Pine River Watershed Wetland Mitigation Design Project

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Presented By:

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Presentation Objectives

- Project Introduction and Location
- Design Needs and Site Features
- Challenges and Solutions
- Construction
- Monitoring Results
- Questions and Answers (Please hold to end)

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Introduction

- MDOT issued a Request for Proposal in July 2006 to design a wetland mitigation bank on a 60 acre parcel (already purchased) located in Bear Creek Township, Emmet Co., approximately 3 miles SE of Petoskey
- Design was to be for up to 40 acres of wetland, to be verified by water budget, groundwater modeling, and cost.
- DLZ was awarded the project and started design in October 2006
- Was also an experiment for regeneration of white cedar included (not discussed) by NMU

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Site Location

- Bear Creek Township, Emmet Co.

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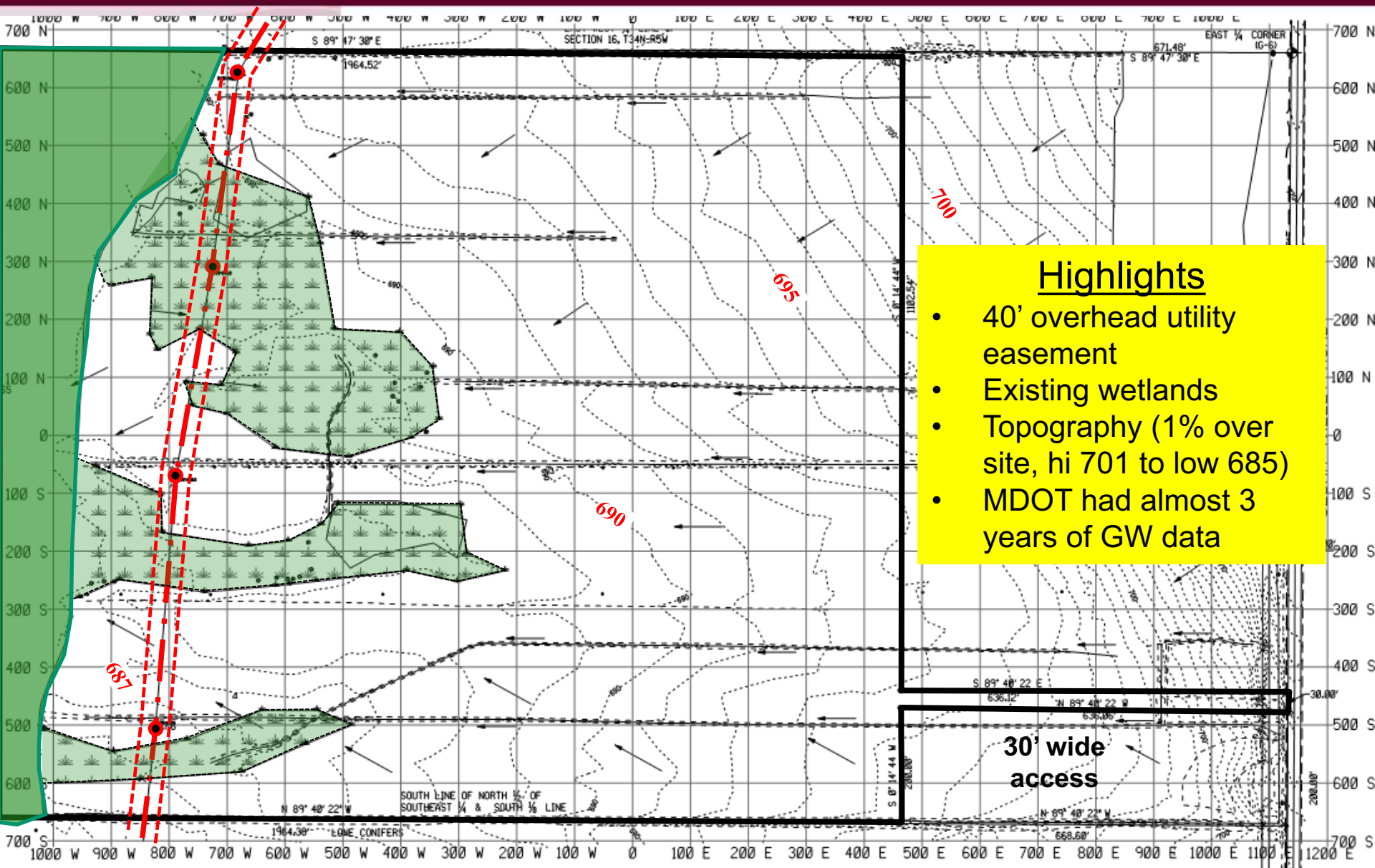
Project Site

