

Sleuthing for Contaminant Pathways in a Fractured Aquifer Setting



Stephen Robertson

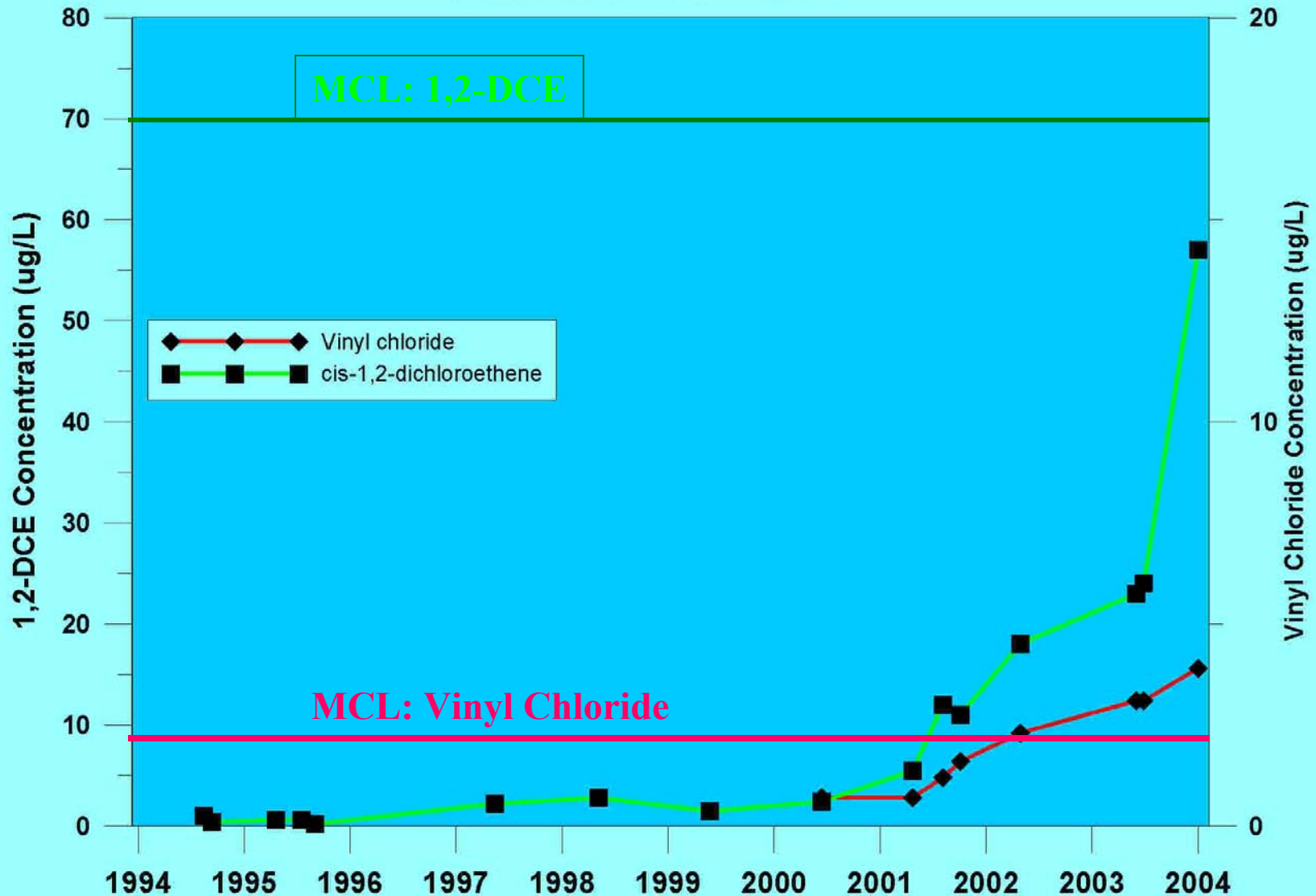
Minnesota Department of Health

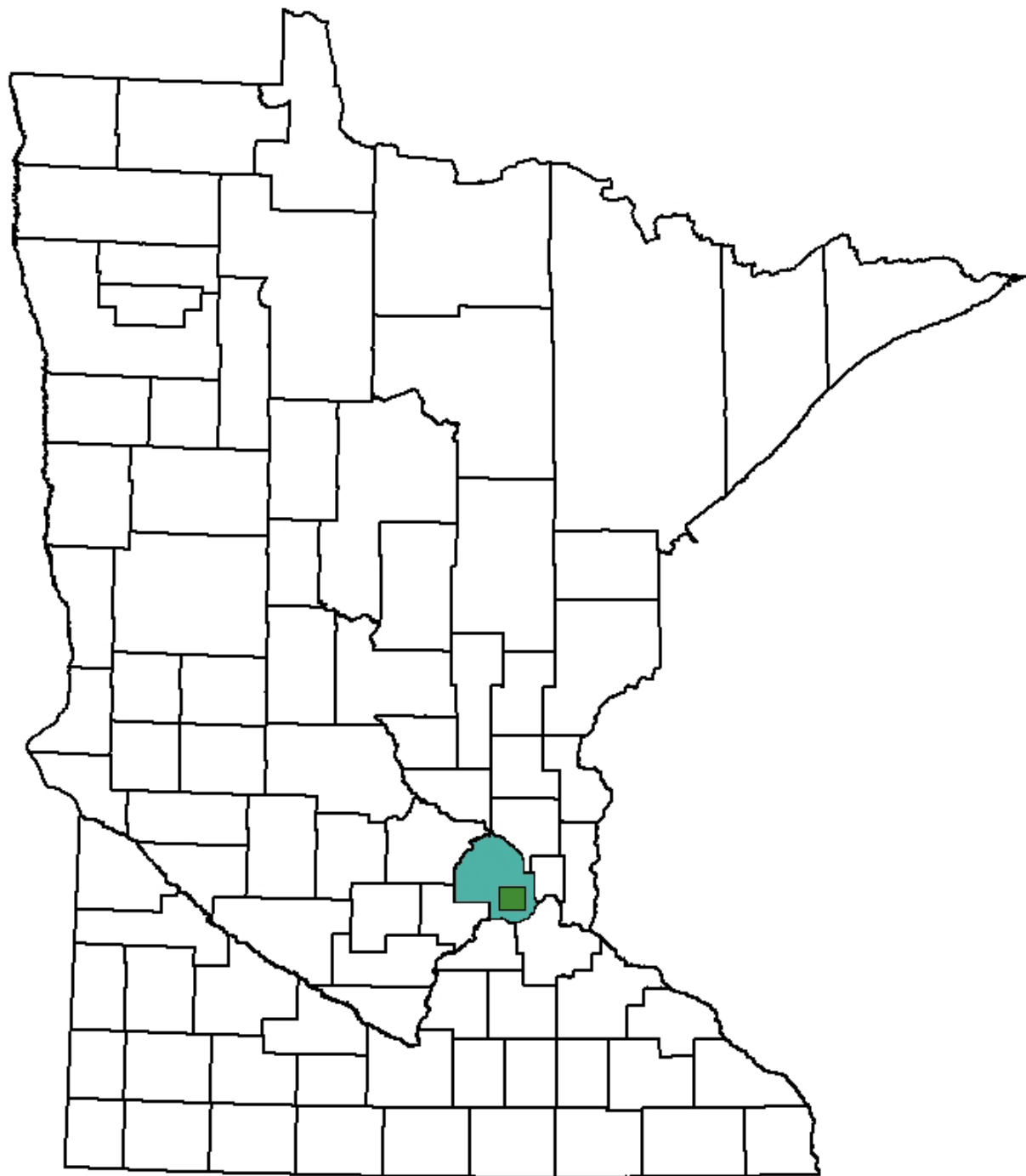


