

Hydrogeologic Tour of SSFL

Stop 2 – Former Sodium Disposal Facility (FSDF)

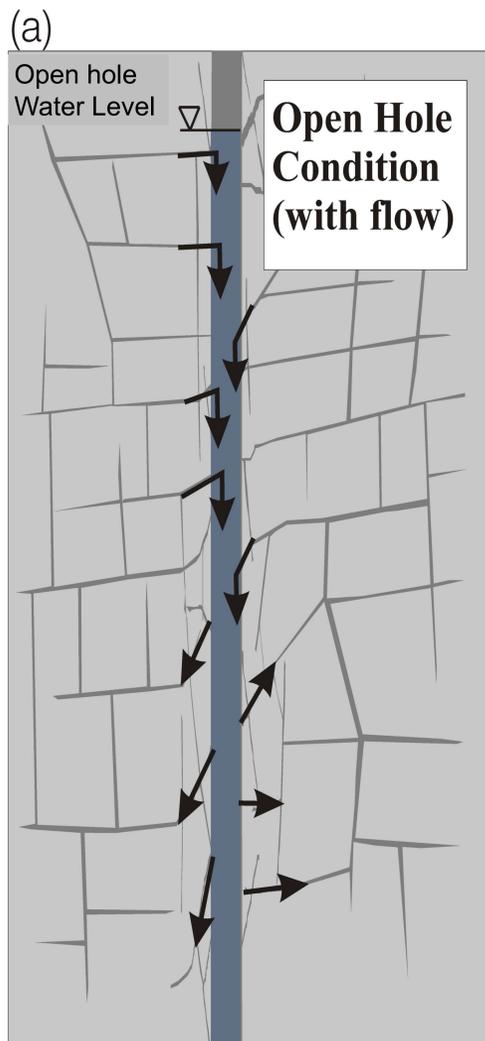
The second stop will include a review of the hydrogeologic and contaminant characterization work that has been conducted at the FSDF, which is at the far western extent of SSFL. The FSDF is located near the junction of the North Fault Zone and the Burro Flats Fault where the Santa Susana Formation abuts the Chatsworth Formation. Runkle Canyon is located off-site to the west-northwest of FSDF. At this stop, the Groundwater Advisory Panel will point out additional characterization technologies that were used at FSDF and other areas of SSFL and explain the insights gained regarding the understanding of contaminant transport and fate.

Flute Liners: Sealing Boreholes and Transmissivity Profiling

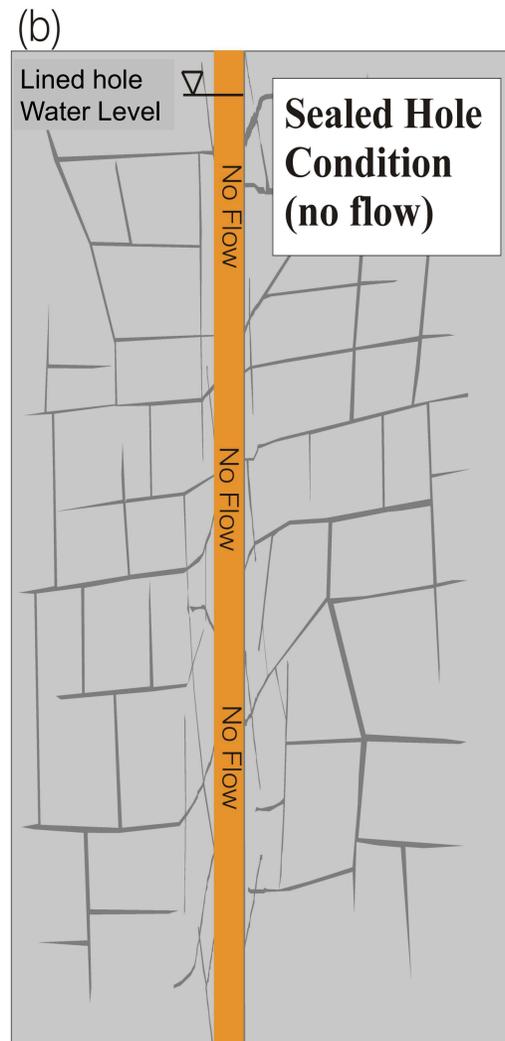
Carl Keller, Beth Parker, John Cherry
School of Engineering, University of Guelph, Guelph, Ontario Canada

Boreholes are Lined to Prevent Cross Connection

All open boreholes in fractured rock disrupt the natural flow system by connecting fracture sets that would otherwise be unconnected (a). This creates a borehole flow system in which water flows from higher to lower head within the open borehole. The installation of an impervious flexible liner soon after the borehole drilling is completed eliminates cross-connection in the borehole because the liner forms a seal along the entire length of the borehole (b).



Water flows into the hole from some fractures and out from others. This cross connection in the open hole disrupts the groundwater flow system.



When the hole is sealed cross-connection is prevented and the natural flow in the rock fractures is re-established.



