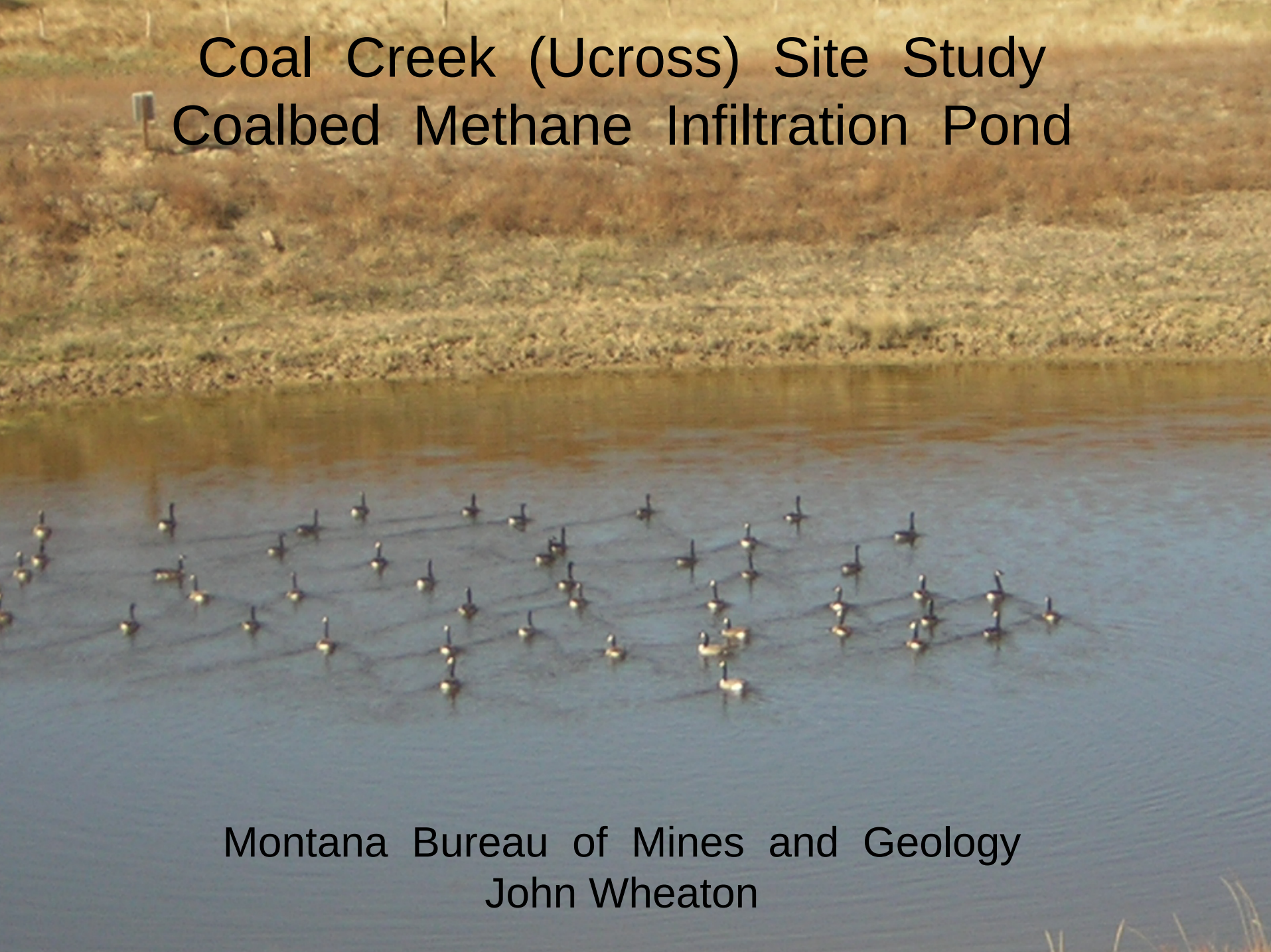
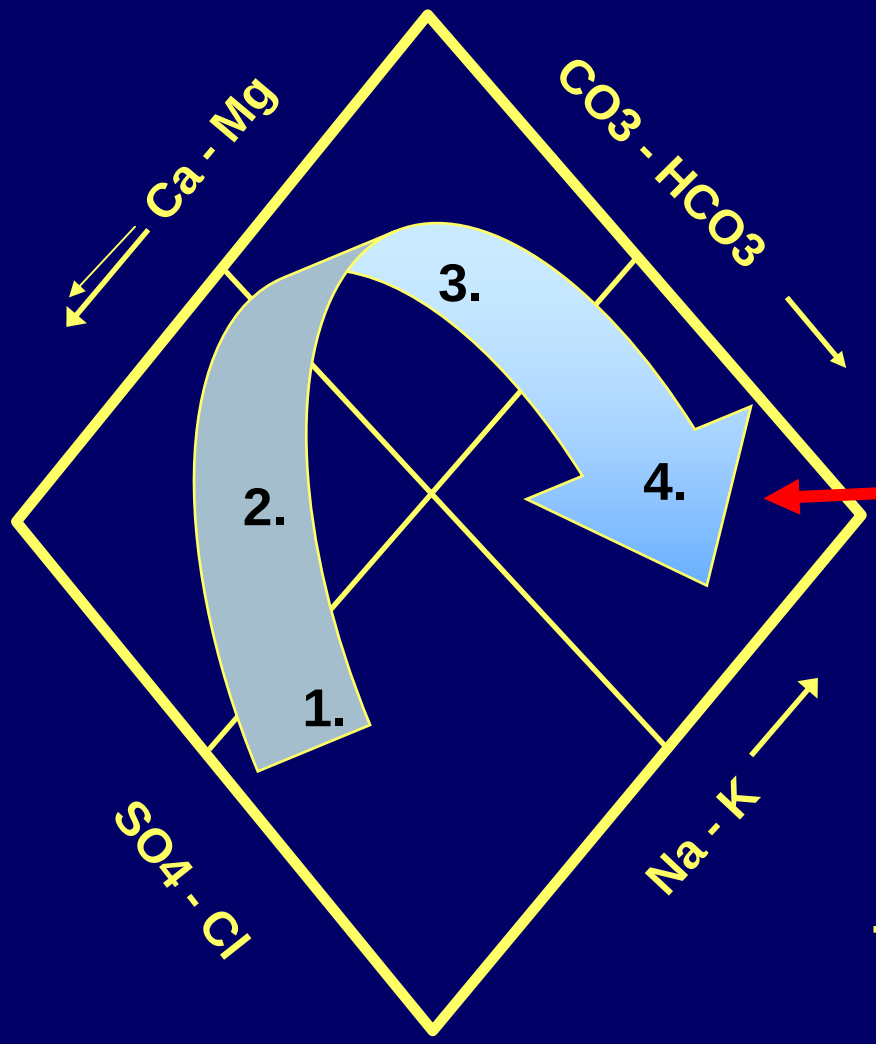
Coal Creek (Ucross) Site Study
Coalbed Methane Infiltration Pond



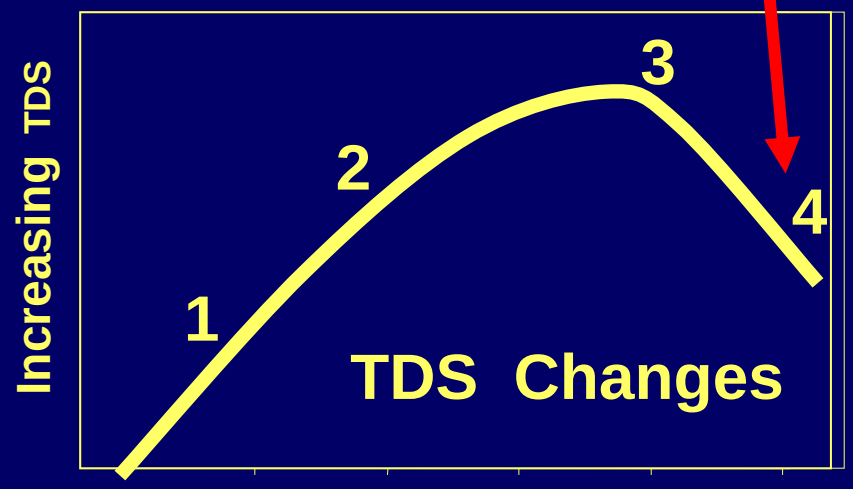
Montana Bureau of Mines and Geology
John Wheaton

