# Proving the Effectiveness of Interceptor Trench for Hydraulic Containment of Chloride Impacted Groundwater at a Natural Gas Liquid Storage Facility, South Central Kansas, USA

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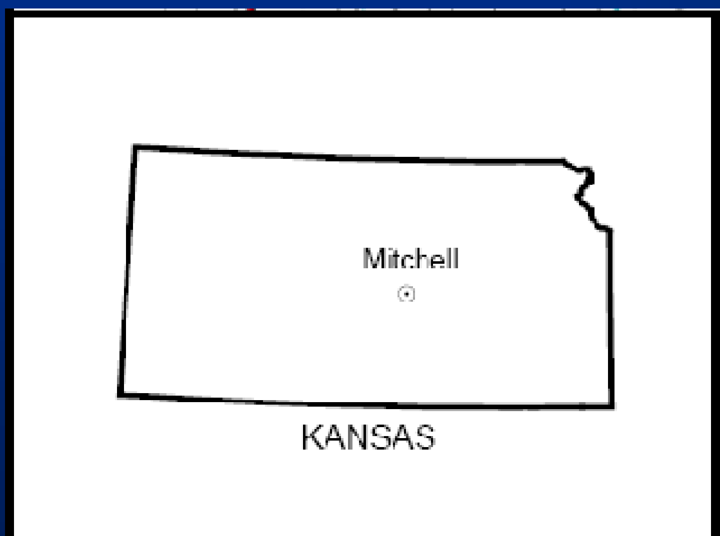
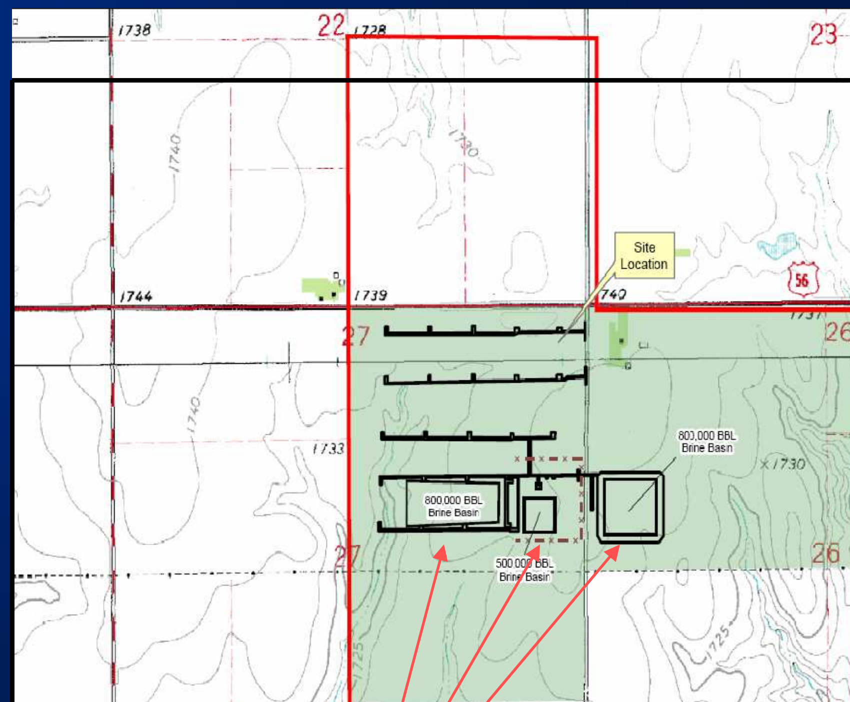
# Site Location Map








