ERH Remediation of Shale Bedrock Site at Rutgers University, New Jersey

Sunila Gupta (Haley & Aldrich, Parsippany, NJ, USA),
Denis Conley (dconley@haleyaldrich.com)
(Haley & Aldrich of New York, Rochester, NY, USA)
Jennifer Fager (Haley & Aldrich, Parsippany, NJ, USA)
Chris Blundy (TRS Group, Longview, WA, USA),
Emily Crownover PhD (TRS Group, Longview, WA, USA)

Background/Objectives. Electrical resistance heating (ERH) was implemented under challenging geologic and logistic constraints at the Rutgers University campus in New Jersey. Past bedrock remediations have combined treating overburden soils with the underlying bedrock matrix. Due to the lithology of the site and the depth of contamination, the ERH target treatment volume consisted entirely of weathered shale bedrock and extended as deep as 30 feet into the shale bedrock formation. Tetrachloroethene (PCE) is the primary contaminant of concern at the site with baseline concentrations exceeding the published water solubility limits. The remedial design and installation depth focused ERH implementation on the identified source area of a larger dissolved-phase groundwater plume.

Approach/Activities. Active roadways were present on three sides of the ERH target treatment area with a maintenance garage on the fourth side. Active utilities including sewer, electrical, natural gas, and multiple fiber optic communication lines exist within and surrounding the ERH target treatment area. A cooling system and temperature sensors were installed to protect and monitor sensitive locations including subsurface utility vaults and conduits to ensure that temperatures remained below each of the utility-specific limits. A portion of the target treatment area was located beneath a building that remained active during the installation and operation of the ERH system. Electrodes were installed within angled borings to enable heating beneath the building and to avoid the large footprint of the utilities which remained active throughout operations.

Results/Lessons Learned. Due in part to the weathered nature of the shale bedrock at the site, subsurface heating achieved with ERH was highly efficient, resulting in steaming conditions at the deepest bedrock treatment depths. All utilities within and adjacent to the target treatment area remained active and below the utility-specific temperature limits through continuous temperature monitoring of the protective cooling system and lessons learned from process conditions. The ERH remediation removed over 3,000 pounds of chlorinated volatile organic compounds (CVOCs) and achieved a 99% reduction in PCE groundwater concentrations within the target treatment area.