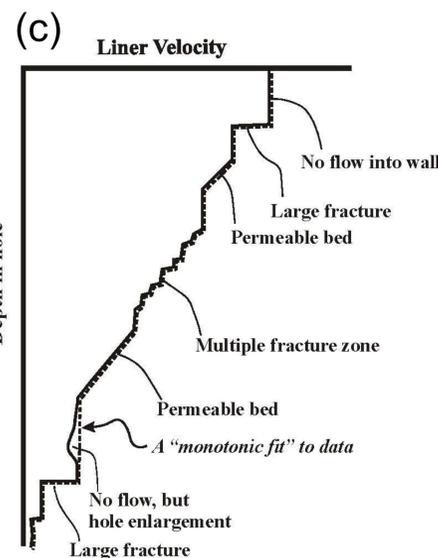
Carl Keller, Inventor



T profiling Machine

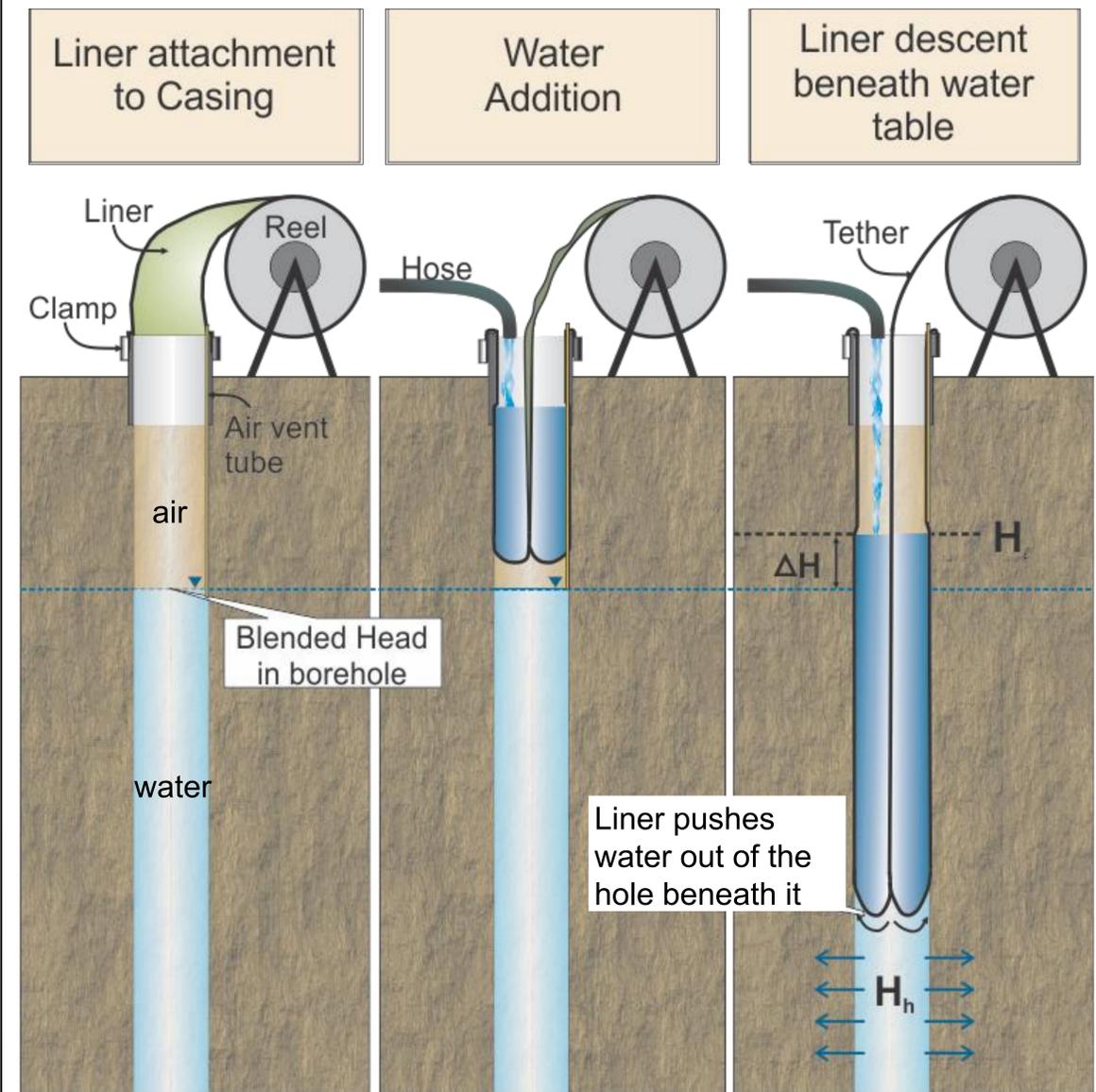