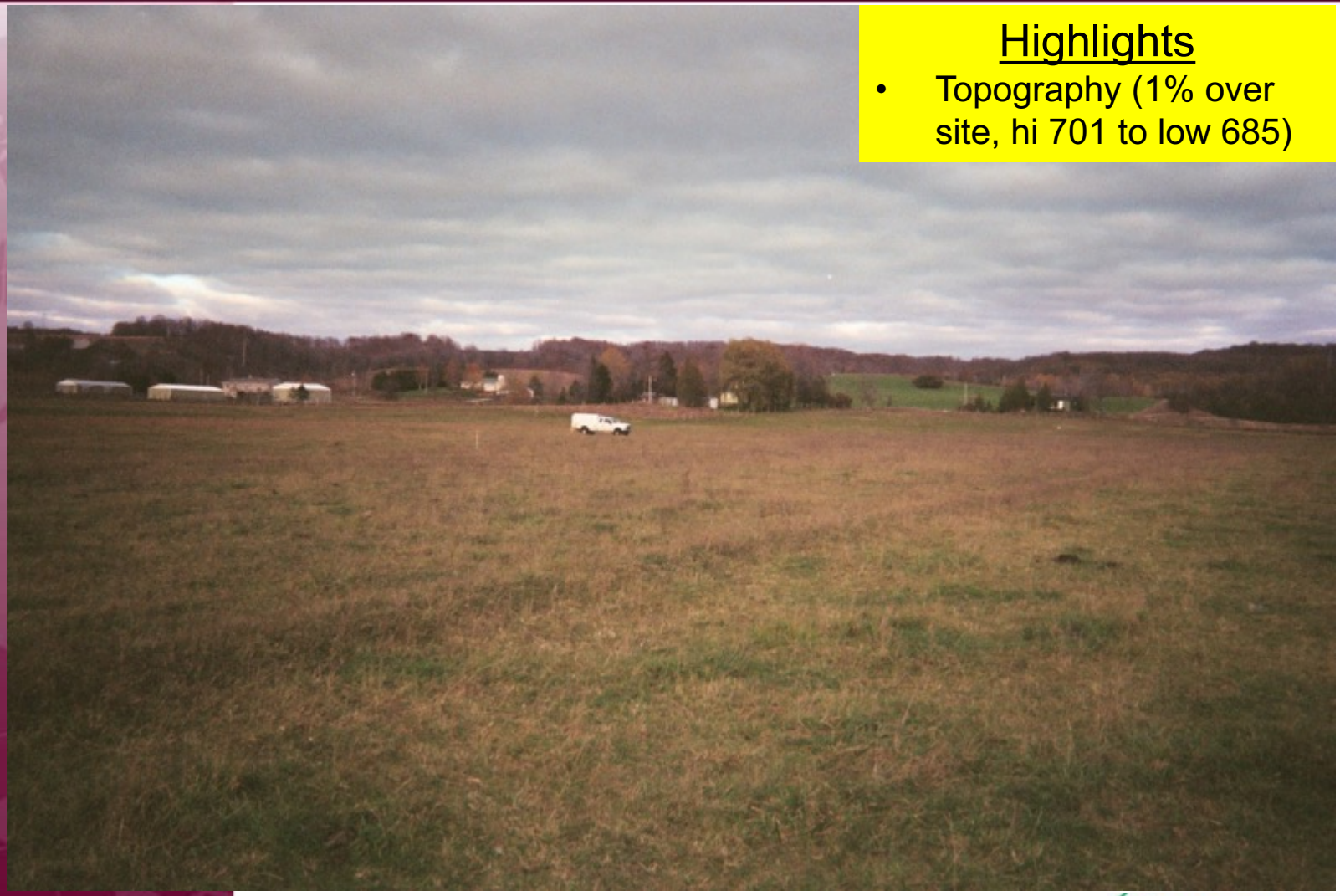
Project Site



Highlights

- 40' overhead utility easement
- Existing wetlands
- Topography (1% over site, hi 701 to low 685)
- MDOT had almost 3 years of GW data

Project Site



Highlights

- Topography (1% over site, hi 701 to low 685)

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Project Site

Highlights

- Existing wetlands

Design Challenges

- Geology
- Groundwater levels and fluctuations
- Construction cost

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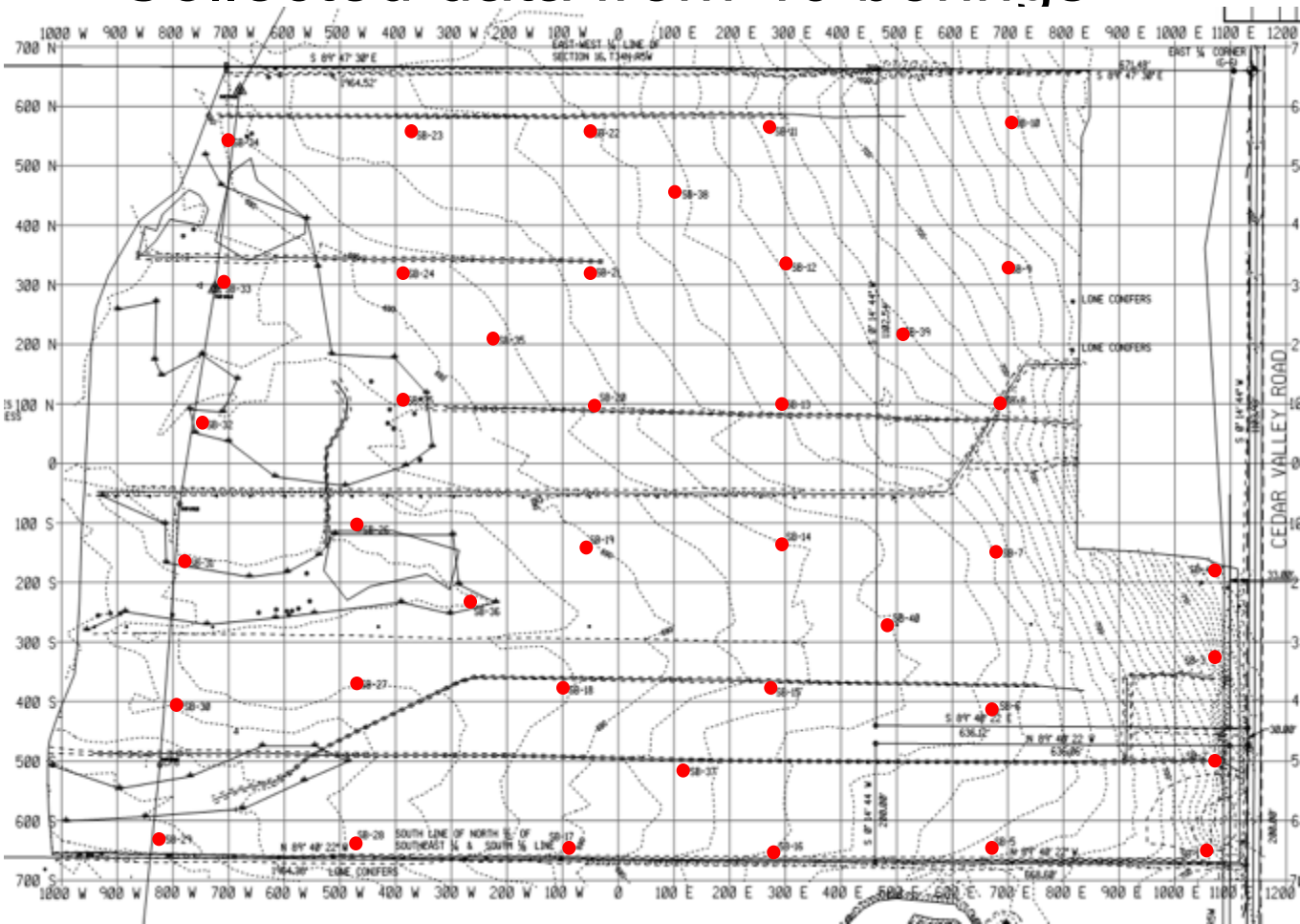
Design Challenges

