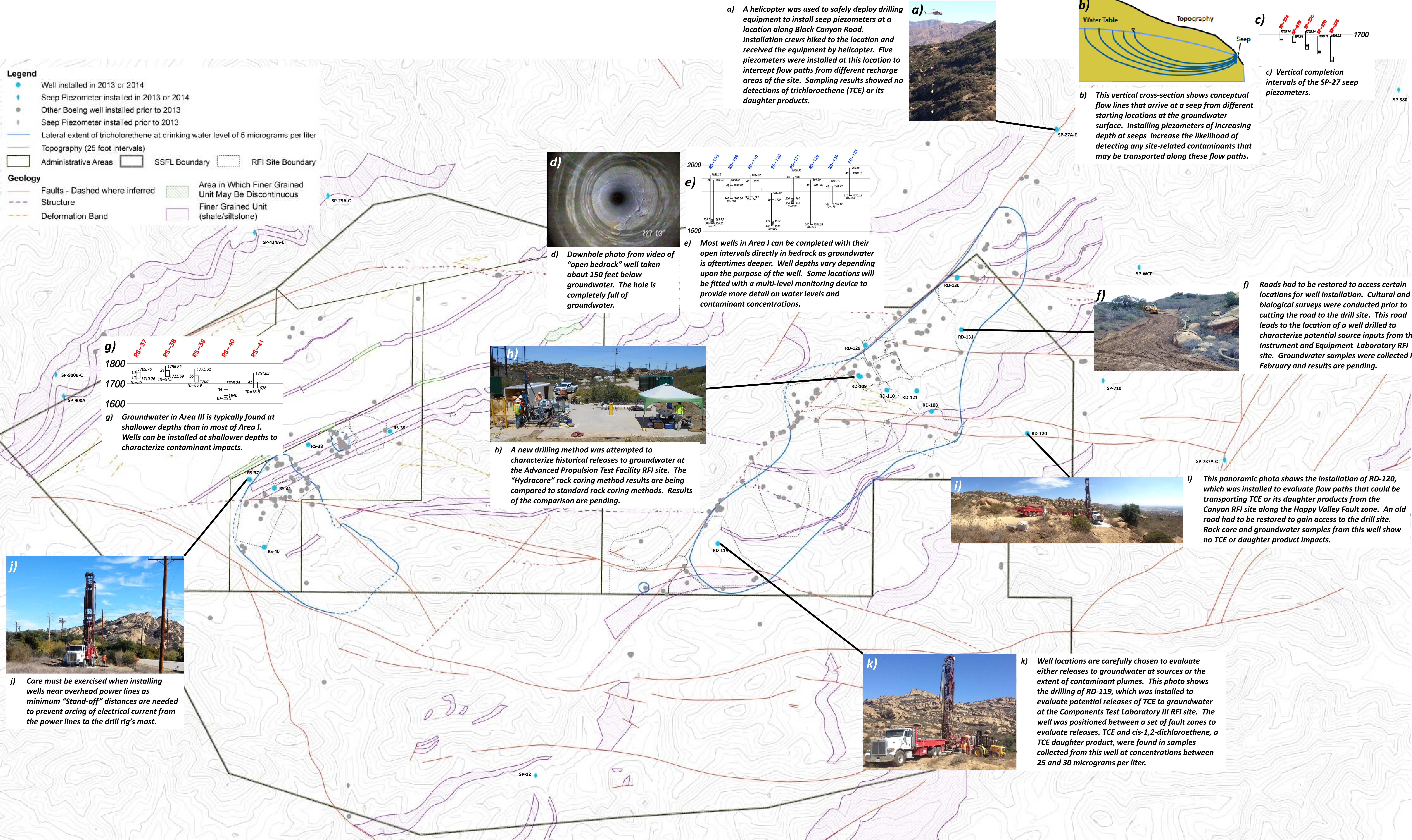


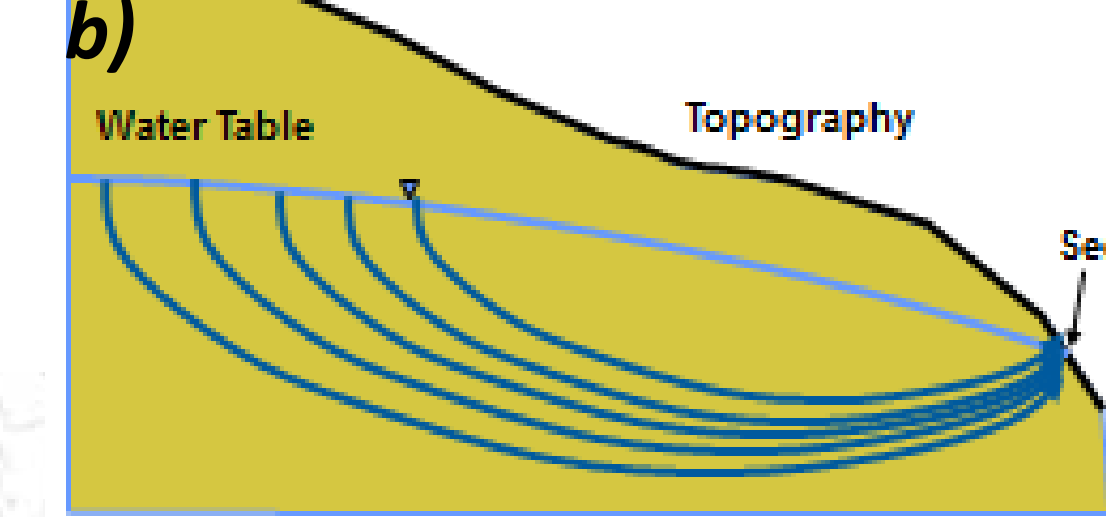
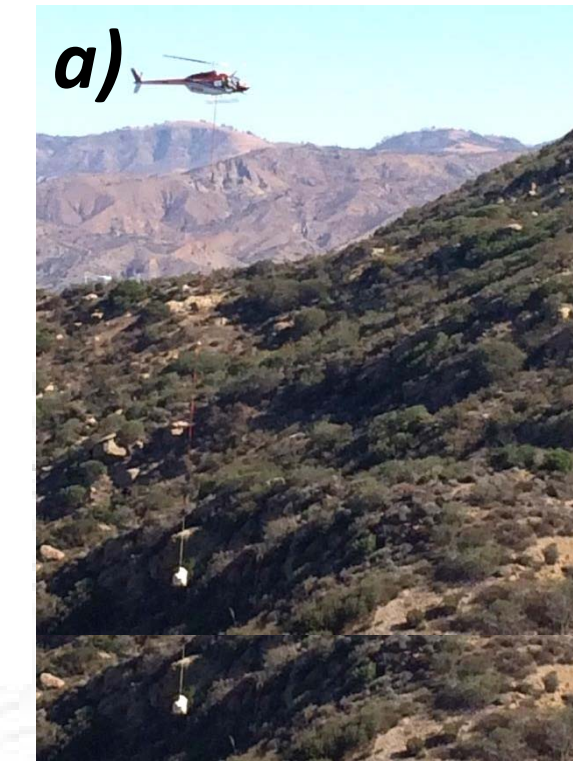
Characterizing Contaminant Sources and Groundwater Plumes: Installation of Additional Wells

Thirty-eight additional monitoring locations have been installed in 2013/14 to finalize groundwater characterization. Fourteen wells were installed using standard drilling techniques, while 24 seep piezometers have been installed using methods developed at SSFL by University of Guelph researchers and the Groundwater Advisory Panel.

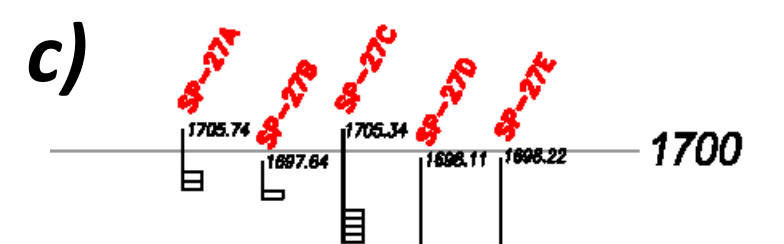
- Legend**
- Well installed in 2013 or 2014
 - Seep Piezometer installed in 2013 or 2014
 - Other Boeing well installed prior to 2013
 - Seep Piezometer installed prior to 2013
 - Lateral extent of trichloroethene at drinking water level of 5 micrograms per liter
 - Topography (25 foot intervals)
 - Administrative Areas □ SSFL Boundary □ RFI Site Boundary
- Geology**
- Faults - Dashed where inferred
 - Structure
 - Deformation Band
 - Area in Which Finer Grained Unit May Be Discontinuous
 - Finer Grained Unit (shale/siltstone)



a) A helicopter was used to safely deploy drilling equipment to install seep piezometers at a location along Black Canyon Road. Installation crews hiked to the location and received the equipment by helicopter. Five piezometers were installed at this location to intercept flow paths from different recharge areas of the site. Sampling results showed no detections of trichloroethene (TCE) or its daughter products.



