

**PILOT PROJECT TO OPTIMIZE GROUND WATER REMEDIATION  
SYSTEMS AT RCRA CORRECTIVE ACTION FACILITIES:  
SUMMARY REPORT AND LESSONS LEARNED**

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REPORT

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# **Pilot Project to Optimize Ground Water Remediation Systems at RCRA Corrective Action Facilities: Summary Report and Lessons Learned**

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## PREFACE

This report was prepared as part of a pilot project conducted by the United States Environmental Protection Agency (U.S. EPA) Office of Superfund Remediation and Technology Innovation (OSRTI) and the Office of Solid Waste (OSW). The objective of this project is to conduct Streamlined Remediation System Evaluations (RSE-Lites) of pump and treat systems under the Resource Conservation and Recovery Act Corrective Action Program. The following organizations are implementing this project:

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The project team is grateful for the cooperation and participation of all site stakeholders, including EPA and/or State Project Managers, facility representatives, and site contractors. They were vital in transferring site documents to the RSE team, scheduling the conference calls and site visit, providing information during conference calls and site visit, and reviewing the RSE-Lite/RSE reports. The authors also extend sincere thanks to the principal investigators from the U.S. EPA Office of Superfund Remediation and Technology Innovation (OSRTI) and the U.S. EPA Office of Solid Waste (OSW).

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## EXECUTIVE SUMMARY

Following the success with conducting independent optimization evaluations at Superfund-financed pump and treat (P&T) sites, the U.S. EPA Office of Solid Waste (OSW) and the U.S. EPA Office of Superfund Remediation and Technology Innovation (OSRTI) sponsored independent optimization evaluations in 2003 and 2004 at five facilities with pump and treat (P&T) systems regulated under the Resource Conservation and Recovery Act (RCRA). The Remediation System Evaluation (RSE) process developed by the U.S. Army Corps of Engineers was used. For each of the five RCRA sites, the RSE process involved an independent team of experts reviewing site documents, interviewing site stakeholders, and providing recommendations for improving remedy effectiveness, reducing costs, and gaining site closure.

Based on the positive results of these RSEs and the consideration that many sites would receive a similar benefit from a streamlined RSE with a lower cost, OSRTI and OSW commissioned a new pilot study to develop and pilot a streamlined RSE process (or “RSE-lite”) that reduces the evaluation cost relative to a full-scale RSE.

Both the RSE-lite and RSE processes involve a team of expert hydrogeologists and engineers, independent of the site, conducting a third-party evaluation of a remedy. It is a broad evaluation that considers the goals of the remedy, site conceptual model, above-ground and subsurface performance, and site exit strategy. The evaluation includes reviewing site documents, communicating with the site team, and compiling a report that includes recommendations to improve the efficiency and effectiveness of the remedy. A full-scale RSE includes a site visit and in-person interviews between the evaluation team and site team. An RSE-lite uses a conference call in place of the site visit and in-person interviews. Recommendations are provided in the following four categories:

- Improvements in remedy effectiveness
- Reductions in operation and maintenance costs
- Technical improvements
- Gaining site closeout

Four sites were selected by the EPA OSRTI and OSW to receive RSE-lites based on nominations provided by EPA project managers. Upon completion of the draft RSE-lite reports, one of the four sites was selected to receive a site visit and additional analysis to convert the RSE-lite into a full-scale RSE.

All four of the evaluated sites are impacted with volatile organic compounds. Three of the sites have unconsolidated geology and one has fractured bedrock. Light non-aqueous phase liquid (LNAPL) is present at one site and dense non-aqueous phase liquid (DNAPL) is present at one of the other sites. The annual costs for operating the systems ranged from \$50,250 to \$945,000 per year.

Recommendations for improving system effectiveness and for reducing costs were provided at all four sites. Recommendations for technical improvement were provided at two of the four sites. Recommendations for gaining site closeout were provided at all four sites.

Recommendations for improving system effectiveness pertained to improving evaluation of plume capture and/or control and evaluating the degree of monitored natural attenuation, sampling residential wells, and evaluating the potential for vapor intrusion. Recommendations for reducing cost included modifications to the ground water sampling programs for two sites, simplifying operations and maintenance activities at one site, and simplifying the treatment train at another site. Recommendations for technical improvement were primarily associated with progress reporting. The recommendations for site closure included considerations for continuing with a plume control remedy, developing an alternative exit strategy, and evaluating an interim action as a potential final action.