Liner attached to casing with water being added

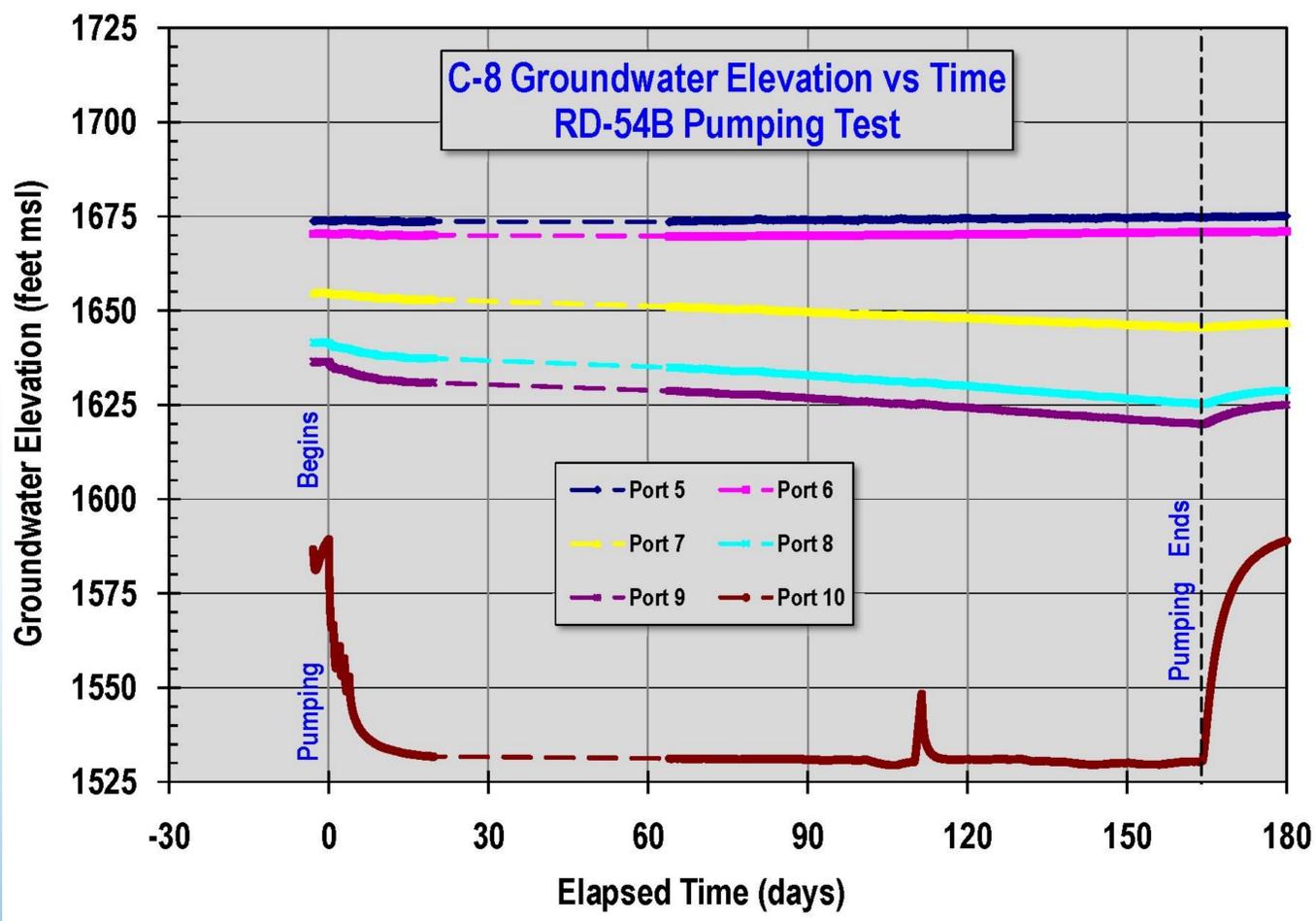
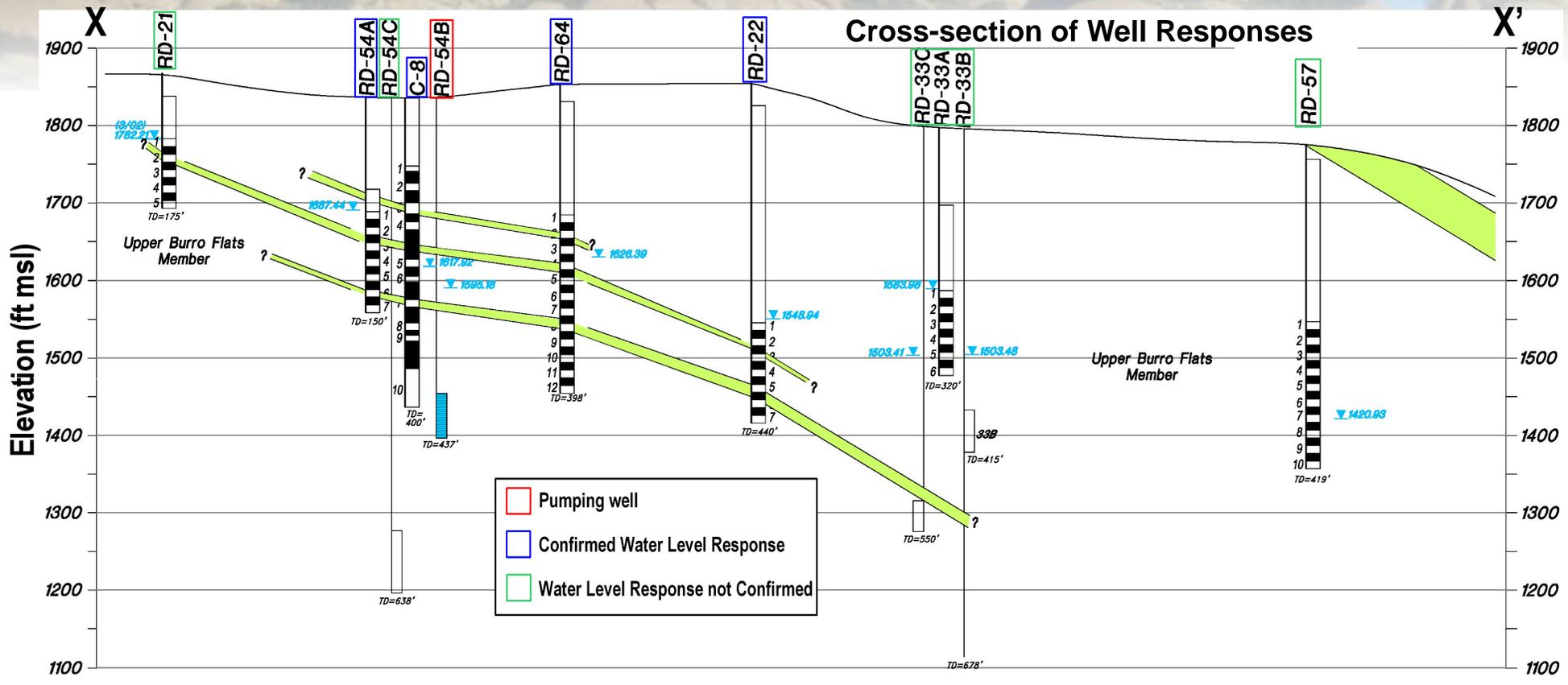
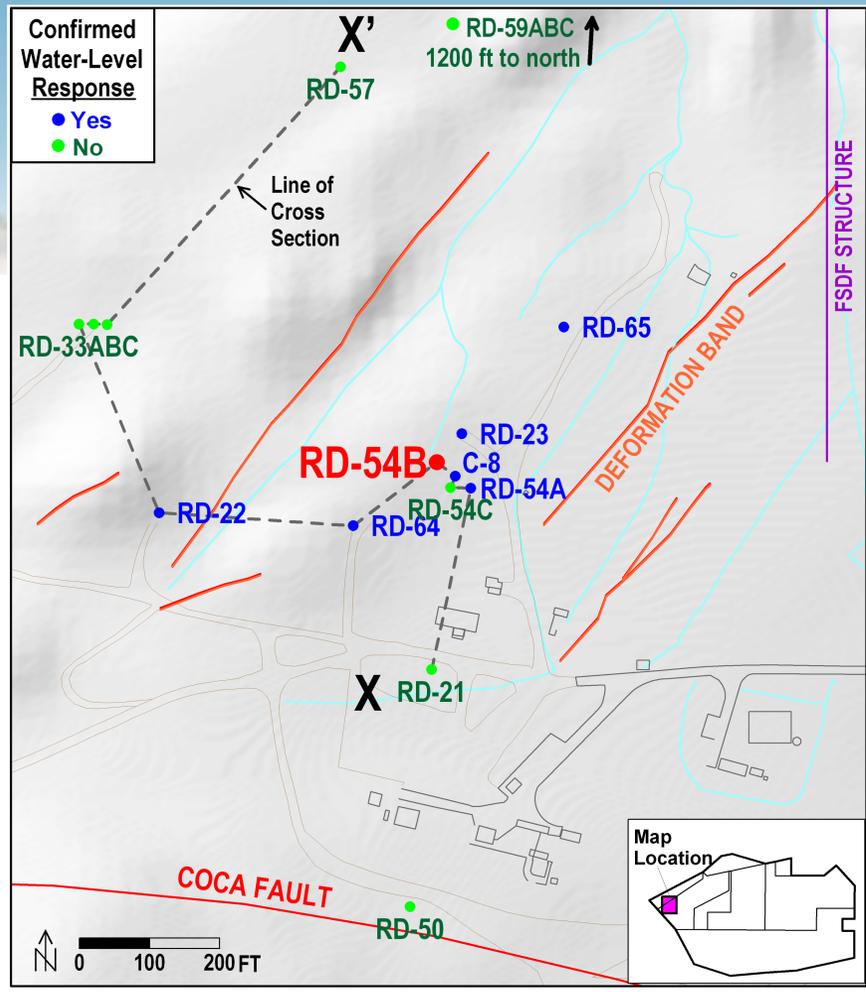