Primary changes on ground - water quality in the Fort Union Formation



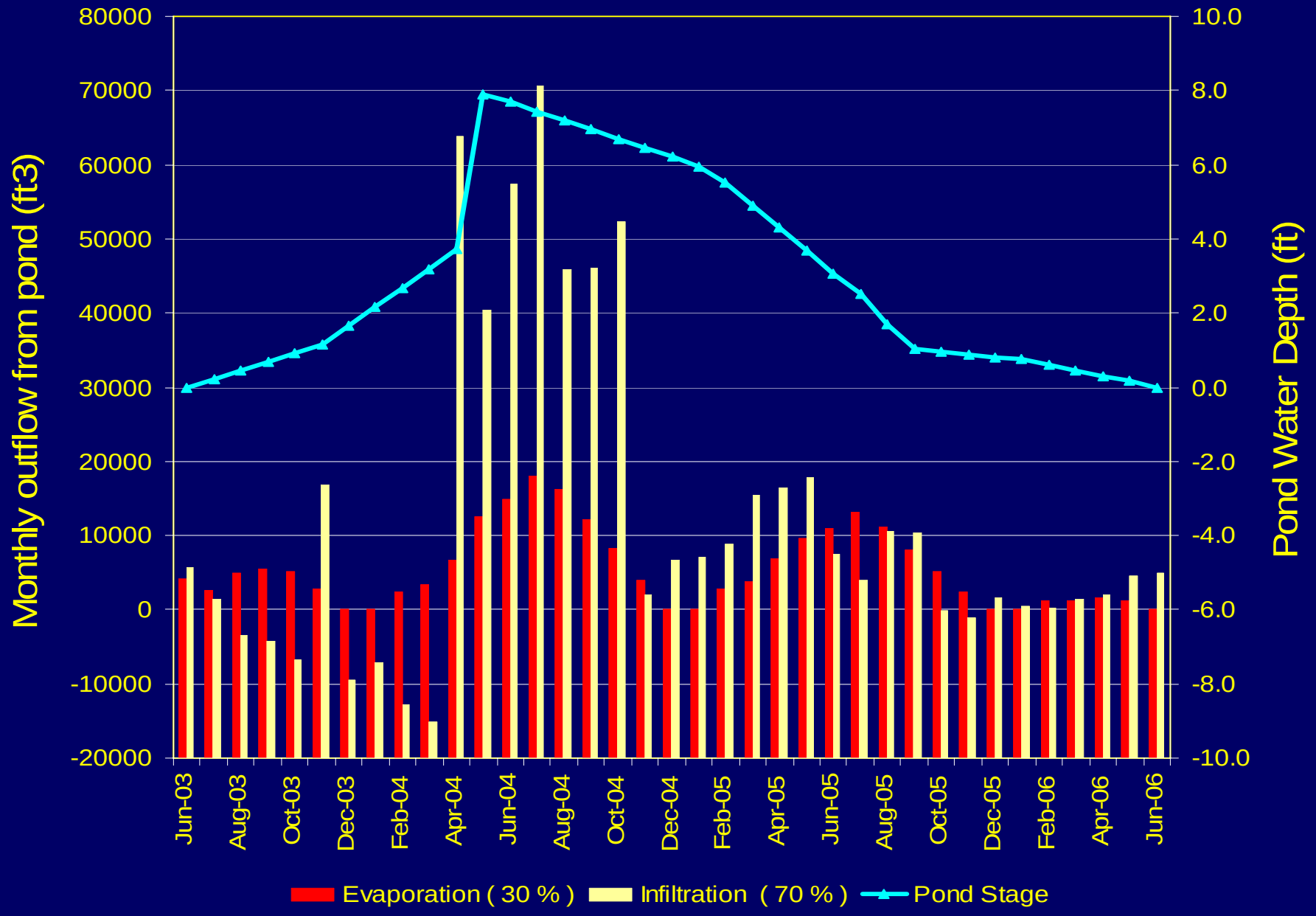
1. Salt Dissolution
2. FeS_2 Oxidation
3. Cation Exchange
4. Sulfate Reduction

CBM Produced Water

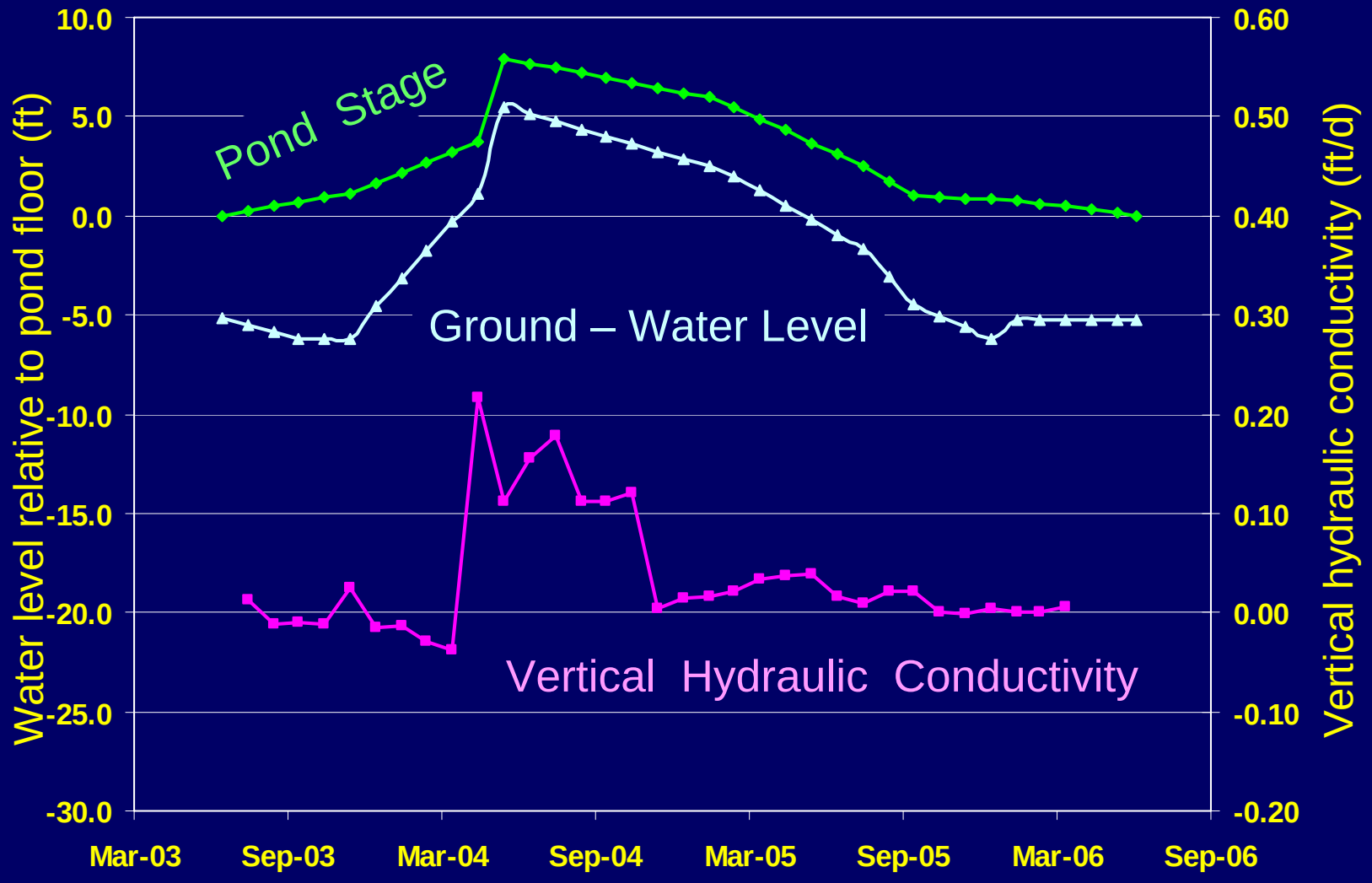


Off – Channel
Infiltration Pond
Installing monitoring wells
June, 2003

Estimated Water Budget Coal Creek Infiltration Pond



Vertical hydraulic conductivity estimated from the water budget

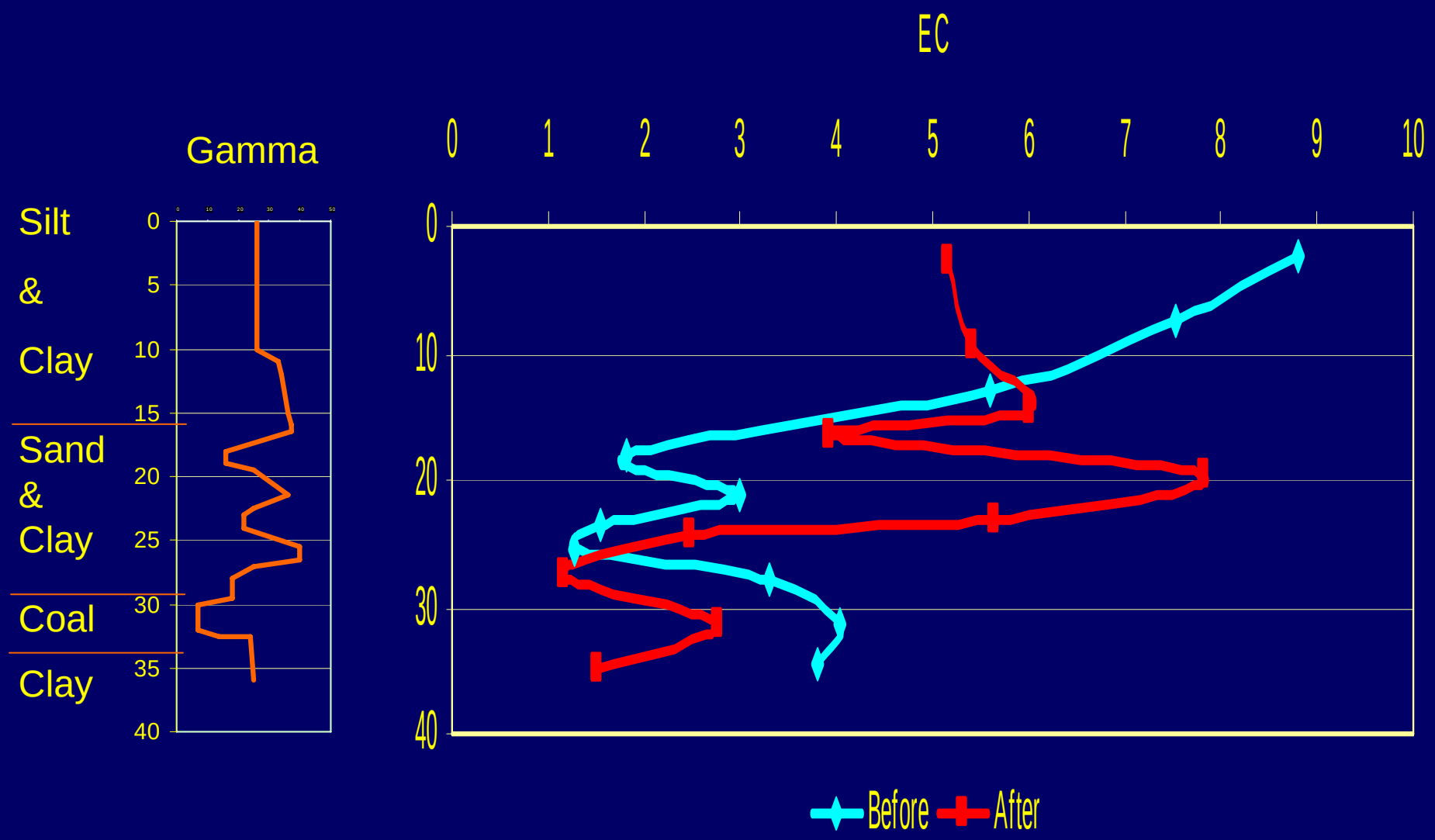


- Very low infiltration rates were seen at all sites after a period of time.
- Percent clay does not appear to relate to the ultimate infiltration rate.
- Percent and types of clays may strongly influence timing of decreased vertical hydraulic conductivity rather than the magnitude.