Brine Ponds

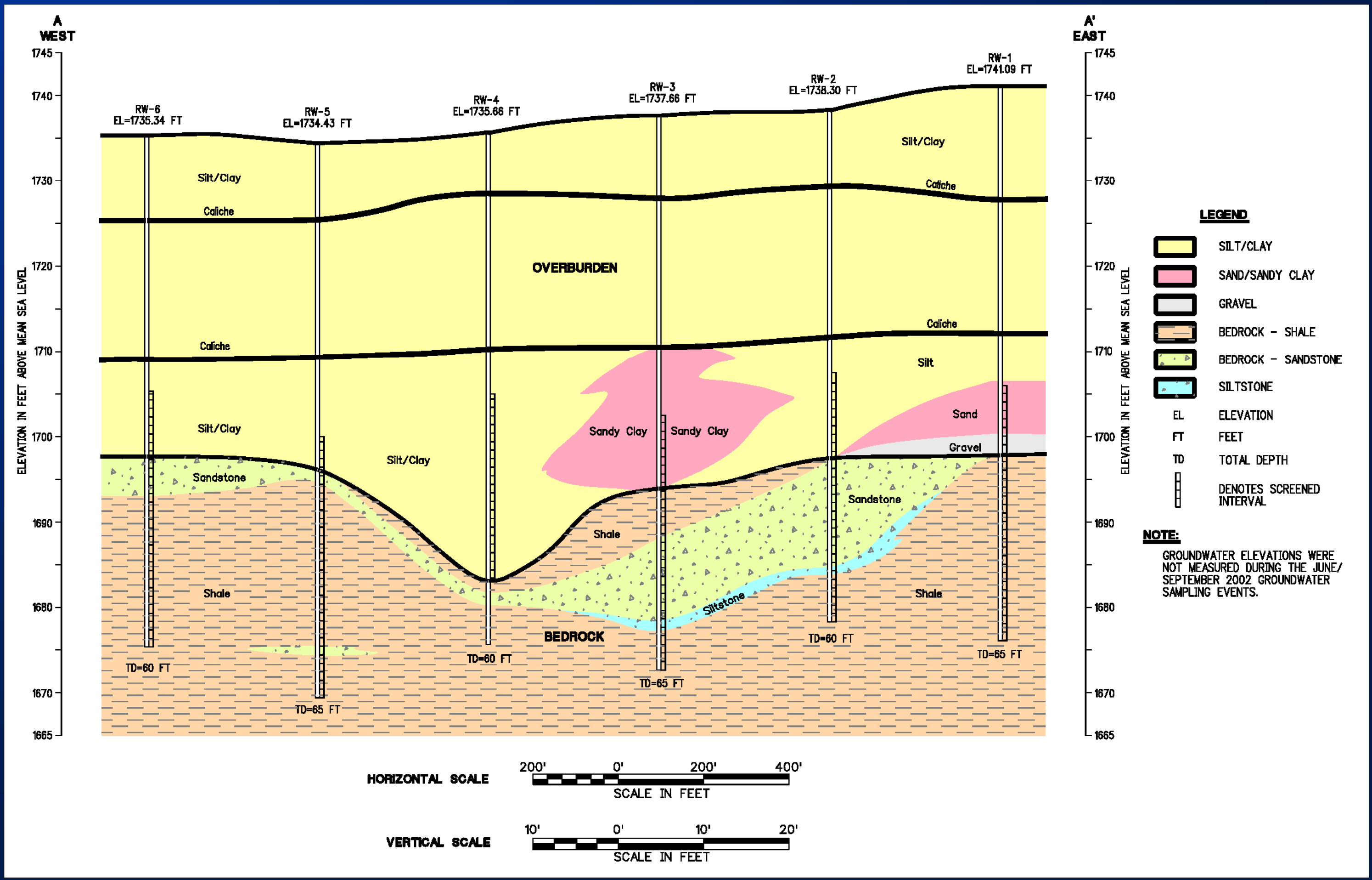
# Site Overview

- Located in rural south central Kansas
- Natural gas liquid (NGL) storage facility with brine storage ponds
- NGL stored in salt caverns 700 ft. bgs
- Groundwater contamination as a result of release from previously unlined brine ponds
- Chloride concentrations in excess of acceptable levels (SMCL 250 mg/L)