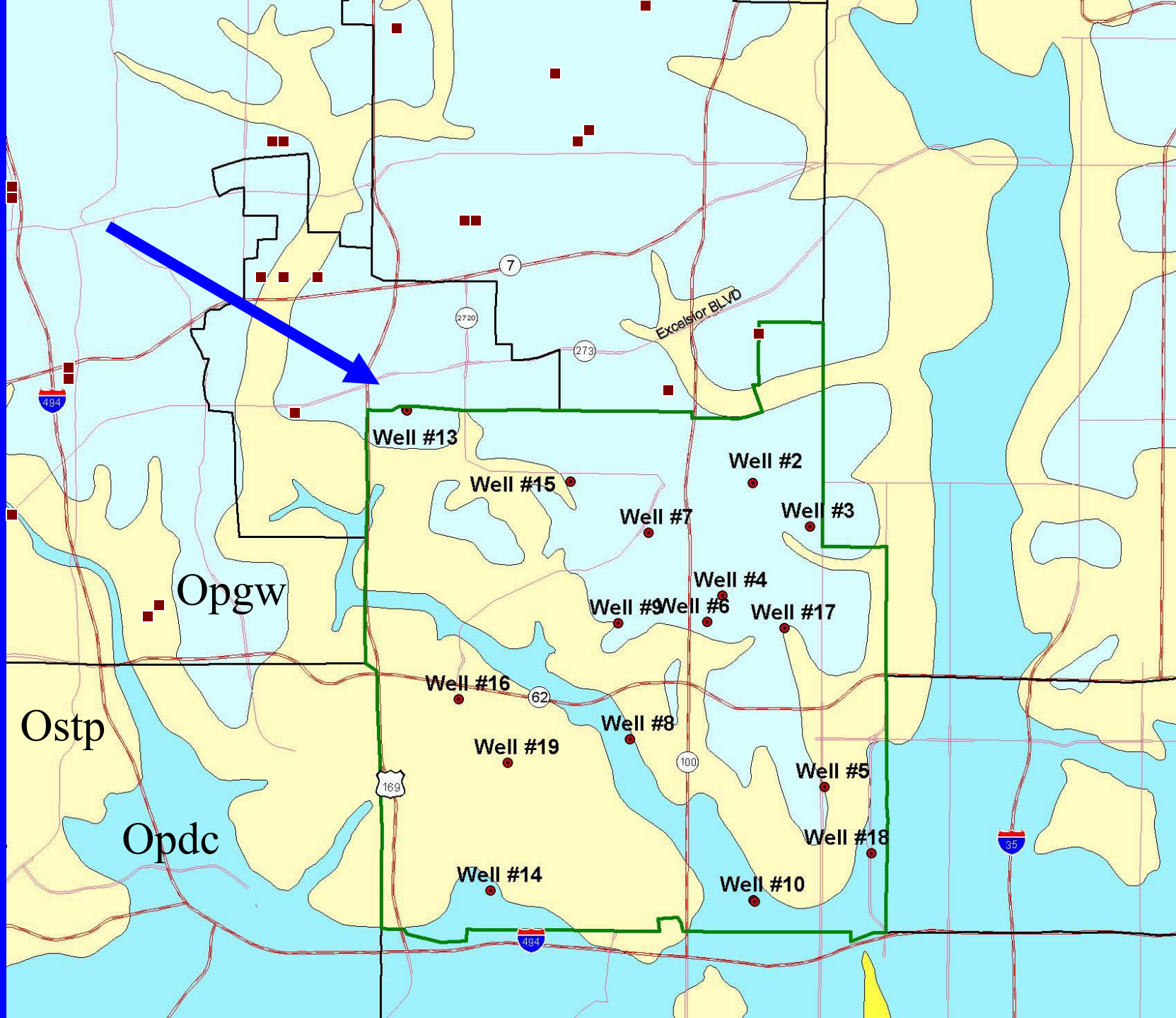
Acknowledgements

- MPCA (Lifeng Guo, Nile Fellows)
- STS Consultants (Peter Rzepecki)
- Cities of Edina, St. Louis Park
- MDH (Jim Lundy)
- University of Minnesota