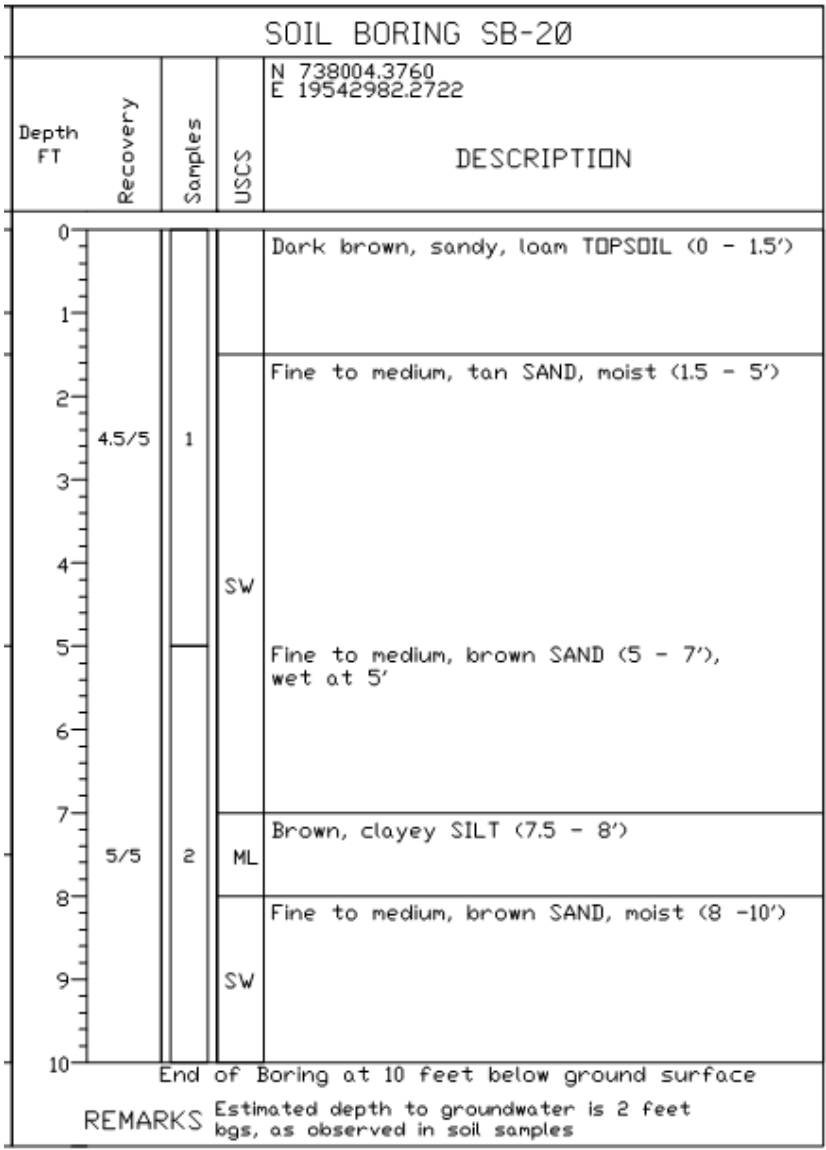
- Geology
  - Collected data from 40 borings



Design Challenges

- Geology
  - Common theme: SAND with a good loam topsoil

CHALLENGE: How do we maintain hydrology in sand???



Design Challenges

- Groundwater levels and fluctuations
  - data provided by MDOT from 4* monitoring wells 08/03 – 05/05
  - severe fluctuations in water table during growing season (May 30-Sept 30)
  - groundwater contours relatively consistent

