

**Superfund Reform Strategy  
Pump and Treat Optimization  
Implementation Plan  
OSWER 9283.1-13**

1. Purpose

In the *OSWER Directive No. 9200.0-33, Transmittal of Final FY00 - FY01 Superfund Reforms Strategy, dated July 7, 2000*, the Office of Solid Waste and Emergency Response outlined a commitment to optimize our Fund-lead pump and treat (P&T) systems. To fulfill this commitment, Headquarters will assist Regions in evaluating their Fund-lead operating P&T systems. During FY 01, all Fund-lead P&T system will be identified, baseline cost and performance data will be collected and up to 2 sites in each Region will be evaluated for optimization potential.

This Reform Initiative provides EPA an opportunity to demonstrate our commitment to improve the both the effectiveness and efficiency of our remedies through the application of optimization approaches to our Fund-Lead pump and treat systems. This Implementation Plan provides the background, results of a pilot study, goals and approach, and a proposed schedule to implement this Superfund Reform Initiative.

2. Background

EPA estimates that the Superfund Program has over 700 sites with pump and treat (P&T) systems operating, under construction or selected as a remedy component in Records of Decision (RODs). Sites may also have had P&T systems installed during actions performed by Superfund's Removal program.

Approximately 30% of these systems are expected to be Fund-financed, suggesting that the Federal Government is or will be paying for the construction, operation, maintenance and monitoring of over 200 pump and treat systems nationwide. Based on an EPA study of 28 operating P&T systems; the average cost for operation of the systems and monitoring of system performance ranges from \$200,000 to \$600,000 annually. Many of these systems are anticipated to operate for as long as decades which will result in a substantial cost to Federal and State Governments. After a 10-year period, States are expected to assume financial responsibility for the Fund-Lead P&T systems.

EPA and the US Army Corps of Engineers (USACE) have identified several approaches to optimize ground water P&T systems that can markedly improve system performance and potentially offer significant reductions in Long-Term Remedial Actions (LTRA) costs. Results of these studies indicate that most sites will benefit from optimization, either through improvement of the existing remedy or cost reduction. On average, a 30% reduction in annual LTRA costs were identified in EPA/ACE studies.

These methodologies have the potential to be applied nation-wide, resulting in considerable savings and/or improvements in remedy performance. It should be noted that private industry as well as the Department of Defense have recognized the benefits of optimization and currently are working towards, or already have a adopted, systematic optimization strategies Agency- or company-wide.

Although in many cases the driving force behind optimization may be cost reduction, it should be noted that opportunities for system improvement may also be identified which impact the overall effectiveness of a remedy. Under these circumstances, additional capital investment and increased LTRA costs may be recommended as part of the optimization analysis. Furthermore, even in cases where overall cost reductions are identified, additional evaluation and capital investment (e.g. drill 2 new wells in order to shut down 4 wells) may be required in order to achieve long-term cost reductions.

### 3. Results of Pilot Project in Regions 4 and 5

TIO conducted a pilot project in Regions 4 and 5 to better understand the number of operating Fund-lead P&T systems and the potential for applying optimization technologies to these sites. Through this effort baseline cost and performance data were collected on all operating and to-be-designed P&T systems in each Region. Two sites in each Region were selected for optimization analysis.

A sample of the baseline system data are summarized below. For a complete summary of the baseline cost and performance information please see Attachment A.

#### Abbreviated Baseline Fund-Lead Pump and Treat Site Data Regions 4 & 5

|                                     | Region 4   | Region 5   |
|-------------------------------------|------------|------------|
| # Fund-Lead P&T Systems (operating) | 6          | 14         |
| # Fund-Lead P&T Systems (planned)   | 3          | 4          |
| Average Annual O&M cost             | \$274/yr   | \$319/yr   |
| Time Horizon                        | 3>>>30 yrs | 4>>>30 yrs |

Optimization of 2 sites in Region 5 has been completed. Optimization of 2 sites in Region 4 is still in

draft form. Results of the optimization of the 2 Region 5 sites offered over 28 suggestions to improve the performance and/or reduce costs of the operating systems. Examples of recommendations for system improvement which would result in additional cost to the sites included suggestions to complete a capture zone analysis, perform ground water modeling, further delineate the ground water plume, expand site monitoring well networks, and evaluate the potential for installing a permeable reactive barrier. Examples of recommendations to reduce operating costs included; elimination of an above-ground treatment component, use of an alternative metals removal technology, and elimination of a duplicate treatment system. Total potential net lifecycle cost savings were in the millions of dollars for the 2 sites evaluated in Region 5. For summaries of the recommendations please see Attachments B and C.

As summarized above, substantial cost reduction opportunities were identified at each site in Region 5. Some of these recommendations also required substantial capital investment (e.g., one recommendation requires a capital investment of over \$1.5M for installation of a permeable reactive barrier (PRB). However, a PRB could potentially reduce system operating costs by \$420K annually). It should be noted that it is likely that not all of the recommendations can or will be implemented. Many of the recommendations require additional evaluation before a decision can be made whether or not to proceed with implementation.

