Air Force Installation & Mission Support Center

PFAS Affected Property Assessment Investigation at Former Reese AFB, Lubbock, Texas

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AFCEC/CIBC

7 November 2023

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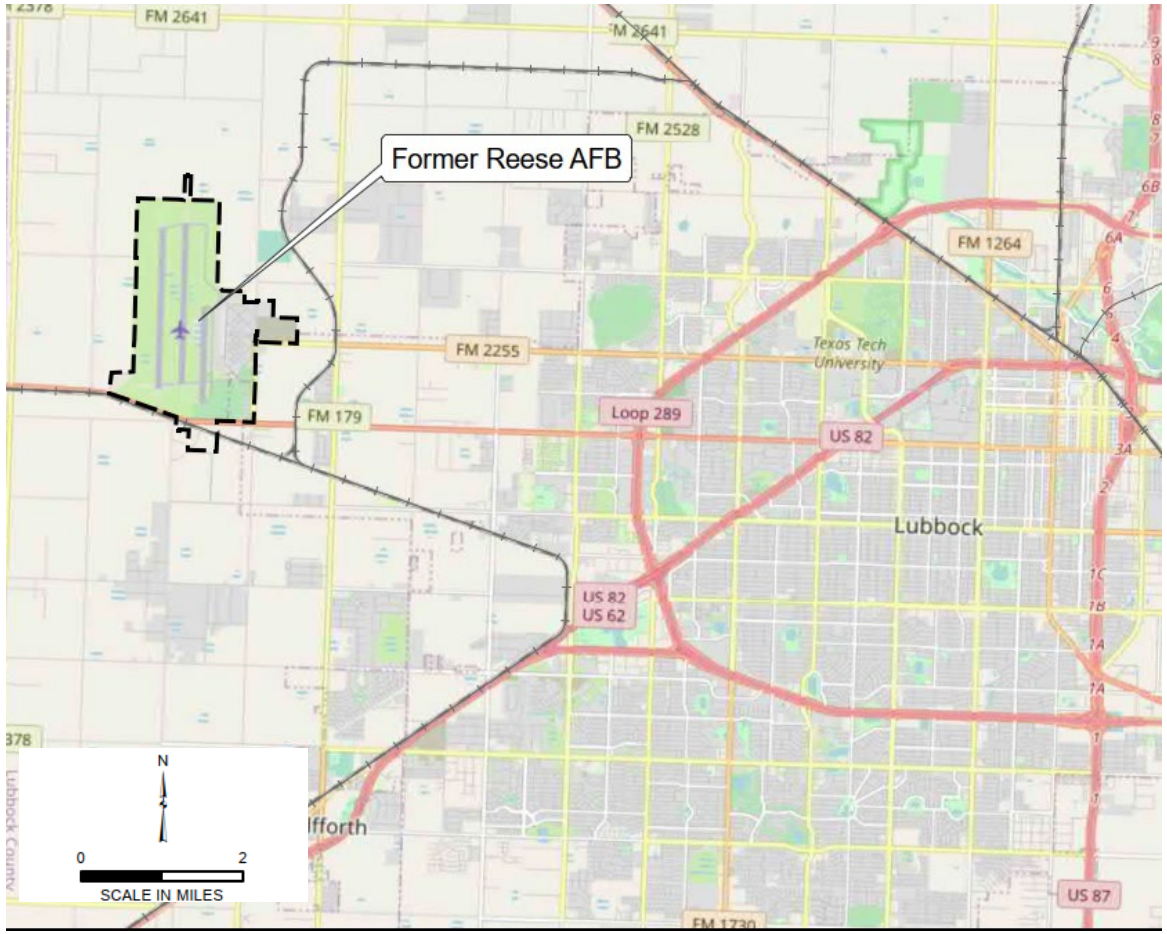
Agenda

- Introduction
- Overview
- Domestic Well Sampling and Treatment
- Affected Property Assessment Summary
- Future Actions
- Questions and Discussion

Overview



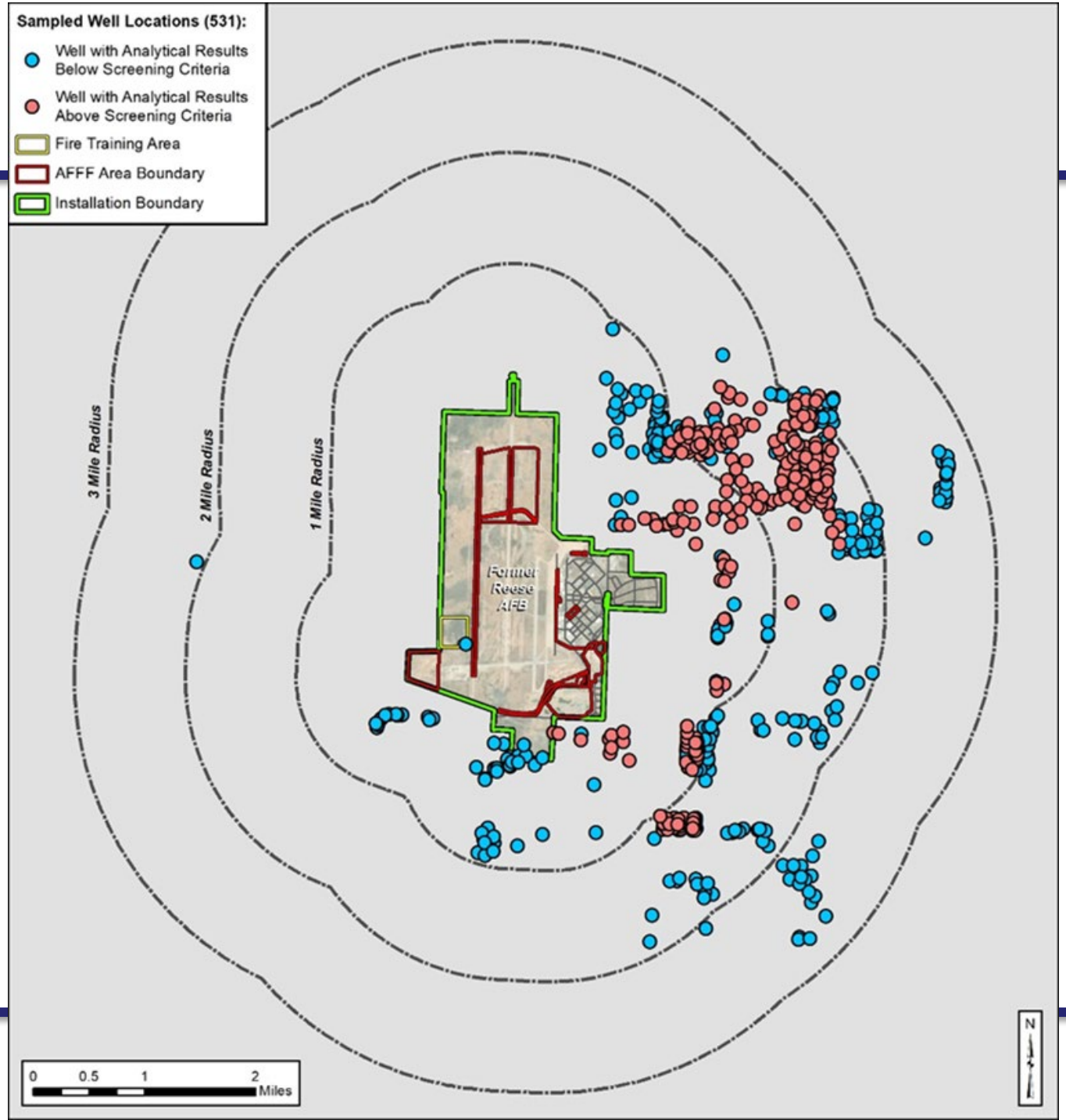
- 1970 - 1997: Aqueous Film Forming Foam (AFFF) used at Reese AFB
- 1997: Reese AFB closed
- 2016: Preliminary Assessment identified 11 AFFF Areas and 1 Fire Training Area (FTA)
- 2017: Site Inspection identified PFAS in soil and groundwater
- 2017 - Ongoing: Domestic Well Sampling and Treatment
- 2019 - 2023 TRRP Affected Property Assessment (APA) per RCRA Permit

