



# Remediation System Evaluations

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## U.S. ARMY CORPS OF ENGINEERS

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The Remediation System Evaluations (RSE) process was developed by the U.S. Army Corps of Engineers Environmental and Munitions Center of Expertise (EM CX), part of the U.S. Army Engineering and Support Center, Huntsville, during the late 1990s to assess the protectiveness and cost-effectiveness of an operational system. Specifically, RSEs are intended to:

- Identify and troubleshoot remedy effectiveness problems
- Reduce operating costs
- Confirm the project team has a clear exit strategy for the site
- Verify proper maintenance of government-owned equipment

The RSE provides an independent technical review of system operations and costs by a team of senior technical staff in consultation with the project team.

### Benefits

The RSE process is routinely applied at Formerly Used Defense Sites and select Army installations and has been successfully used on behalf of several federal agencies at many sites across the country. The Environmental Protection Agency (EPA) has integrated the RSE process into its optimization initiative for improving the cost-effectiveness of remedies at fund-financed sites and has applied, with assistance of USACE staff and contractors, the RSE process at dozens of Superfund sites.

Periodic optimization of the systems can improve their effectiveness in protecting human health and the environment, speed cleanup and substantially reduce costs for operation, maintenance and monitoring. Optimization efforts conducted to date at federal sites suggest that annual operations and maintenance (O&M) costs may be reduced by 20 to 30 percent (or more) using the RSE process. RSEs conducted by USACE have identified potential cost savings of \$35,000 to more than \$500,000 per year in O&M at each site. The process can also be applied at sites in the feasibility study stage to evaluate potentially cost-effective remedies.

### Costs

An RSE typically costs less than \$35,000 for single site and can be completed in several months. This includes senior staff labor and travel.

Two case studies are described on Page 2.



At this Army site, a Remediation System Evaluation (RSE) conducted by the Environmental and Munitions Center of Expertise identified an opportunity to reduce the life-cycle costs for treatment by over \$2,000,000.

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## Case Study 1

A facility-wide RSE was performed at a 5,000-acre Air Force base in the central United States. The RSE addressed contamination in 12 operable units (OUs). The RSE evaluated multiple groundwater extraction, soil vapor extraction, multiphase extraction systems and associated treatment facilities. Groundwater treatment facility flow rates ranged from 15 to 100 gpm. Primary water treatment processes consisted of air stripping and granular carbon adsorption. Contaminants included petroleum hydrocarbons, chlorinated solvents and selenium.

**Findings:** The existing operations staff was continuously evaluating methods of optimizing operations. The RSE evaluators made the following recommendations:

- Perform additional capture zone analyses at three OUs
- Modify pumping rates at two OUs
- Reduce groundwater monitoring frequency at numerous OUs
- Consider converting one soil vapor extraction system to bioventing
- Convert four extraction systems to monitored natural attenuation
- Use an alternative discharge point from the primary treatment facility
- Modify the existing well maintenance program
- Develop a closure strategy plan

**Costs:** Annual O&M costs were \$1.4 million, and the RSE cost was \$35,000. The projected annual savings was \$350,000 or 25 percent of the O&M costs.

## Case Study 2

An RSE was performed at a 1-acre Superfund Site in Michigan. The former electroplating site lies adjacent to a stream. Untreated wastes containing volatile organic compounds (VOC) and heavy metals from plating and finishing operations were discharged on site. Following source removal, a soil vapor extraction system was installed to remove VOCs, and a groundwater treatment facility was built to remove VOCs, heavy metals and cyanide. Processes employed included metals precipitation, air stripping and granular activated carbon at a flow rate of approximately 140 gpm.

**Findings:** The existing operations staff and regulators were extremely helpful in the evaluation and implementation of recommendations. The RSE team made the following recommendations:

- Perform capture zone analyses
- Assess alternate source area treatment alternatives
- Revise monitoring program, data evaluation protocols and reporting
- Bypass treatment plant discharge to the Publicly Owned Treatment Works
- Modify the existing well maintenance program
- Develop a closure strategy plan
- Reduce level of operations oversight

**Costs:** Annual O&M costs were \$440,000, and the RSE cost was \$25,000. The projected annual savings is \$115,000 or 27 percent of the O&M costs.

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