*One well provided intermittent data only

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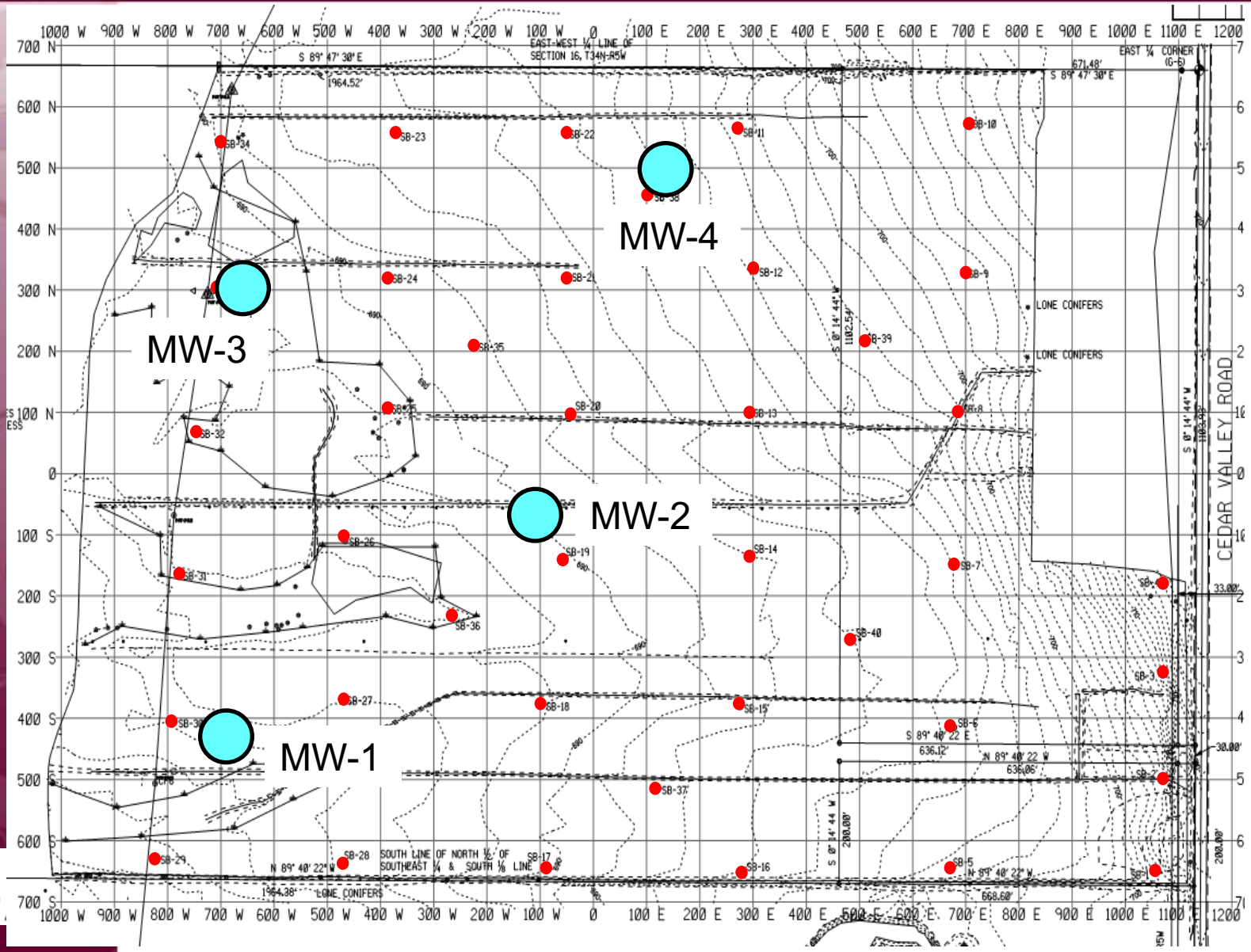
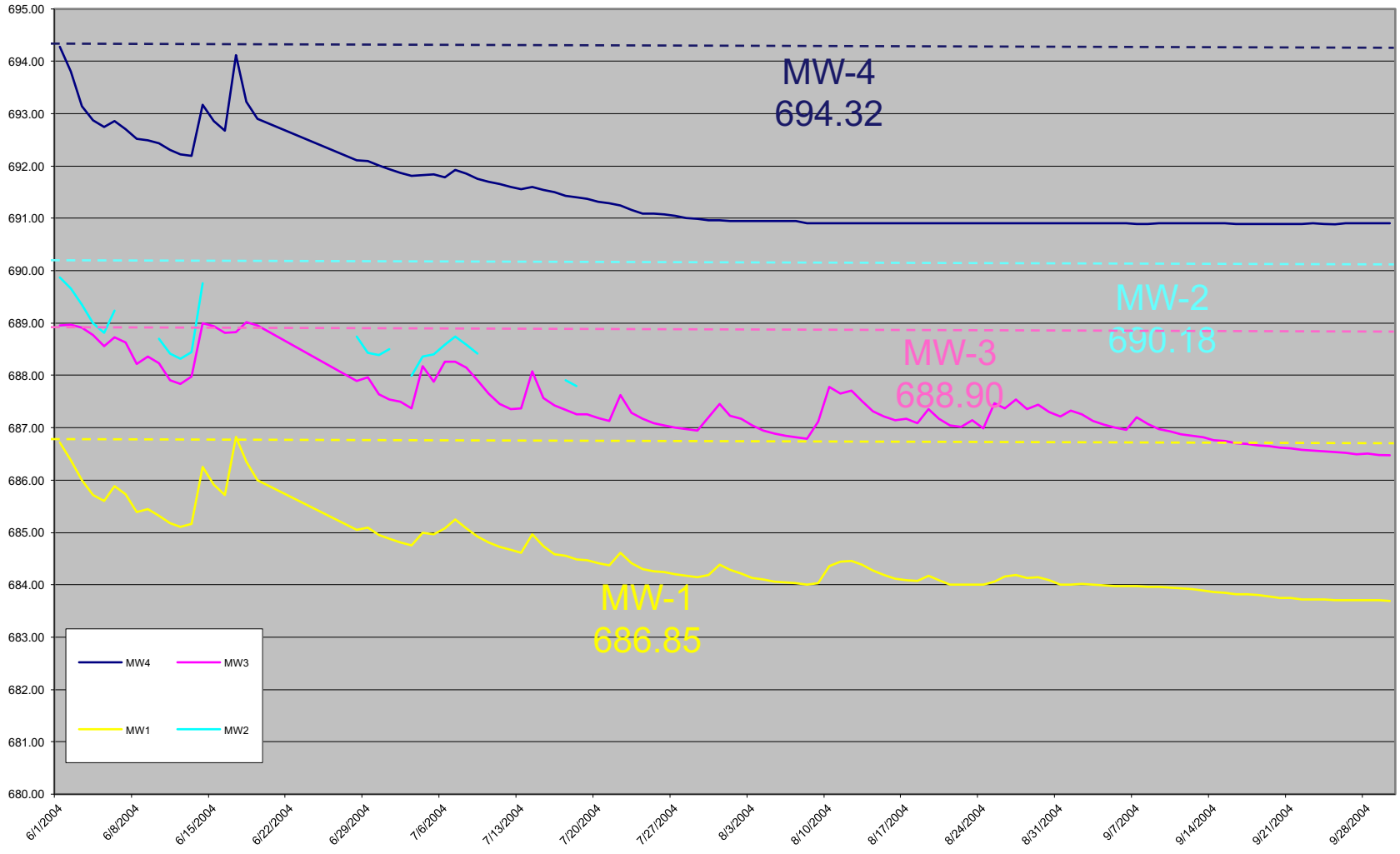
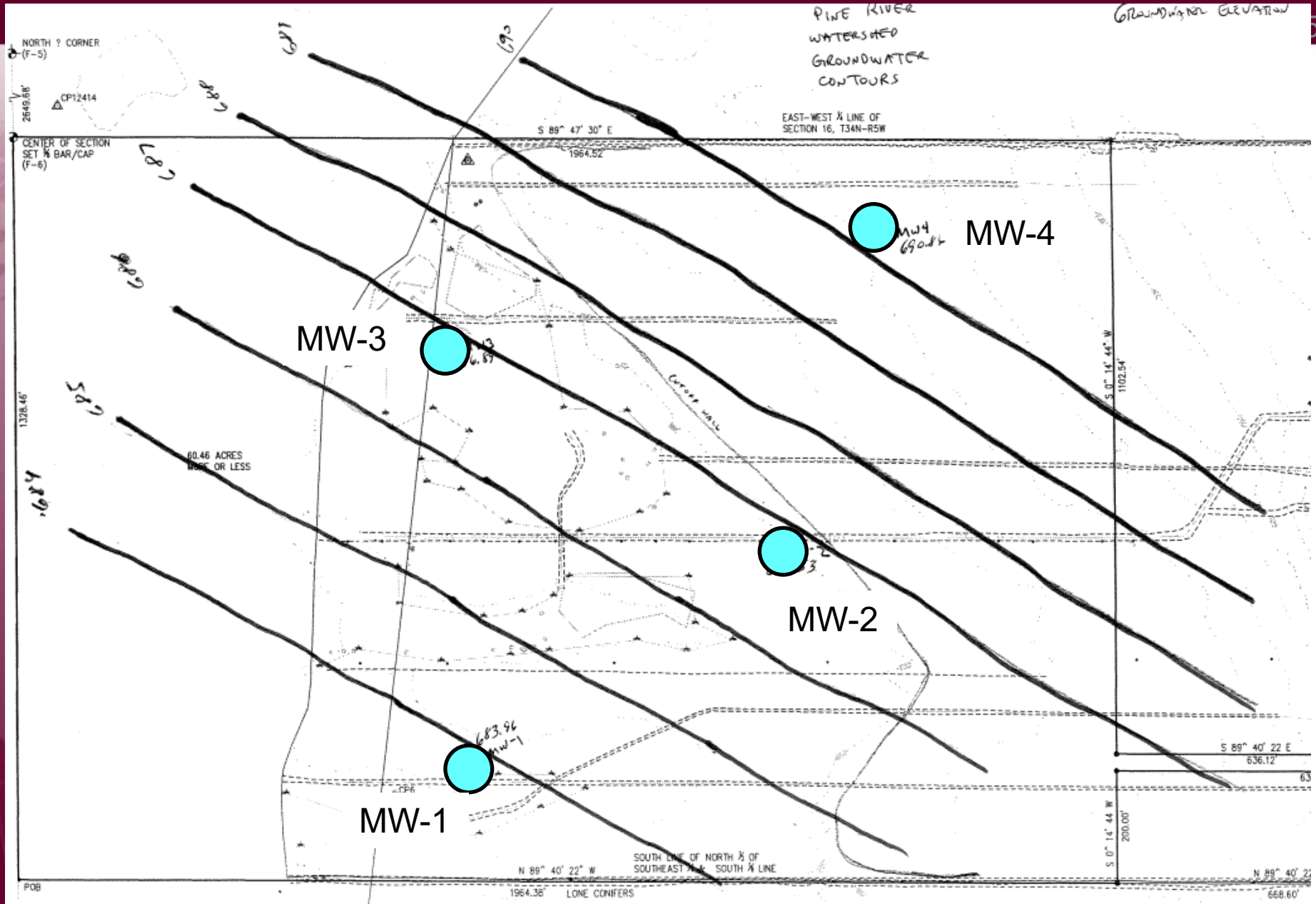
Design Challenges



Design Challenges



Design Challenges



Design Challenges

- Construction cost
  - Cost to excavate sand for wetland exceeded budget
  - No impermeable soils (clay) on the site for containment berms, would need to be imported ($$)
  - Excavated sand had some market value to offset cost but not enough

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Design Challenges

How are we on time?

