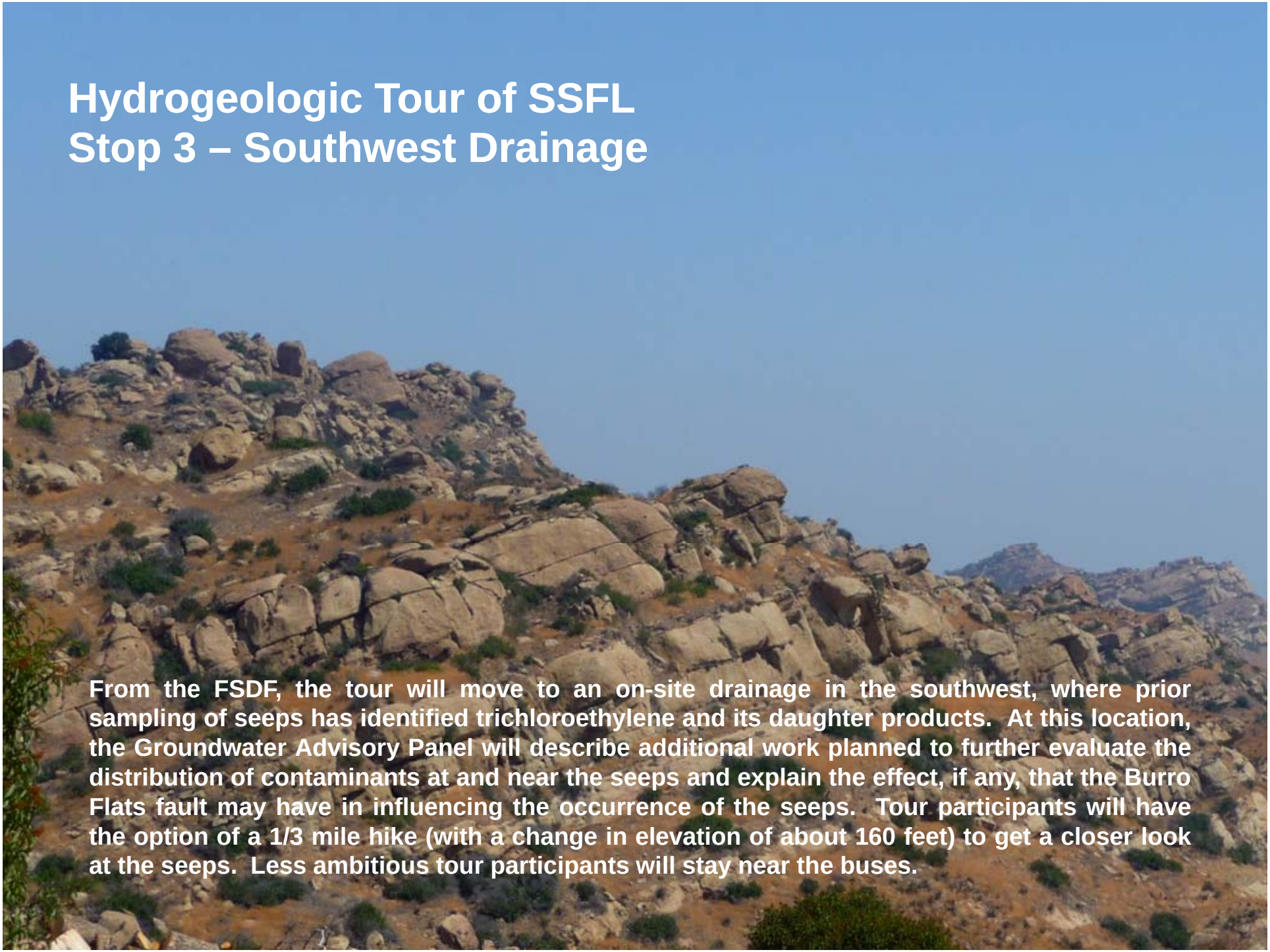
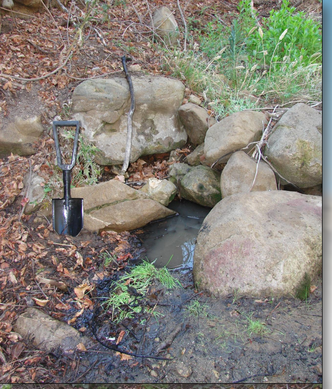
Hydrogeologic Tour of SSFL
Stop 3 – Southwest Drainage

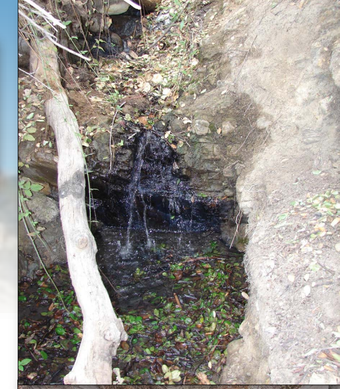


From the FSDF, the tour will move to an on-site drainage in the southwest, where prior sampling of seeps has identified trichloroethylene and its daughter products. At this location, the Groundwater Advisory Panel will describe additional work planned to further evaluate the distribution of contaminants at and near the seeps and explain the effect, if any, that the Burro Flats fault may have in influencing the occurrence of the seeps. Tour participants will have the option of a 1/3 mile hike (with a change in elevation of about 160 feet) to get a closer look at the seeps. Less ambitious tour participants will stay near the buses.