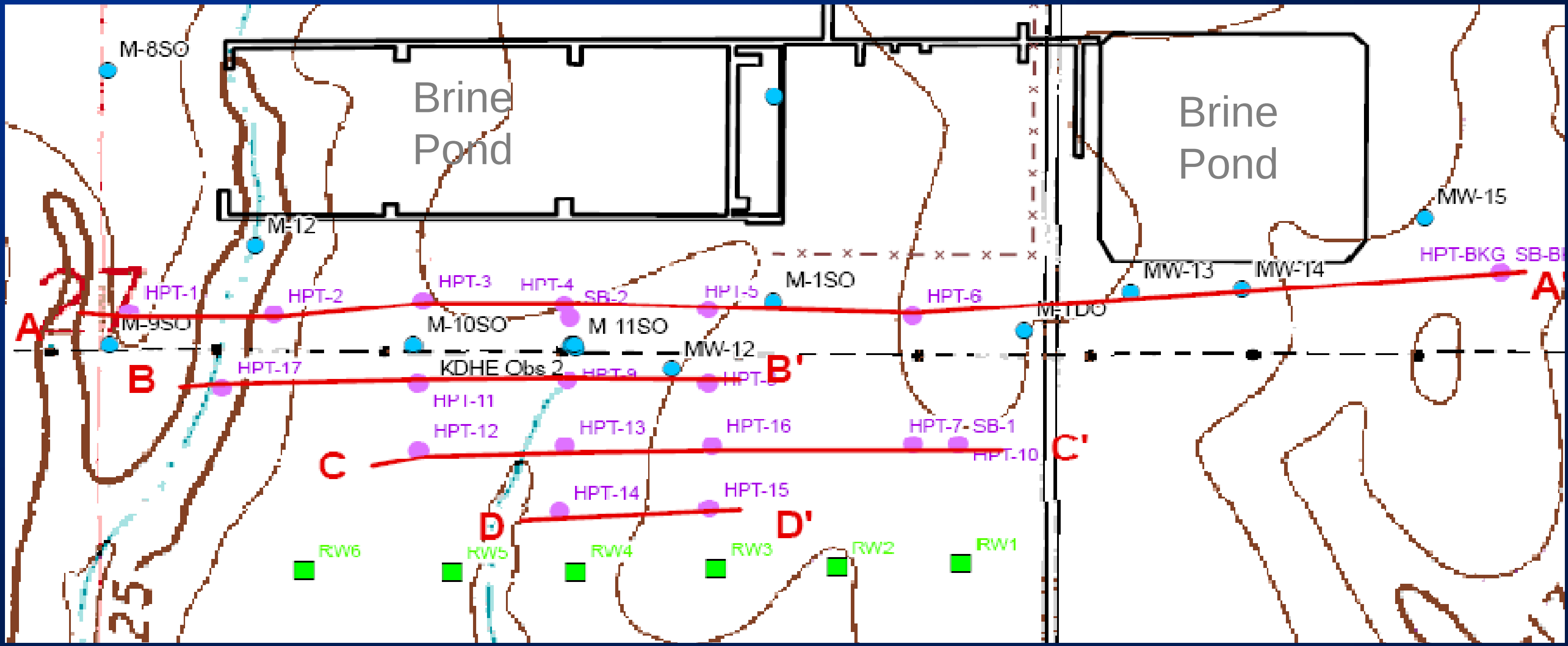
# Geology and Hydrogeology

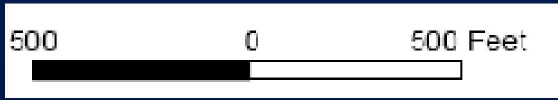
- Site consists of loess overburden deposits
- The uppermost bedrock consists of shale, siltstone and sandstone of the Cretaceous Kiowa Shale
- Groundwater yield to wells is limited to 0.25 to 1.5 gpm
- Groundwater movement controlled by flow along preferential pathway in soil and bedrock
- Relatively tight soil/rock matrix

# Generalized Geologic Profile



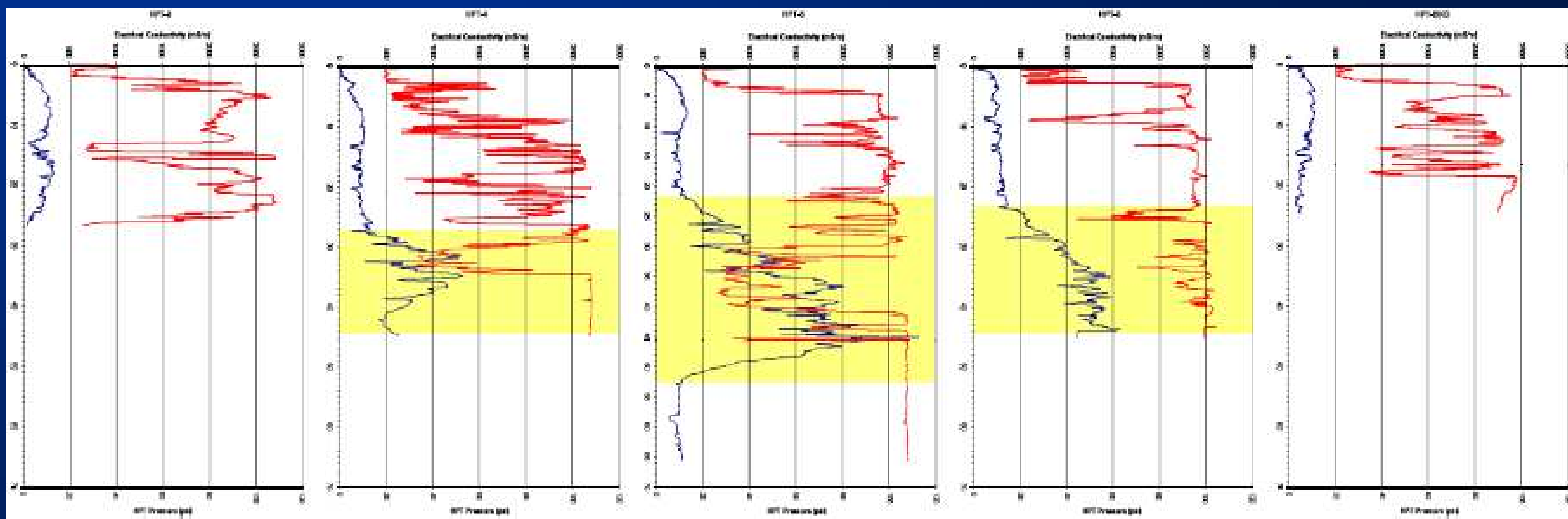
# HPT Locations and Profile Lines




| | |
|---|---|
| ● | Monitoring Well |
| ● | HPT Survey |
| ■ | Recovery Well |
| A —— A' | Profile Line |