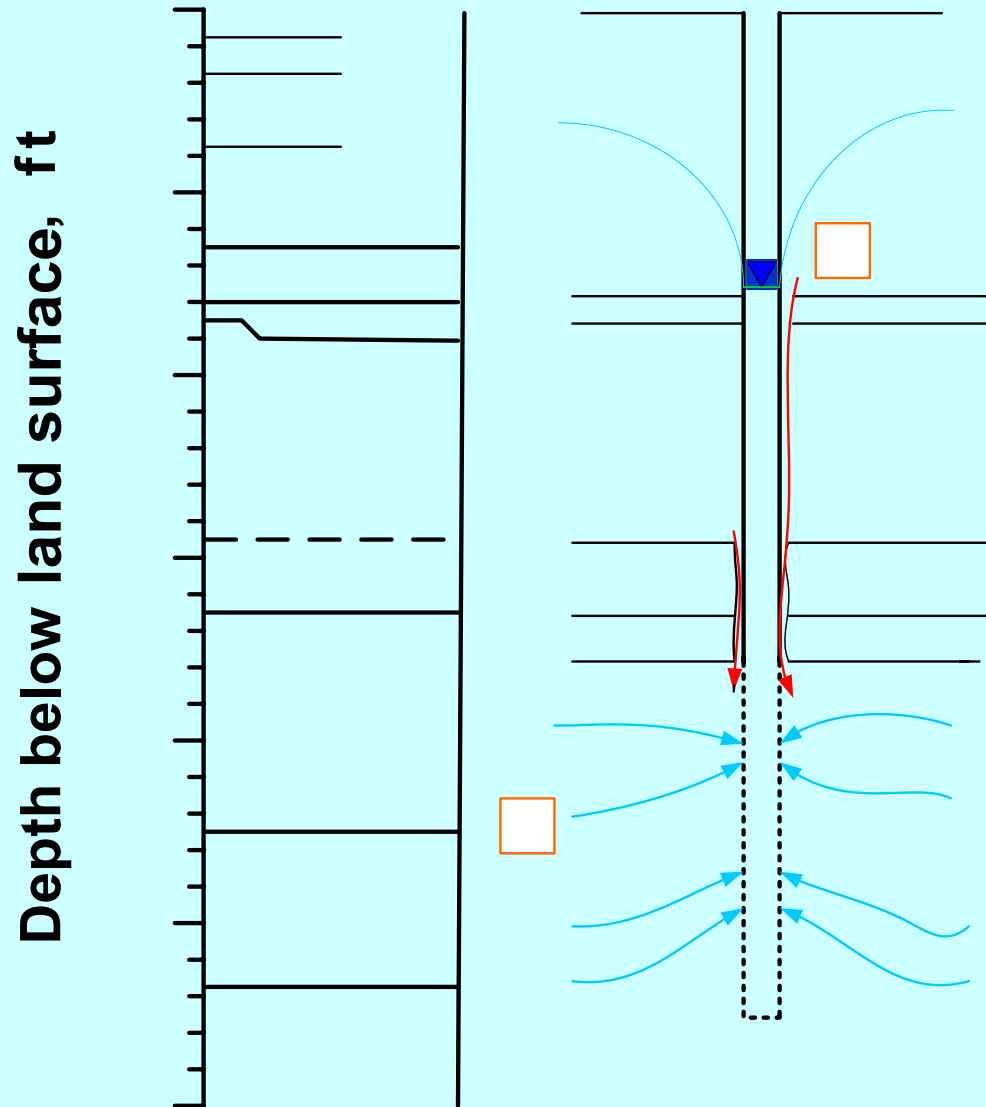
Groundwater Quality Fluctuations (1994-2004) Edina Well No. 7







Schematic Stratigraphic Column and Well Construction Diagram, Edina No. 7



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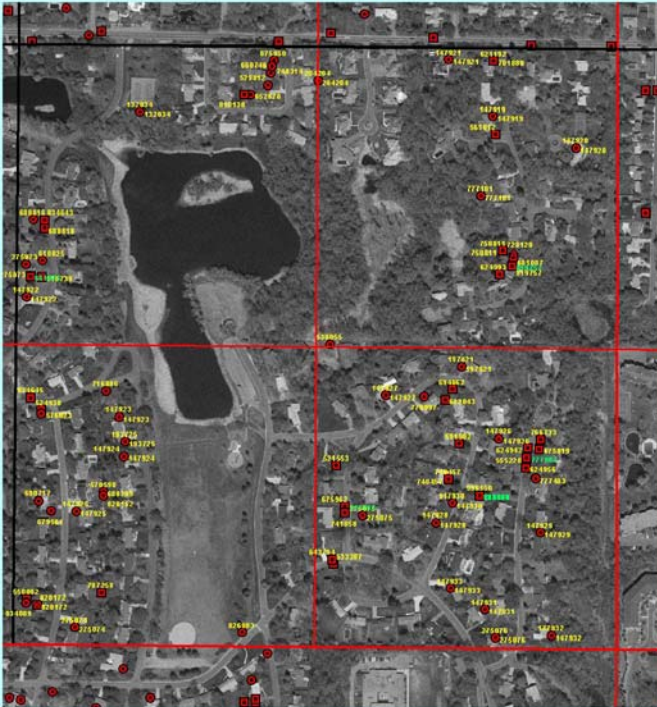
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Where do we stand?

- Deep, large diameter well (~200 open hole)
- O_{PDC} dominated by secondary porosity
- Many potential sources
- Uncertain groundwater flow direction (transients)



Immediate Concerns



- Safeguard Municipal Drinking Water Supply
- Private Wells
 - Well Inventory
 - Sampling

Workplan

- Integrity of well construction
- Vertical and horizontal distribution of contaminants (attempt source identification)
 - MPCA / STS Consultants
- Analysis of hydraulically active intervals of the Prairie du Chien-Jordan

Downhole Investigations

- Video logging
- Borehole geophysics
- Discrete interval sampling
- Flowmeter logging
- Hydrolab (chemical) profiling

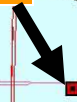


Hydrolab Probe

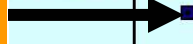


- Seven parameters:
 - Specific conductance
 - pH
 - Dissolved oxygen
 - ORP
 - Temperature
 - Chloride
 - Pressure
- Rapid measurements saved to computer

Park Theater



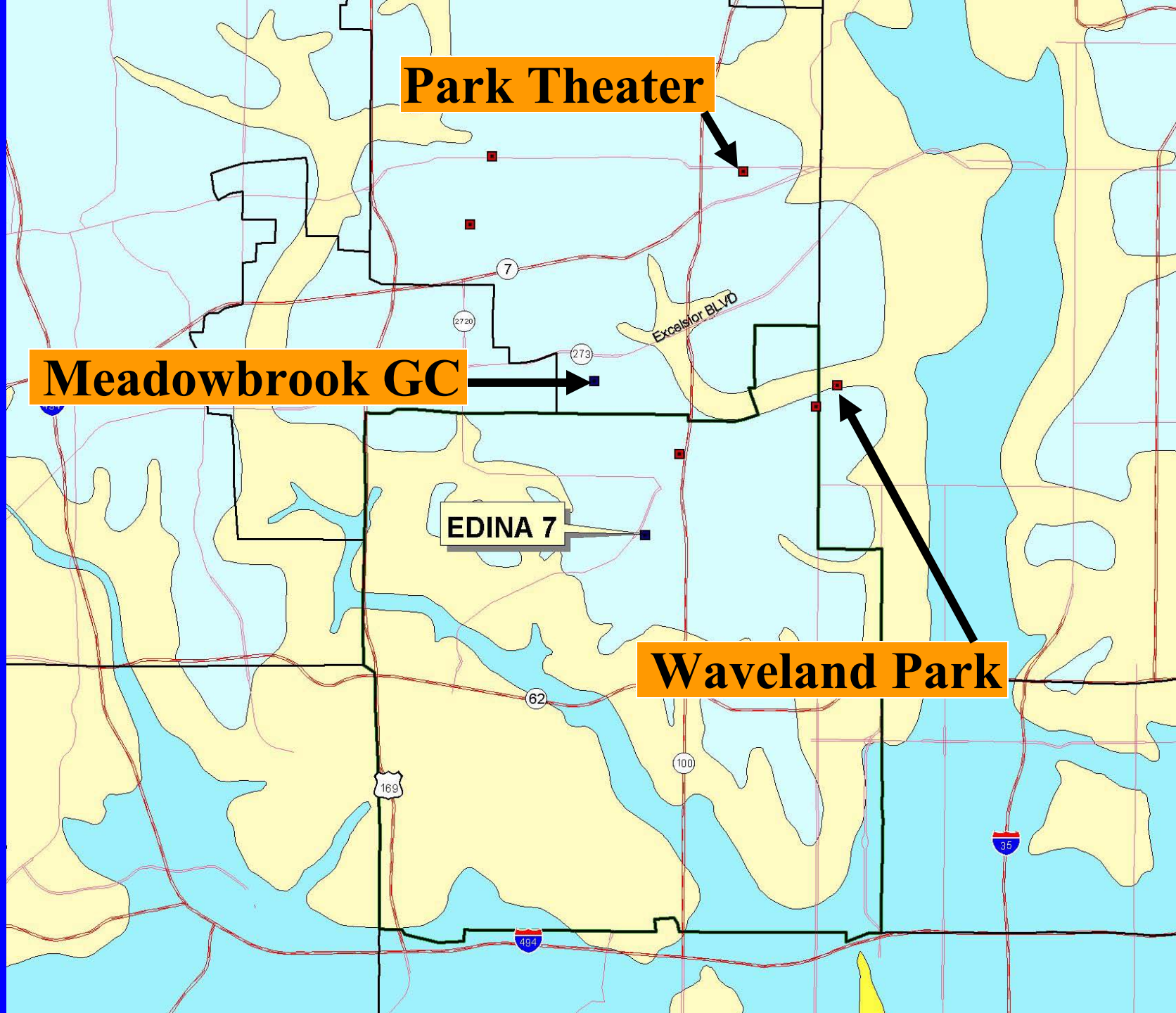
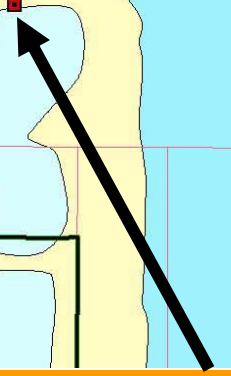
Meadowbrook GC