Drinking Water Mitigation

- Drinking water well database search within 4 miles
- Domestic well sampling initiated in November 2017
- 545 drinking water wells sampled; 266 private wells and four public wells exceeded 70 PPT in accordance with DoD Policy and/or TCEQ PCLs

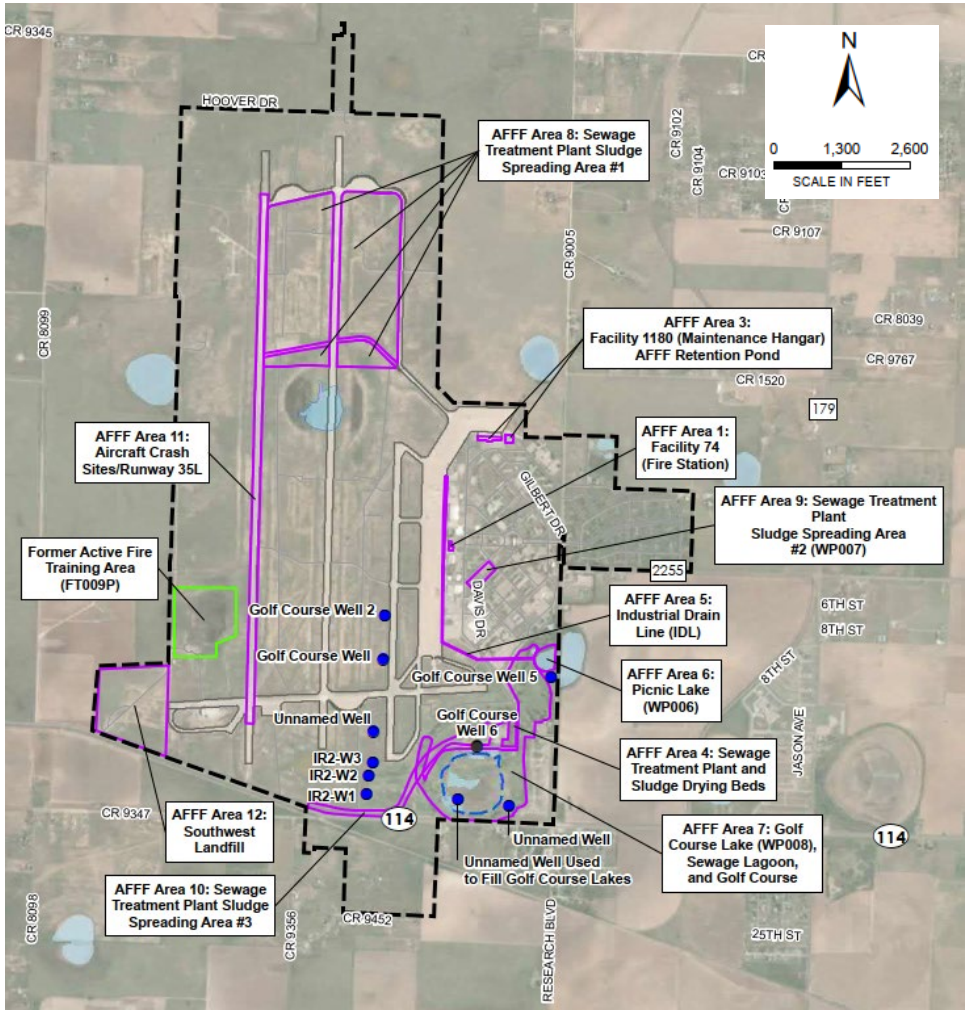
- Bottled water provided immediately to owners/residents
- 258 Point of Entry Treatment (POET) Systems installed beginning April 2018

Impacted Wells



Affected Property Assessment

- Conceptual Site Model (CSM)
- Media sampled: groundwater, soil, surface water, sediment, fish, benthic invertebrates, plant tissue, vegetable tissue
- Human Health Risk Assessment
- Tier 3 Human Health Risk Assessment for fish ingestion
- Screening Level Ecological Risk Assessment
- Site-Specific Ecological Risk Assessment
- Residential Vegetable Garden Evaluation
- Lysimeter Study



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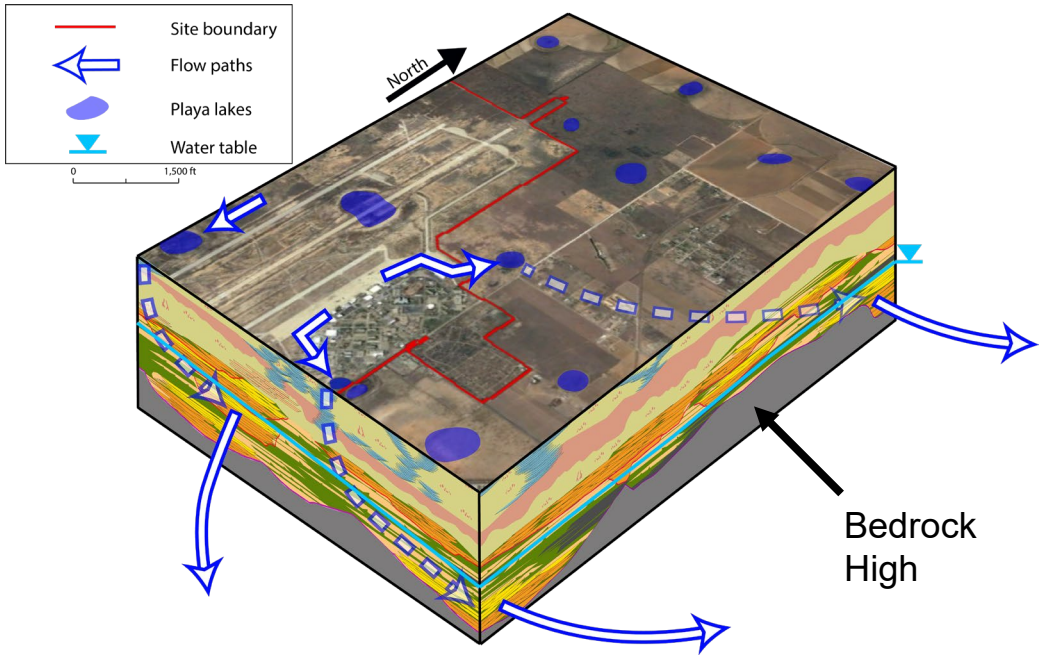
Conceptual Site Model