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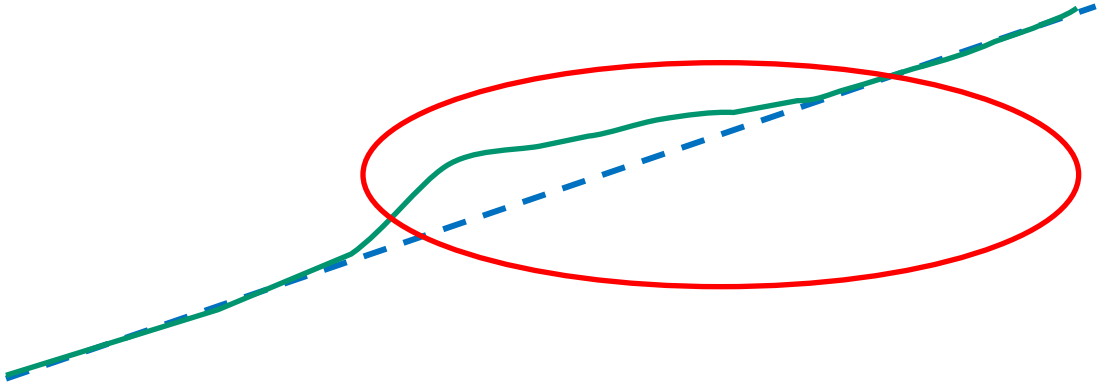
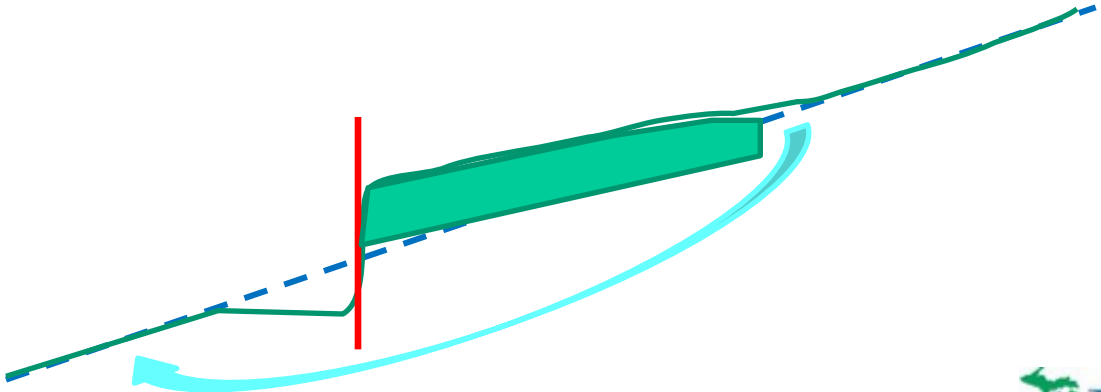
Design Challenges

Needed to find a way to flatten the groundwater gradient to closer to the surface and hold it there sufficiently for a portion of the growing season. This would reduce excavation.



Solution

Researched options and borrowed a concept (cut-off or slurry wall) used to recover free product contamination in groundwater. Came up with a creative, cost-effective solution (and MDOT bought in!).



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Solution

Modeled impact of placing a geotextile with bentonite vertically in a trench like a curtain. Theory was that it would slow the flow of groundwater and cause it to “mound” upgradient and flatten the groundwater contour. Model showed it would have an impact but not as much as we would like. The excavation of soil could not be modeled accurately but we believed it would aid our goal, decided to go forward with this design concept.

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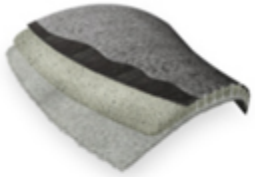
Solution

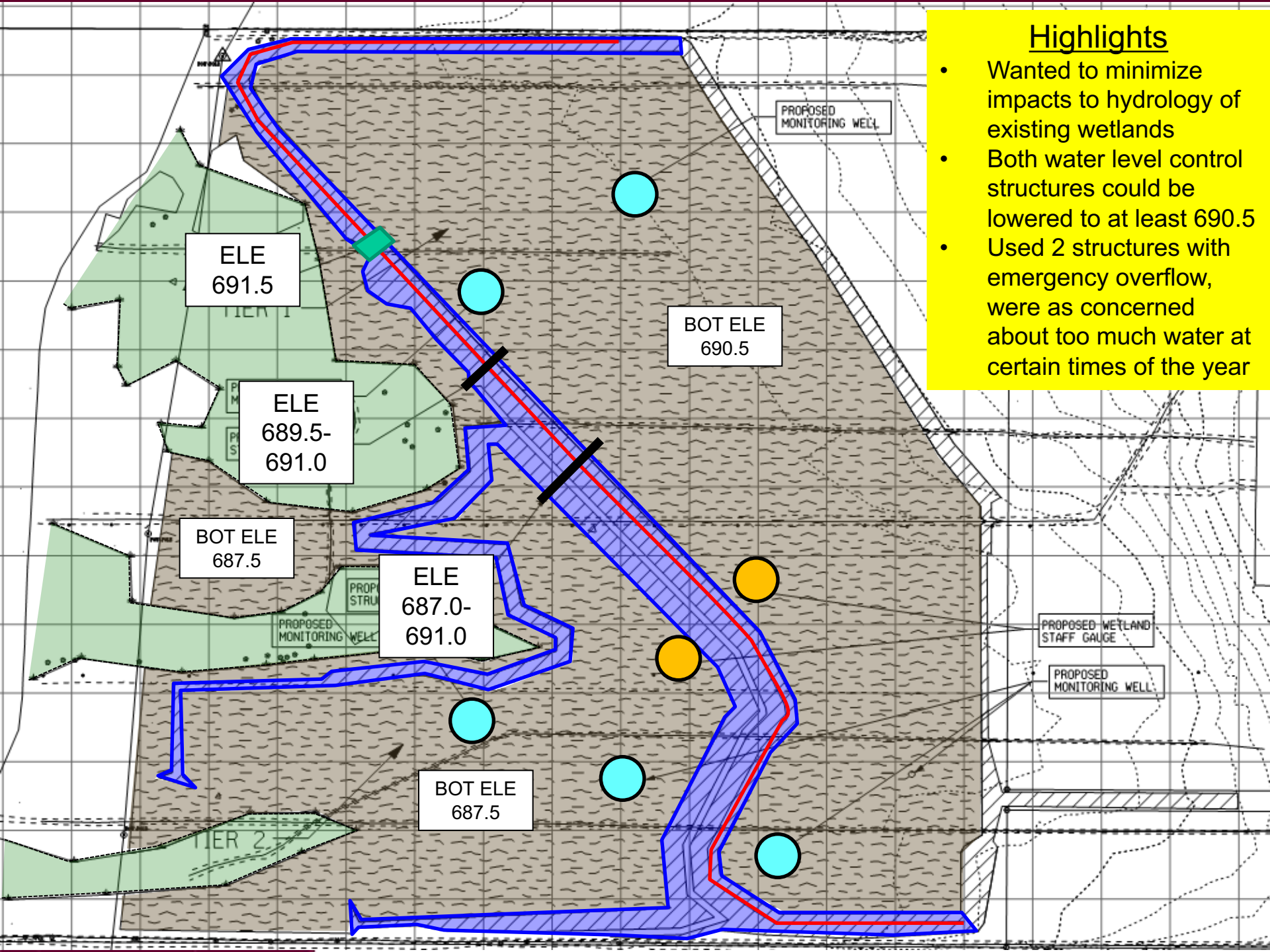
Researched and selected Bentomat ST geosynthetic clay liner (GCL)