# HPT Profile A-A’



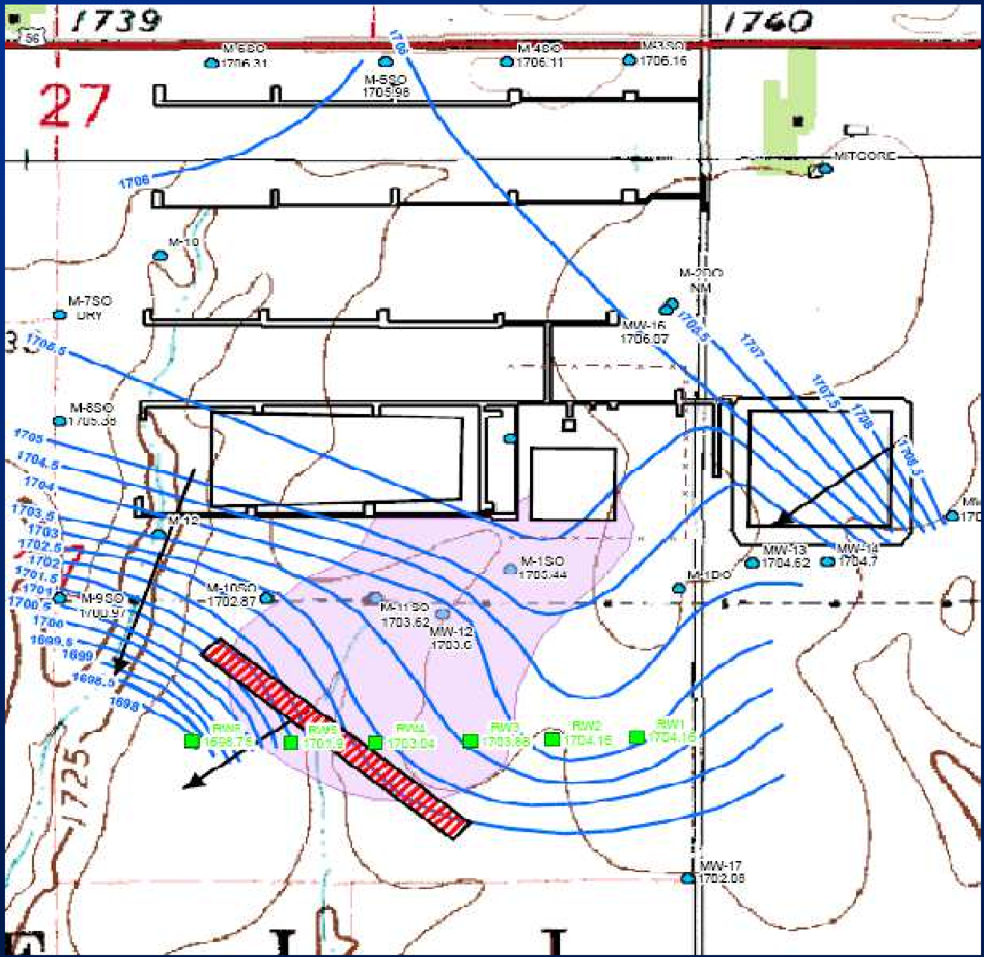
**LEGEND**

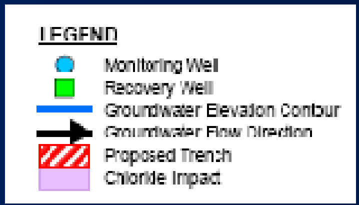
CHLORIDE IMPACT

ELECTRICAL CONDUCTIVITY (EC)

HYDRAULIC PROFILLING TOOL (HPT)

# Potentiometric Surface


2006

# Hydrogeologic Testing

- Historically several attempts to perform pump tests in vertical wells
- Previous tests indicated yields between 0.25 to 1.5 gpm
- ROI was 10 to 30 feet
- Evaluation led to installation of the collection trench as hydraulic containment alternative to maximize the interconnection of preferential groundwater flowpaths

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# OnePass Trencher

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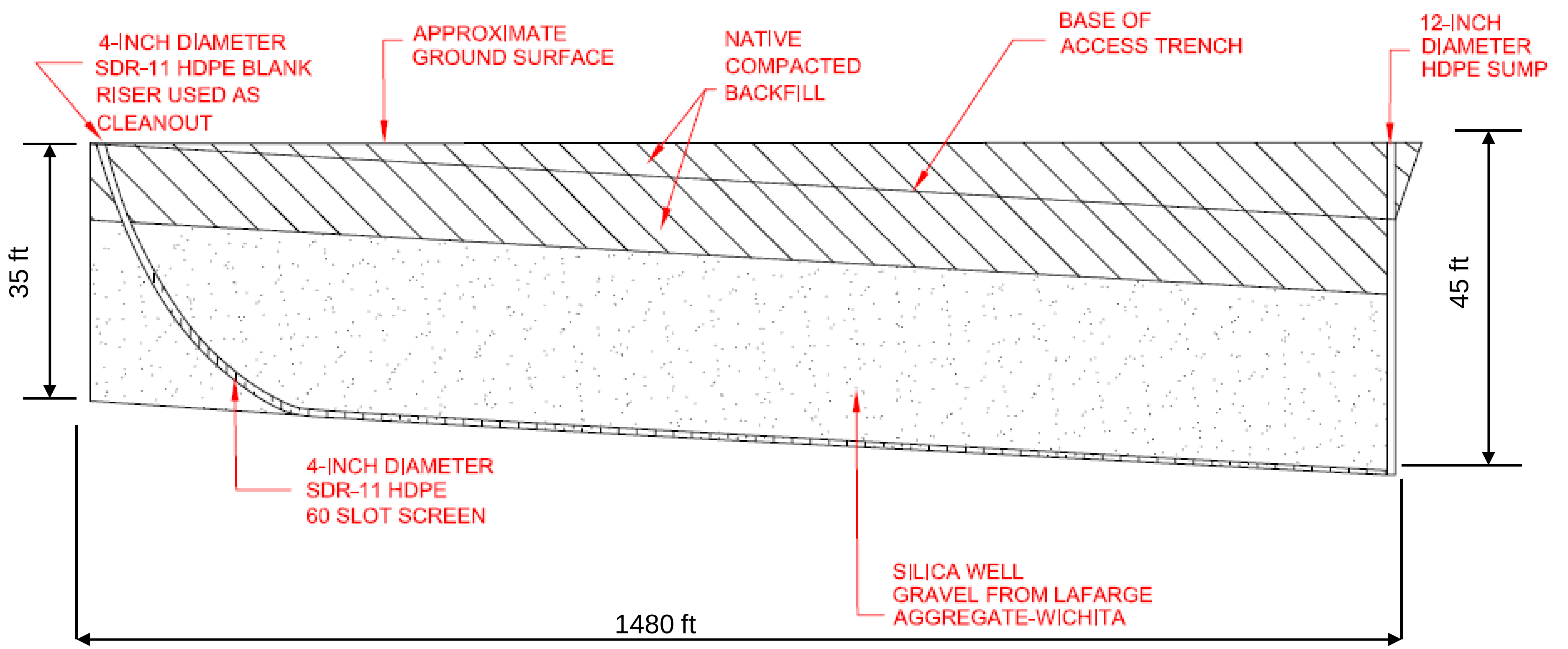
# Trench Construction