- **Geology, using environmental sequence stratigraphy, provides framework in which subsequent chemistry and hydrogeology are integrated.**



Common CSM Elements in the Southwest

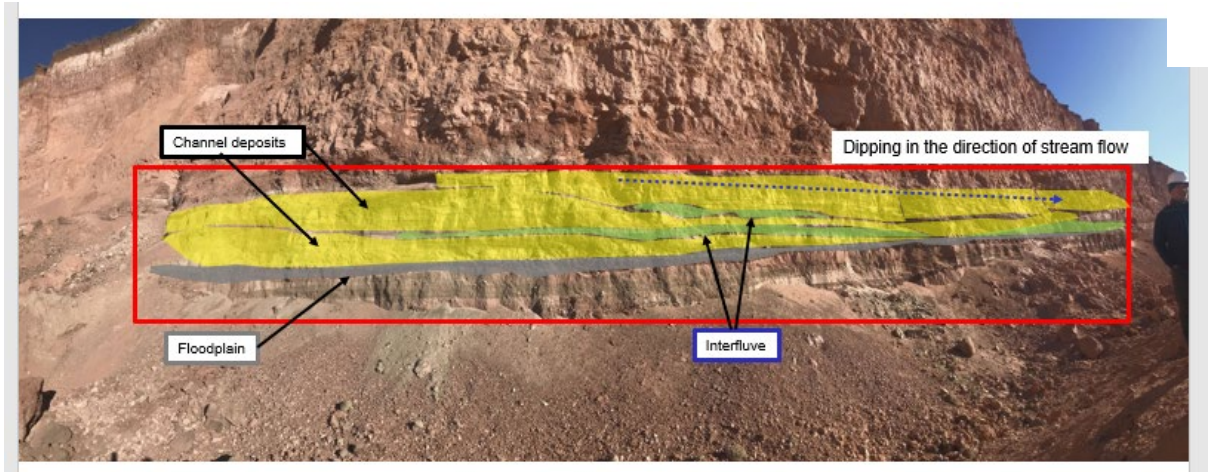
- **Groundwater –**
  - Limited precipitation/recharge
  - Deep, highly-variable water table
- **Surface Water –**
  - Limited, but critical to lateral & vertical migration
- **Pathways to Groundwater –**
  - Often indirect, far removed from source

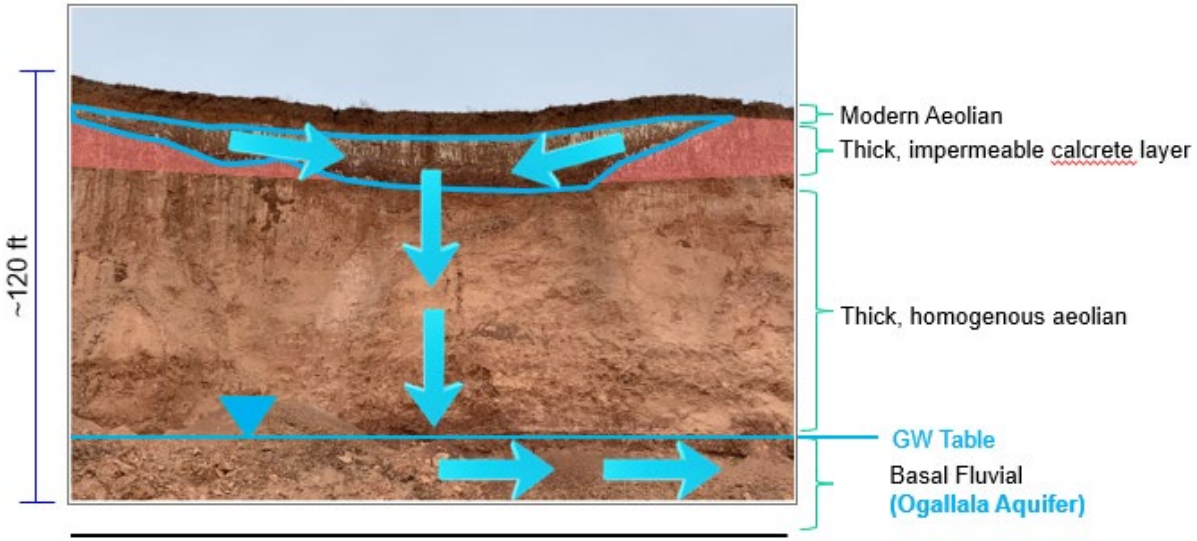
Pathways at former Reese AFB

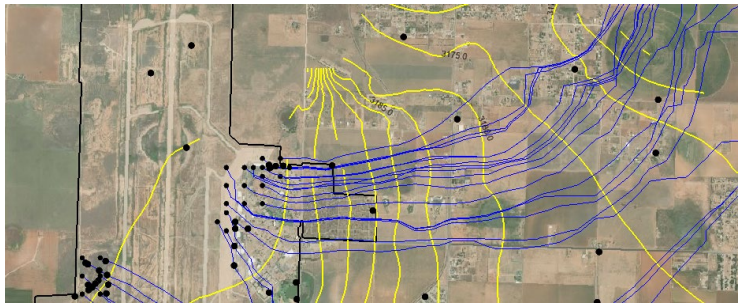
- Surface water pathways into playa lakes
- Playas drive vertical migration through thick vadose zone
- Preferential groundwater flow through coarse channel deposits

Laying the Groundwork

- Outcrop study (Local Quarry)
- Preliminary CSM using Environmental Sequence Stratigraphy (ESS)
- Pre investigation modeling
- Pre-drilling projections







Initial MODFLOW Model

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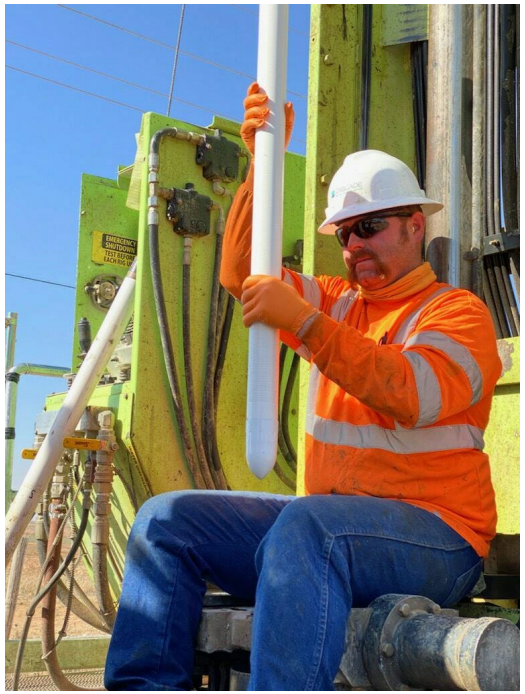
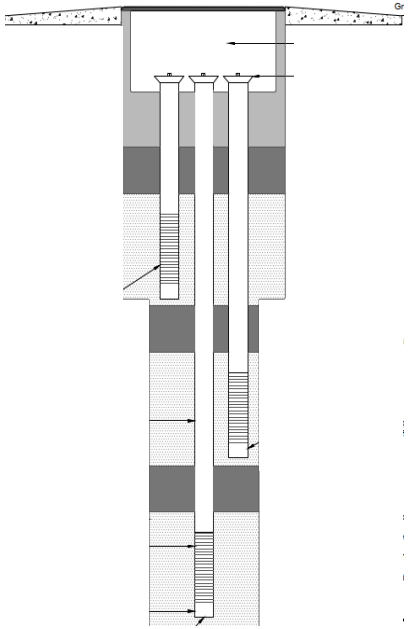
Groundwater Monitoring Network