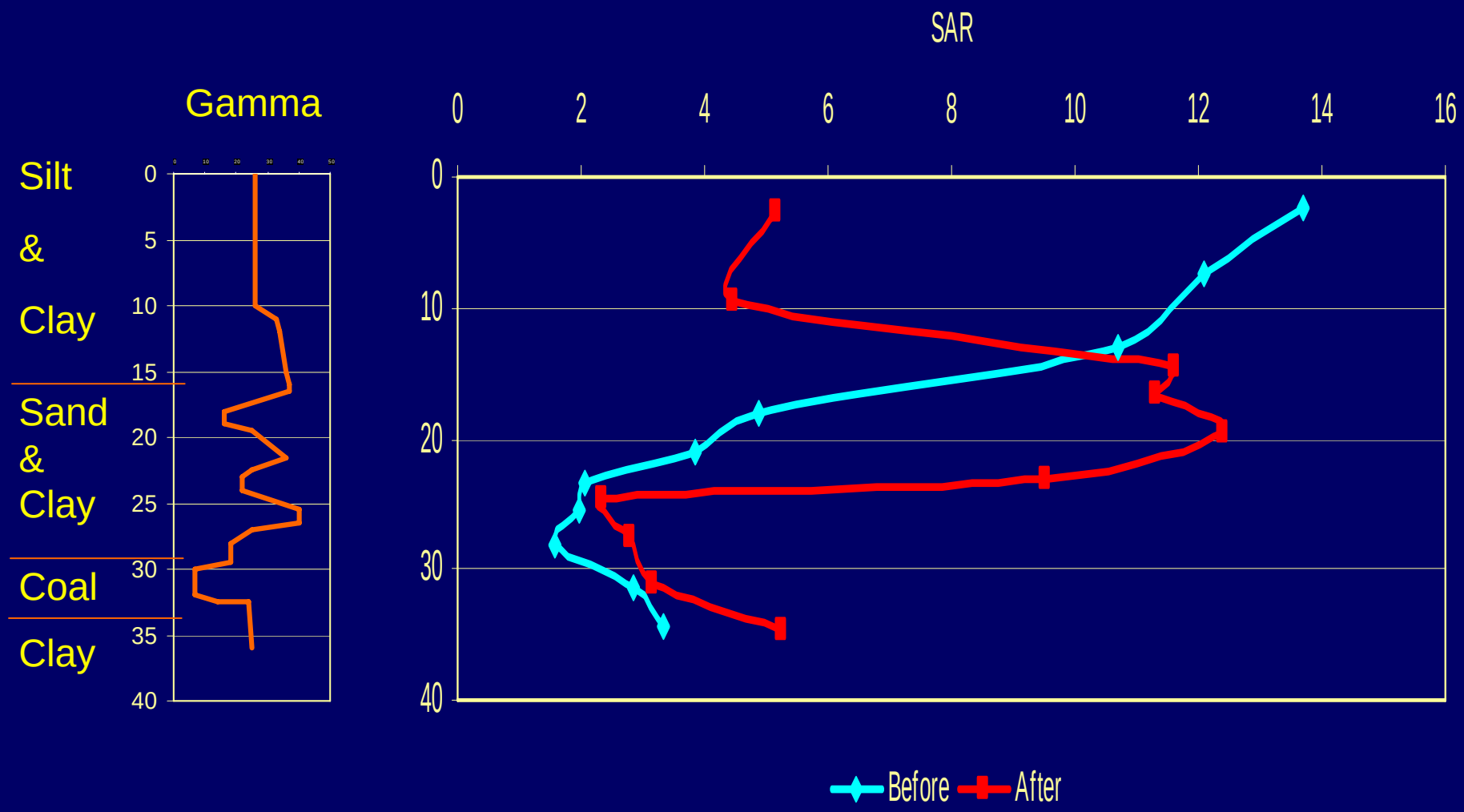
Salt fate and transport

Coring for post – infiltration SPE data

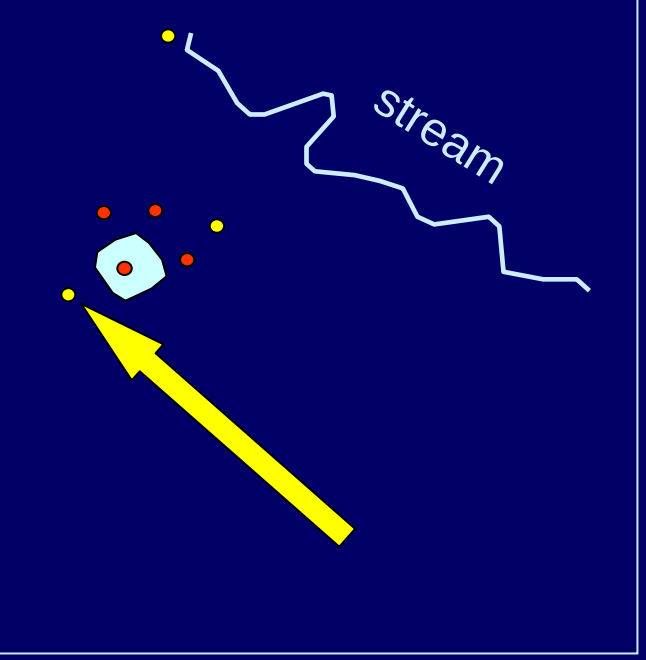
Coal Creek Infiltration Pond
Saturated Paste Extract Data before and after infiltration
Electrical Conductivity

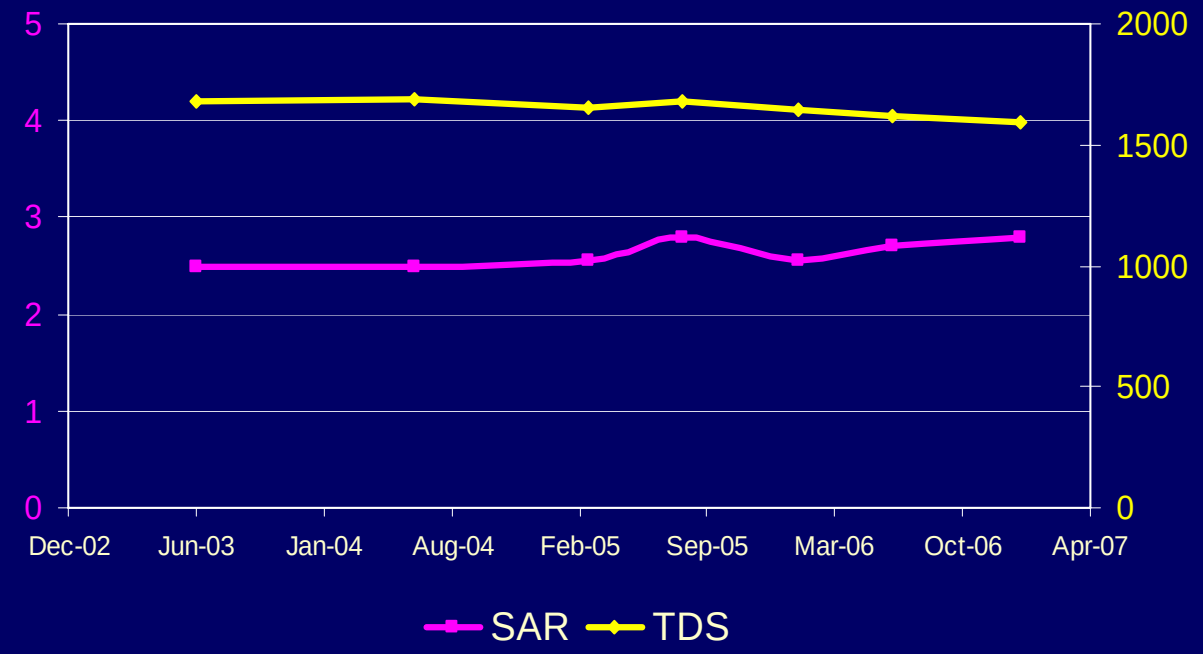


Coal Creek Infiltration Pond
Saturated Paste Extract Data before and after infiltration
Sodium Adsorption Ratio
CBM = 23