# Trench Installation



# Groundwater Recharge

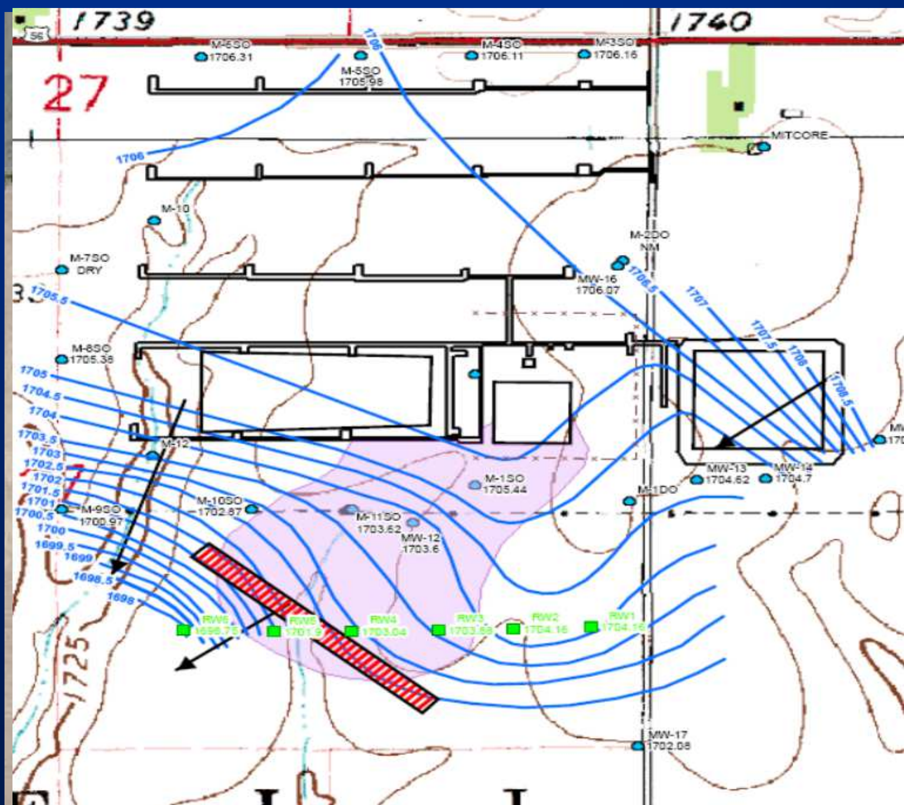
- Following installation of trench the question arose as to the estimated yield for design of the collection and treatment system
- Client wasn’t interested in aquifer testing
- End result was to use existing data and SWAG approx. yield and pumping rate
- Maximum rate was 10 gpm with operation at around 8 gpm (system installed 2007-2008)