- Groundwater monitoring well network includes 299 monitoring wells at 130 locations, completed in the upper, middle, and lower portion of the Ogallala aquifer.
- Rotasonic Drilling Techniques with Continuous Cores





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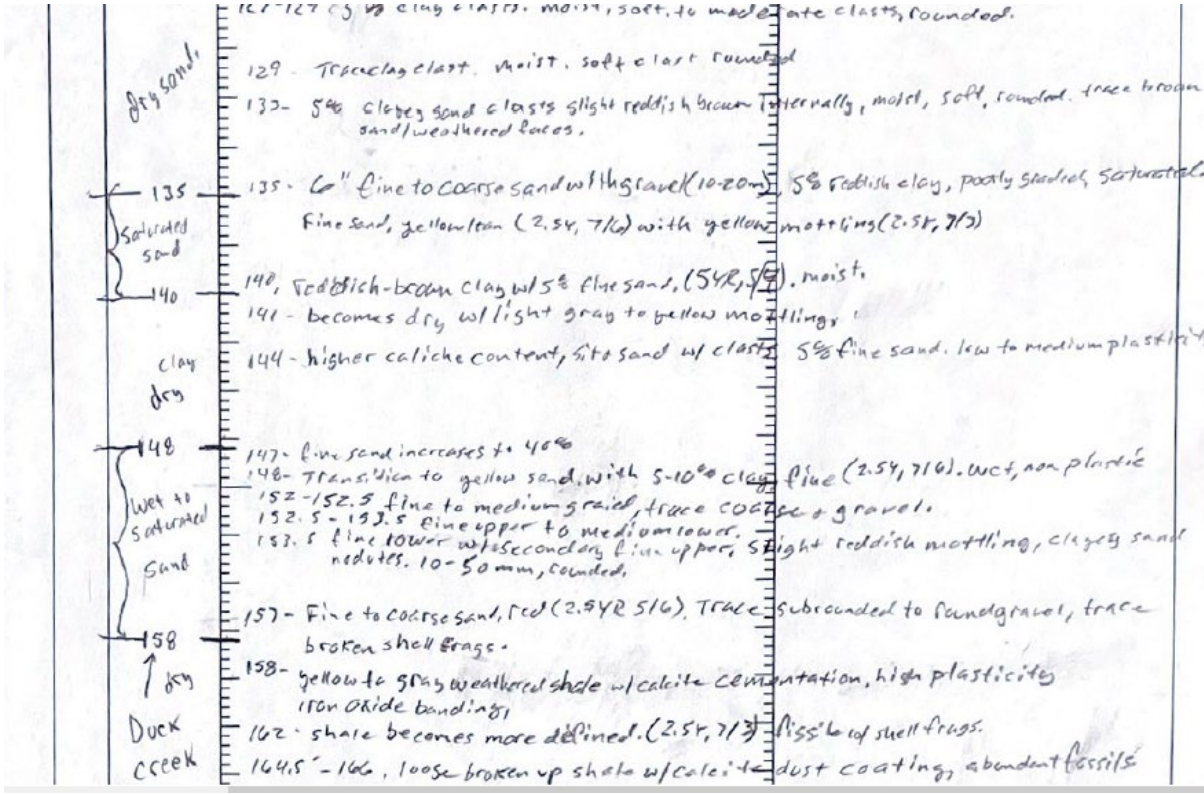
High-Resolution Field Logging

Geologists trained in high resolution field logging techniques



Example Field Log

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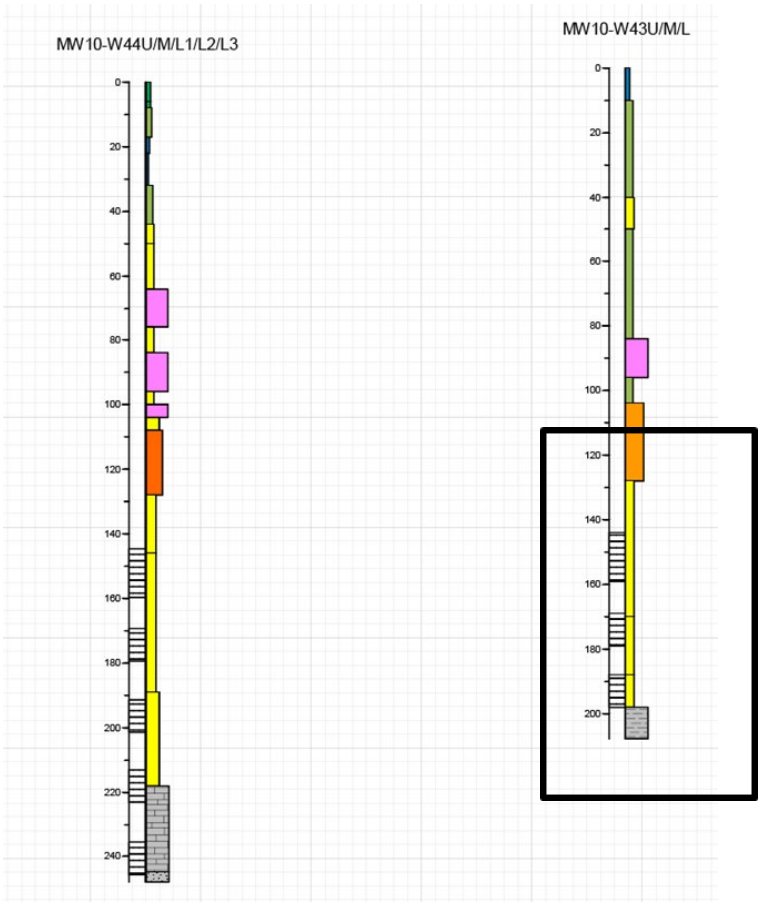
High-Resolution Data = Better Interpretation