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## **1.0 INTRODUCTION**

### **1.1 PROJECT BACKGROUND**

In 2003 and 2004, the EPA Office of Solid Waste (OSW) and the EPA Office of Superfund Remediation and Technology Innovation (OSRTI) sponsored independent optimization evaluations called Remediation System Evaluations (RSEs) at five RCRA sites with pump and treat (P&T) systems. These RSEs involved an independent team of experts reviewing site documents, interviewing site stakeholders, and providing recommendations for improving remedy effectiveness, reducing costs, and gaining site closure.

Based on the positive results of these RSEs, OSRTI and OSW commissioned a new pilot study to develop and pilot a streamlined RSE process that reduces the evaluation cost relative to a full-scale RSE. It is thought that the streamlined RSE will provide much of the same benefit as a full-scale RSE for many sites but at a lower cost.

For this new pilot study, four facilities regulated under the RCRA Corrective Action Program that have operating P&T systems were selected to receive streamlined RSEs or “RSE-lites”. Upon completion of the draft RSE-lites for these sites, one of the sites was selected to receive additional evaluation, including a site visit to enhance the RSE-lite into a full-scale RSE.

This report summarizes the following:

- The RSE and RSE-lite processes
- The site-selection process for this project
- Brief descriptions of participating sites
- Typical recommendations generated from the optimization evaluations at these sites
- Lessons learned from conducting this pilot project

### **1.2 RSE AND RSE-LITE PROCESSES**

#### *RSEs and RSE-lites*

The RSE process was developed by the U.S. Army Corps of Engineers (USACE). It involves a team of expert hydrogeologists and engineers, independent of the site, conducting a third-party evaluation of a remedy. It is a broad evaluation that considers the goals of the remedy, site conceptual model, above-ground and subsurface performance, monitoring, data management, costs, and site exit strategy. The evaluation includes reviewing site documents, visiting the site for 1 to 1.5 days, and compiling a report that includes recommendations to improve the system. Recommendations are provided in the following four categories:

- Improvements in remedy effectiveness
- Reductions in operation and maintenance costs

- Technical improvements
- Gaining site closeout

The RSE-lite process is similar to the RSE, but instead of conducting a site visit, the evaluation team conducts a two hour conference call with the site team. This reduces contractor labor associated with visiting a site and eliminates other travel costs. Conceptually, however, the evaluation team obtains enough information to provide valuable recommendations similar to those that would be generated from a full-scale RSE.

The documents reviewed by the evaluation team typically include information pertaining to site investigations, remedy design, and remedy operations and maintenance (O&M). Upon reviewing this information, the evaluation team conducts either the site visit (RSE) or conference call (RSE-lite) with the remedy project manager to address questions that may have arisen as part of the document review or to address other information gaps.

### *RSE and RSE-lite Reports*

Based on the site documents and the information from the site visit (RSE) or conference call (RSE-lite), the evaluation team prepares a report documenting recommendations for improving efficiency and effectiveness. The reports for RSEs and RSE-lites for this project are similar. The reports include the following:

- An introduction that details the evaluation process (RSE or RSE-lite), the evaluation team, and the documents that were reviewed
- A brief summary of site history, site conceptual model, ground water remedial system, remedy goals, and costs
- Findings from the document review and conference call (RSE-lite) or site visit (RSE) pertaining to remedy effectiveness, cost-effectiveness, and remedy progress with respect to site closure
- Recommendations intended to
  - Enhance remedy effectiveness and efficiency with respect to preventing plume migration and monitoring other exposure pathways
  - Reduce life-cycle O&M costs
  - Improve technical operations
  - Gain site closeout
- A table summarizing the recommendations, including estimated capital costs and estimated annual cost increases or decreases associated with each recommendation
- Figures, developed by the evaluation team or by the site contractor, to provide perspective and a visual reference for the reader

The observations and recommendations presented in the RSE or RSE-lite reports are not intended to imply a deficiency in the work of the designers, operators, or site managers. They are offered as constructive suggestions that have the benefit of an independent review of operational data that were unavailable to the original designers. The recommendations are also not requirements for the site team to implement. They are provided for the consideration of the site team.

