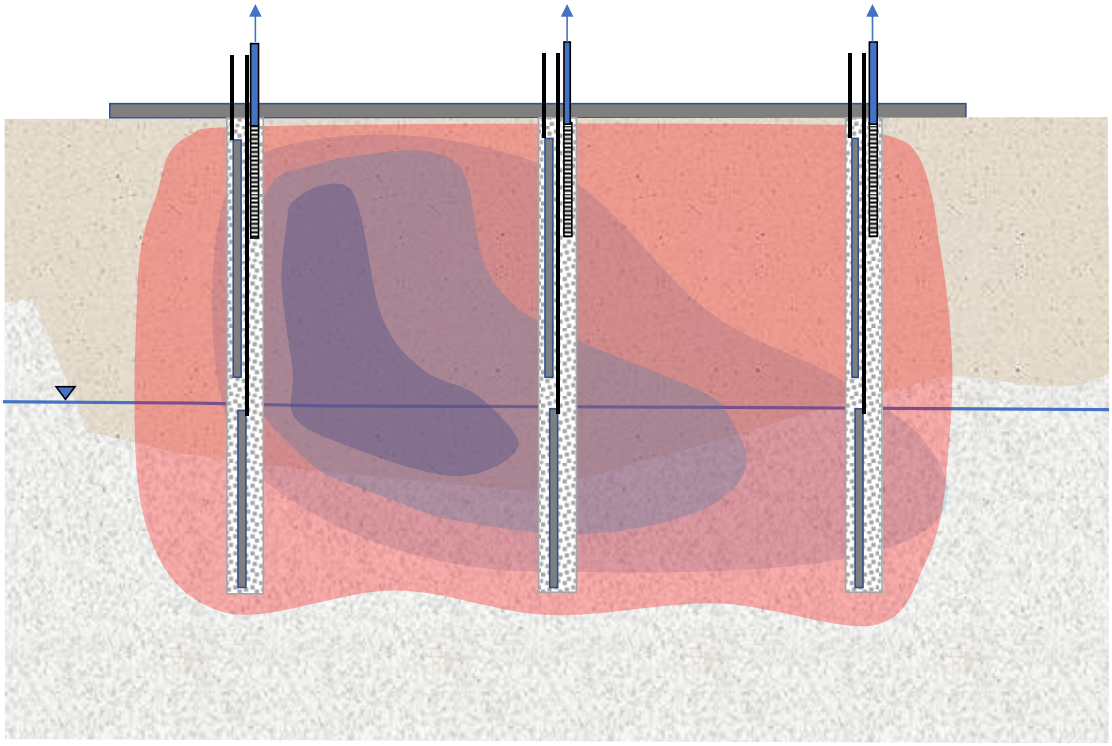
Electrical Resistance Heating

How?

Electrical resistance heating (ERH) uses the resistance of soil to generate heat in the subsurface and reach temperatures up to the boiling point of water. We deliver power through electrodes, converting groundwater and soil moisture to steam, removing the volatilized contaminants via steam stripping and distillation. We co-locate our vapor extraction screens with our electrodes. On-site treatment ensures that we capture or destroy the contaminants. We complete most ERH projects in 90 to 150 days of heating.



Principle of ERH – grey segments are electrodes with co-located vapor extraction wells. Blue color represents a source zone.

Which contaminants of concern (COCs)?

The sweet spot for ERH is the volatilization and removal of volatile organic compounds (VOCs), as they vaporize readily at the temperatures achieved. These compounds include chlorinated solvents, such as TCE and PCE, and the light fractions of petroleum hydrocarbons, such as benzene, toluene, ethylbenzene and xylene (BTEX). We also apply ERH to hydrolyze chlorinated alkanes such as 1,1,1-TCA, energetic compounds, such RDX and TNT, and pesticides.