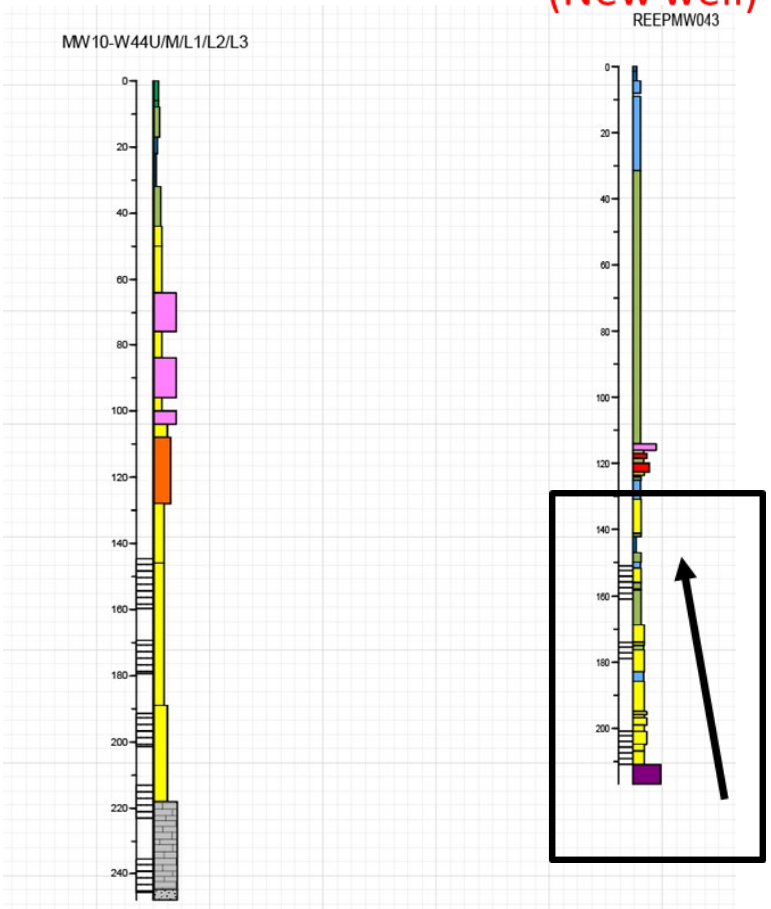
Pre-mobilization lithology data

Example from C-C’

Post-mobilization lithology data

(New well)





Fining-up!

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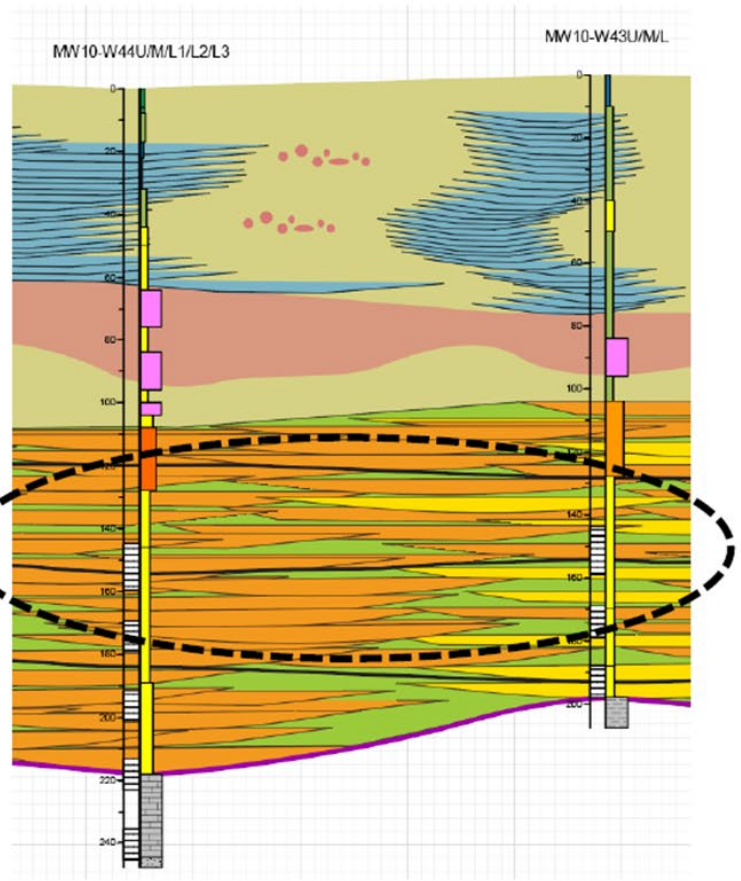
High-Resolution Data = Better Interpretation

Example from C-C'

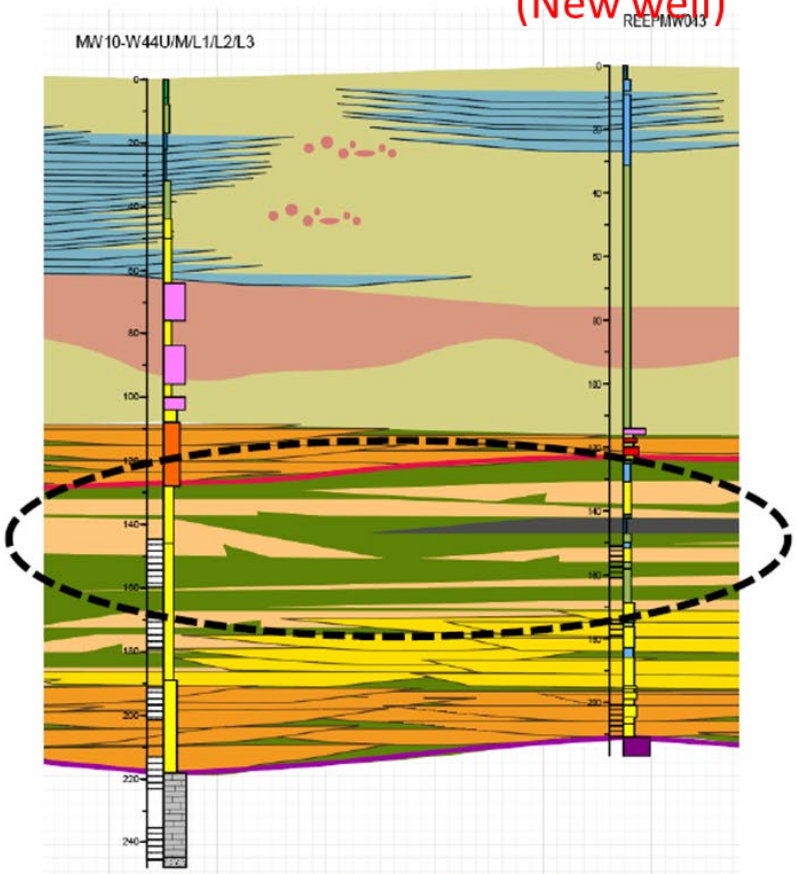
Pre-mobilization 1 data



The data creates a homogenized view of the aquifer

Post-mobilization 1 data

(New well)



Improved data resolution allows for identification of heterogeneity in the aquifer

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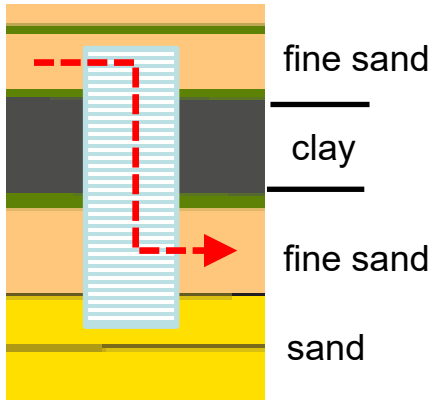
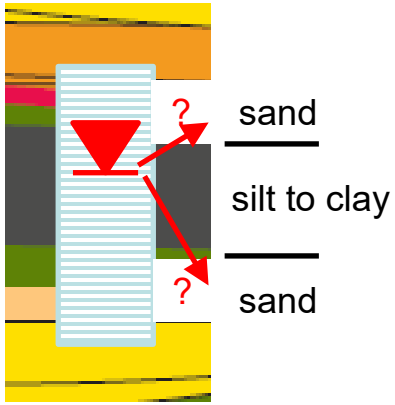
Targeted Monitoring Well Screen Installation

AVOID:

Cross-cutting competent confining layers with a single screen.