- Typically used to line ponds, mine tailwater ponds, etc.
- Layer of bentonite sandwiched between a woven and non-woven geotextile fabric
- 15’ tall x 150’ long rolls
- Decided to install 7.5’ tall liner in trench along centerline of containment berm on the downgradient side of wetland, wrapped around the side (cut roll in ½)



BENTOMAT® ST

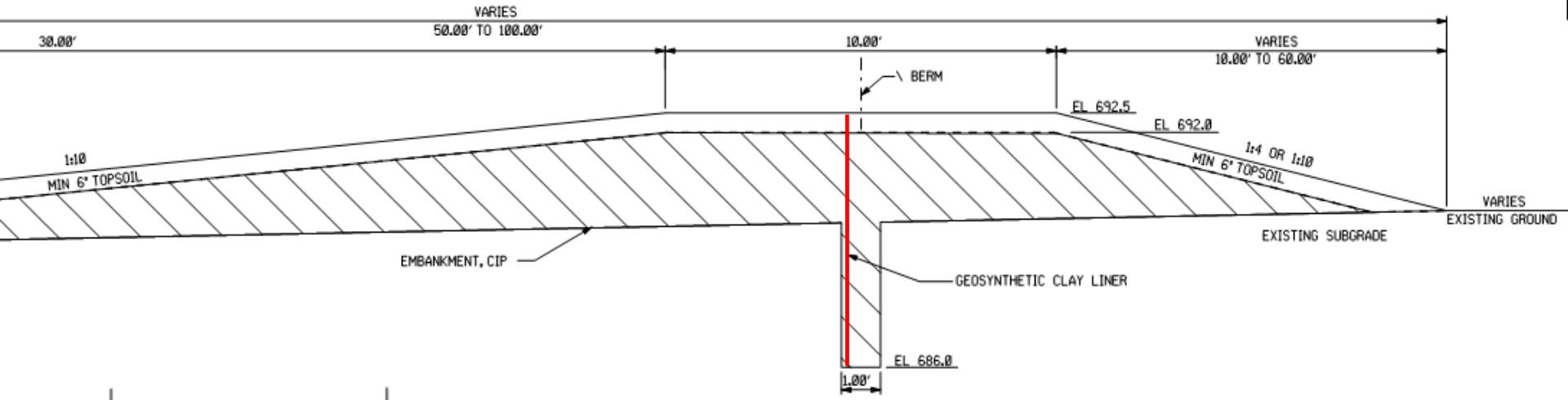
BENTOMAT® ST is a reinforced GCL consisting of a layer of sodium bentonite between a woven and a nonwoven geotextile, which are needlepunched together.



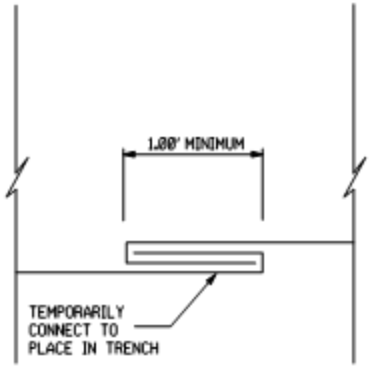
Highlights

- Wanted to minimize impacts to hydrology of existing wetlands
- Both water level control structures could be lowered to at least 690.5
- Used 2 structures with emergency overflow, were as concerned about too much water at certain times of the year