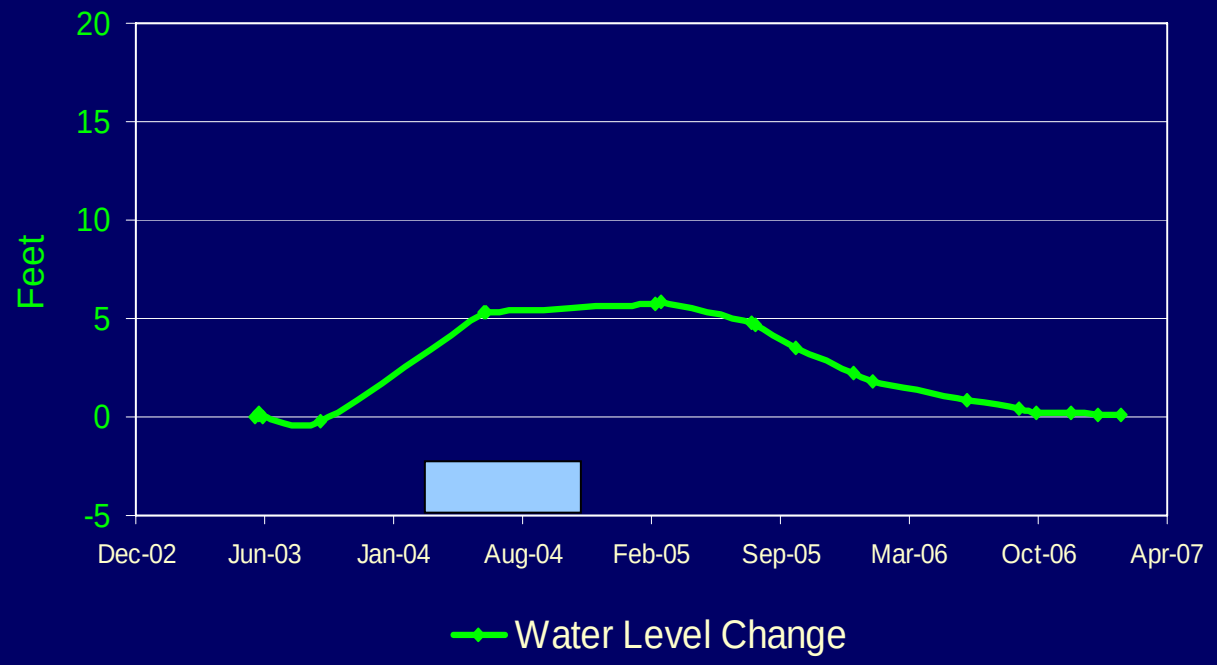


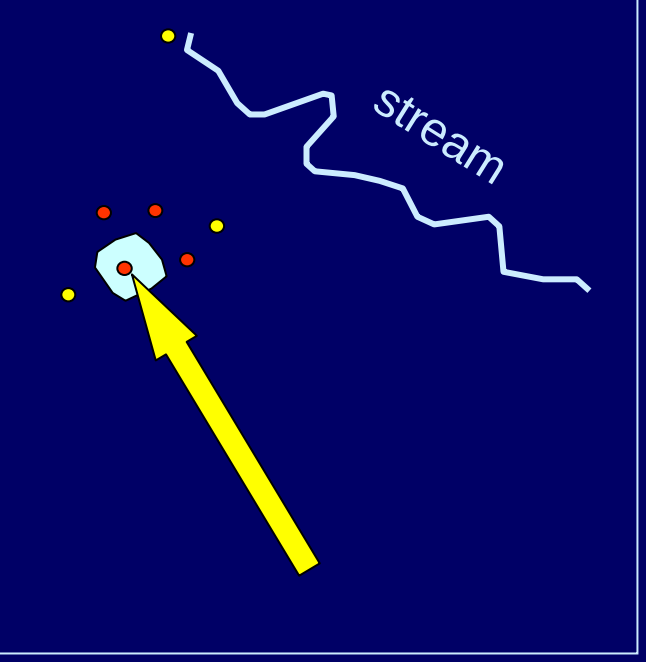
Monitoring changes in ground – water quality

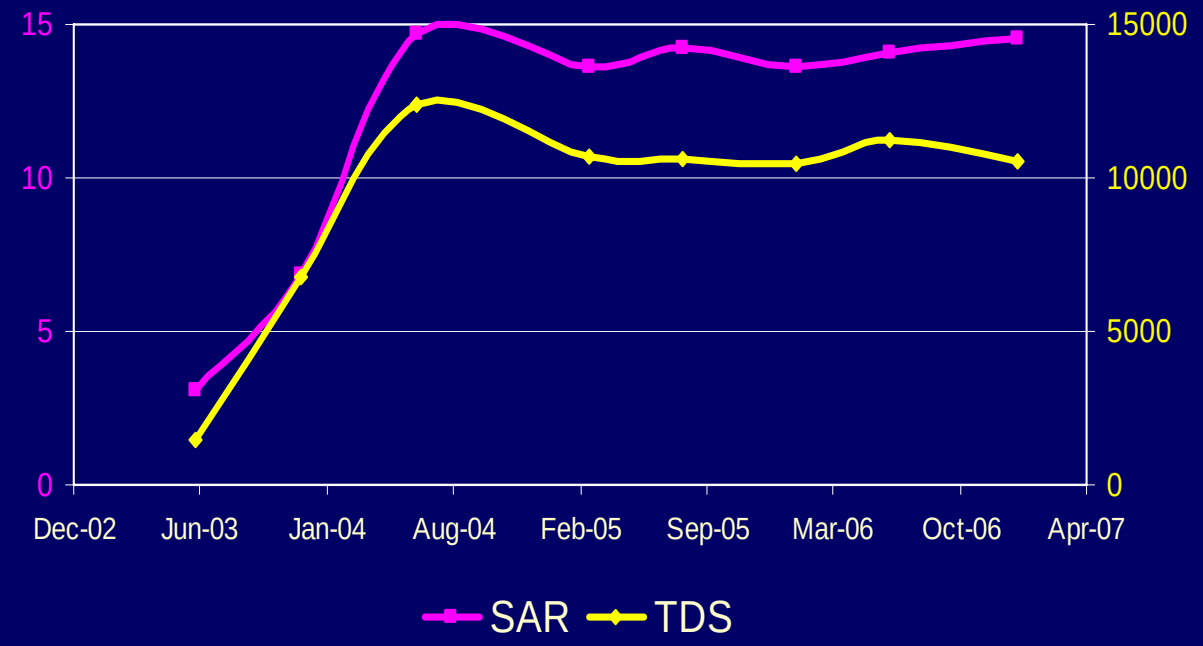




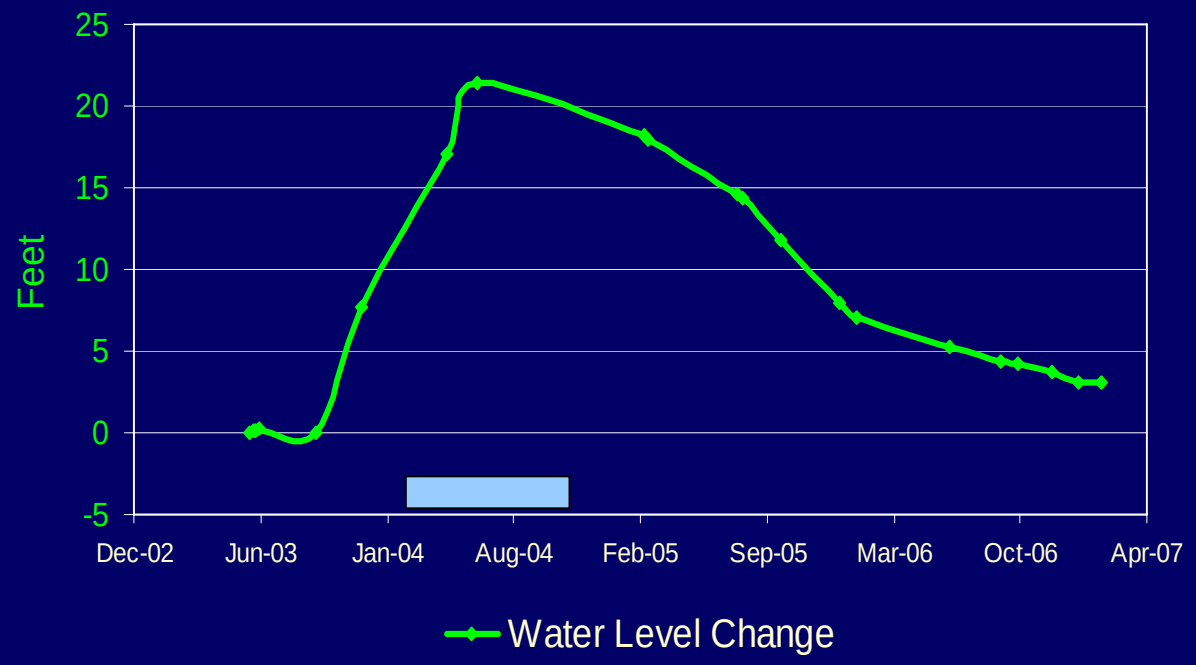
Shallow wells
Upgradient of pond
58 ft deep
9B

