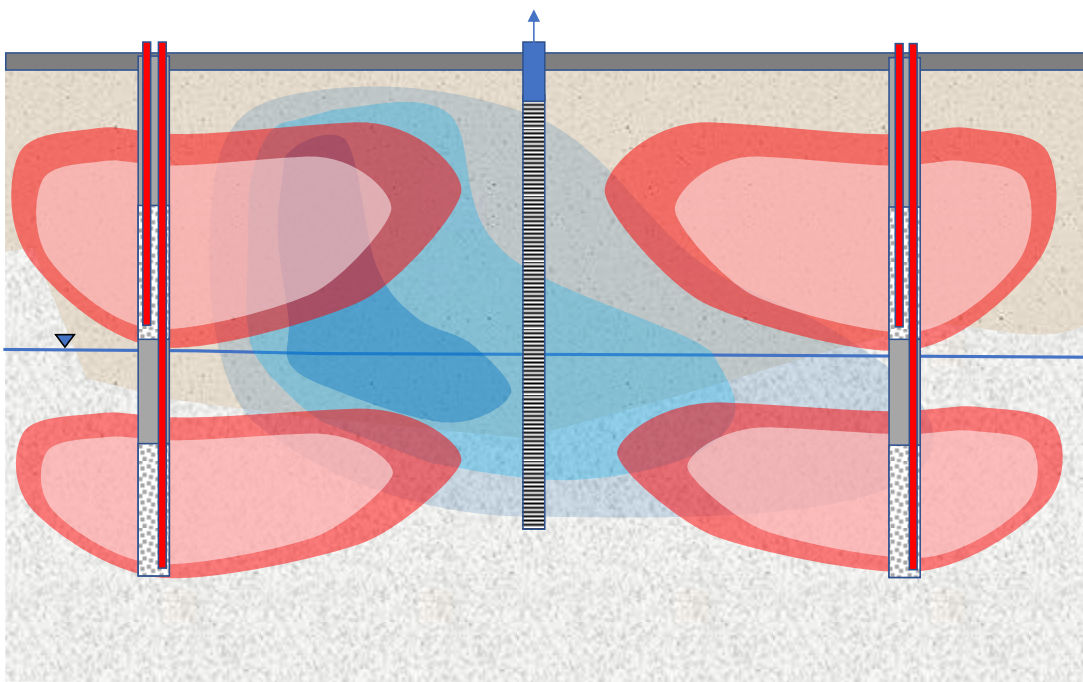


## Steam Enhanced Extraction

### How?

Steam enhanced extraction (SEE) is an in situ thermal remediation technology used to heat higher permeability zones. Steam is generated at the surface in a boiler and injected through wells screened in the targeted permeable layers. We extract the migrating steam and hot liquids using multi-phase extraction wells. TRS then treats the extracted water and vapor.



*Principle of SEE – steam shown in white, condensed hot water in red. Blue color represents a source zone.*

### *Which contaminants of concern (COCs)?*

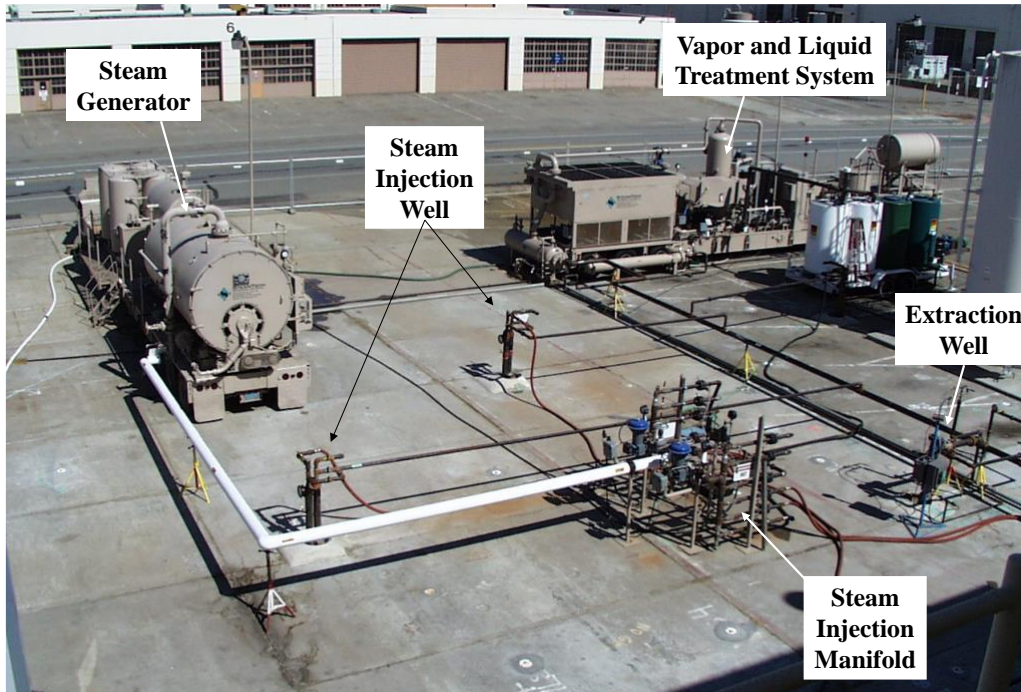
Because SEE is an injection and delivery method, it can be very effective at displacing NAPLs within transmissive aquifers and pushing them to extraction wells. This reduces the mass of all the COCs in the NAPL. Typically, SEE removes less than 90% of the NAPL. After steam breaks through to extraction wells, we use flushing and pressure cycling to enhance the removal of the volatile components, with treatment efficiencies often exceeding 99%.

### *SEE for large and deep sites*

We can place steam injection wells far apart at large and deep sites (more than 100 feet or 30 meters), dramatically reducing installation costs. For sites with permeable layers that are connected and of suitable geometry, SEE can be far less expensive than ERH or TCH.

*SEE used to augment TCH or ERH at complex sites*

TCH and ERH excel at heating tight matrices. At sites that include permeable units with high groundwater flow velocities, which can rob energy from the treatment volume, we can combine technologies; that is, apply ERH or TCH to the tight materials and SEE to the permeable units. An example would be a silt or clay layer heated using ERH, and the underlying permeable aquifer heated using SEE.



*SEE site in operation.*