Solution



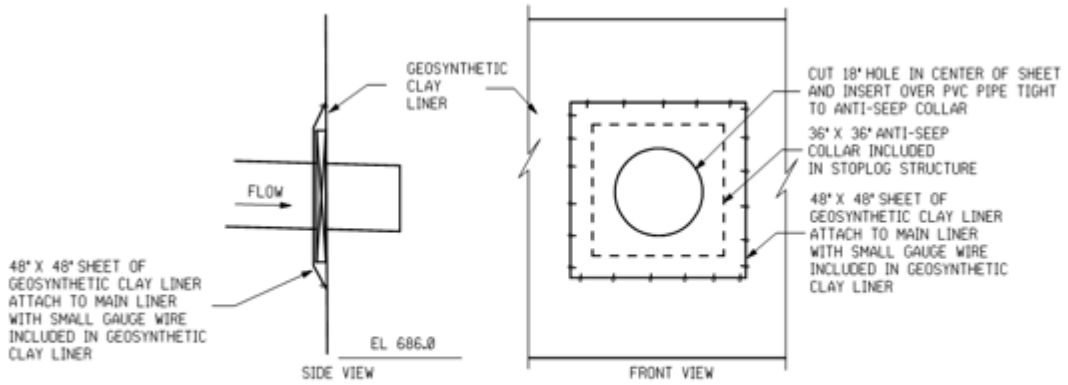
TYPICAL BERM SECTION



GEOSYNTHETIC CLAY LINER OVERLAP DETAIL

PLAN VIEW
NO SCALE

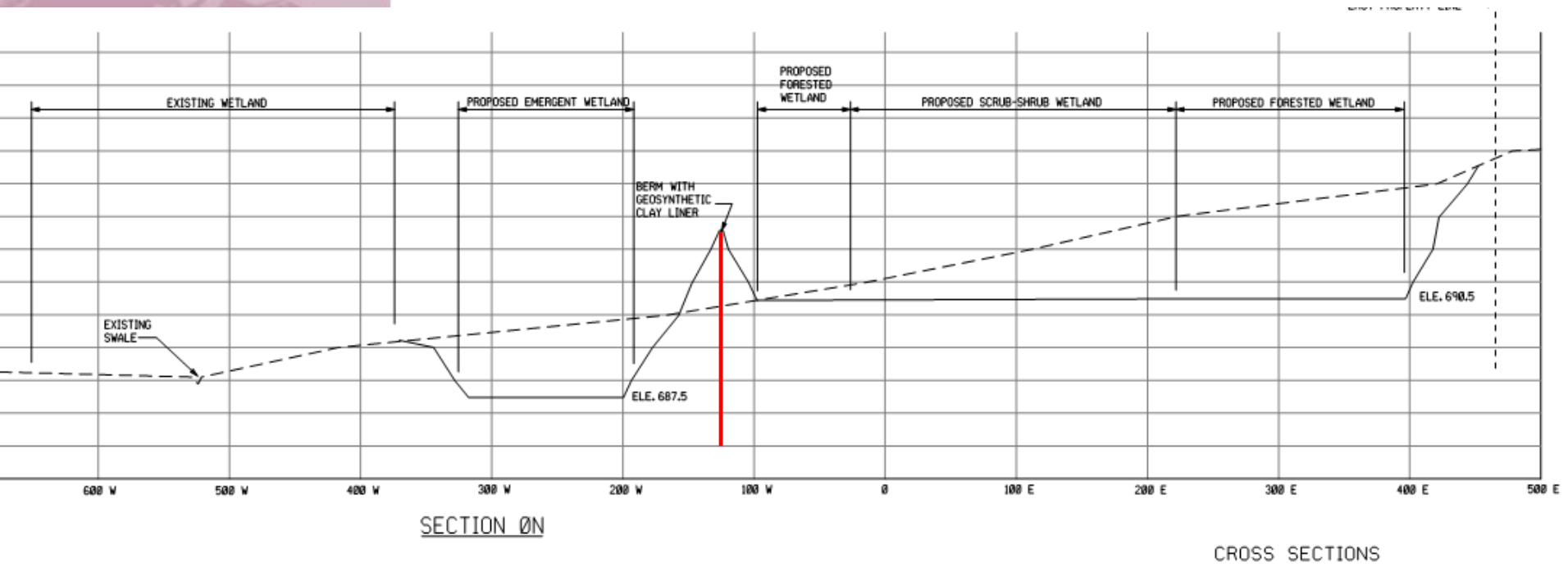
NOTE:
1. OVERLAP AND INTERLOCK GEOSYNTHETIC CLAY LINER BY MINIMUM 1 FOOT AT END OF ROLL.



ANTI-SEEP COLLAR DETAIL WITH GEOSYNTHETIC CLAY LINER APPLICATION

SCALE: 1" = 2'

Solution



We were able to reduce average soil removal to 2’ over the site (75,000 cy)

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Construction

GCL installed in trench in “berm” centerline

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Monitoring

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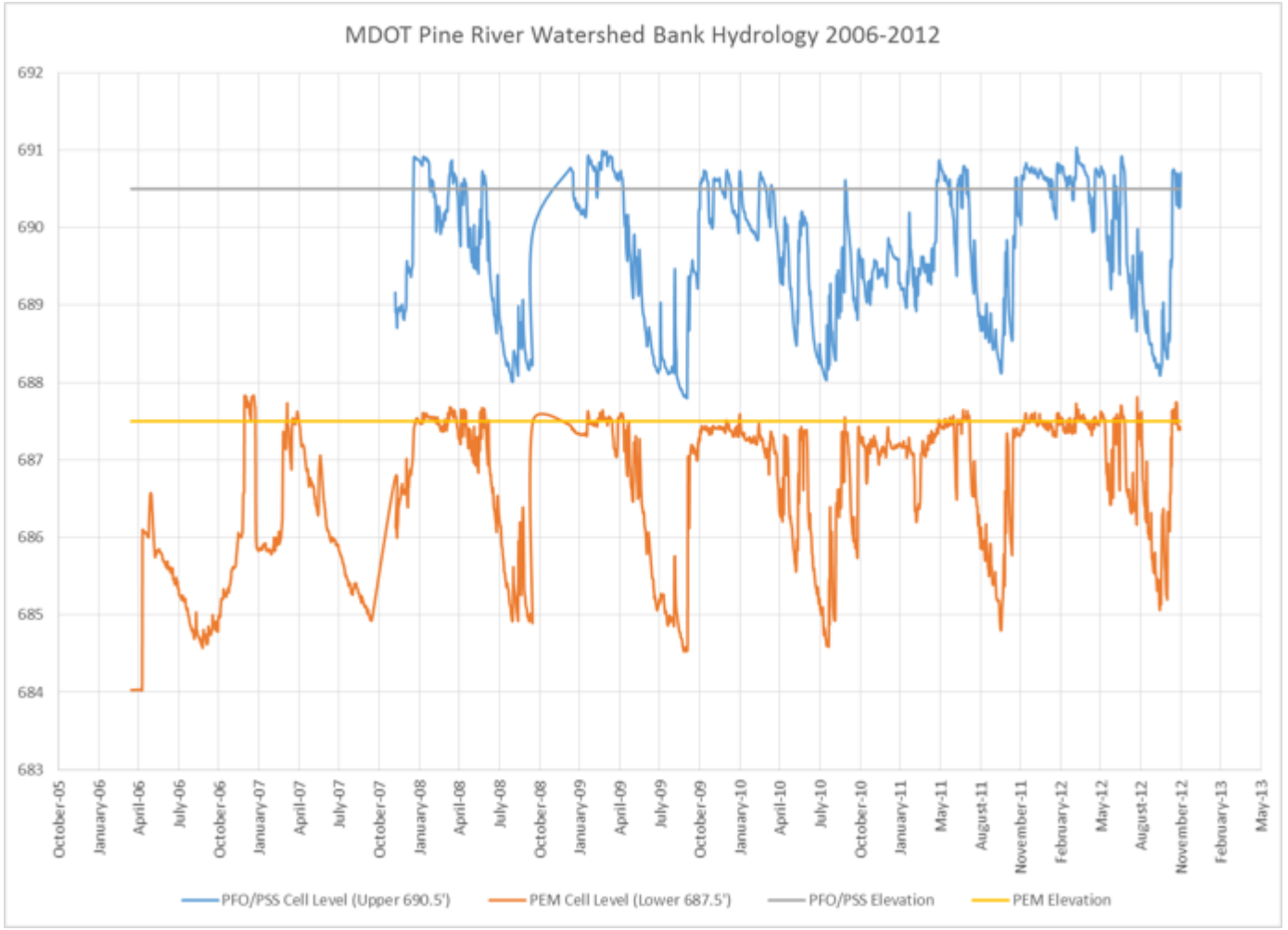
Site Hydrology 2006-2012