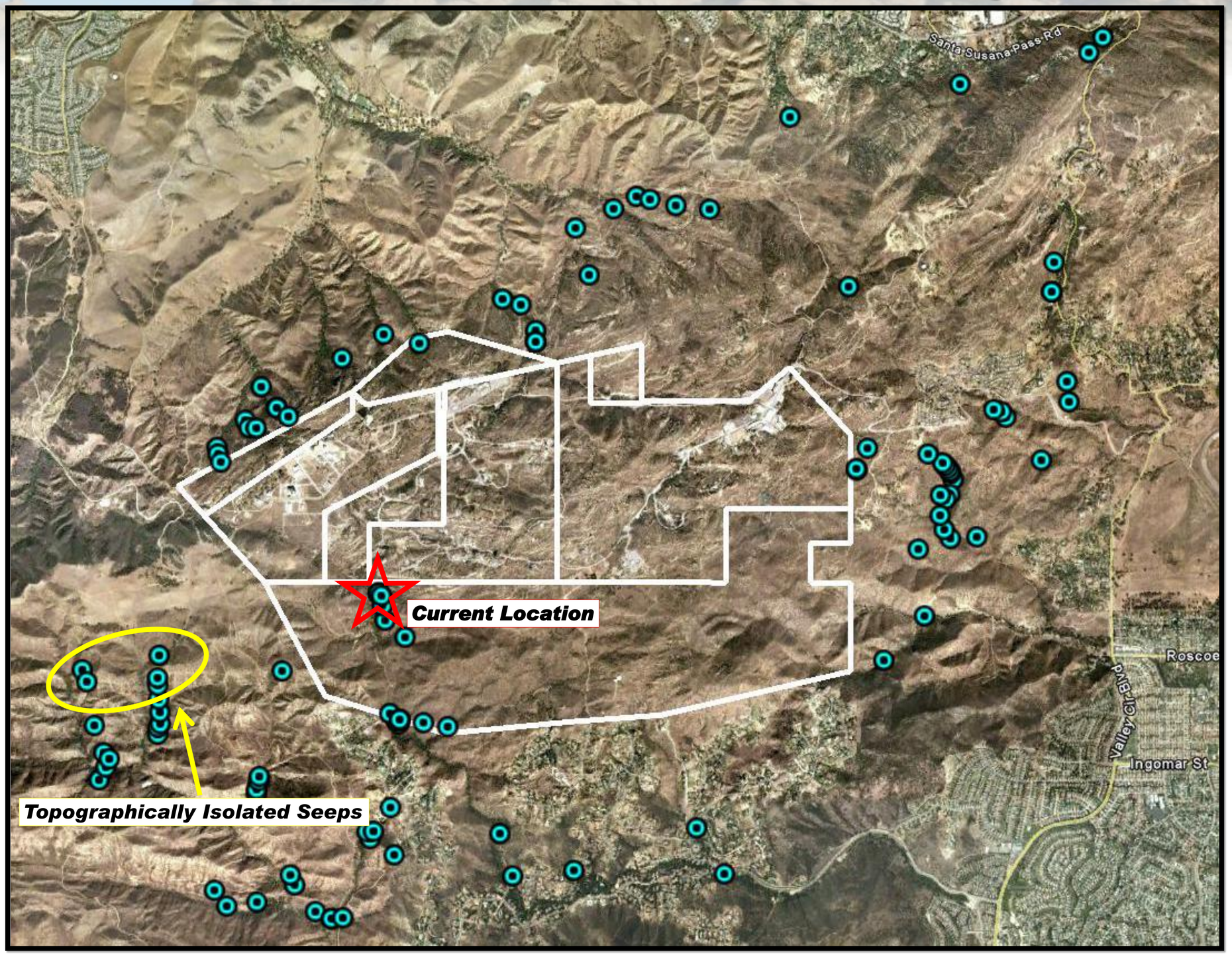
Seeps Surrounding the Santa Susana Field Laboratory

