Atmospheric Tritium is a Groundwater Tracer

Atmospheric tritium in recharge water moves along the groundwater flow paths while it is influenced by matrix diffusion and decay.

**What is tritium?**

- **Radioactive isotope of hydrogen with a decay half-life of 12 years.**

**Units for tritium**

- Picocuries (pCi) – 2 disintegrations per minute
- Tritium Unit (TU) – 1 tritium atom in $10^{18}$ hydrogen atoms

1 pCi ~ 3 TU

**Tritium occurs in rainfall**

- Tritium in rainfall caused by atmospheric nuclear tests.

- Atmospheric tritium range: $10^2$ to $10^{-2}$ TU

**Tritium in rainfall caused by atmospheric tritium zone**

- Monitoring wells across the site sampled for atmospheric tritium.

Examples from two cluster well locations; smaller tritium concentrations at greater depth.

**Conclusion:**

The distribution of atmospheric tritium contributes to understanding groundwater flow and the behavior of all types of dissolved contaminants in the Chatsworth Formation bedrock.

**Atmospheric $^3$H in monitoring wells decreases with depth.**


If the tritium molecules traveled at the same velocity as the groundwater in fractures, then high tritium would be found much deeper.

The tritium movement is much slower than the water because diffusion causes tritium to be transferred from the fracture into the rock matrix.
Seeps Investigations
Seeps on the mountain slopes are being investigated to determine nature of recharge water and where SSFL contaminants could emerge.

Seeps are typically a mixture of groundwater from different travel paths and age.

Contaminants have been found at 3 seeps in southwest drainage.

154 seeps have been identified along the mountain slopes, 90 have been sampled.

Contaminants were found at on-site seeps, but not at off-site seeps.

Because:
- Seep not on plume flow line
- On plume flow line but not arrived

Contaminants are actually at the seep but;
- Loss due to surface volatilization at seep
- Trapped in the mud around the seep

Groundwater samples are collected in bottles from seeps at points of discharge.

Portable drilling equipment will be used to install monitoring wells at isolated seep locations.

The Shaw Back-Pack Core Drill was used in May 2011 to core to a maximum depth of 20 feet.

Three monitoring well clusters consisting of four wells each were installed in May at on-site seeps in southwest.