OptiFlux™ ERH

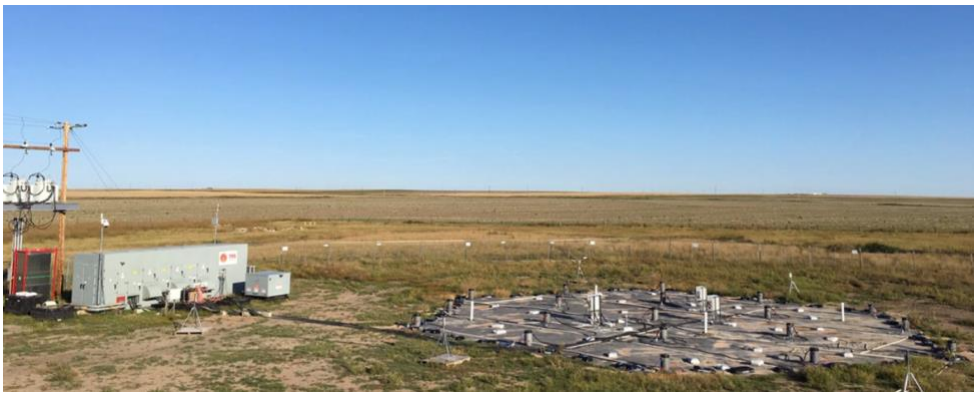
TRS has optimized power delivery with our **OptiFlux™** ERH system. We use commonly available electricity and deliver it to the subsurface through our **OptiFlux™** electrodes, which we install vertically to any depth, at angles or horizontally underneath operating facilities and surface structures, and in the presence of buried utilities. Applying ERH since 2000, TRS has improved electrode efficiency and power delivery so that we typically reach boiling temperatures in two to three months, resulting in significant cost savings, as faster heat-up rates reduce heat losses.

Above and below water

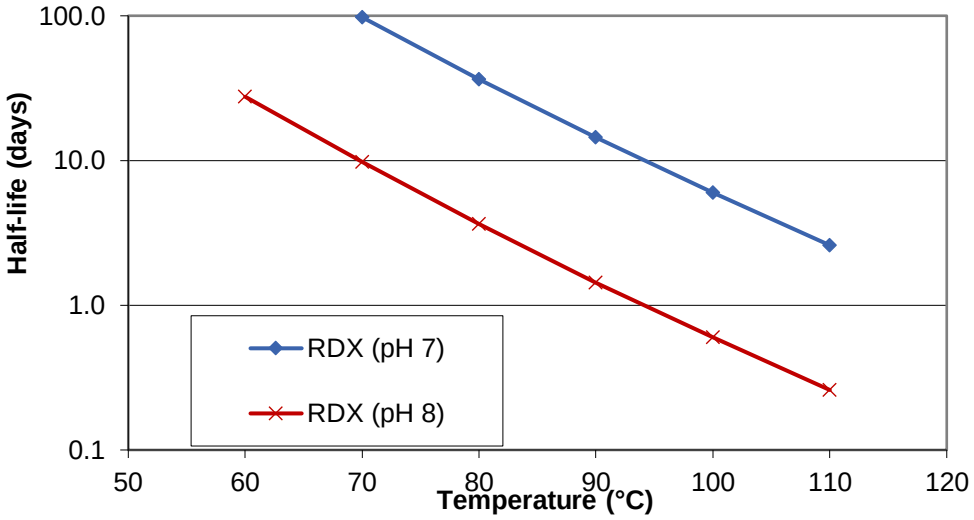
The technology is effective in soil and most bedrock, and in the vadose and saturated zones. We have treated sandstone, siltstone, shale, and karstic systems.

ERH for gentle heating

Because the electricity is distributed relatively uniformly in the formation, ERH is well suited to gently raise subsurface temperatures to enhance bioremediation, hydrolysis, and other degradation reactions, which we call **HEPA®** remediation. As we place electrodes about 20 to 25 feet apart, and as the temperatures are sub-steaming, which generally eliminates vapor capture and treatment requirements, costs are far lower than applying ERH at steaming temperatures.



*Applying **OptiFlux™** ERH to hydrolyze energetic compounds. Notice that there is no vapor treatment equipment at the site.*



Hydrolysis of RDX
(1,3,5-trinitro-1,3,5-triazinane – used extensively in WWII)