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Manual
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Engineering and Design
MULTI-PHASE EXTRACTION

1. **Purpose.** This Engineer Manual (EM) is intended to provide detailed guidance on all phases of remediation projects involving Multi-phase Extraction (MPE). This includes guidance on (1) the appropriate site characterization and pilot studies for MPE; (2) appropriate considerations in screening MPE for a site; (3) design of subsurface and above-ground components (excluding off gas and water treatment systems); and (4) start-up, operations and maintenance, and site closure.

2. **Applicability.** This EM applies to all USACE commands having Civil Works and/or Military Programs hazardous, toxic, or radioactive waste (HTRW) responsibilities.

3. **References.** References are provided in Appendix A.

4. **Distribution Statement.** Approved for public release, distribution is unlimited.

5. **Discussion.** MPE is natural but rapidly evolving outgrowth of both traditional ground water extraction and dewatering technology and the innovative soil vapor extraction technology. The manual focuses on the underlying physical/chemical processes (and related technology screening issues) that determine the success or failure of the technology at a site. In many cases, MPE has been misapplied because of a poor understanding of these fundamentals. Designers and decision-makers should use this manual to guide them through the early site characterization and technology screening phases of MPE projects. The design and operational guidance contained herein should be considered, to the extent applicable to a specific project, as good MPE practice by both designers and reviewers. The MPE technology is still maturing and designers are encouraged to monitor future developments using some of the resources provided in this manual.

FOR THE COMMANDER:

4 Appendices
App A - References
App B - Index
App C - Glossary
App D - Symbols


RUSSELL L. FUHRMAN
Major General, USA
Chief of Staff