Flute Transmissivity Profiling

A borehole liner is used to produce a profile of the transmissivity (T) of the borehole. The liner is attached to the top of the casing and filled with water to cause the liner to go down the hole like a piston (to evert down the borehole), pushing the water in the open hole below it outwards into the transmissive fractures or other permeable zones of the formation. The descent rate of the liner decreases each time the bottom of the liner passes and seals a transmissive feature (c).



Plan View Map of Well Responses



RD-54B AQUIFER TEST

Well RD-54B was pumped at a constant rate of 173 gallons/day for 165 days from January-June 2004.

Water levels were monitored in 16 observation wells, of which there were confirmed responses in six.

The Moench (1984) solution for dual porosity fractured rock provides matrix and bulk hydraulic conductivity (K_m & K_b) estimates:

$$K_m = 3 \times 10^{-9} \text{ cm/sec}$$

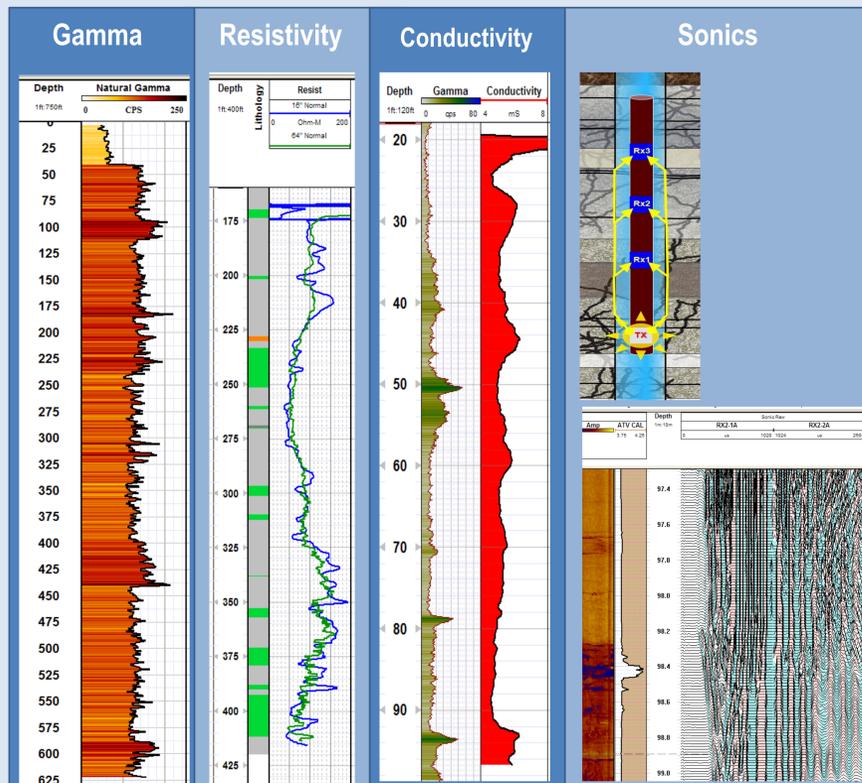
$$K_b = 6 \times 10^{-7} \text{ cm/sec}$$

The test confirmed the local occurrence of a hydraulically interconnected fracture network, although K_b is considerably lower than other areas of SSFL.

Different types of measurement devices (tools) are lowered down open boreholes to measure profiles (geophysical logs) of physical properties used to infer information about geology/minerology, borehole features and the water in the open hole.

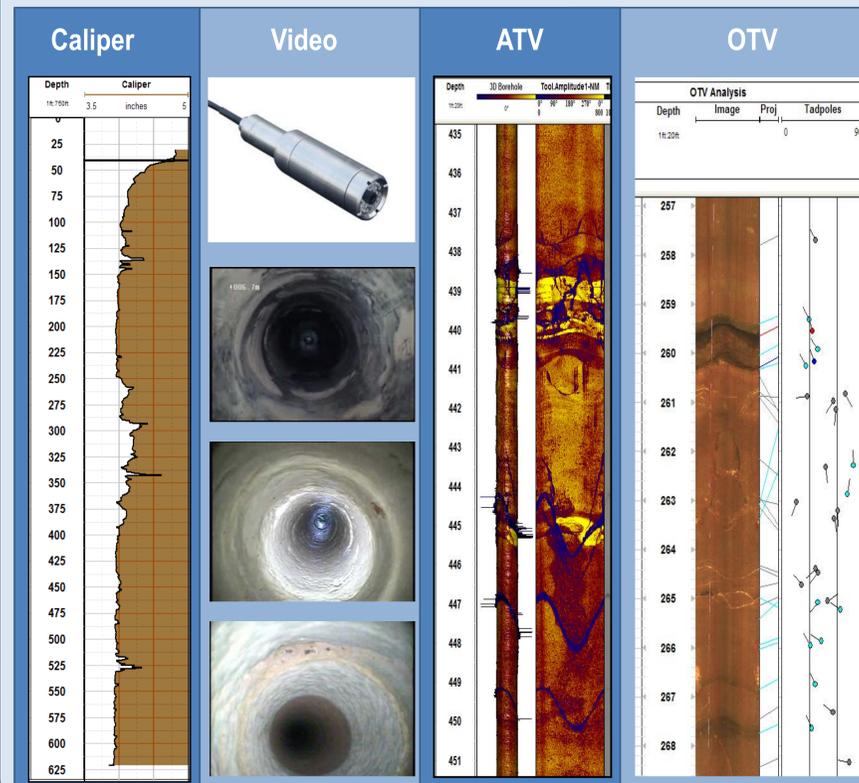
Information about geology from measurements of:

- natural radioactivity test
- resistivity (electrical current)
- electromagnetic field (conductivity)
- sonics (applied sound)