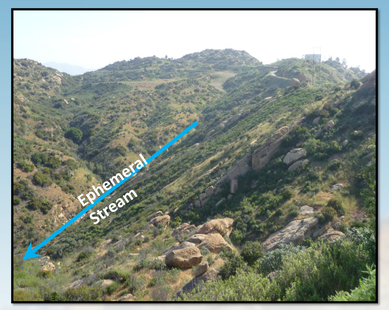










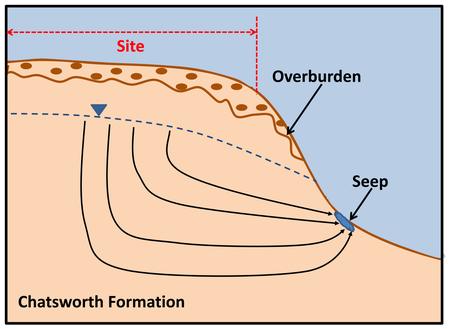
Rainfall from the SSFL recharges groundwater flowing to many seeps and springs and phreatophyte clusters in the ephemeral drainages on the mountain slopes.

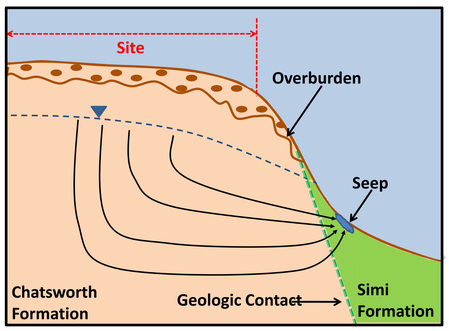
There are seven categories for how the groundwater emerges to surface.

Ross Wagner, Amanda Pierce, Beth Parker, and John Cherry

The sketches of seeps show the groundwater table and the trend (flow path) for groundwater flow that carries rainfall from the mountain to the seep. The groundwater flow paths shown are feeding the seep after long periods of no rainfall. After rainfall, the seep is fed by more local temporary groundwater that disappears during the dry periods.

CATEGORY 1: SEEP EMERGES FROM BEDROCK

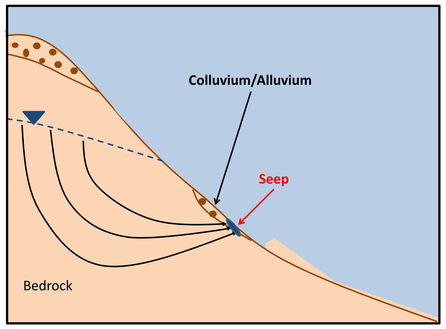




a) Seep emerges from bedrock of the Chatsworth Formation and;
b) Seep emerges from strata younger than the Chatsworth Formation.

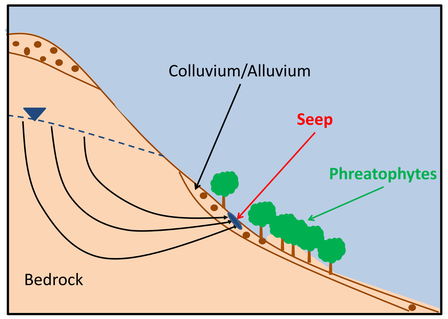
Category 1 includes seeps that emerge exclusively from bedrock. In some cases, seepage was noted emerging from bedrock and alluvium/colluvium in the immediate vicinity of bedrock. Samples from Category 1 seeps were collected directly from the bedrock seepage.

CATEGORY 2: SEEP EMERGES FROM ALLUVIUM/COLLUVIUM IN AN AREA WHERE ALLUVIUM/COLLUVIUM IS LESS THAN 0.3m THICK AND IS LATERALLY DISCONTINUOUS



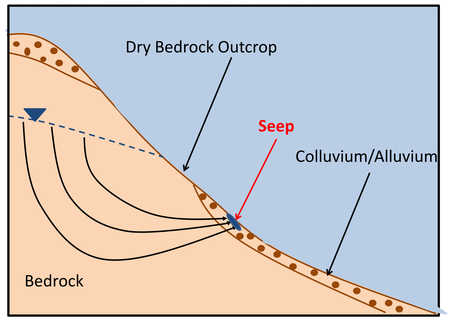
Category 2 includes seeps that are commonly found in a creek bed that contains thin and discontinuous deposits of alluvium/colluvium. Field Observations of seeps in this category suggest the spring water emerges from bedrock very near the location at which it discharges into the alluvium/colluvium at the surface.

CATEGORY 3: SEEP EMERGES FROM ALLUVIUM/COLLUVIUM LOCATION OF SEEP IS NEAR THE UPSTREAM END OF PHREATOPHYTES



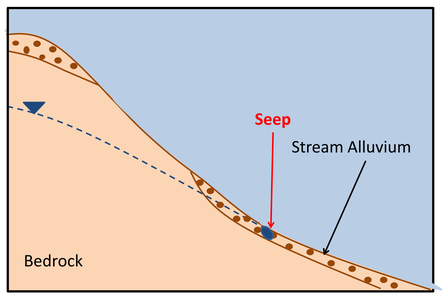
Category 3 includes seeps that emerge from shallow sediment that typically extends a considerable distance upstream of the seep location. A phreatophyte is a plant that utilizes groundwater by extending its roots across the water table.