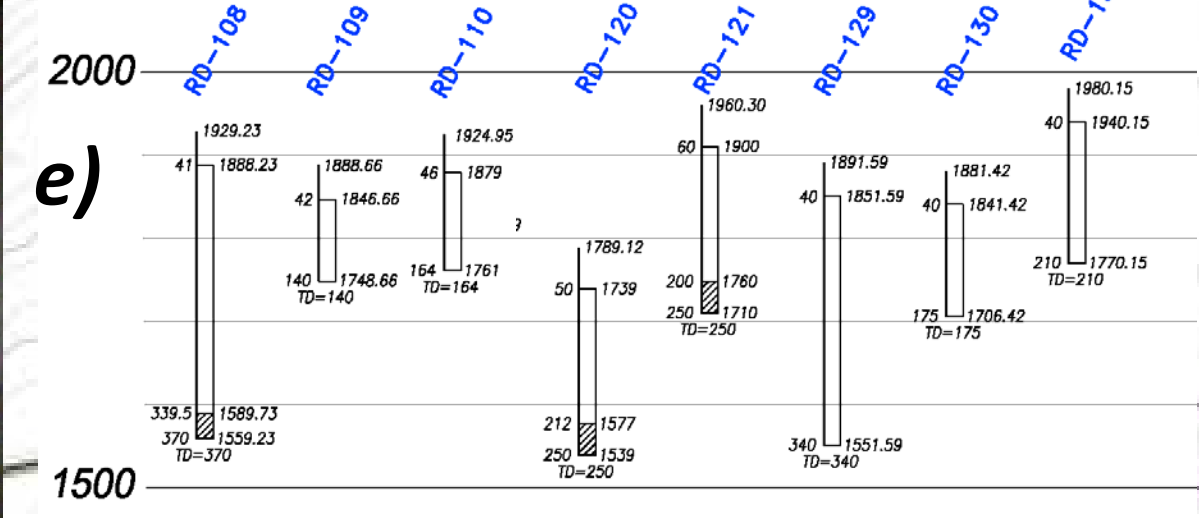
b) This vertical cross-section shows conceptual flow lines that arrive at a seep from different starting locations at the groundwater surface. Installing piezometers of increasing depth at seeps increase the likelihood of detecting any site-related contaminants that may be transported along these flow paths.



c) Vertical completion intervals of the SP-27 seep piezometers.



d) Downhole photo from video of "open bedrock" well taken about 150 feet below groundwater. The hole is completely full of groundwater.



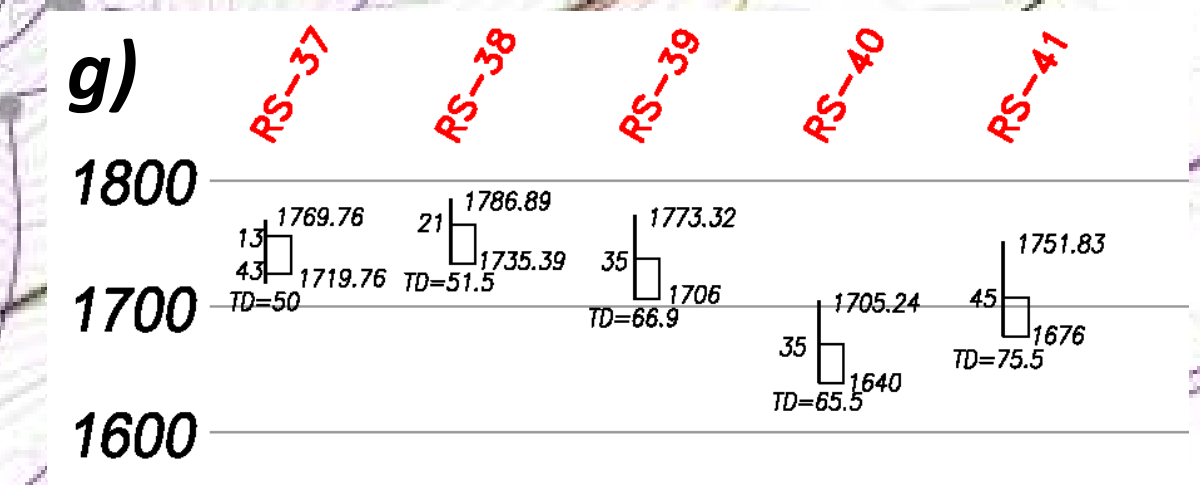
e) Most wells in Area I can be completed with their open intervals directly in bedrock as groundwater is oftentimes deeper. Well depths vary depending upon the purpose of the well. Some locations will be fitted with a multi-level monitoring device to provide more detail on water levels and contaminant concentrations.



h) A new drilling method was attempted to characterize historical releases to groundwater at the Advanced Propulsion Test Facility RFI site. The "Hydracore" rock coring method results are being compared to standard rock coring methods. Results of the comparison are pending.



f) Roads had to be restored to access certain locations for well installation. Cultural and biological surveys were conducted prior to cutting the road to the drill site. This road leads to the location of a well drilled to characterize potential source inputs from the Instrument and Equipment Laboratory RFI site. Groundwater samples were collected in February and results are pending.



g) Groundwater in Area III is typically found at shallower depths than in most of Area I. Wells can be installed at shallower depths to characterize contaminant impacts.



j) Care must be exercised when installing wells near overhead power lines as minimum "Stand-off" distances are needed to prevent arcing of electrical current from the power lines to the drill rig's mast.



i) This panoramic photo shows the installation of RD-120, which was installed to evaluate flow paths that could be transporting TCE or its daughter products from the Canyon RFI site along the Happy Valley Fault zone. An old road had to be restored to gain access to the drill site. Rock core and groundwater samples from this well show no TCE or daughter product impacts.



k) Well locations are carefully chosen to evaluate either releases to groundwater at sources or the extent of contaminant plumes. This photo shows the drilling of RD-119, which was installed to evaluate potential releases of TCE to groundwater at the Components Test Laboratory III RFI site. The well was positioned between a set of fault zones to evaluate releases. TCE and cis-1,2-dichloroethene, a TCE daughter product, were found in samples collected from this well at concentrations between 25 and 30 micrograms per liter.