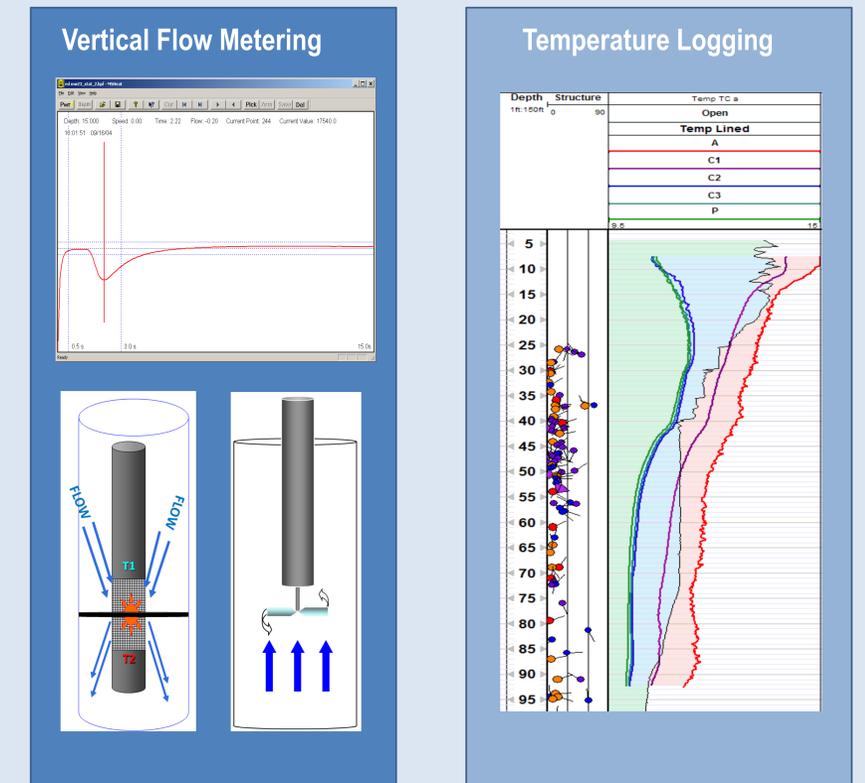
Information about borehole features (eg. fractures, vugs) from:

- caliper (hole diameter)
- video tele-viewer (TV)
- acoustic tele-viewer (ATV)
- optical tele-viewer (OTV)