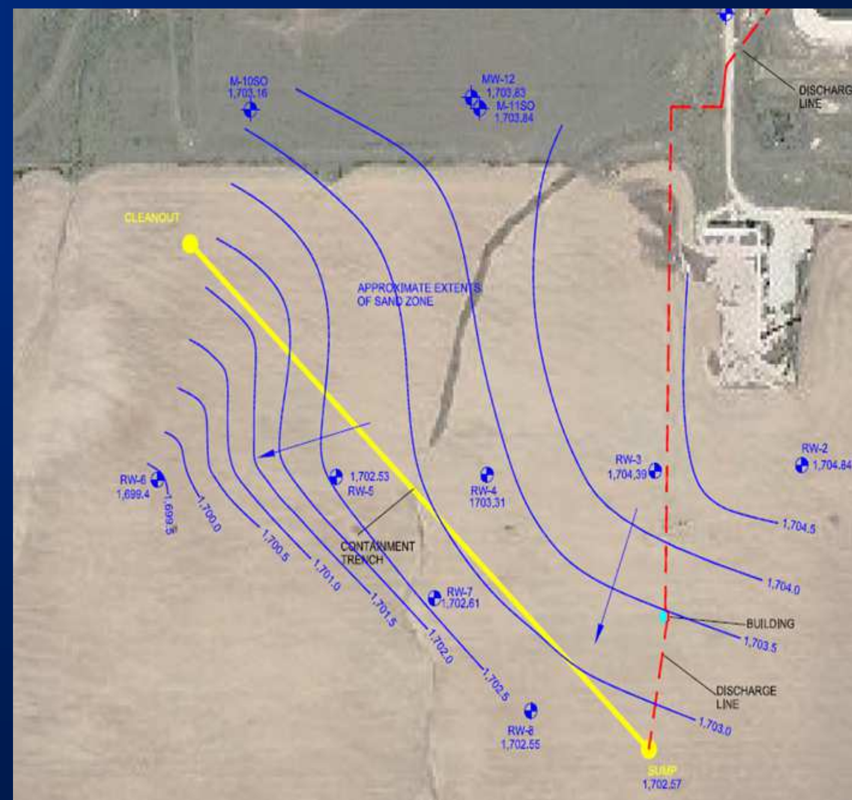
# Concerns

- System didn't provide capture and only provided minimal recovery of impacted fluids
- Regulators were not satisfied with the lack of hydraulic containment/control
- Requested that aquifer testing be performed to prove or disprove effectiveness of trench

# Comparison Pumping vs. Static

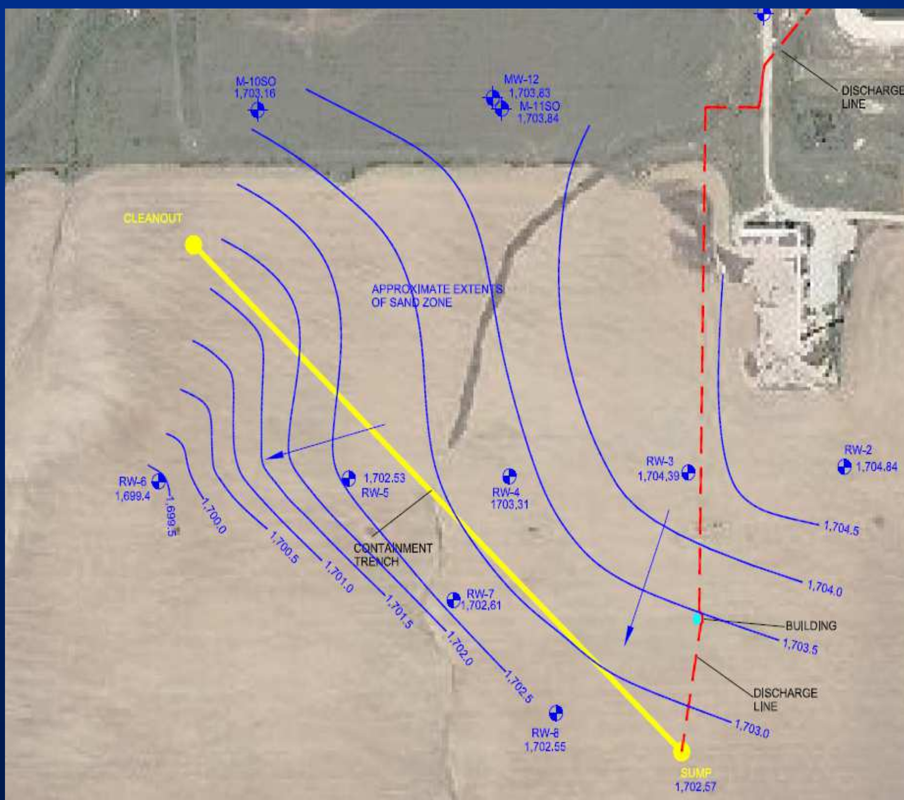
**Static Condition 2006** **Pumping Condition 2010**