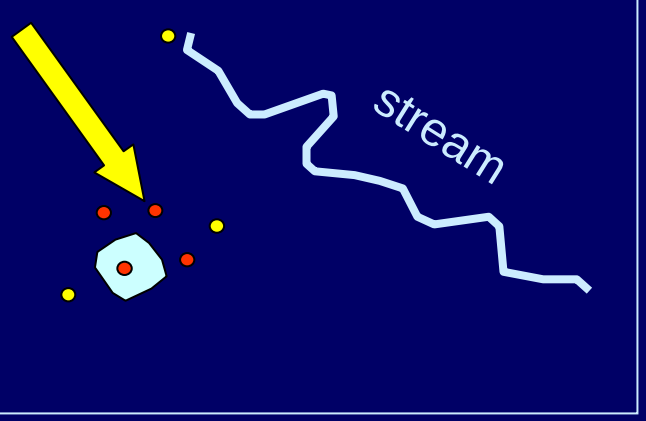




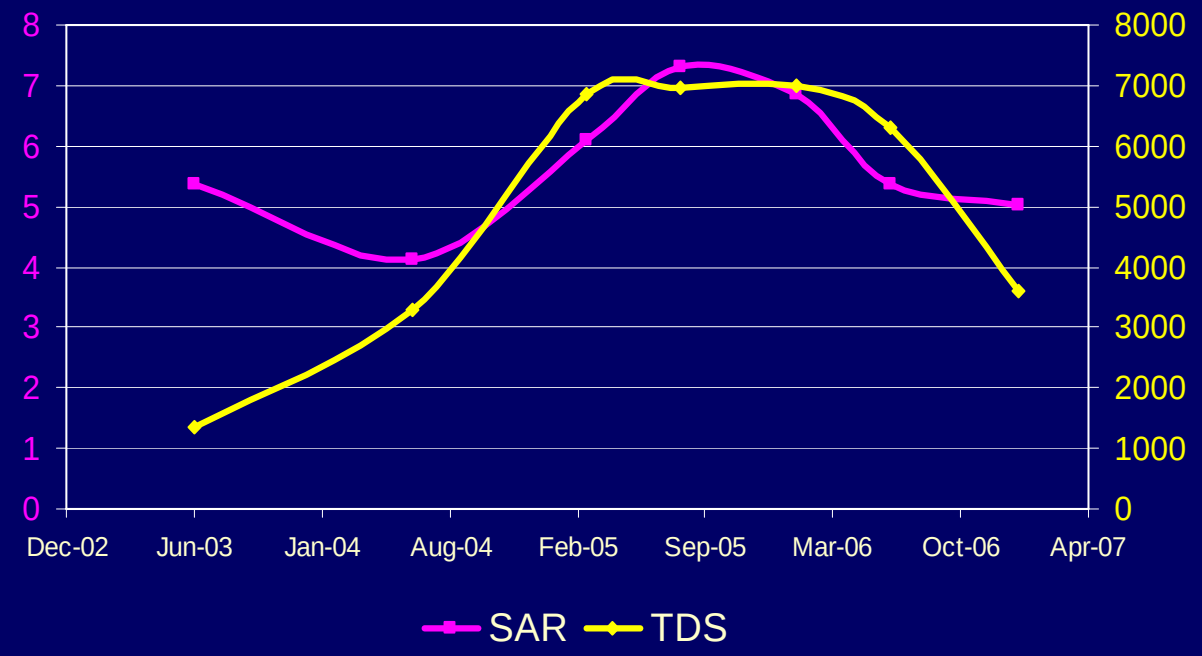


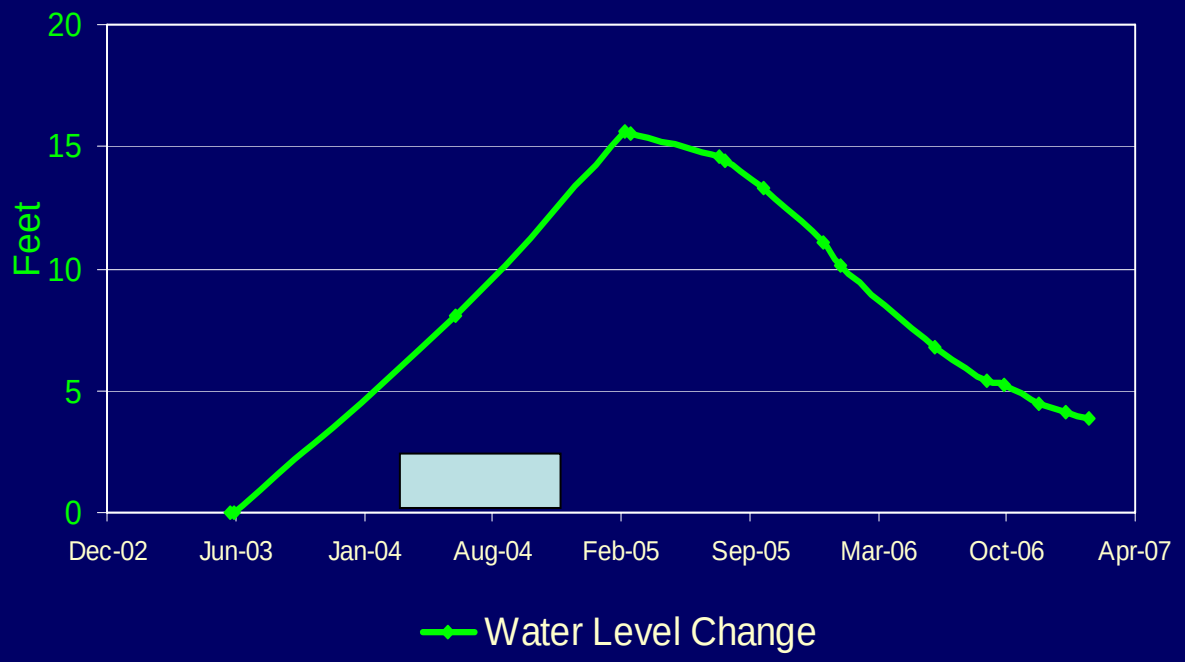
Shallow wells
in pond
7B
23 ft deep

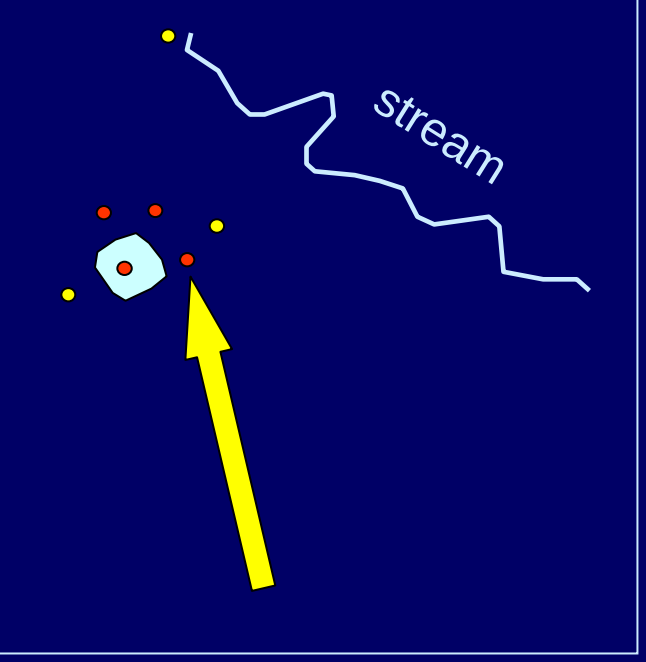


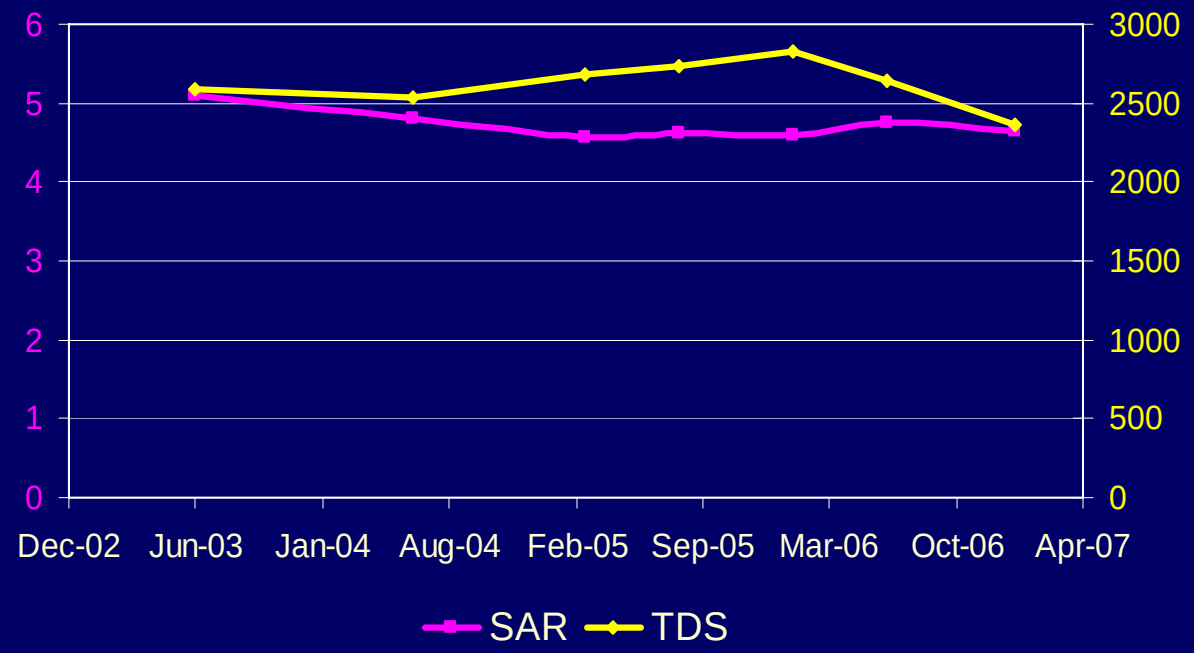


Shallow wells
near pond downgradient
2B
35 ft

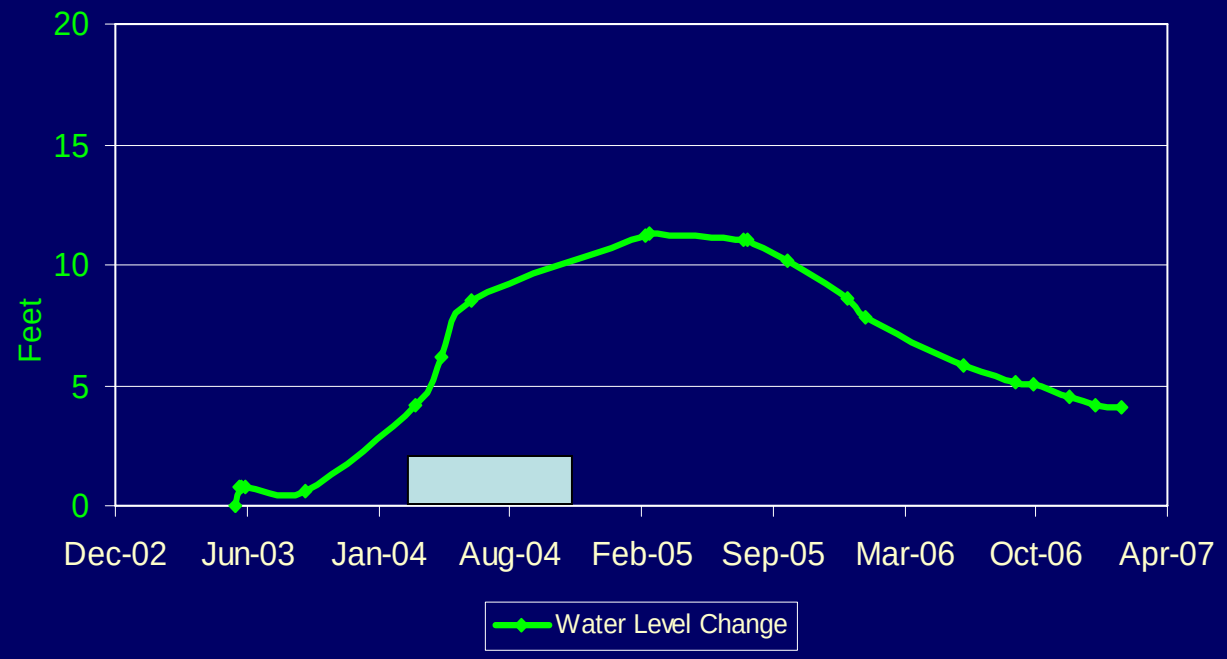








Shallow wells
near pond downgradient
1B
42 ft Deep



Off – Channel Pond

Water Budget:

Loss to Infiltration and ET

Infiltration decreases with time

Water Quality:

Water quality changes in receiving ground water are temporary

Mobilized salts have moved fairly short distance

Saturated **P**aste **E**xtract : Can predict ground water quality changes

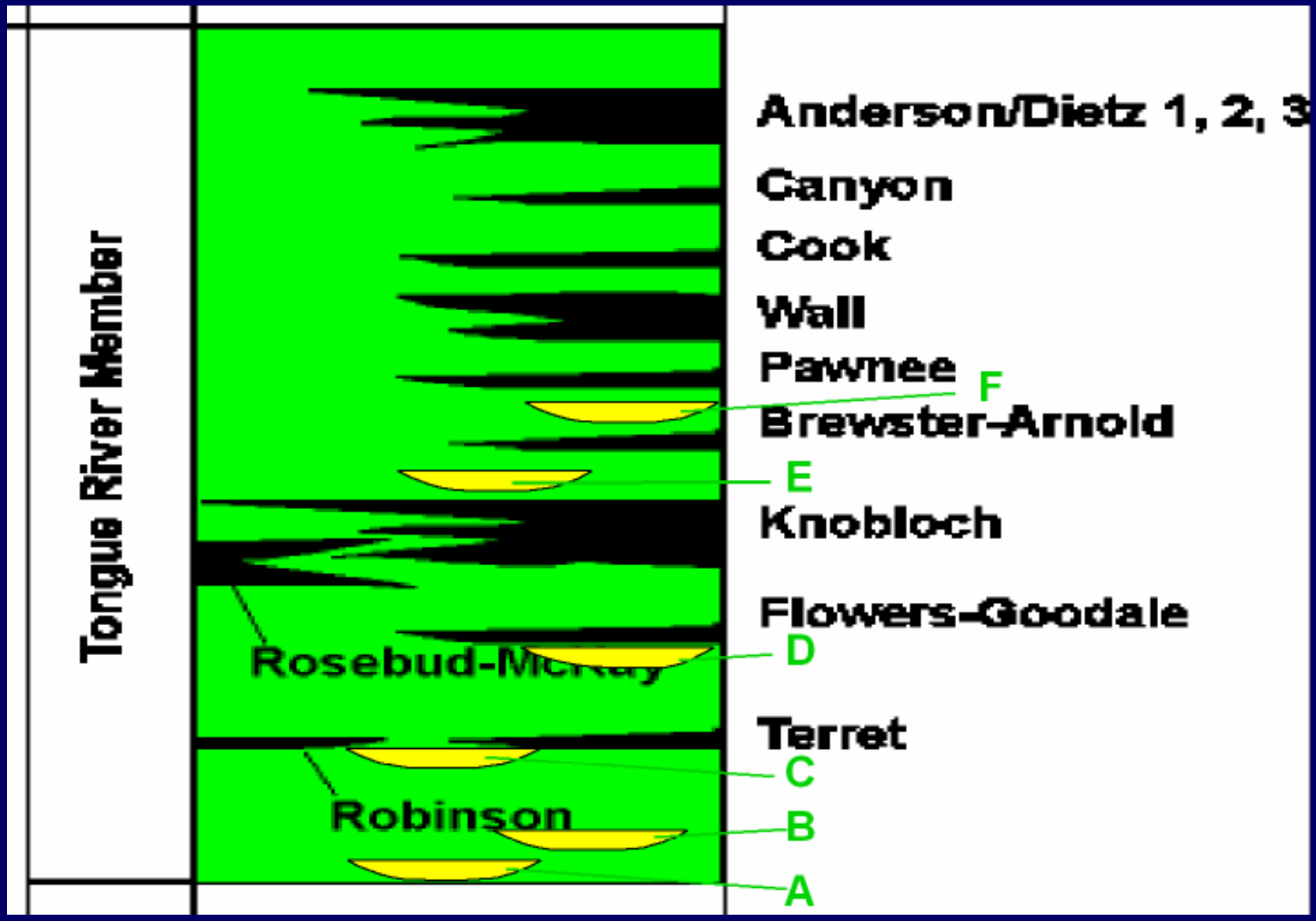
CBM PRODUCED-WATER DISPOSAL BY INJECTION, GEOLOGIC CONSTRAINTS, POWDER RIVER BASIN, MT

David A. Lopez
MT Bureau of Mines and Geology
MT Tech of University of MT

Presented at AAPG

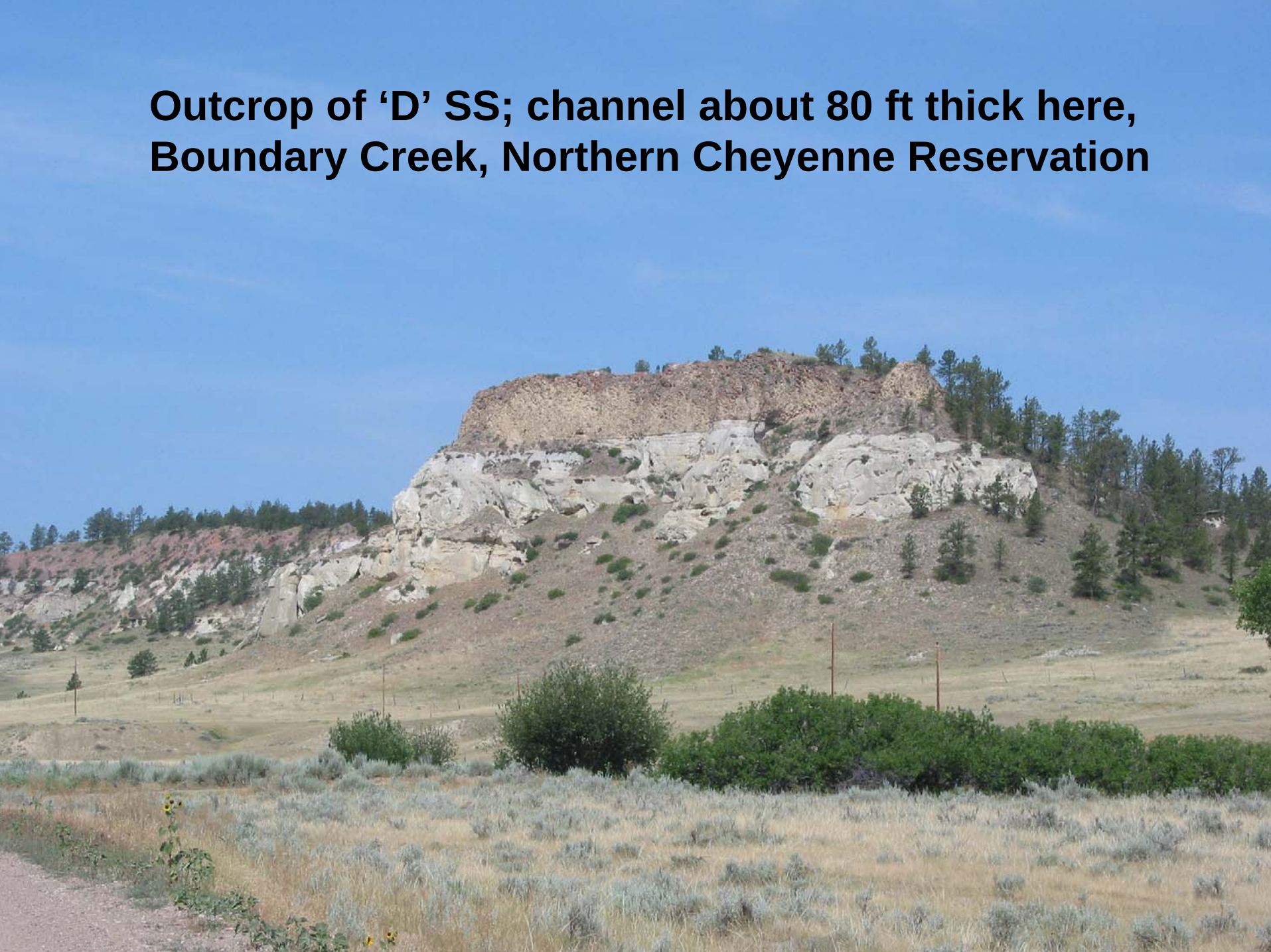
Potential Injection Targets

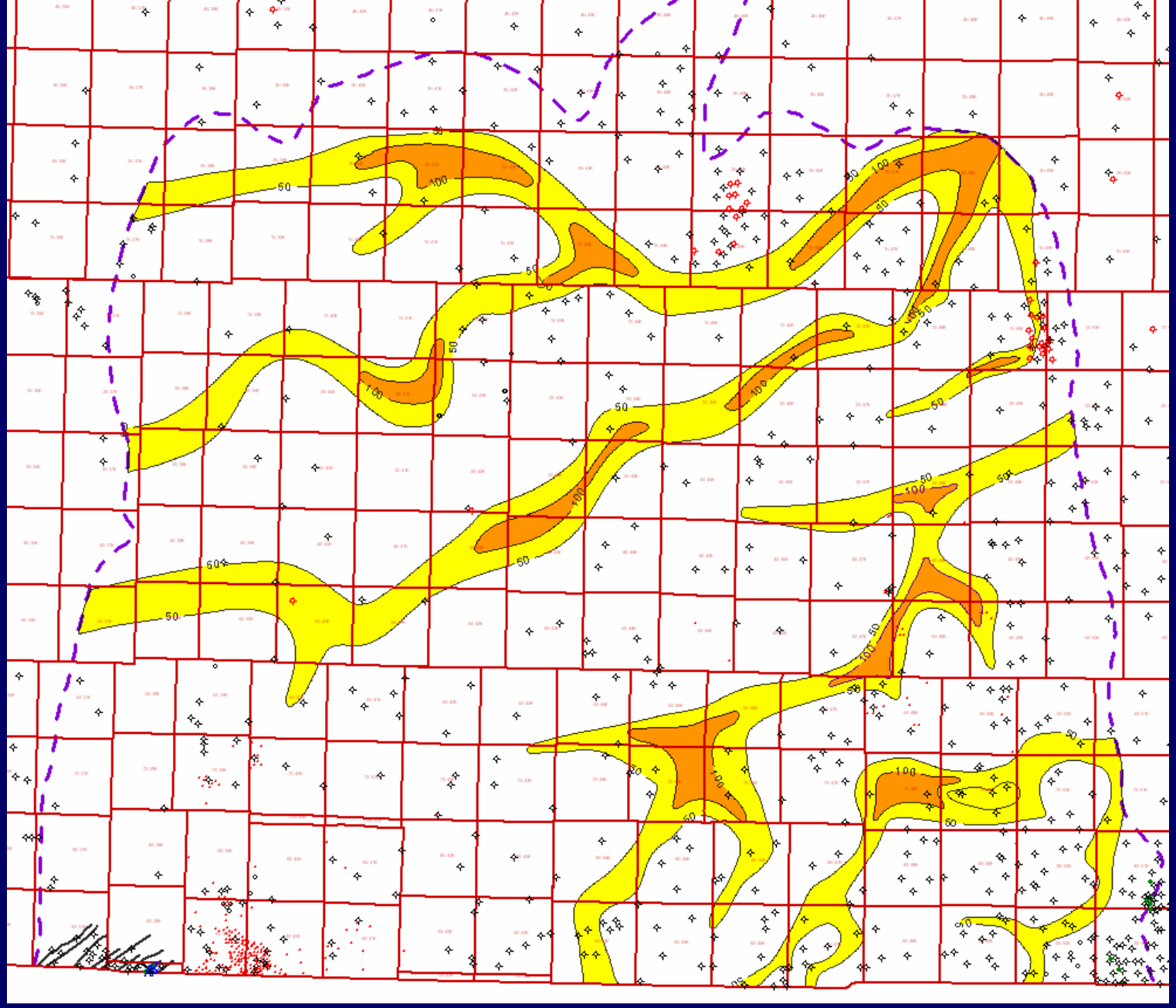
- Porous and permeable sandstone beds in the Tongue River Member