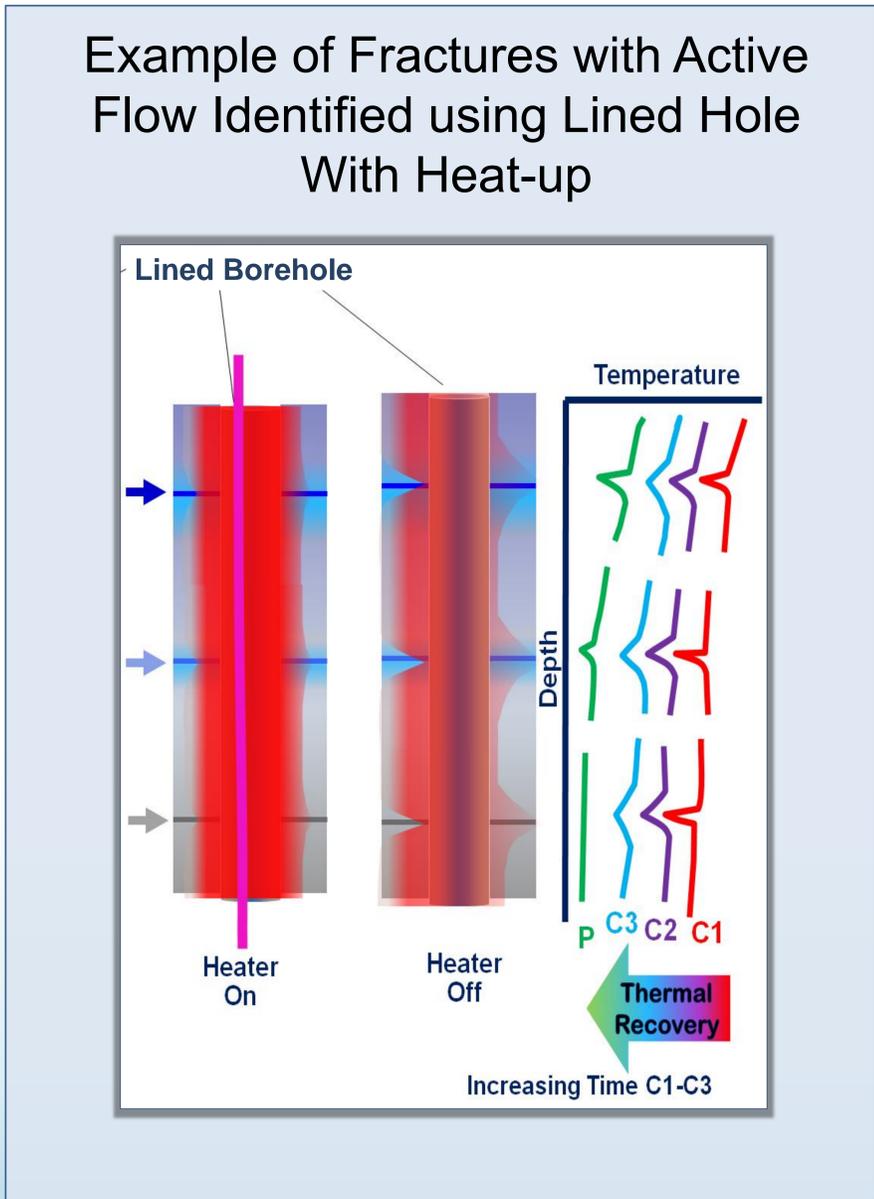
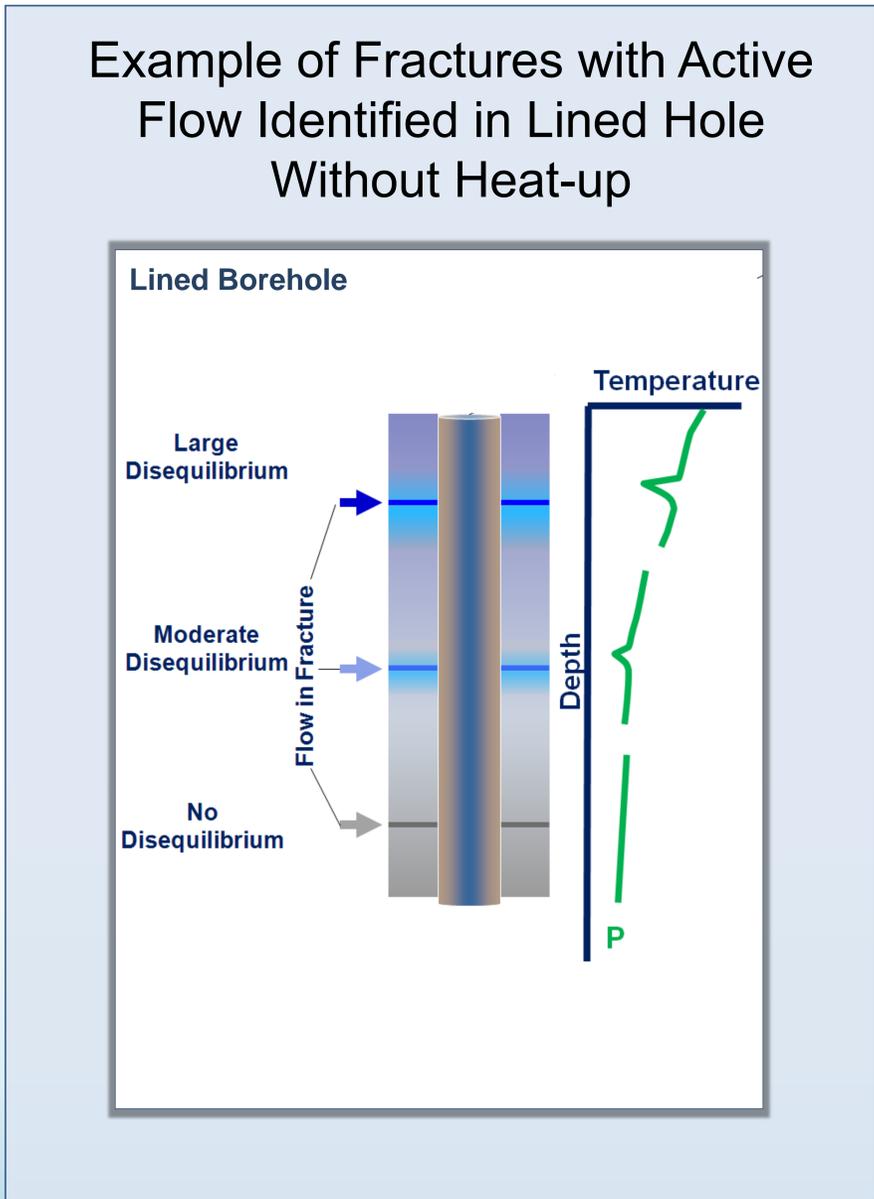