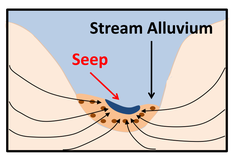
CATEGORY 4: SEEP EMERGES IN ALLUVIUM/COLLUVIUM AT A LOCATION THAT IS LESS THAN 7m DOWNSTREAM OR DOWNSLOPE OF A DRY BEDROCK OUTCROP



Category 4 includes seeps that emerge from alluvium/colluvium. However, dry bedrock is present upstream of this location suggesting that groundwater discharging at this location has flowed a limited distance in the alluvium/colluvium material.

CATEGORY 5: SEEP EMERGES IN LATERALLY EXTENSIVE STREAM ALLUVIUM OR COLLUVIUM

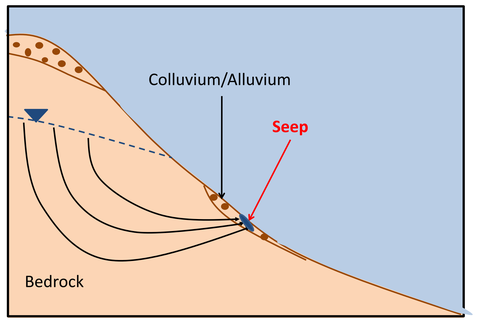




Category 5 includes seeps that emerge in stream beds where the stream sediments are continuous along the axis of the canyon. Due to the continuity of the stream sediments it is most likely that seeps emerging at these locations may flow a significant distance through these sediments.

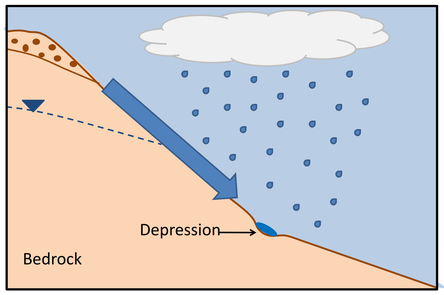
← Cross-Sectional View

CATEGORY 6: SEEP EMERGES IN COLLUVIUM/ALLUVIUM IN AN AREA WHERE COLLUVIUM/ALLUVIUM IS OF LIMITED LATERAL EXTENT



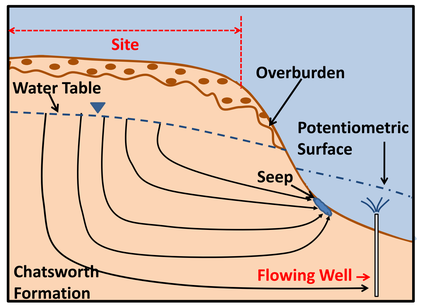
Category 6 seeps emerge in alluvium/colluvium in an area where the alluvium/colluvium is of limited lateral extent.

CATEGORY 7: WATER FOUND IN POTHOLES IN BEDROCK.



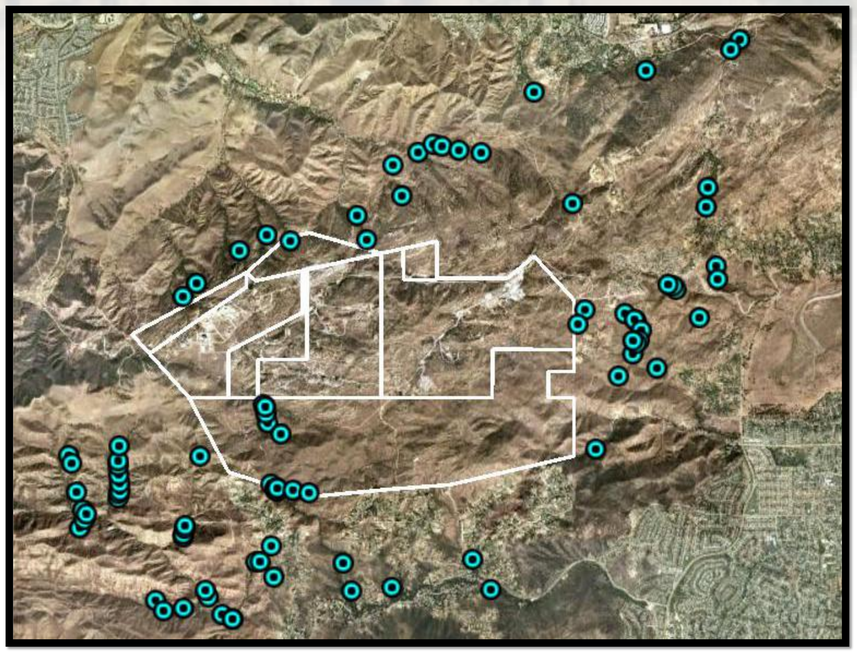
Category 7 seeps may or may not be locations where groundwater discharges. Based upon analytical results from these locations, these seeps are most likely locations where overland flow has collected in potholes in the bedrock.