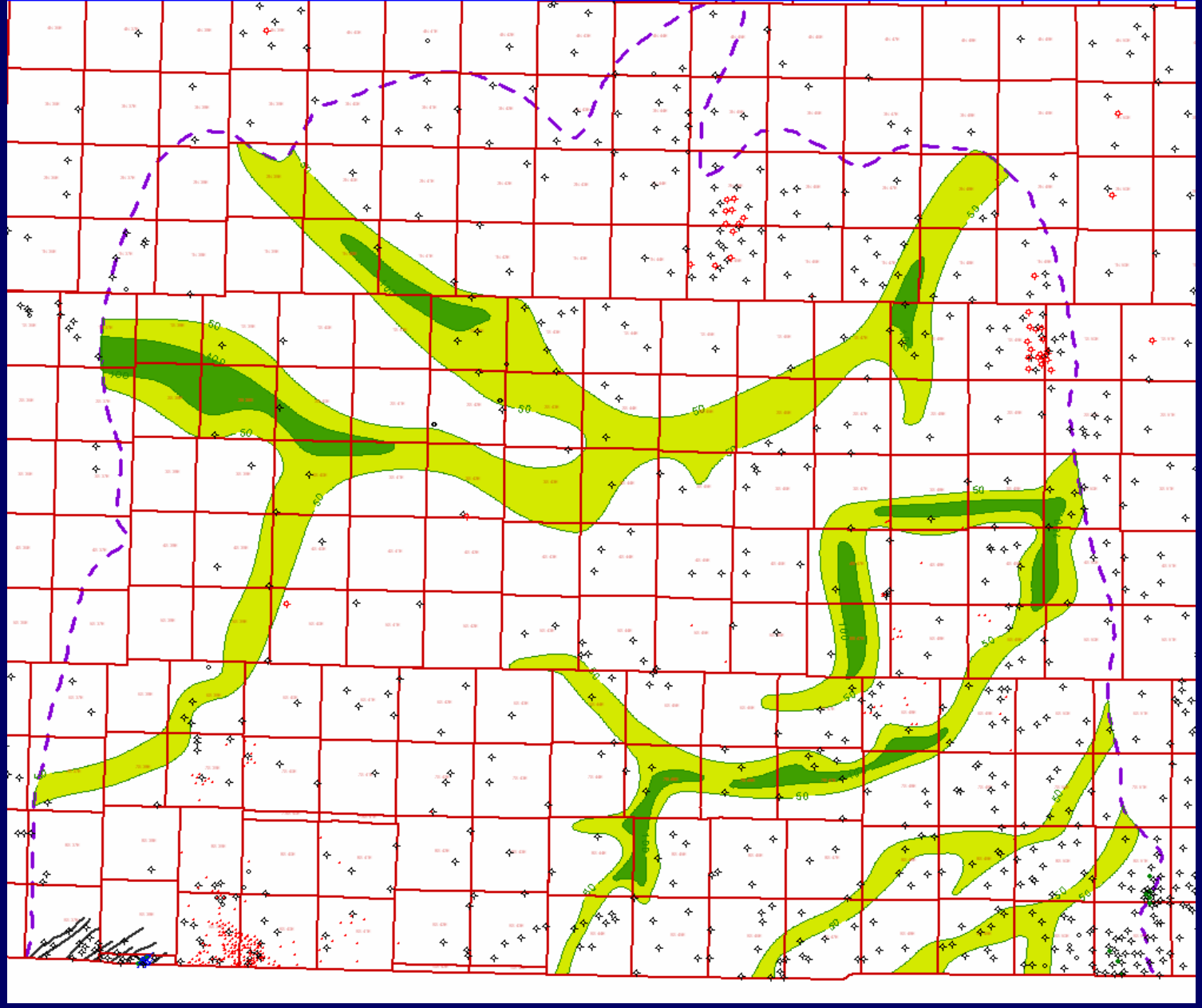
Approximate Stratigraphic position of channel sandstones mapped in the Tongue River Member, Ft Union Formation

Outcrop of ‘D’ SS; channel about 80 ft thick here, Boundary Creek, Northern Cheyenne Reservation

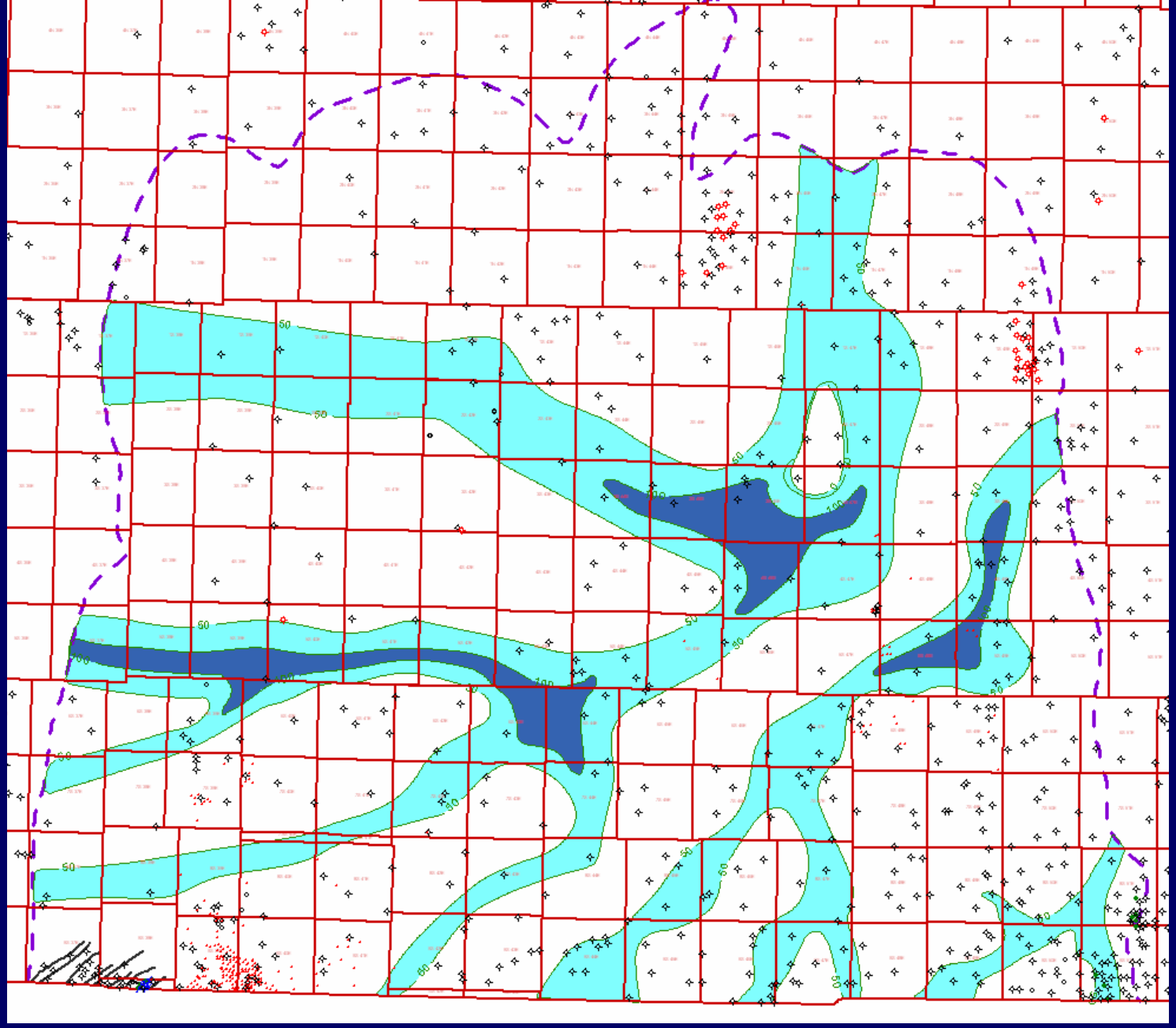




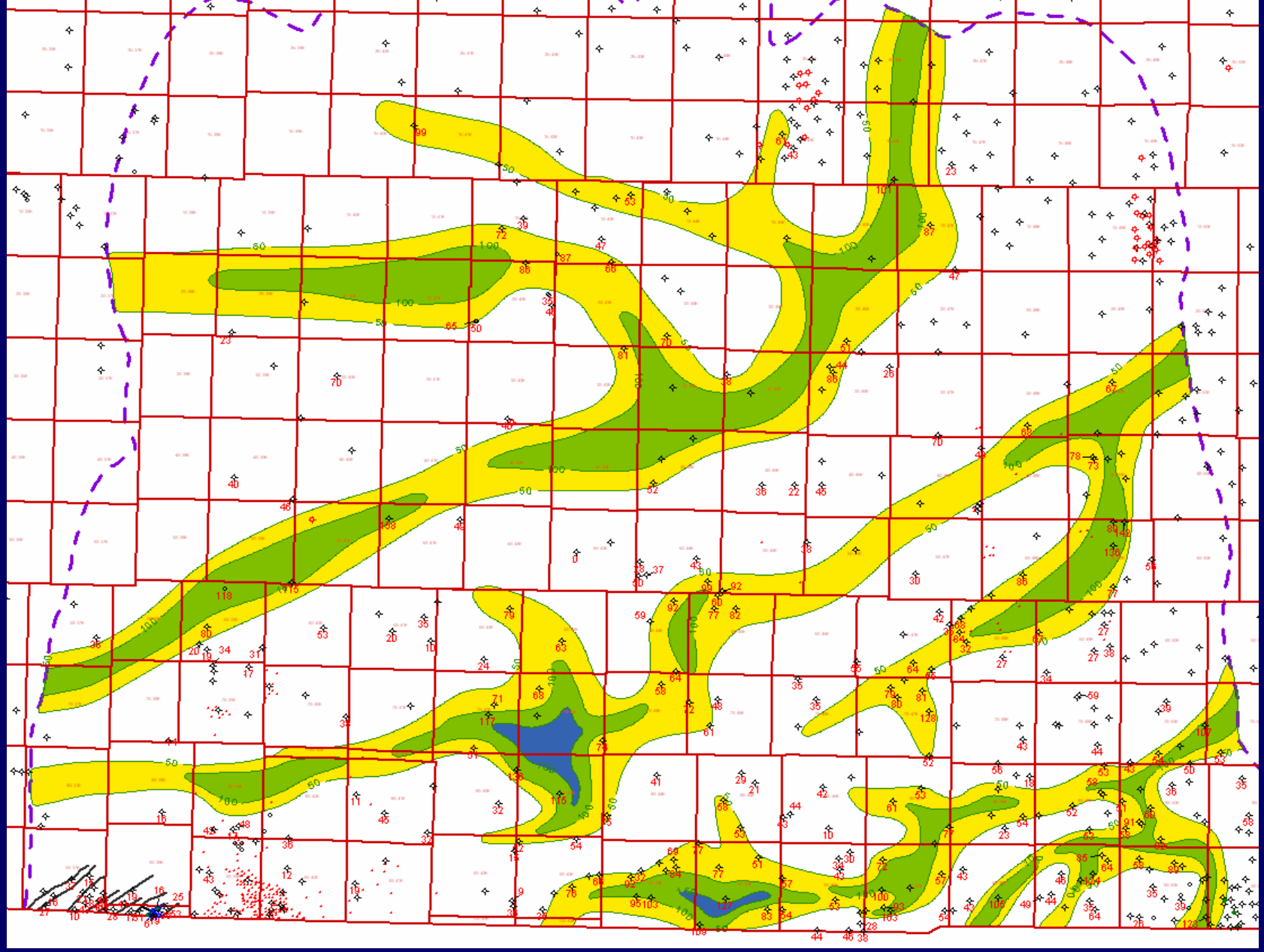
Isopach map of ‘A’ Sandstone Channels
Yellow > 50 ft thick; Orange > 100 ft thick