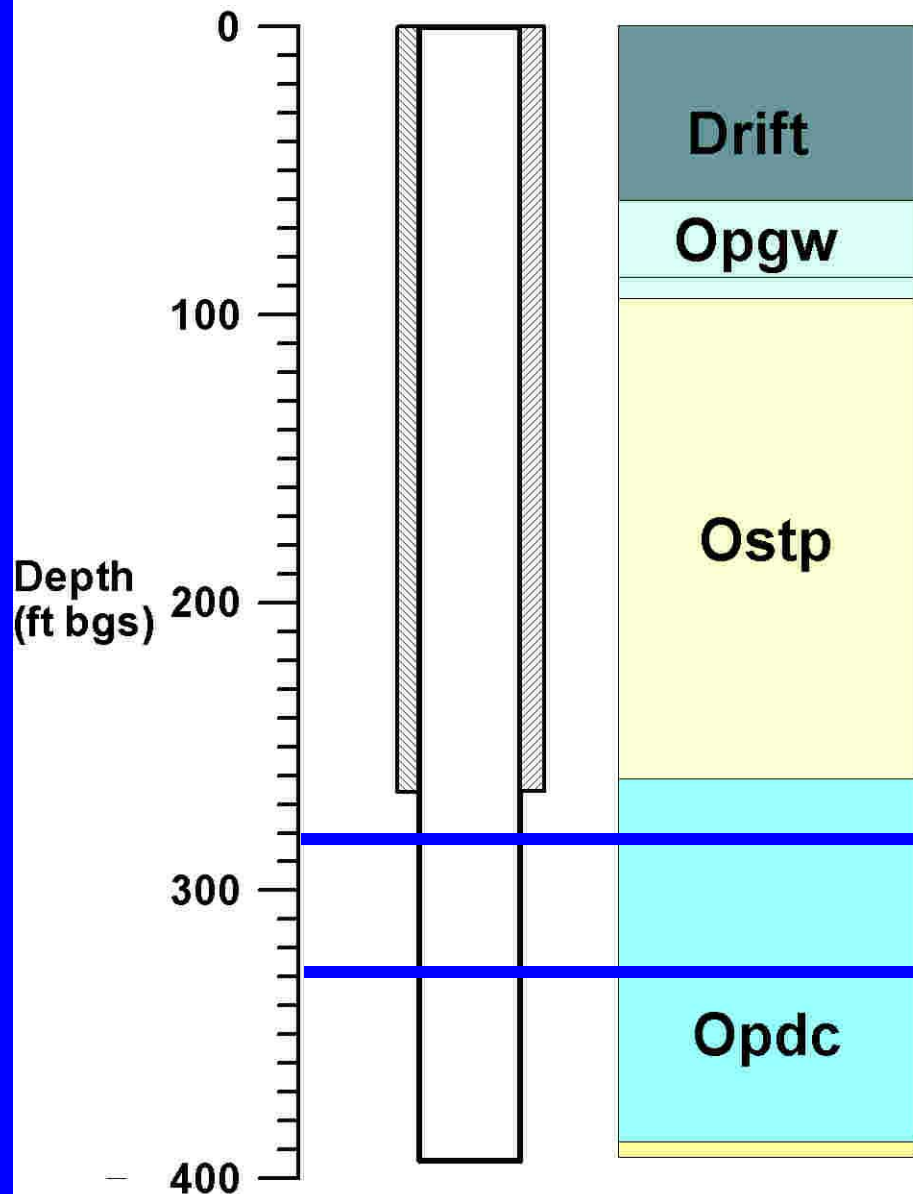
EDINA 7



Waveland Park



Waveland Park Monitoring Well (508116)



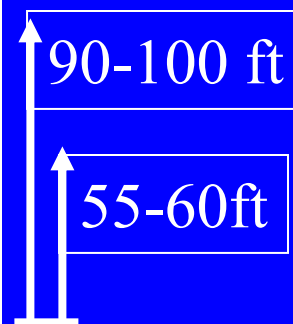
Borehole
Measurements
(MGS):