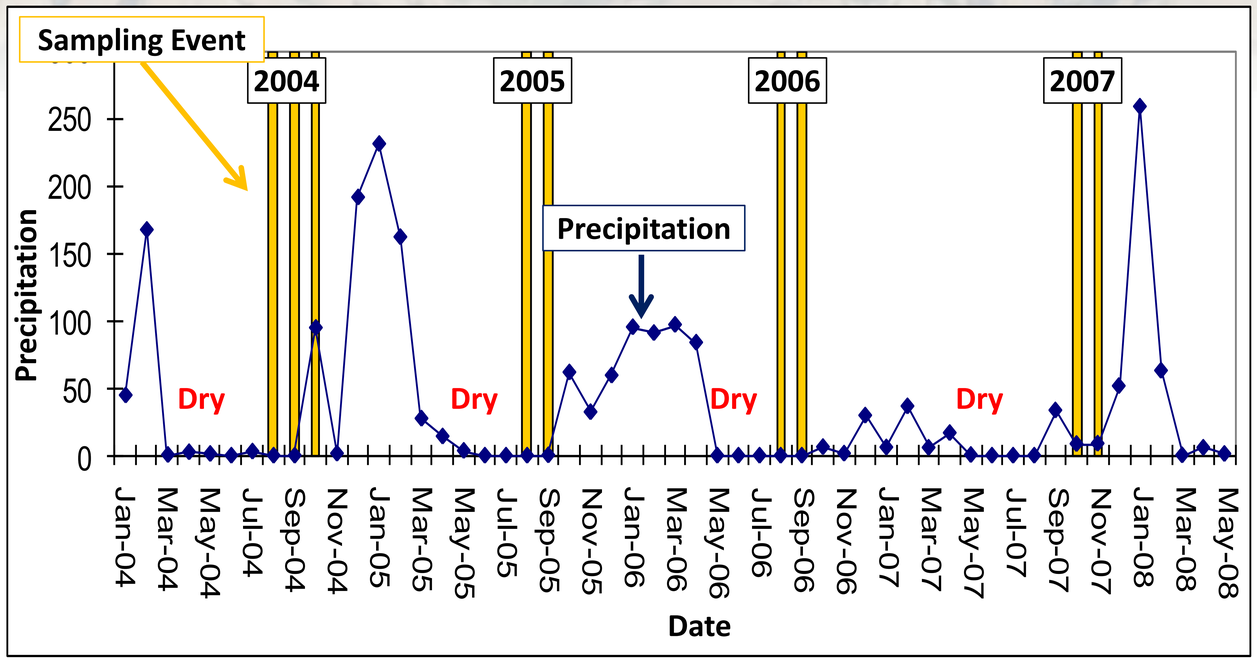
FLOWING OFF-SITE WELL



A number of off-site wells surrounding the SSFL are flowing wells. The hydraulic head at the bottom of these wells is above the top of flowing wells.

Hydrochemistry and Isotope Sampling of Seeps Surrounding SSFL: First Phase (2004 to 2007)

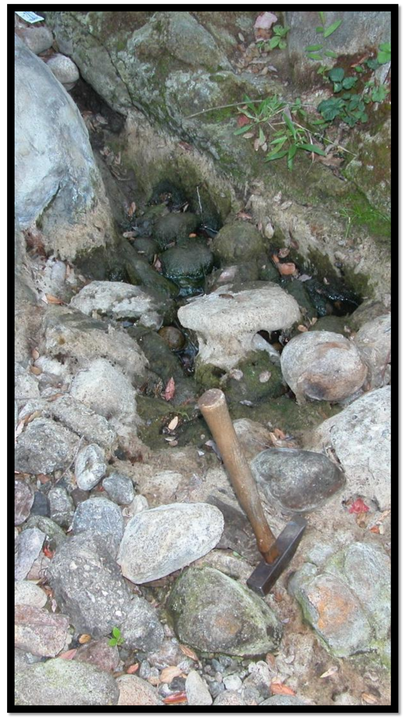




97 seeps were sampled for hydrochemical and isotopic constituents

Sampled from a dug hole;