Isopach Map of ‘B’ Sandstone Channels
Light Green > 50 ft thick; Green > 100 ft thick

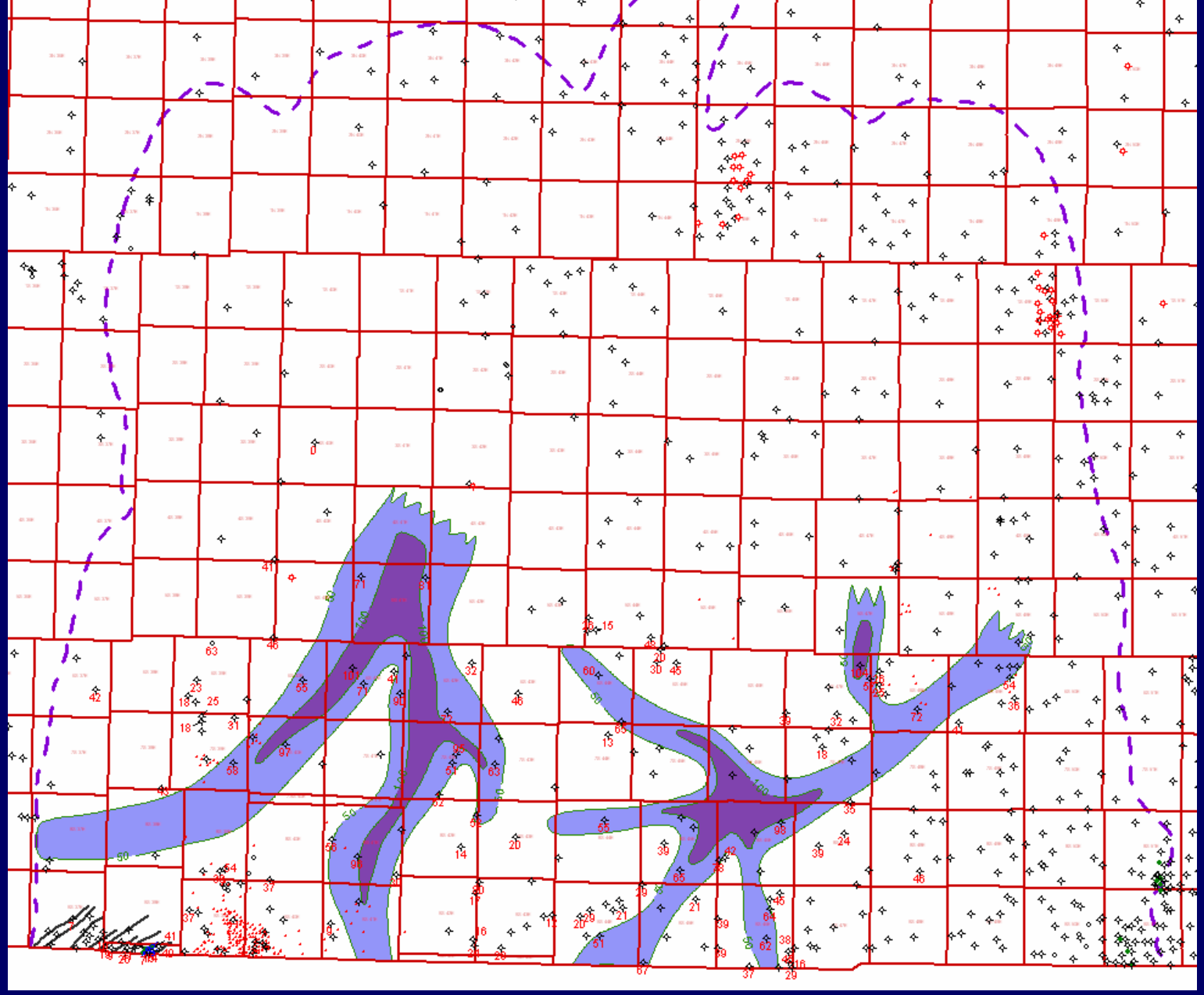


Isopach Map of ‘C’ Sandstone Channels
Light Blue > 50 ft thick; Blue > 100 ft thick



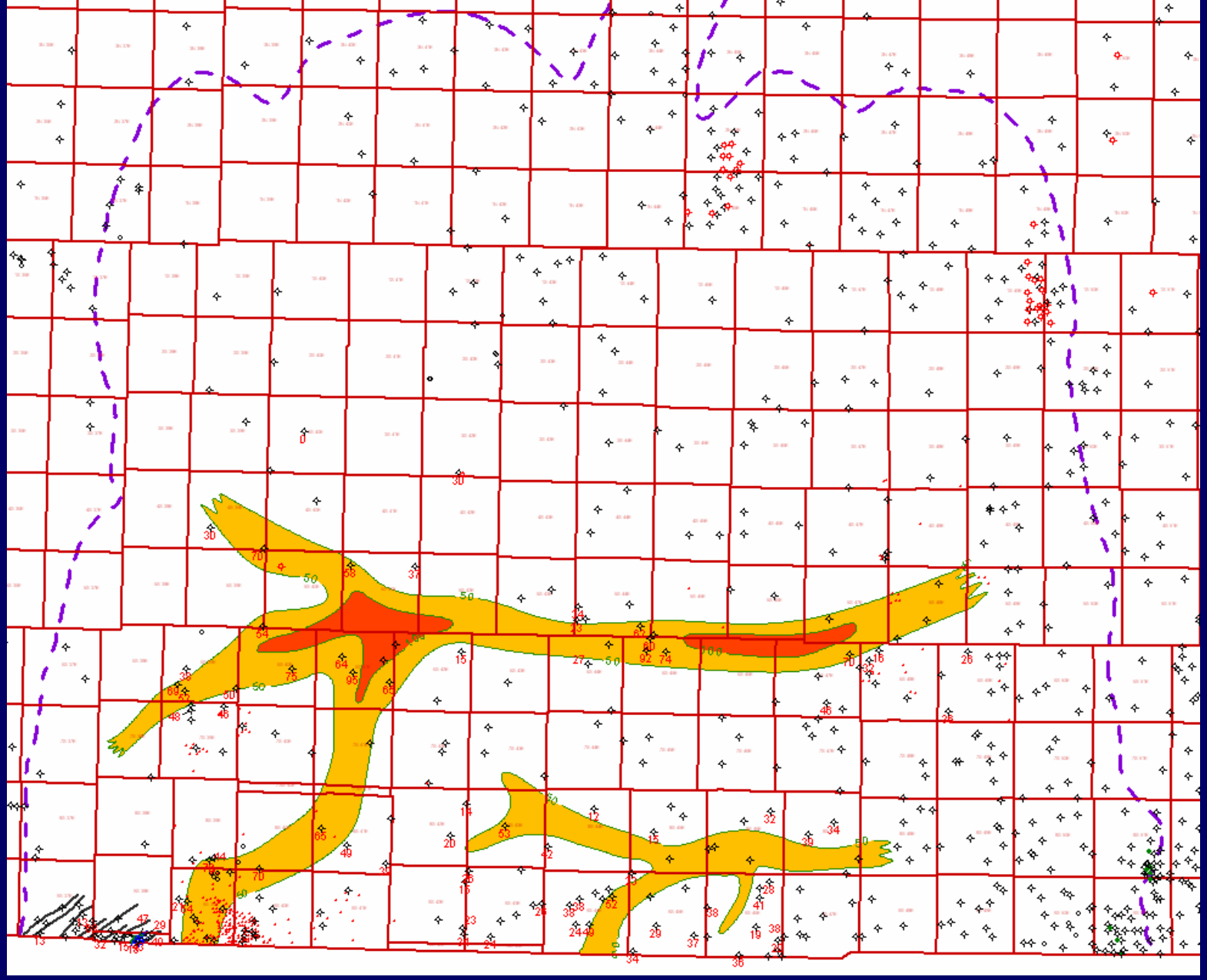
Isopach map of ‘D’ Sandstone Channels

Yellow > 50 ft thick; Green > 100 ft thick; Blue>150 ft thick



Isopach map of ‘E’ Sandstone Channels

Lavender > 50 ft thick; Purple > 100 ft thick;



Isopach map of ‘f’ Sandstone Channels
Orange > 50 ft thick; Red > 100 ft thick;

Injection

- Patterns of channel systems reflect regional Paleocene paleo-geography and possible structural controls.
- Shallow injection (above the Lebo) limited .
- Mapping of channel SS illustrates the risk of finding these sands.