Caliper

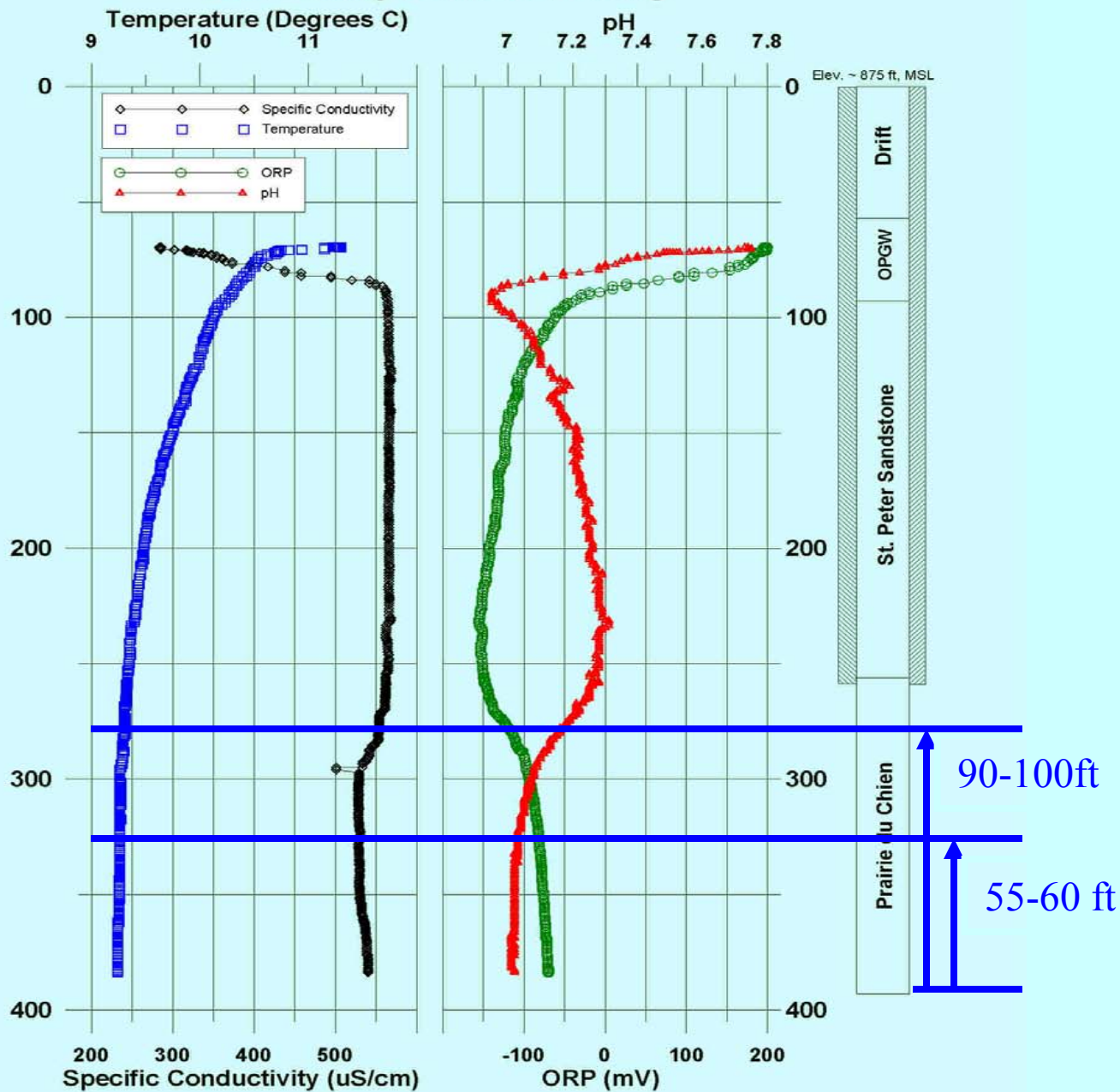
Gamma

Fluid Resistivity

Flow Meter

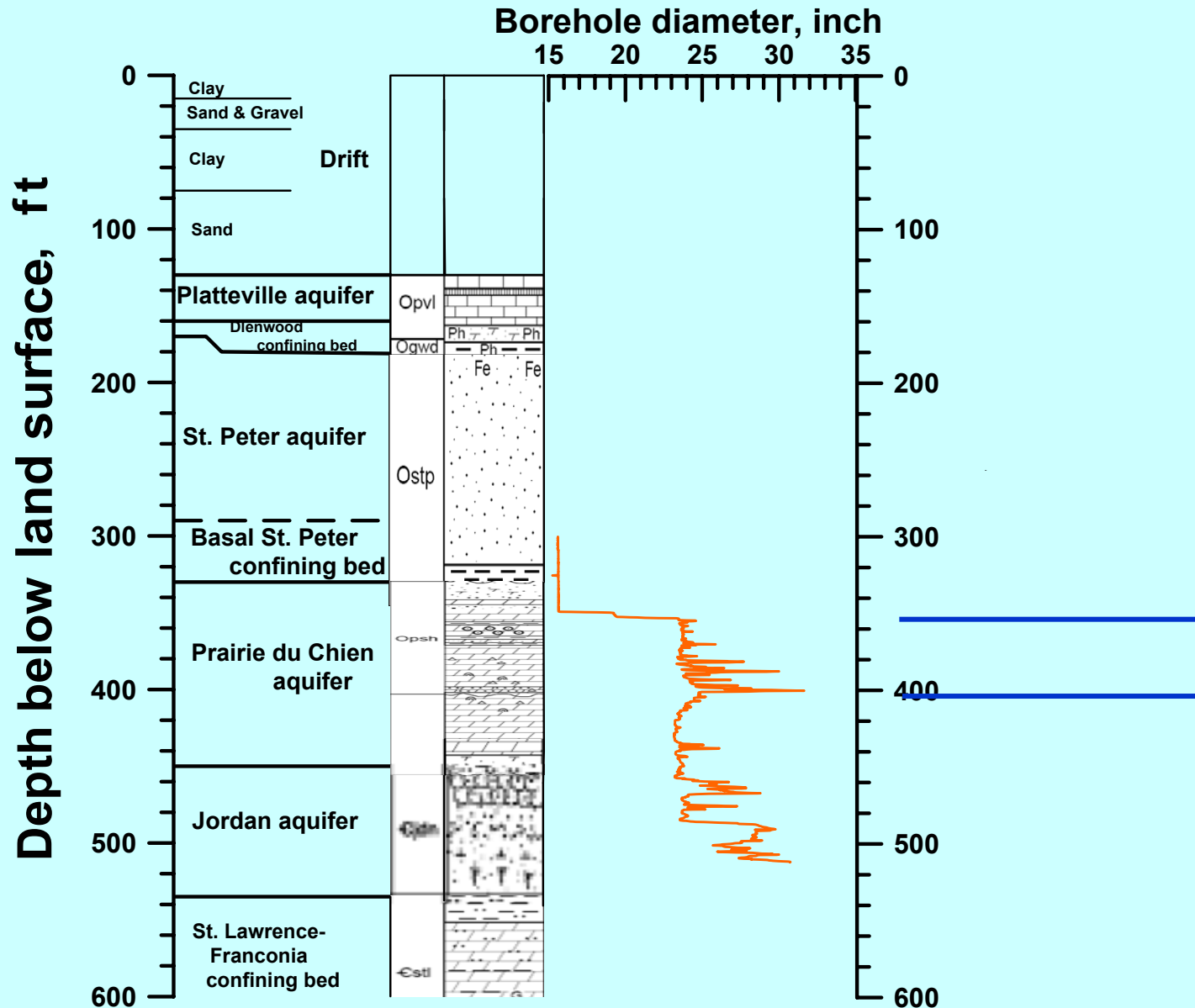