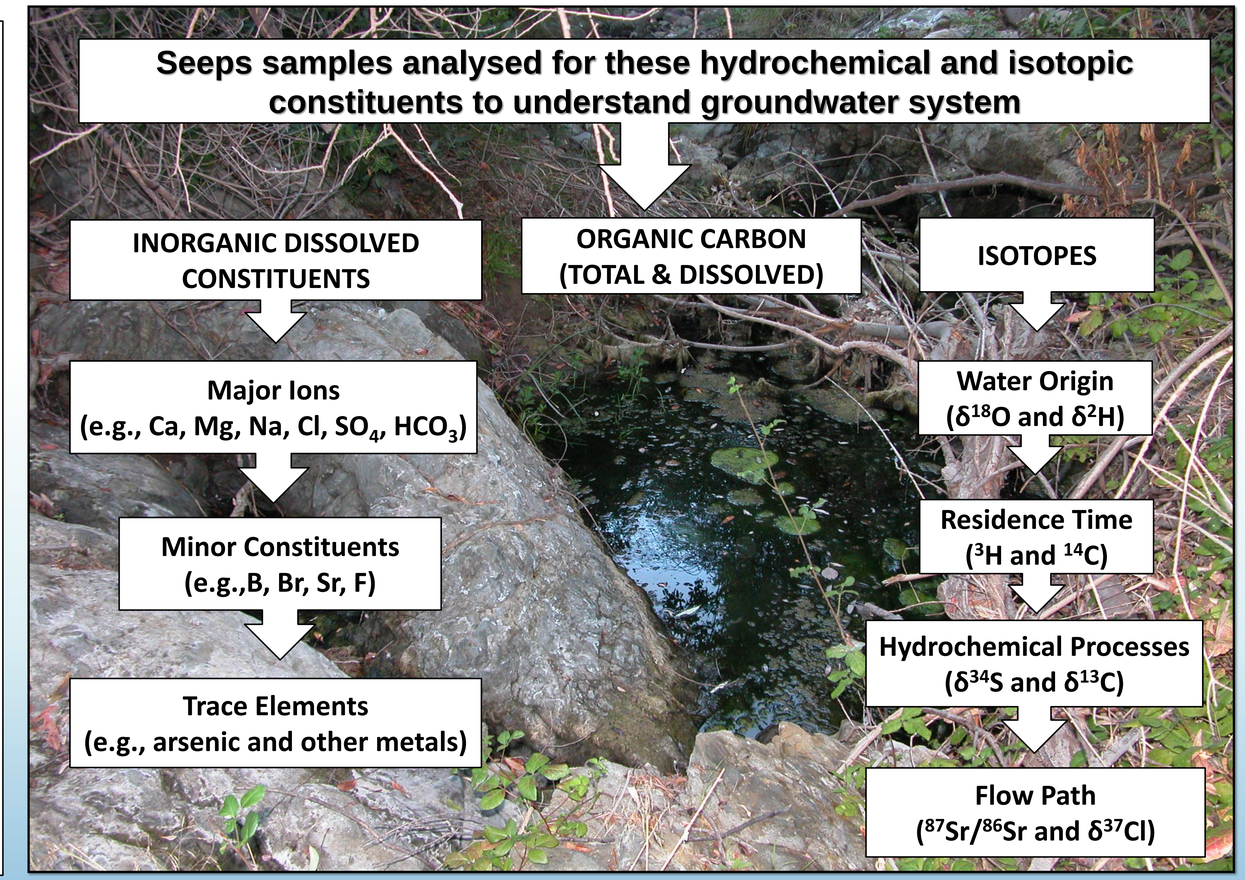
directly from the fracture;



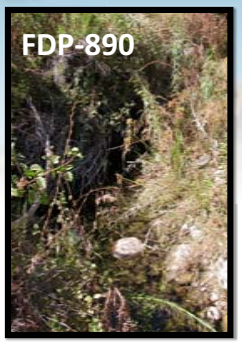
or from flowing water.

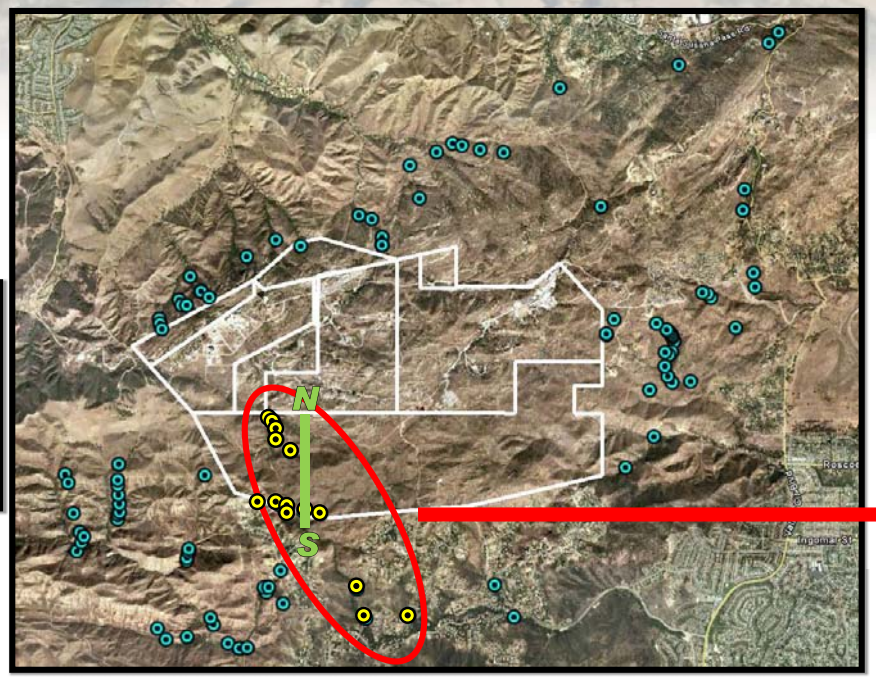
Groundwater samples obtained from seeps at points of discharge.