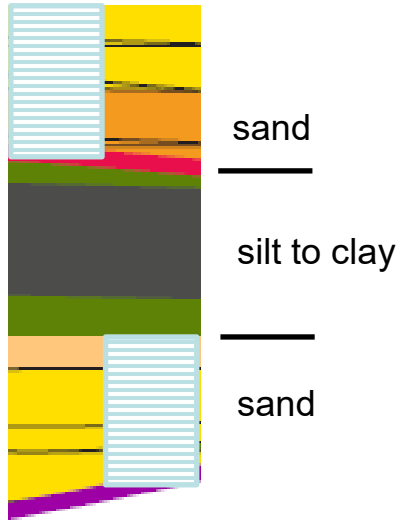
May create unnatural 'conduits' between upper and lower zones of the aquifer



Creates difficulties for future analysis and CSM input (are analytical samples & groundwater elevations giving information about the upper or lower sand unit?)

DO:

Place screens in discrete 'homogenous' zones of the aquifer.



Maintains integrity of confining layers, and enables gathering of discrete groundwater elevation and contaminant concentration data

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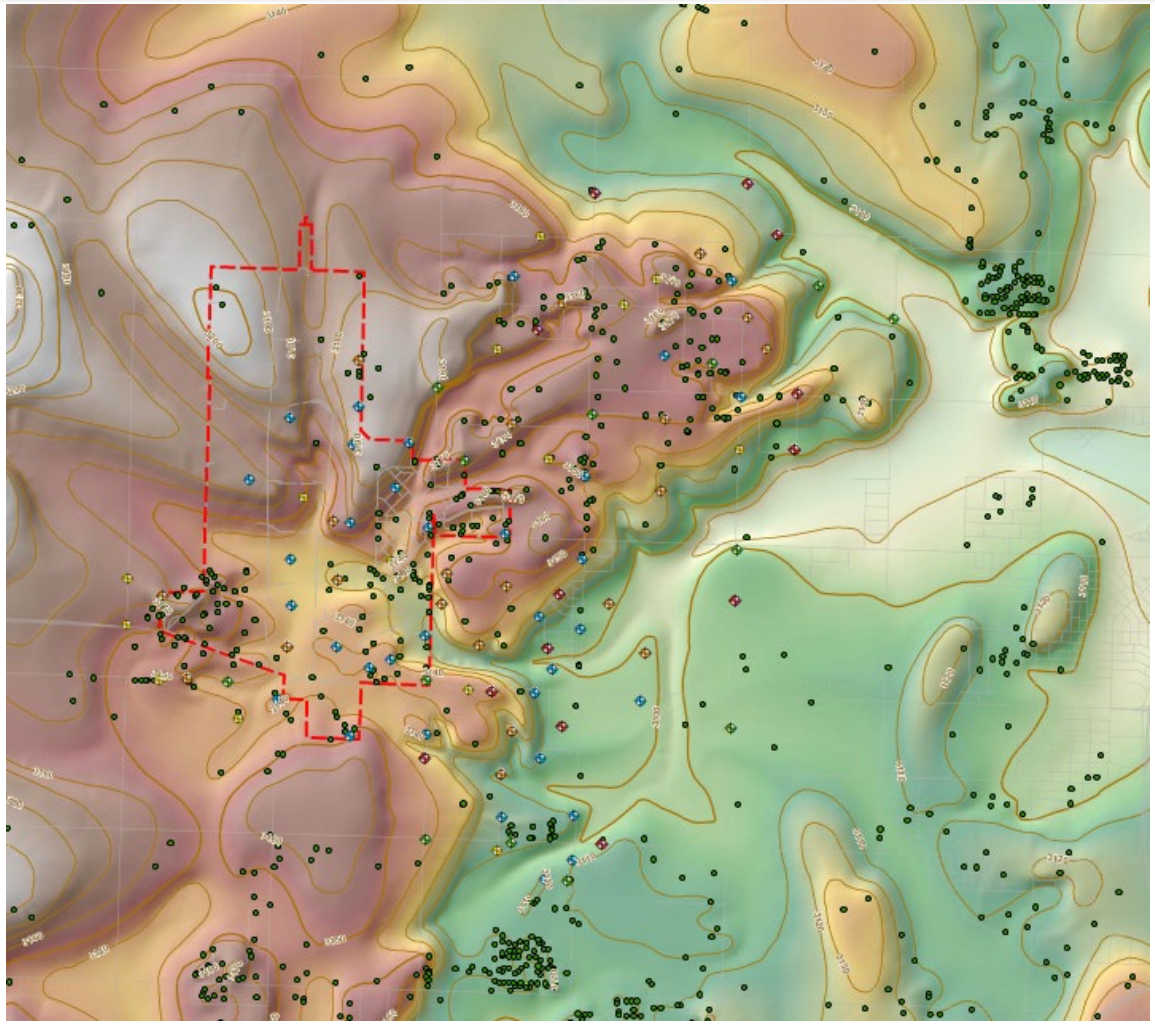
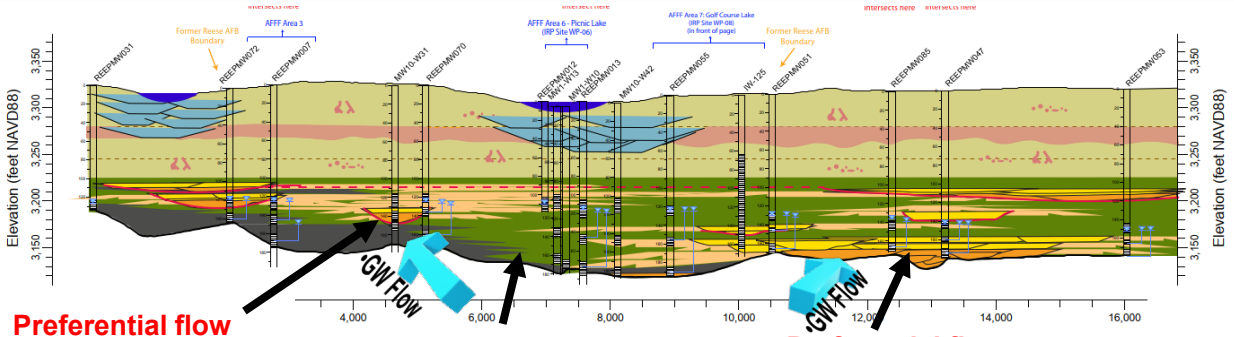
Top of Confining Unit Map

- **Statistics:**
  - **Total Points Evaluated: 3,193**
  - **Total Points Used: 2,023**