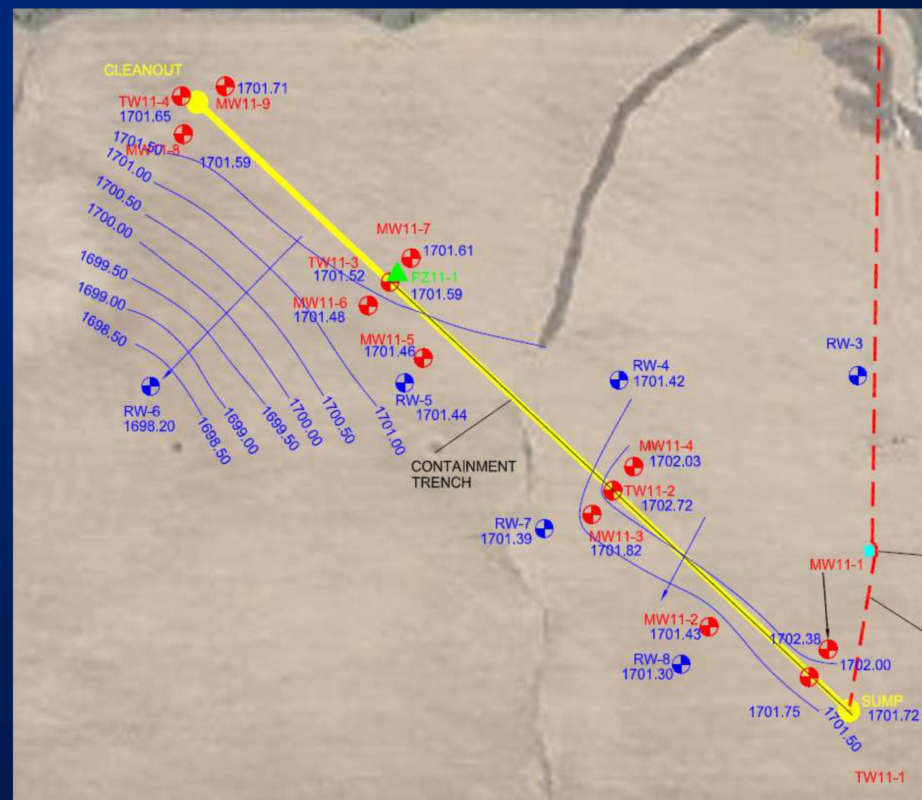



# Comparison Pumping vs. Static

## Pumping Condition 2010




## Static Condition 2012



# Field Activities

- Series of piezometers and monitoring wells were installed ( four inside and nine outside trench)
- Step test performed (40, 60, 80, & 93 gpm). 50 gpm selected for constant rate
- 76 hour constant rate test