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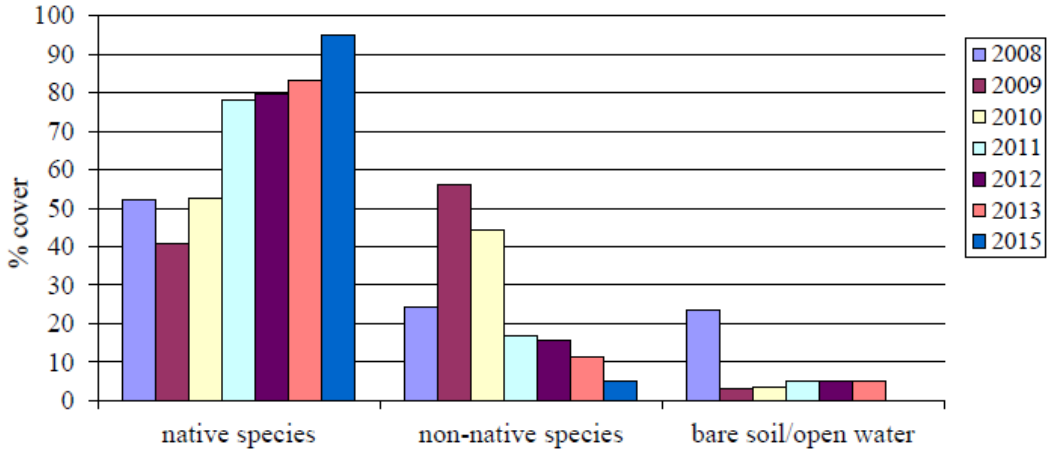
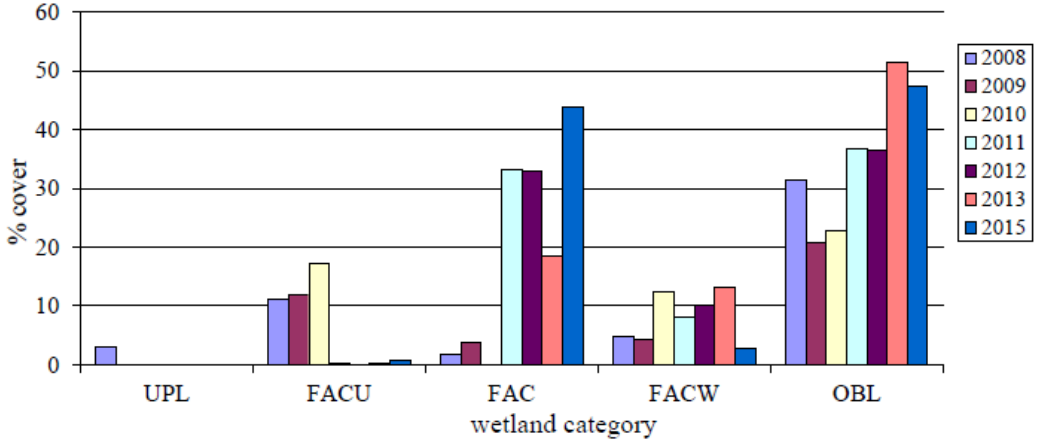
Vegetation Results

C. Relative Percent Cover of Plant Species Found and Bare Soil/Open Water Areas 2008 - 2015



D. Relative Percent Cover of Native Plant Species by Wetland Category 2008 - 2015



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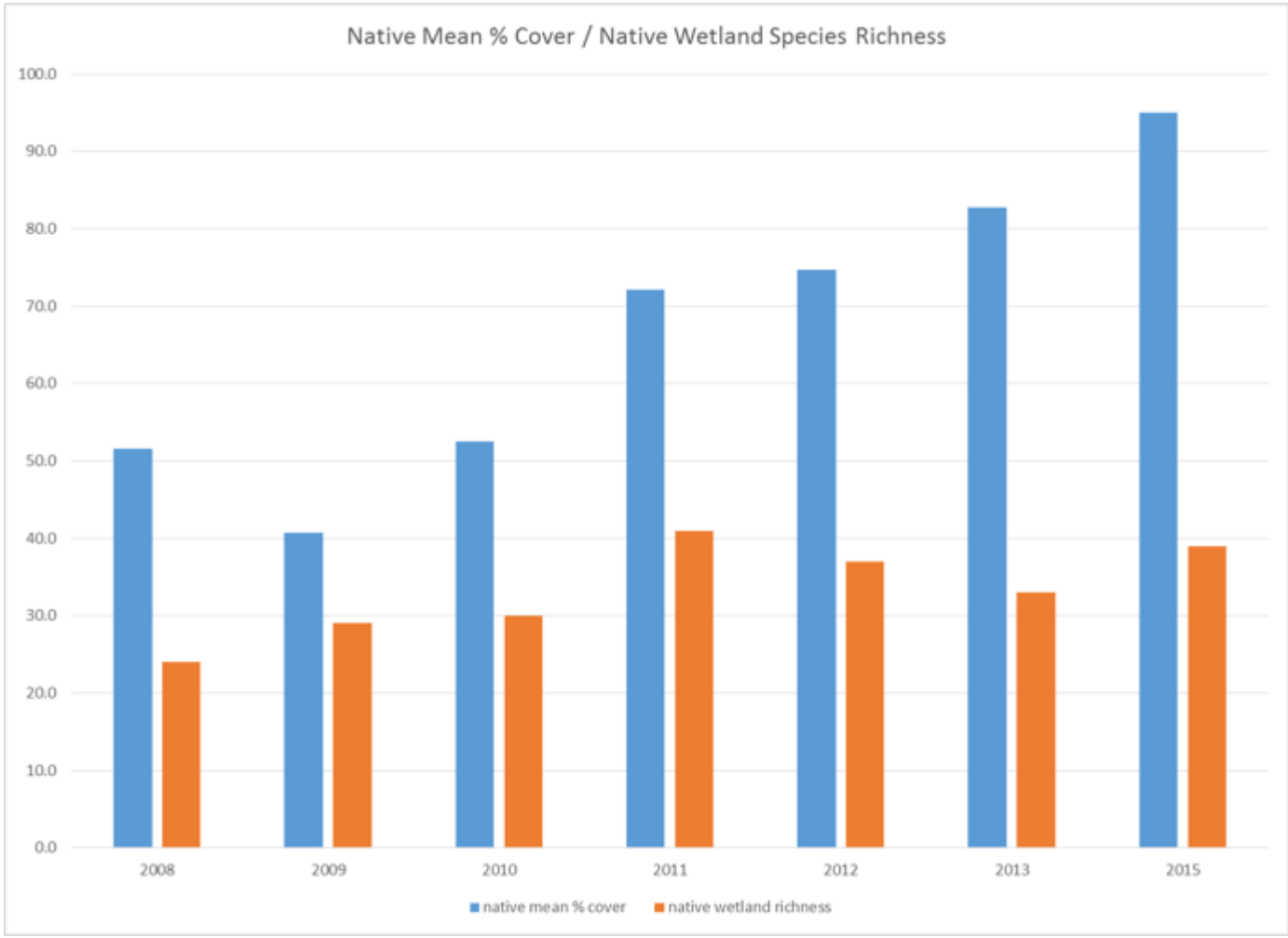
Vegetation Results



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Questions??