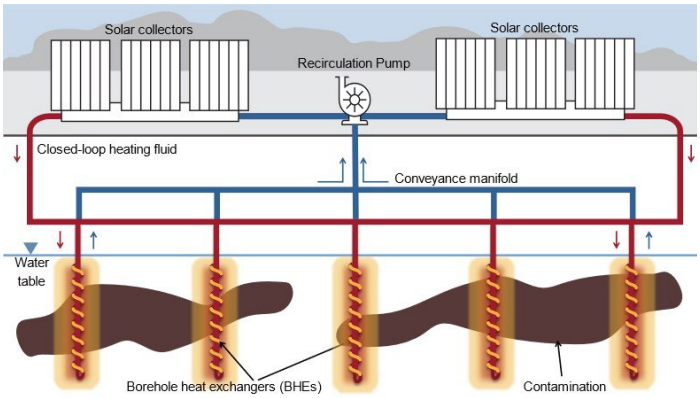
CRITICAL FINDINGS

TISR® to Enhance Biotic and Abiotic Reactions and Accelerate Remediation Timeframes

ER20-5028 | December 2023

TECHNOLOGY DESCRIPTION

- TISR®: Thermal In-Situ Sustainable Remediation.
- Utilizes solar radiation for enhanced remediation through promotion of contaminant desorption and degradation, suitable for diver hydrogeologic environments.
- Applicable to diverse hydrogeologic settings.
- Sustainable solution with low energy consumption and reduced lifecycle costs.



Schematic Diagram of the TISR® System

DEMONSTRATION OVERVIEW

- A TISR® system, with eight borehole heat exchangers, was installed at Vandenberg Space Force Base (Lompoc, CA) for enhanced in situ bioremediation (EISB) of a chlorinated solvent groundwater plume.
- Performance assessment monitoring was initiated in April 2022 and will be completed in December 2024.
- The field study aimed to achieve the following objectives:
  - Demonstrate the efficiency of subsurface heating and treatment enhancement in an active EISB chlorinated solvent source zone.
  - Confirm and characterize dominant treatment mechanisms, including biodegradation, multi-phase mass partitioning, and chemical hydrolysis.
  - Collect high-resolution temperature data to support detailed numerical modeling of thermal and contaminant transport.
  - Develop a practical guidance document and an Excel-based design tool based on the study findings.

CRITICAL FINDINGS

- Achieved an average temperature increase of 6°C during 18 months of operations.
- Observed increase in the abundance of key bacteria/genes associated with reductive dichlorination, correlating with rising temperatures.
- Accelerated biodegradation rate, evidenced by decreased concentrations of volatile organic compounds and chlorine number.

ADVANTAGES OVER ALTERNATIVES

- Complements traditional methods by accelerating the remediation process effectively.
- Particularly effective for treating contaminants in low-permeability soils.
- Utilizes renewable energy sources and remote monitoring for self-sustaining operations.
- Reduces remedial timeframes and life cycle costs.
- Incorporates reusable and modular components to optimize costs and support right-sizing.

About ESTCP

ESTCP is the U.S DoD's environmental and resilience demonstration program, harnessing the latest science and technology to improve the DoD's environmental performance, reduce costs, and sustain mission capabilities.

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Learn more by visiting the project page here:

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This is a Fact Sheet developed under ESTCP project ER20-5028, "Thermal In Situ Sustainable Remediation (TISR) to Enhance Biotic and Abiotic Reactions and Accelerate Remediation".

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