It was evident from the number of Fund-lead P&T systems in these Regions (9 in Region 4 and 18 in Region 5) and results of the optimization of 2 Region 5 sites, there is a potential for significant system improvement and/or cost reduction with optimization. The number and nature of the Fund-Lead P&T systems in other Regions will be evaluated, however some degree of improvement is likely given the results of the pilot study in Regions 4 and 5, and results of previous EPA and ACE studies.

#### 4. Project Goals and Approach

The goal of this effort is to apply optimization methodologies at EPA Fund-lead operating P&T systems with the assistance from EPA Headquarters to improve the effectiveness and efficiency of operating P&T systems. A secondary goal of this effort is to increase the national awareness (RPMs, PRPs, contractors, etc.) of optimization approaches such that optimization becomes integrated into the overall cleanup process for all sites, regardless of program.

Optimization, as defined by this initiative, includes an overall site evaluation of system performance using the US Army Corps of Engineers (USACE) Remedial Systems Evaluation (RSE) process. The RSE process evaluates most aspects of an operating P&T system including; aboveground treatment systems, extraction well networks, sampling protocols, monitoring networks, data management, labor costs, and more.

The major components of this effort are listed below. The lead office (listed 1<sup>st</sup>) and supporting offices (listed subsequently) are indicated in parentheses.

FY 01:

- ! Collect baseline operation, maintenance and monitoring data on all Fund-lead P&T systems in Regions 1-10 (TIO, OERR, Regions, Regional Project Liaisons);
- ! Provide baseline data to EPA Headquarters and each Region (TIO, OERR);
- ! Optimize up to 16 Fund-lead P&T sites nationwide (up to 2 in each Region) using the USACE RSE process (TIO, OERR, Regions, Regional Project Liaisons);
- ! Evaluate and implement optimization recommendations, as appropriate (Regions, Regional Project Liaisons, OERR);
- ! Provide technical, administrative, and monetary assistance to EPA Regions in implementing all of these recommendations, as necessary, through existing program mechanisms (OERR, Regions, Regional Project Liaisons, TIO); and
- ! Track progress of site optimization initiative and the optimization recommendations at each of the 16 sites nationwide for reporting requirements of the Superfund Reform Strategy (OERR).

FY02

- ! Work with the Regions to determine if additional Fund-lead P&T sites not optimized during the first year of this project should be optimized (OERR, TIO, Regions);
- ! Evaluate and implement optimization recommendations, as appropriate (Regions, Regional Project Liaisons, OERR);
- ! Continue to provide technical, administrative, and monetary assistance to Regions to implement recommendations, as necessary, through existing program mechanisms (OERR, Regional Project Liaisons, Regions, TIO); and
- ! Continue to track progress of the site optimization initiative and implementation of optimization recommendations (OERR).

What Types of Systems are Included in this Initiative?

Baseline operation, maintenance and monitoring data on operating and to-be-designed Fund-lead P&T systems will be collected during this project. Only operating Fund-lead P&T systems will be optimized.

What Types of Systems are Not Included in this Initiative?

Only operating Fund-lead P&T systems will be optimized in this project. Other types of systems including soil vapor extraction systems, landfills, monitored natural attenuation, and other sites with long-term operation, maintenance or monitoring components would likely benefit from optimization, but are not included in this effort.

Furthermore, optimization can also be beneficial for the design of a new P&T system. In future initiatives, OERR may consider providing technical assistance to the Regions for the design of optimal P&T systems using the optimization techniques applied during this initiative. Future optimization of the system during LTRA would still be necessary at these sites.

## 5. Implementation Approach

### 5.1 Briefings

- ! Headquarters:
  - Kick-off meeting with OERR (September 13, 2000)
  - Follow-up meetings with OERR (DCM, Regional Coordinators, Budget network) to discuss project tracking and funding (September/October 00)
  
- ! Regional Management
  - Work planning meetings with Regions and OERR (October-November 00)
  - Focus Forum Meeting (October 00)
  - Division Directors Monthly Conference Call (October 00)
  
- ! RPMs & Ground Water Forums
  - TIO will organize internet based seminars with the Regions to discuss the goals, approach, and schedule of this project. RPMs and Ground Water (GW) Forum members from each Region will be asked to participate in the seminars to better understand the optimization technologies being applied through this project and the overall approach to their Fund-lead sites.

### 5.2 Site Identification, Data Collection & Prioritization

#### 5.2.1 Site Identification and Data Collection

TIO will identify all Fund-lead P&T sites in each Region and collect basic information on system construction, operation, maintenance and monitoring. See Attachment D for an 18-question information form to be completed for each site. This information will be used to prioritize sites for optimization analysis.