Waveland Park W402 (508116) Water Quality Parameter Profiling

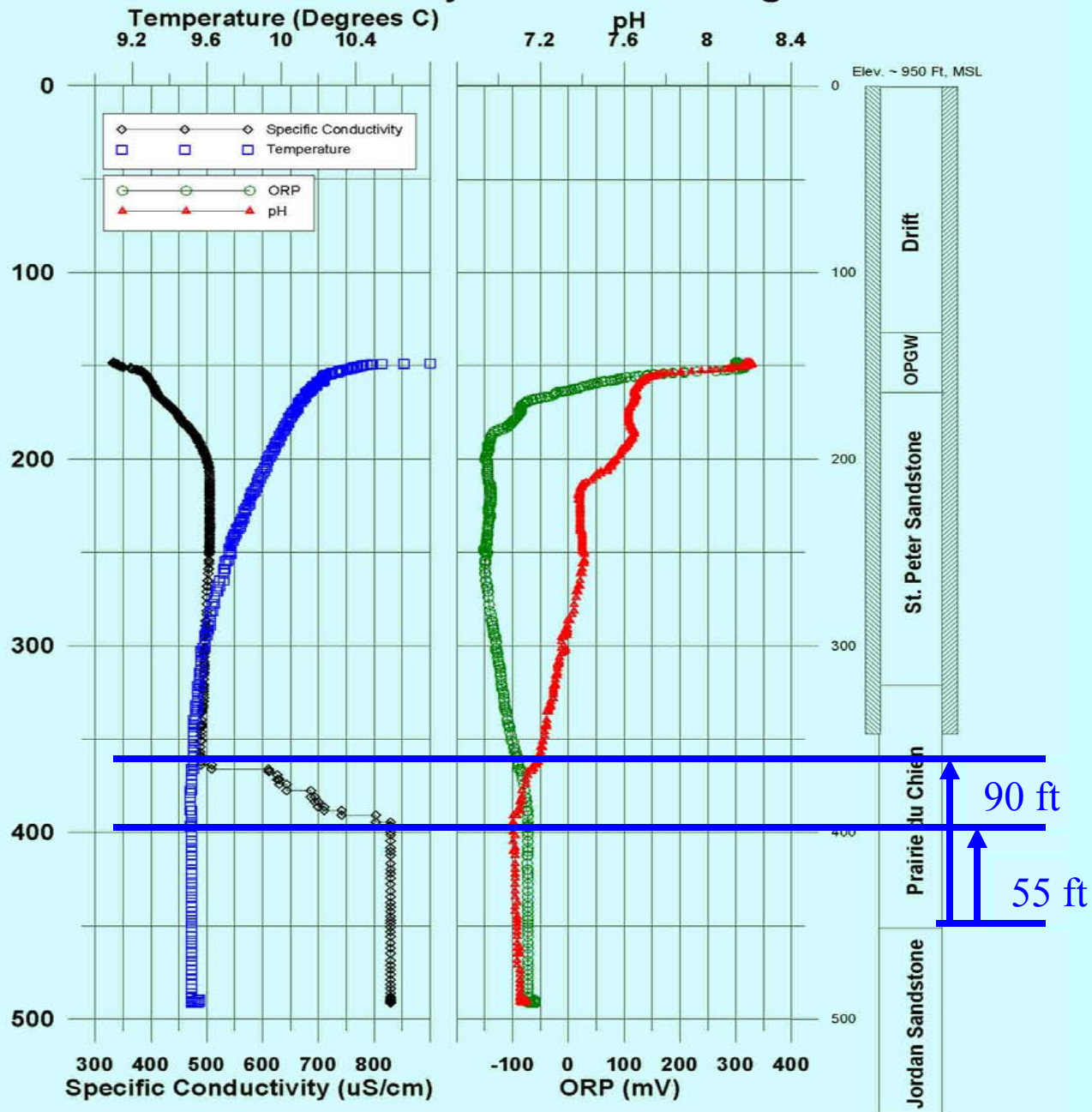


Edina 7 (206474)