Geologic/Hydrologic CSM

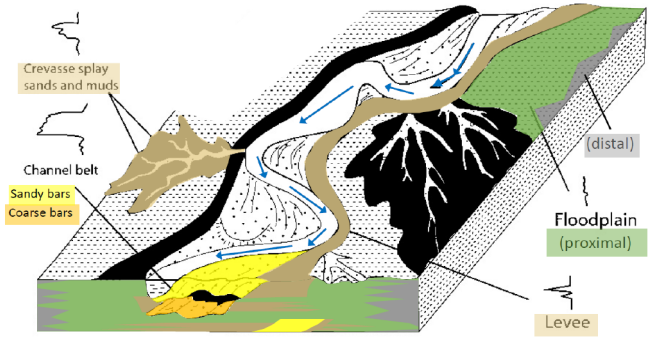
Robust CSM using environmental sequence stratigraphy



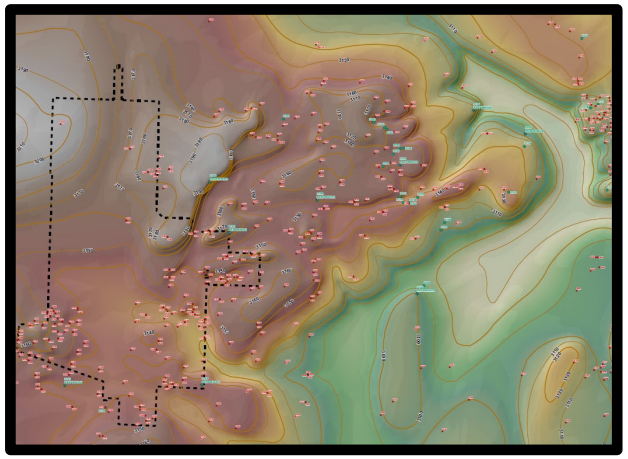
Preferential flow through coarse-grained channel deposits

Fine-grained floodplain deposits acting as barrier to GW flow

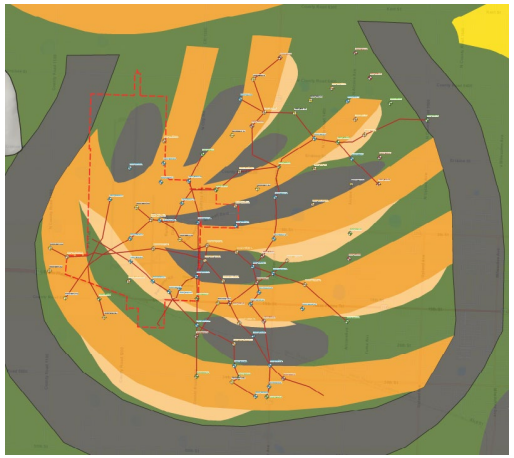
Preferential flow through coarse-grained channel deposits



Depositional Environment



Top of Bedrock (Duck Creek Formation) Map



3195 ft amsl

Facies Maps

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Highlights of Investigation – Data Collection

- **Samples Collected for PFAS Analysis:**
  - **Soil: 1336**
  - **Groundwater: 749**
  - **Surface water: 49**
  - **Sediment: 105**
  - **Fish: 19**
  - **Vegetables/Produce: 77**
  - **Benthic macroinvertebrates: 6**
  - **Plants: 20**
  - **Industrial Drain Line solids: 8**
  - **Industrial Drain Line waters: 8**
  - **Porewater lysimeter samples: 7**
  - **Concrete: 10**

Groundwater Sampling

Vegetable sample

Highlights of Investigation

- Downhole Geophysics
- Sonic Drilling
- Slug tests
- 3-Month time series water level evaluation
- Biological field survey
- Lysimeter sampling
- CSM Iterative Updates

Sonic Drill Rig

Texas Horned Lizard

Downhole Geophysics

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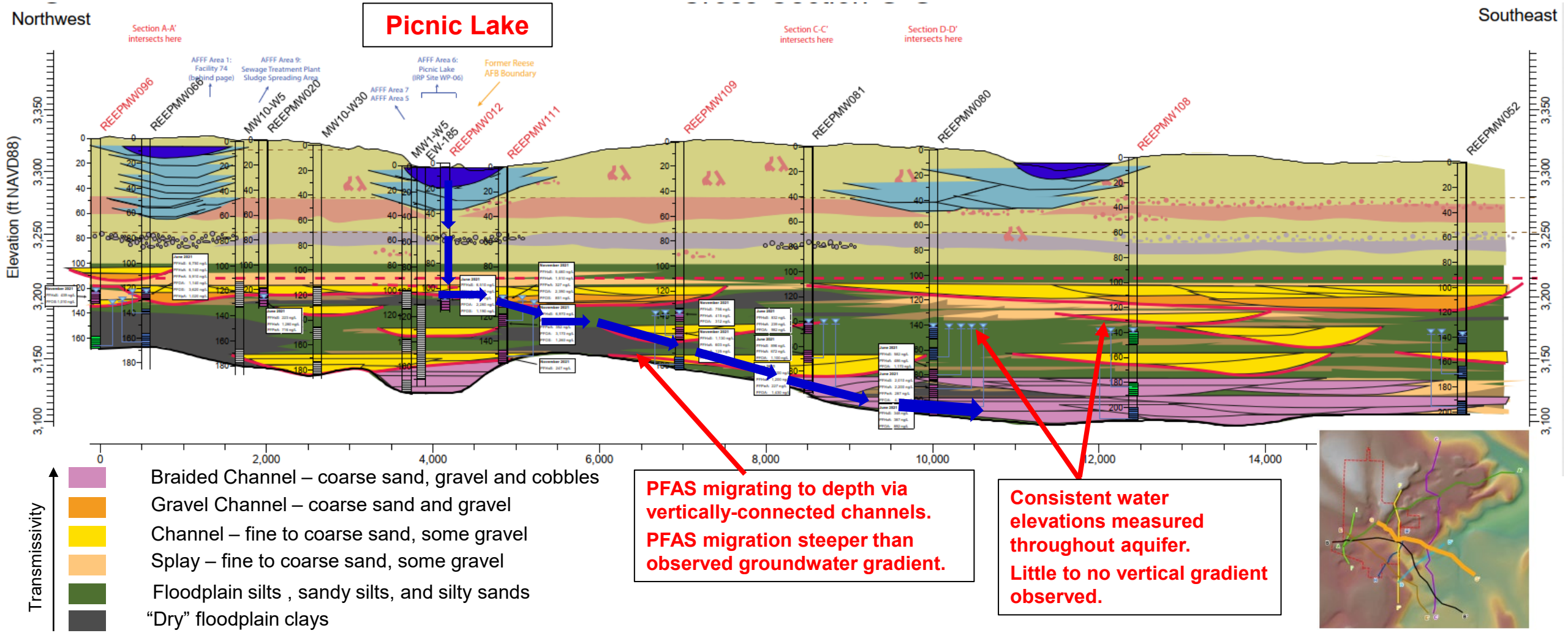
PFAS Migration Pathways Based on CSM