TIO will start with a master list of potential Fund-lead sites (obtained from CERCLIS, Annual Status Report, and/or OERR funding information). Each Regional Project Liaison will send a request to each RPM with a listed Fund-lead site asking if their site is still Fund-financed and if a P&T system is planned or operating at the site. The RPMs will have two options for submitting basic information on their Fund-lead site:

- ! RPM can go to a central website and complete an 18-question information form on the system, or
- ! RPM can request we contact them, and/or their O&M contractor and obtain information over the phone. If this option is selected TIO's contractor will contact the RPM and complete the information form over the phone.

#### 5.2.2 Site Prioritization

The information forms will be used to prioritize sites for optimization. The prioritization process is based on an initial assumption of 20% savings at each site, the percent savings is adjusted up or down depending on site data. For example, the percent savings is decreased for sites pumping less than 10 gallons per minute (gpm) and increased for sites pumping greater than 500 gpm. See Attachment E for complete prioritization methodology. The prioritized results will help HQs and the Regions, select the 2 sites in each Region for optimization.

HQs will prepare a report summarizing prioritization results for each Region. The report will include the following information (See Attachment A for summaries of Region 4 and 5 prioritization data):

- ! Site Name;
- ! Status (operating or planned);
- ! Estimated Time frame
- ! Annual O&M Cost
- ! Baseline Present Value
- ! Estimated Potential Savings (%)
- ! Estimated Potential Saving (\$)

### 5.3 Site Optimization

Remedial Systems Evaluations will be performed at up to 2 sites in each Region. Collection of data and site optimization will be managed by TIO with assistance from a contractor, HSI GeoTrans. Several individuals from the USACE will be part of the RSE core technical team. The USACE will review all reports before submission to RPMs and Headquarters. The RSE team will be assembled as follows:

#### Core Technical Team (3 people)

- T HSI GeoTrans Senior Hydrogeologist
- T US ACE Senior Engineer
- T One Alternate from either GeoTrans, USACE Center of Expertise, academia or consulting;
  - Robert Greenwald, HSI GeoTrans MS, Stanford 14 yrs experience)
  - Peter Rich, HSI GeoTrans
  - Dave Becker, USACE/ MS, Nebraska (17 yrs experience)
  - Lindsey Lien, USACE
  - Other (option for academic or consultant with particular expertise, e.g., modeling, long-term monitoring optimization)

#### Regional Project Liaison/Troubleshooter/Headquarters Representative (1 person)

- T One person - either the Regional Project Liaison, TIO, or OERR will participate in each RSE. Regional Project Liaisons are expected to participate in 8 RSEs, TIO in 4 RSEs, and OERR in 4 RSEs.

Region/State (3 or more people)

- T EPA RPM;
- T State RPM; and
- T Site contractor

Within 45 days of the RSE site visit the core technical team will complete a draft RSE report for review by the EPA RPM and Regional Project Liaison. Following incorporation of, or response to Regional comments, a final report will be prepared and submitted to the RPM and EPA Headquarters.

The RSE report will contain the following items (see Attachments B and C for sample RSE executive summary reports):

- ! Executive summary
- ! Introduction
- ! System Description
- ! System Objectives, Performance and Closure Criteria
- ! Finding from the RSE Visit
- ! System Problems
- ! Recommendations
- ! Cost Summary Table (the Cost Summary Table could be used as a simple way of tracking recommendations at a site)

#### 5.4 Project Tracking and Implementation of Recommendations

OERR will be responsible for tracking the progress of this project, including the implementation of recommendations. Regional Superfund Division management, Regional Superfund Administrative Reforms contact for remedy updates, and the Information Management Coordinators (IMCs for budget) could also assist with project tracking.

It is recommended that each RPM prepare a response to prioritize the recommendations and suggest a schedule and process by which the recommendations be evaluated or implemented. If an RPM or Region disagrees with a recommendation, he/she can note that in the response with a brief explanation. This response would also include an indication of whether additional funding or contractual support is required to further evaluate or implement the recommendations (e.g., One recommendation may be to remove a component of the above ground treatment system. Before the component is removed, the RPM would need to evaluate the implications of making such a change to the aboveground treatment system and propose a method to evaluate the effectiveness of the change. The RPM may need contractual support for this evaluation).

OERR will provide assistance to RPMs that wish to make changes to their systems. This may involve guidance on understanding the regulatory process in making minor and major changes to a system

(e.g., Is an Explanation of Significant differences required?), technical support in evaluating recommendations, and funding to evaluate and implement recommendations.

## 6. Schedule

|   |  |             |
|---|--|-------------|
| ! | Regional Briefings                               | 10/00-12/00 |
| ! | Data Collection and Prioritization (all Regions) | 11/00-2/01  |
| ! | Site Optimization (16 total)                     | 12/00-9/01  |
| ! | Regional Review and Implementation               | Ongoing     |
| ! | OERR Tracking                                    | Ongoing     |