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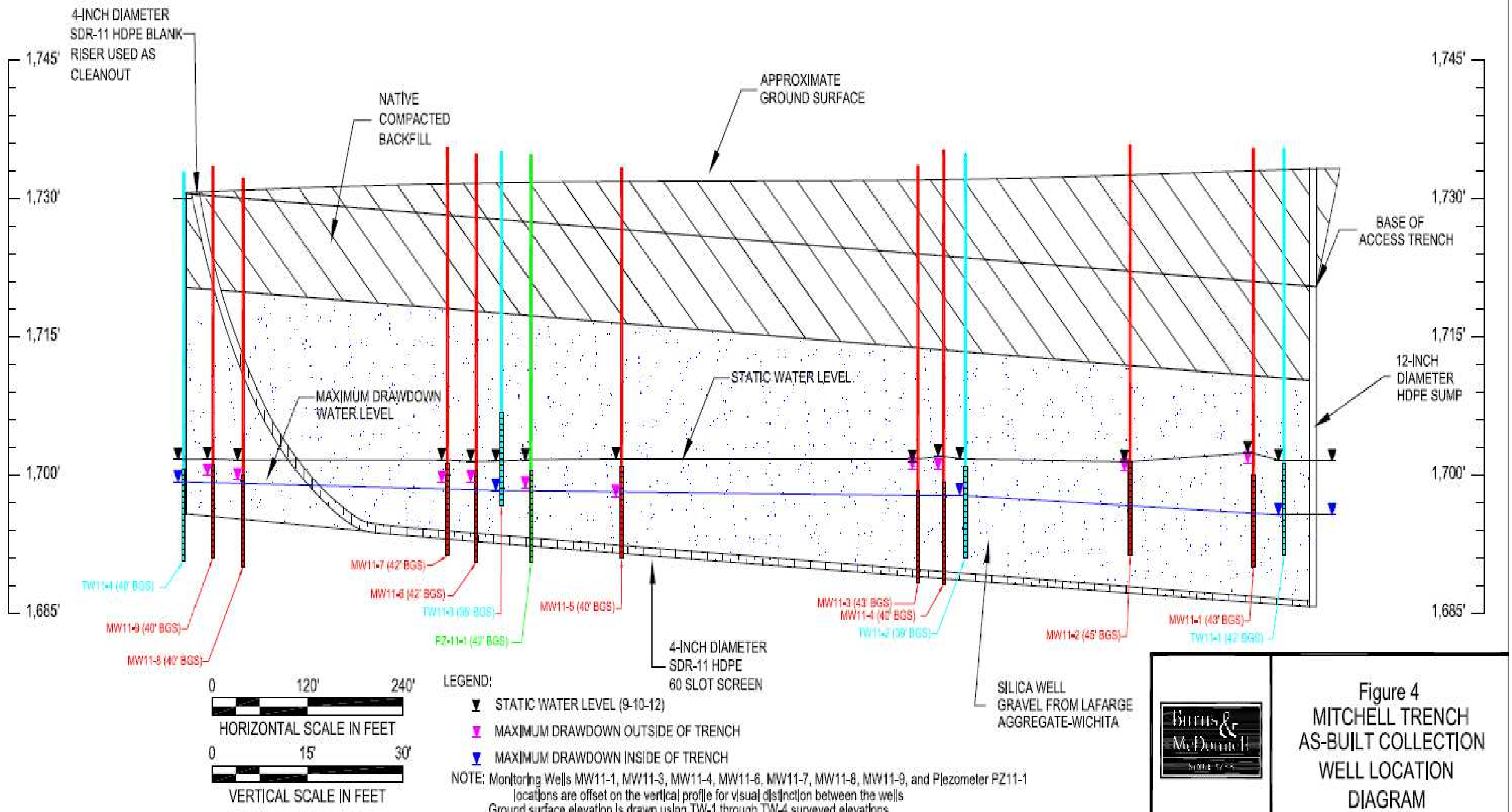
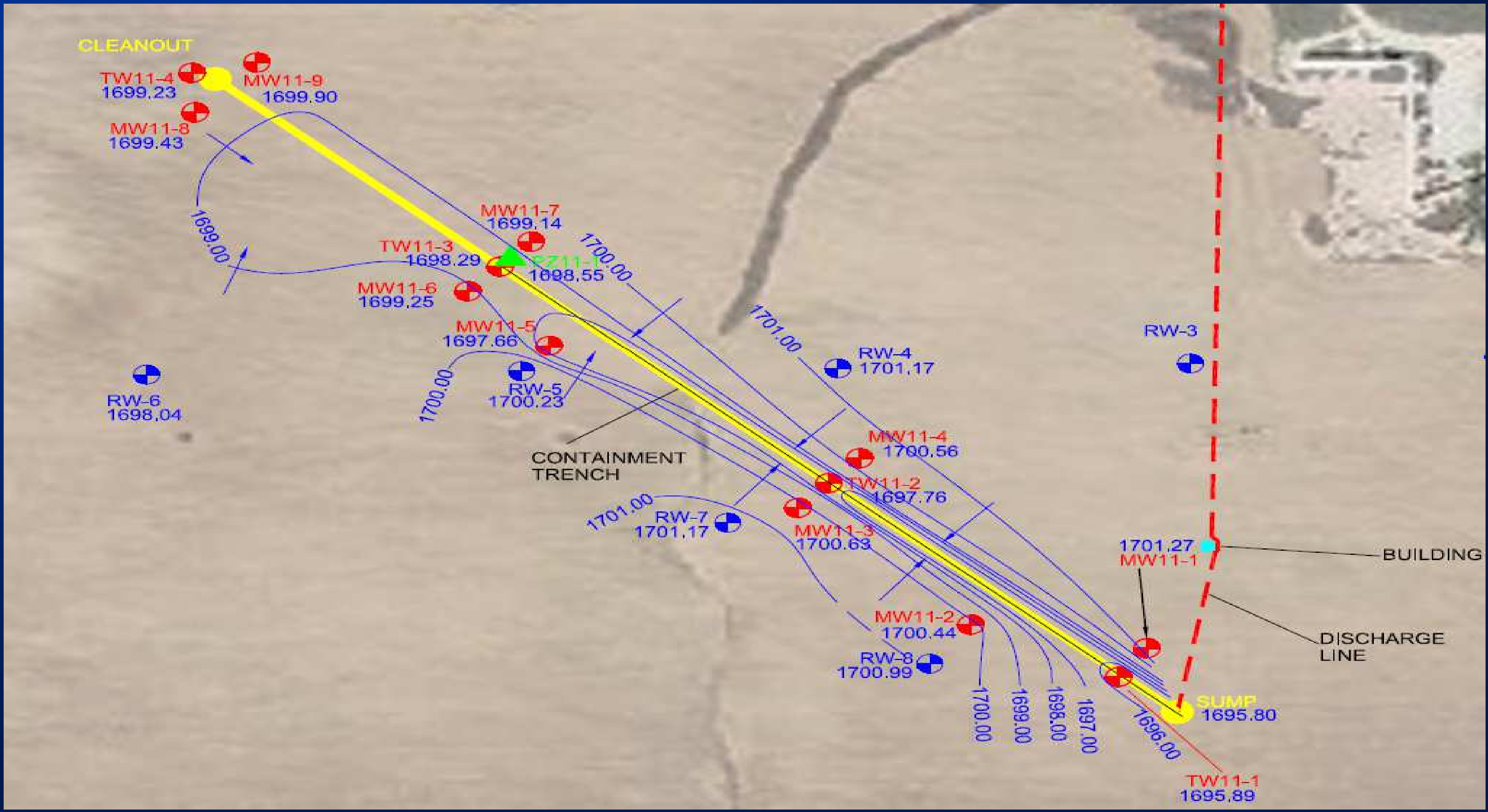
# Trench Profile



# Maximum Drawdown – 2012 Test



# Findings

- Aquifer saturated thickness = 16.33 ft
- Drawdown observed along trench (ranged from 1.8 ft. (cleanout) to 5.9 ft (sump)
- Hydraulic conductivity E10$^{-1}$ cm/s (trench) and E10$^{-2}$ to E10$^{-4}$ cm/s (outside trench)
- Influence and capture observed within and outside the trench

# Conclusions

- Data from the constant rate test proved that trench construction was viable
- Linear and radial zones of influence were obtainable and sustainable
- Regulators concurred
- Increasing pump size and collection infrastructure to accommodate higher flow/yield

# Questions?


11/01/2007