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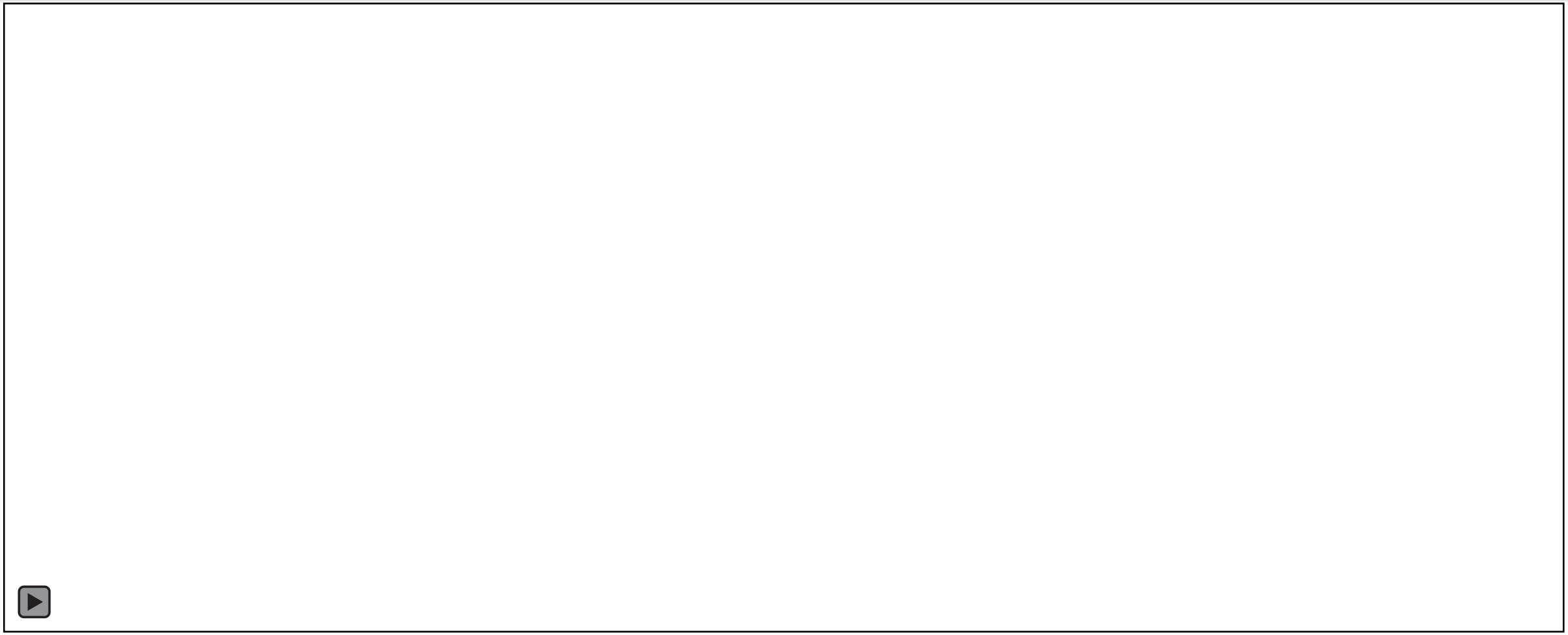
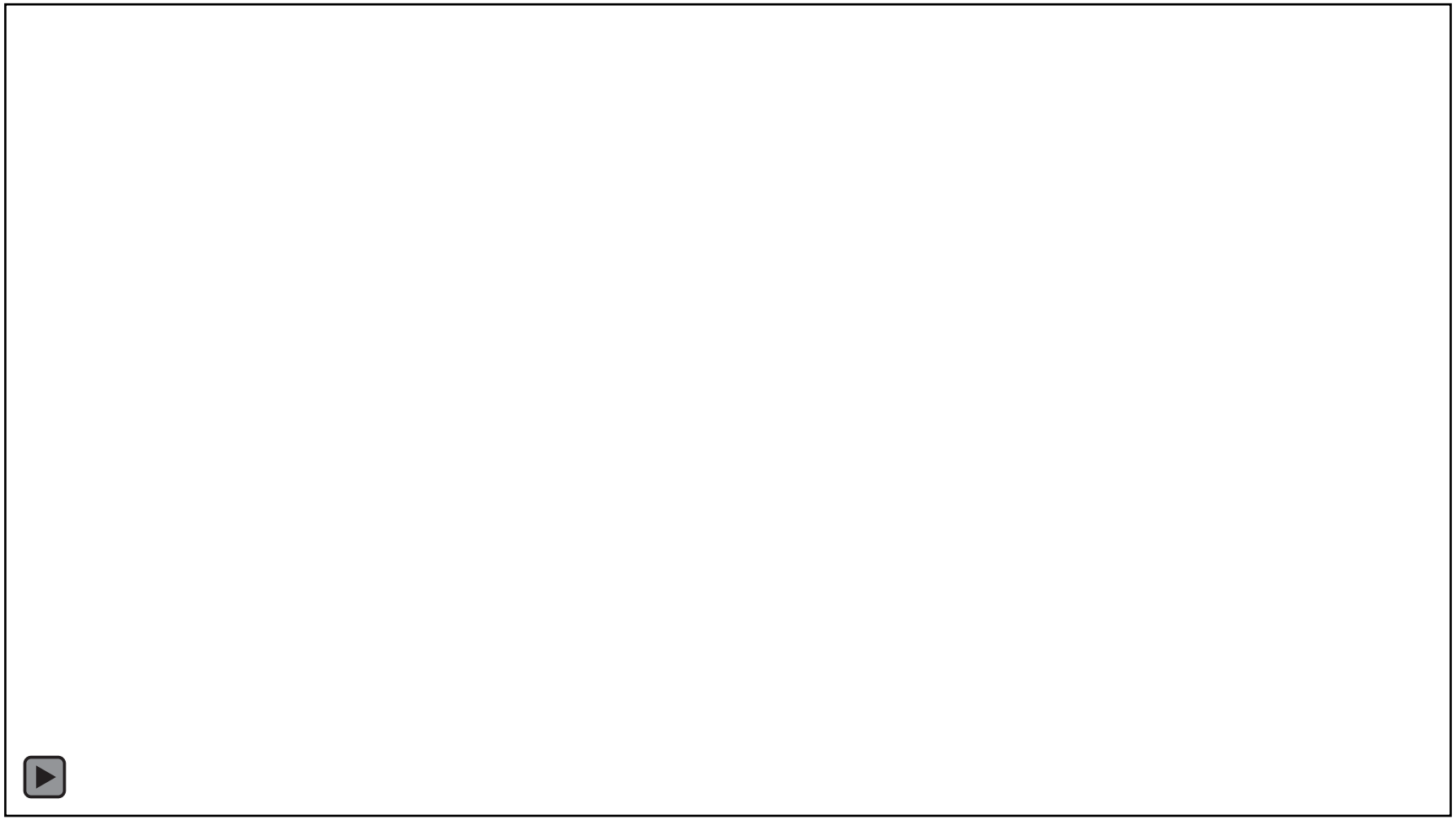
2-D GW Flow Simulation from ESS-Based Numerical Model



Southeastern Area Animation



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Conclusions

- Programming and planning – a substantive effort went into developing the scope and contracting to complete this process in three years
- Modeling (Lithological and Groundwater) using existing data
- Hydrogeological CSM using Environmental Sequence Stratigraphy to drive investigation path forward at each mobilization
- Comprehensive approach for Affected Property Assessment
  - Predictive modeling
  - High resolution logging – Sonic drilling
  - Downhole Geophysics, Slug tests, lysimeters
  - Ecological and HH Risk assessment
- Modeling and CSM will drive remediation design and operations

Questions

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