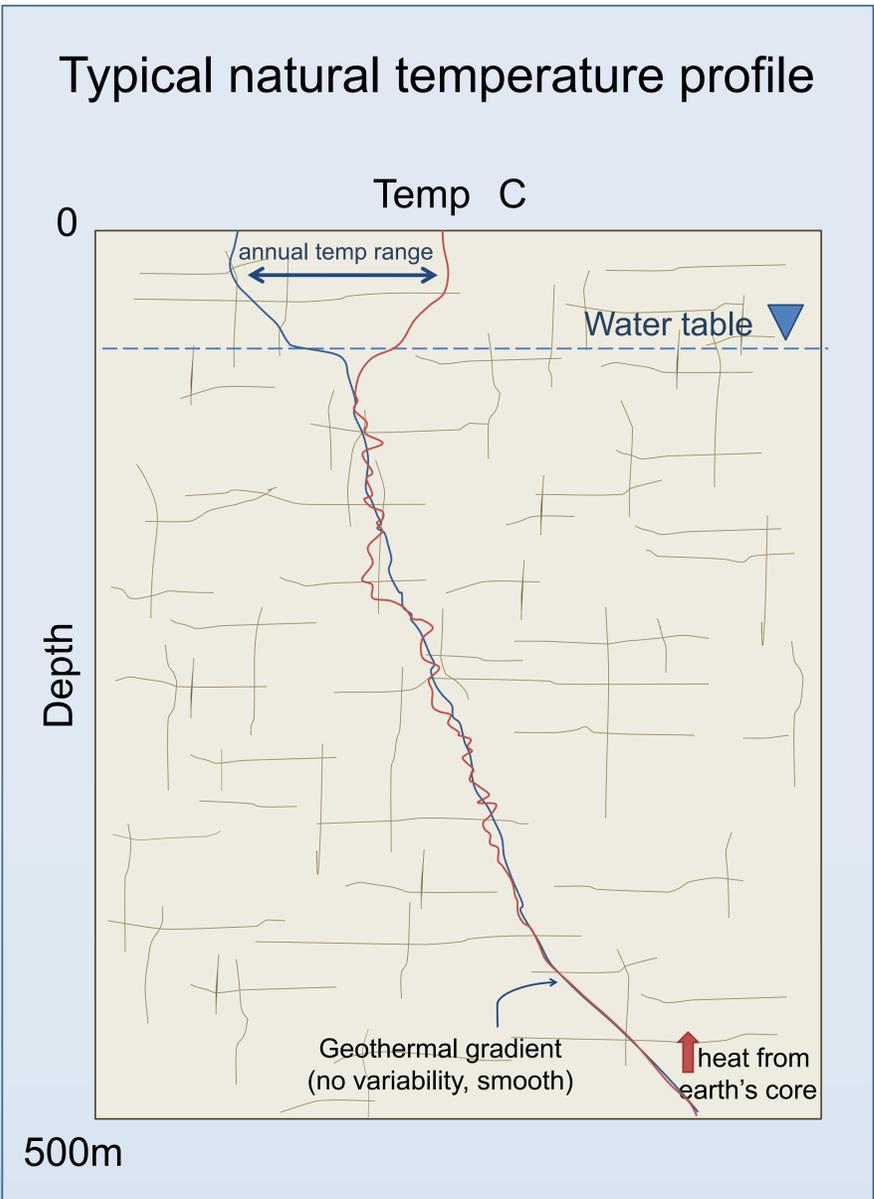
Information about the water in open holes:

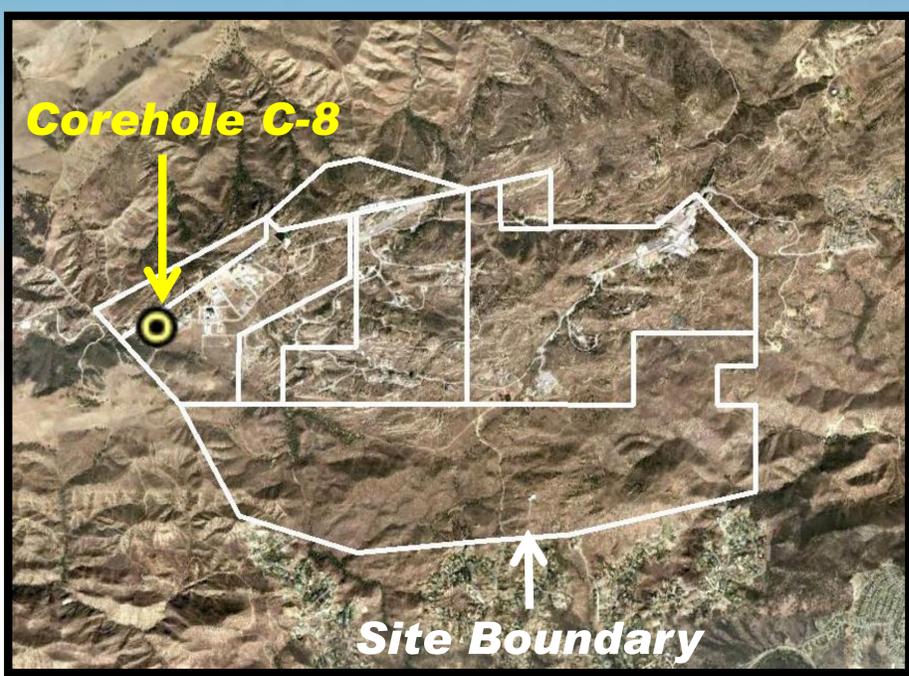
- Vertical flow metering
- Temperature
- Salinity



Temperature Profiling in Lined Holes to Identify Fractures with Active Groundwater Flow

High resolution temperature (T) profiles (~1/10,000 C) are measured in the static water columns in holes sealed using flexible impervious (FLUTE) liners. First, the T-profiles are measured under natural thermal conditions. Second, the water column is quickly heated and then multiple T-profiles are measured as the heat dissipates and temperature returns to natural thermal conditions.





Corehole C-8 Characterization DFN™ Data Sets

