Pond Retrofit Project:
Woodridge Park Pond Improvements



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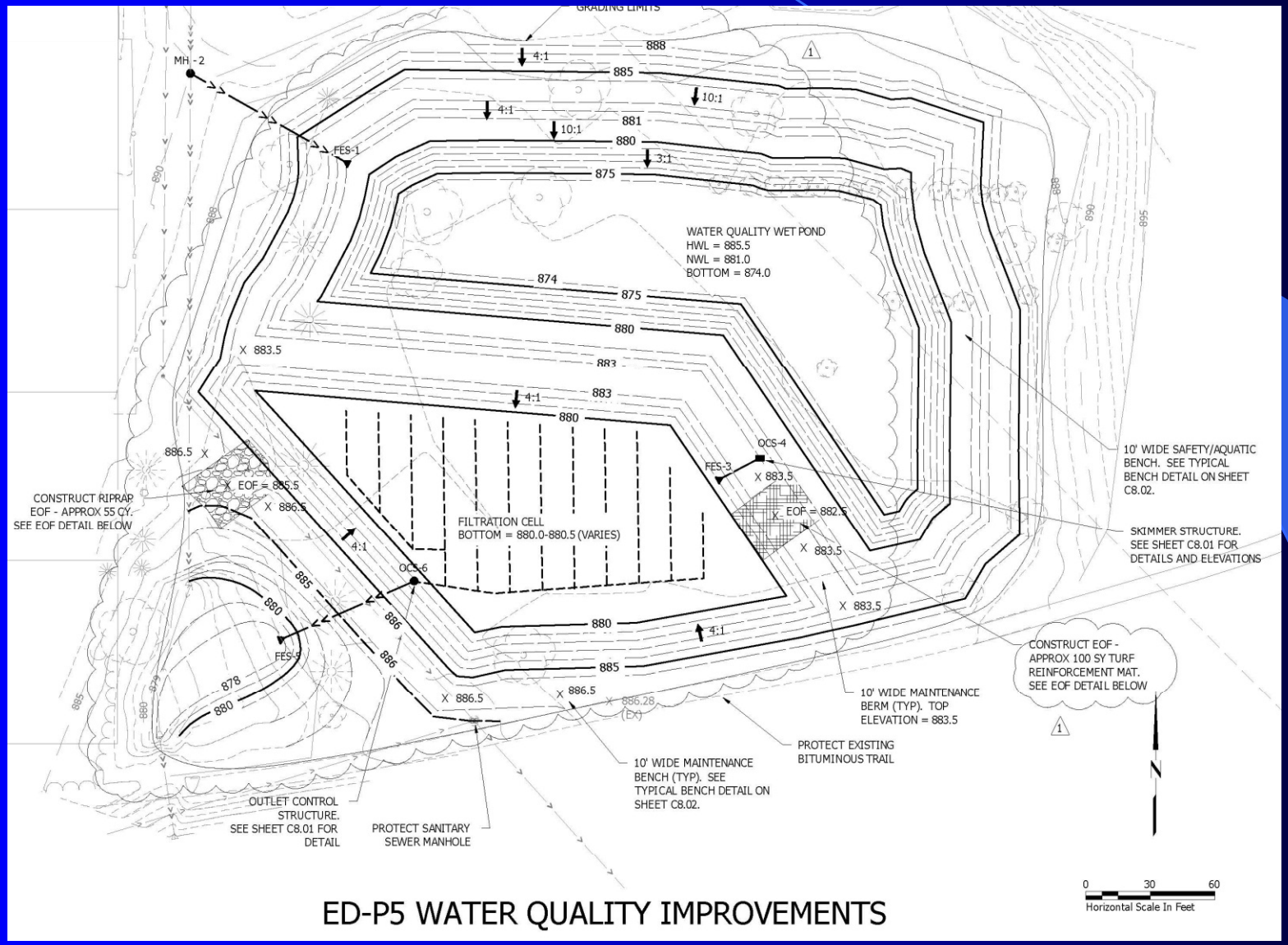
Pond Retrofit Project:
Pond ED-P5 Water Quality Improvements



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Pond Retrofit Project:

Final Thoughts:

- Wellhead protection concerns are real
- Know the source water protection issues facing your community
- When designing infiltration features, knowledge of both surface water and ground water impediments is necessary
- Err on the side of caution and develop a stormwater management approach that places a priority on drinking water protection

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Questions?

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