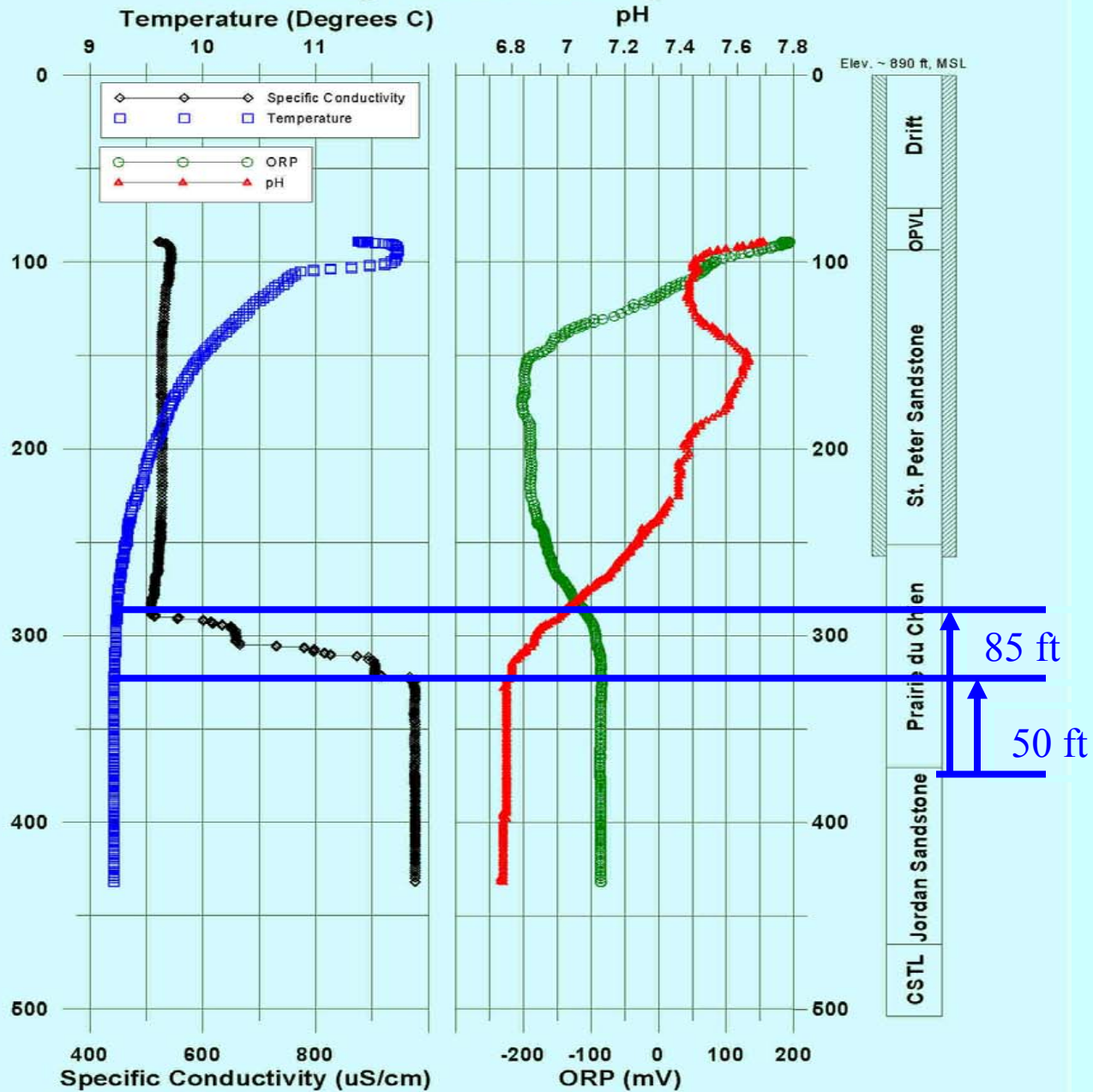
Borehole Profile, Caliper Log



Edina Well No. 7 (206474) Water Quality Parameter Profiling

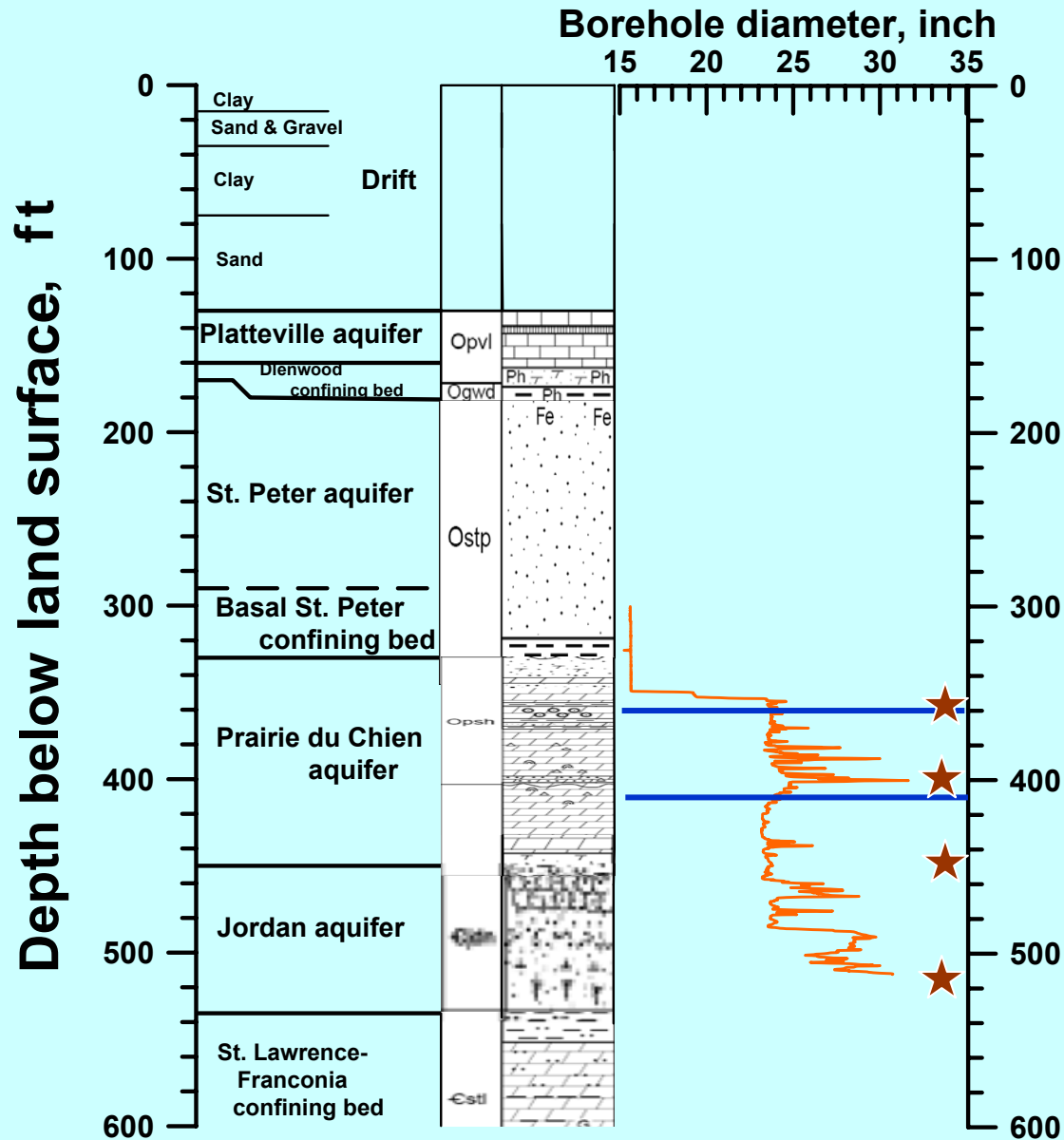


Meadowbrook Golf Course Well (216009) Water Quality Parameter Profiling

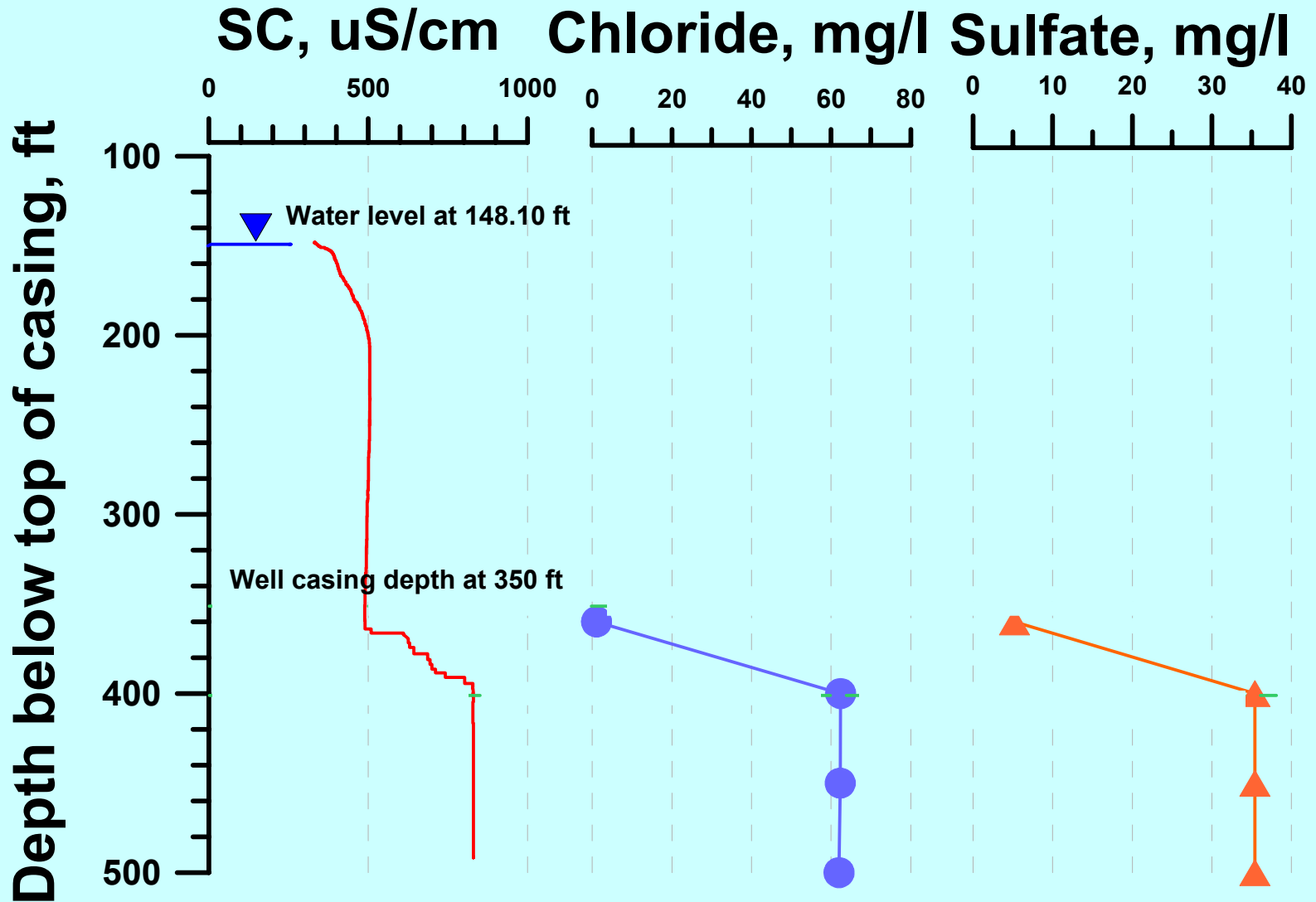


Edina 7 (206474)

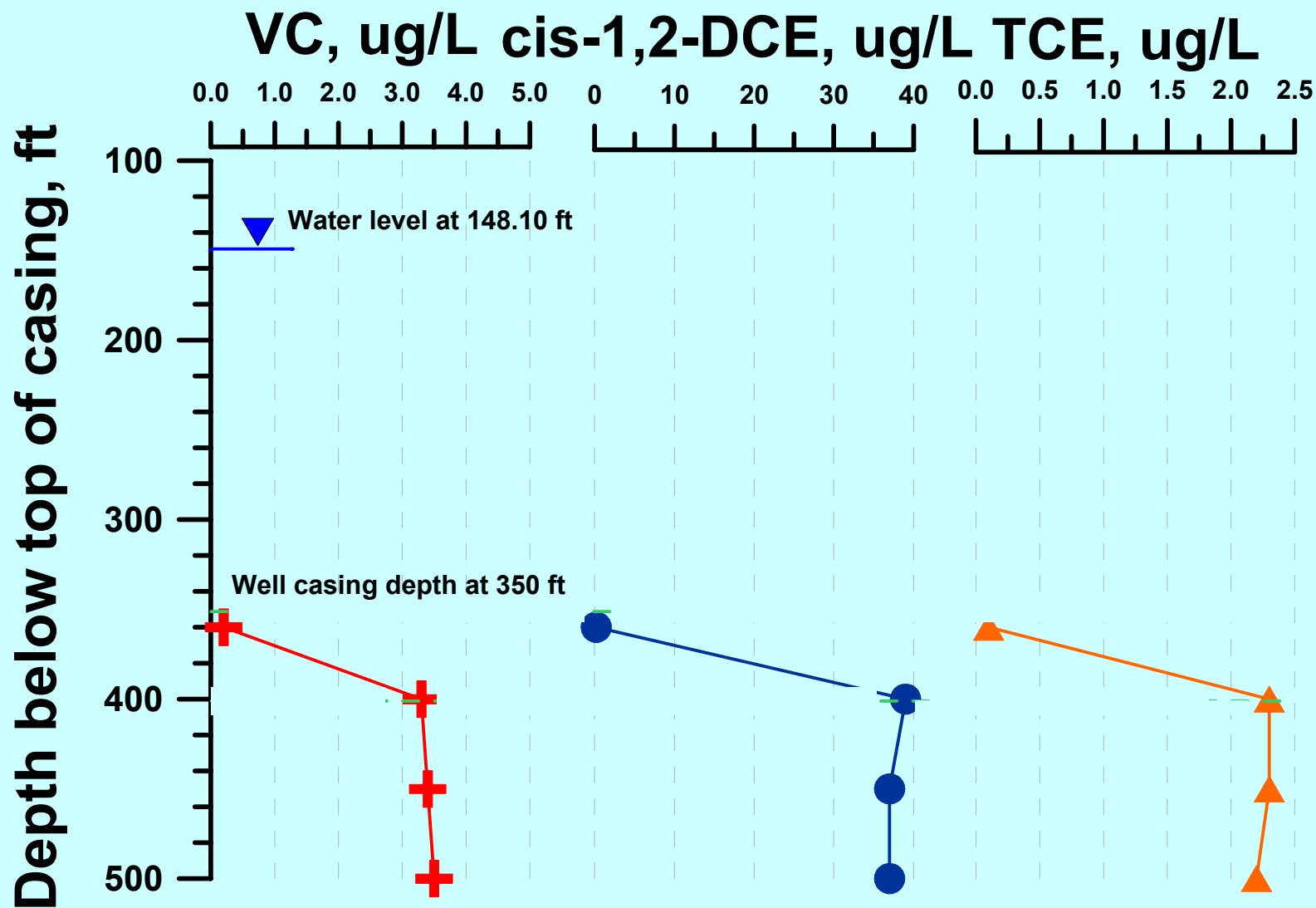
Borehole Profile, Caliper Log



Chemical Profile of Edina Well No. 7



Chemical Profile of Edina Well No. 7



Conclusions

- Borehole chemical profiling works well
- Hydraulically active zones of Opdc identified
- VOCs introduced into Edina No. 7 at specific stratigraphic levels
- Dead tritium, other chemical data, indicate hydraulically separate horizons in Opdc.



Continuing Investigative Activities

- Continue to make borehole chemical profiles over larger area
- Understanding hydraulic transients
- Plume mapping/source identification
 - AIH Seminar: 23 November, 2005; P. Rzepecki and L. Guo
 - Room 225 of the Biosystems and Agricultural Engineering Bldg. on the St. Paul campus.