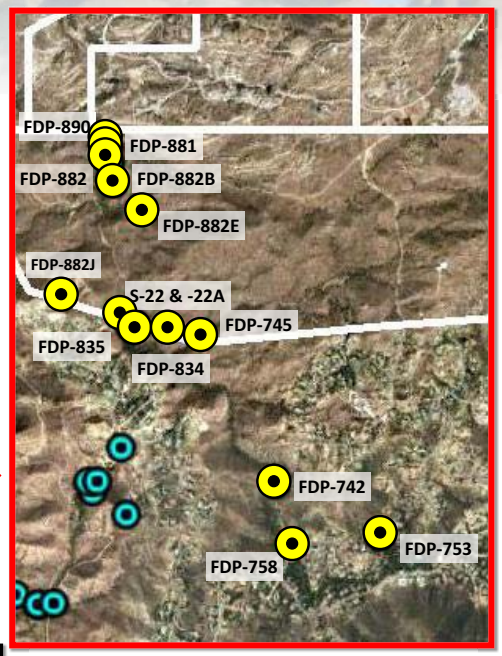
Groundwater samples obtained from seeps during dry periods.

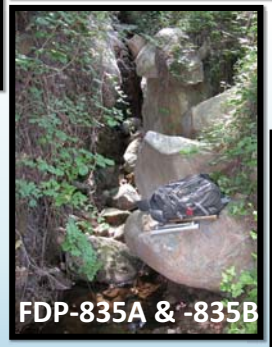


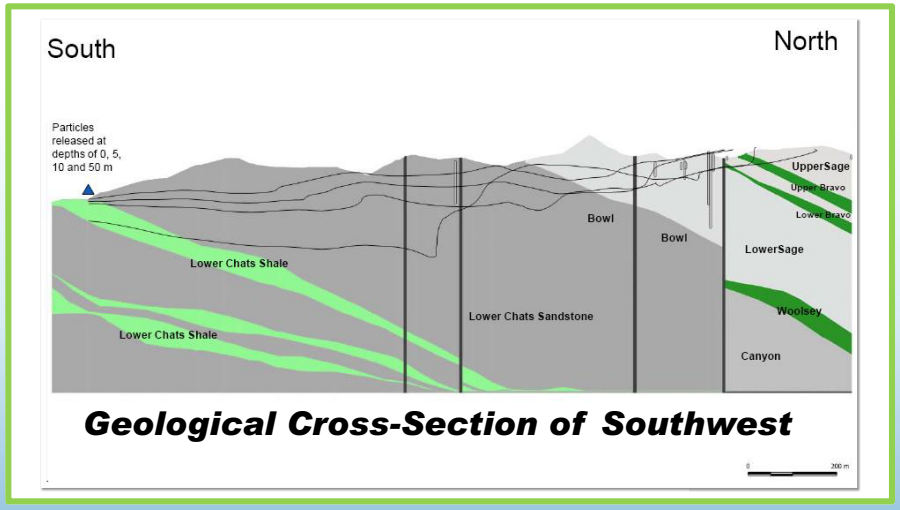
Seeps Located in Southwest SSFL and south of SSFL





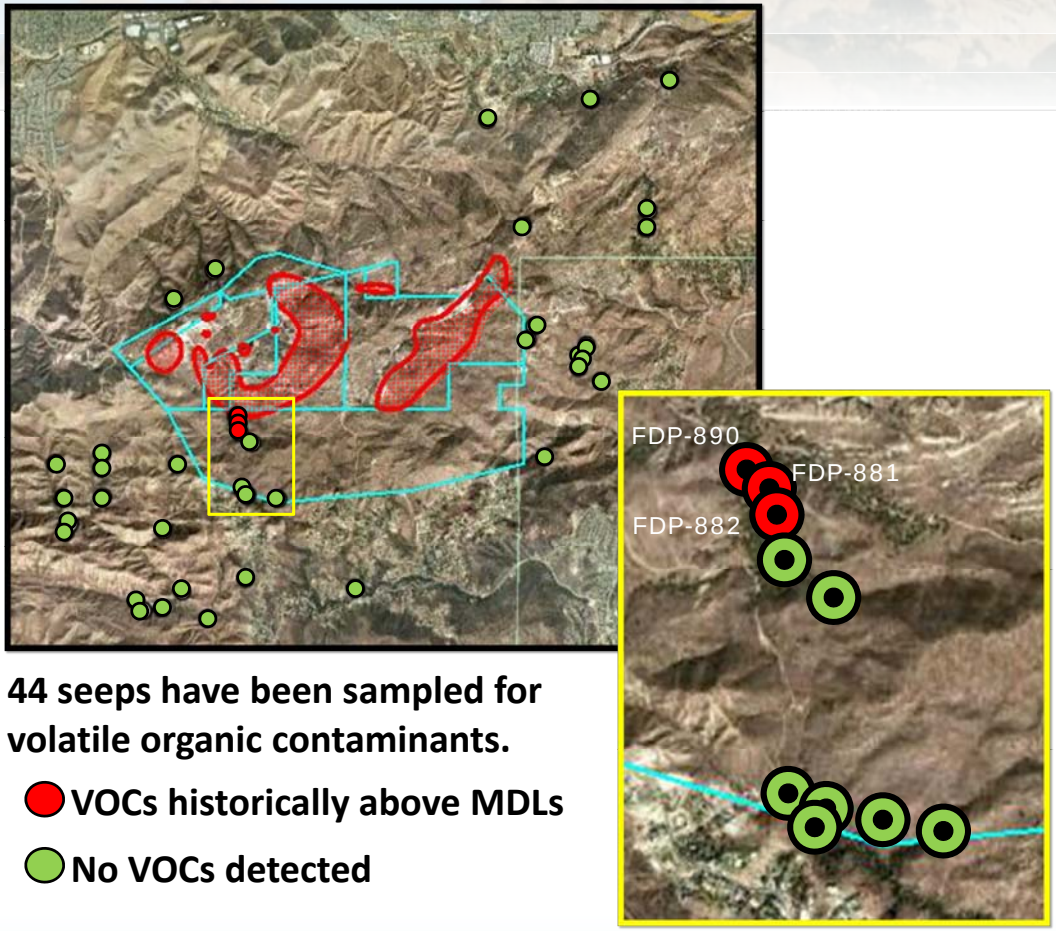






Geological Cross-Section of Southwest

On-Site Southwest Drainage Seeps: Contaminant History



44 seeps have been sampled for volatile organic contaminants.

- **VOCs historically above MDLs**
- **No VOCs detected**

- ***VOC concentrations <MDLs in all off-site seeps sampled***
- ***3 on-site seeps located in the southwest drainage have historically detectable concentrations of TCE, cDCE and/or tDCE***

FDP-890

TCE 3.8 µg/L
cDCE 110 µg/L
tDCE 5.2 µg/L

Sample Date: May 15, 2009

FDP-881

TCE 1.8 µg/L
cDCE 140 µg/L
tDCE 12 µg/L

Sample Date: May 15, 2009

FDP-882

cDCE 36 µg/L
tDCE 3.4 µg/L

Sample Date: May 15, 2009

Portable Drilling Equipment
For Installing Monitoring Wells in Bedrock at Off-Road Locations

Shaw Portable Core Drill

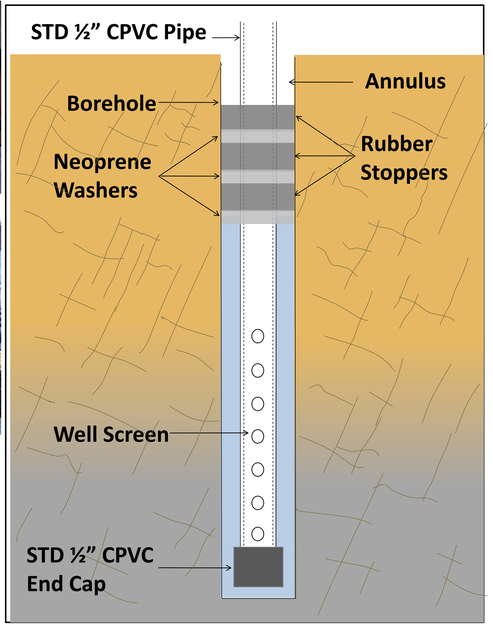
The Shaw portable core drill and tools fit into a backpack. The total weight is ~50 lbs or more (www.backpackdrill.com)

← Field set-up for coring vertical holes.

Diamond Drill Bits:
1”
1.5”
1.65”
2.0”

The Winkie Drill cores to depths > 50’ with a 1.89” diamond drill bit.

Monitoring Well Design



Schematic of preliminary monitoring well design.