### **1.3 SITE SELECTION PROCESS FOR THE RSE-LITES**

EPA OSW and OSRTI requested that EPA project managers in each of the 10 EPA Regions nominate sites to participate in this pilot project. The nomination form provided by EPA OSW and OSRTI to the Regions requested information on the following types of facilities:

1. Facilities that are on the EPA Corrective Action GPRA baseline (either 2005 or 2008).
2. Facilities with significant uncertainty with respect to whether the existing ground water remedy is sufficient to meet the Migration of Contaminated Groundwater Under Control environmental indicator (i.e., whether existing plumes of contaminated ground water are getting larger or adversely affecting surface water bodies).
3. Facilities with uncertainty with respect to whether the existing ground water remedy is sufficient to meet the Current Human Exposures Under Control environmental indicator (i.e., whether there is a significant potential for existing unacceptable exposures to contaminants in or from ground water).
4. Facilities located on highly valued ground water resources (e.g., sole source aquifers, nearby public or private uses of ground water as drinking water).
5. Facilities where a ground water remedy has been operating for at least one year.
6. Facilities that are not making expected progress toward cleanup goals.
7. Facilities where EPA project managers (PMs) would agree to provide copies of RSE/RSE-lite reports (i.e., findings and recommendations) to all interested parties (e.g., facility owners/operators, state representatives, and EPA management). [Note that PMs are not required to implement all recommendations included in RSE/RSE-lite reports; however, PMs are asked to thoroughly consider all recommendations and document progress toward evaluating and implementing RSE recommendations within one year of RSE/RSE-lite completion].
8. Facilities where EPA project managers require technical assistance in reviewing a technical proposal put forth by the owners/operators of RCRA facilities to modify an existing ground water remedy. [Note: In conducting the RSE/RSE-lite (an independent evaluation), the RSE/RSE-lite team would assess the proposal and include associated findings and recommendations in the RSE/RSE-lite report.]

9. To maintain the independent aspect of the RSE/RSE-lite process, facilities will not be considered if there is a conflict of interest for the evaluation team. The evaluation team includes representatives from GeoTrans, Inc., an environmental consulting firm that is a wholly-owned subsidiary of Tetra Tech, Inc., which has contracts with many of the EPA Regions. The following two scenarios represent a definite conflict of interest for GeoTrans:

- a) The owner/operator of the RCRA facility is a client of GeoTrans.
- b) The owner/operator is a client of another Tetra Tech company.

The third scenario represents a potential conflict of interest for GeoTrans that would need to be resolved on a case by case basis.

- c) A Tetra Tech company is the oversight contractor for that site. (Note: This is not necessarily a conflict of interest in the opinion of GeoTrans, but may appear as a conflict of interest to Tetra Tech, EPA, or the facility.)

10. The facility and the overseeing regulator Agency have a history of relatively good communication, the facility is willing to provide access to the RSE/RSE-lite team, and the facility and/or the overseeing regulator is willing to provide copies of relevant reports and data.

EPA Regions 1, 2, 4, 7, and 9 provided nominations. A total of seven nominations were received. Of those seven sites, there were conflicts of interest (see item 9 of the nomination questions) for three of them. The remaining four were deemed appropriate to benefit from the RSE or RSE-lite process, so EPA OSW and OSRTI did not make additional requests for nominations from the Regions.

#### 1.4 SCHEDULE OF RSE-LITES

The four sites that participated in the pilot project are listed in the following table along with the dates of various project milestones. As is evident in the table, the BP Carson Refinery site was the one site selected to receive the full-scale RSE after completing the RSE-lite process.

Site Name and Location	EPA Region	Date of Conference Call	Date Draft RSE-Lite Report Submitted	Date Final RSE-Lite Report Submitted
Chemko Technical Services, Inc. Mims, FL	4	3/17/2005	4/20/2005	8/8/2005
Engelhard Corporation Facility Plainville, MA	1	3/22/2005	5/27/2005	8/3/2005
BP Carson Refinery Carson, CA	9	4/7/2005	RSE-Lite: 6/10/2005	N/A*
Eaton Corporation Facility Kearney, NE	7	5/4/2005	6/21/2005	12/9/2005

\* A full-scale RSE was conducted at BP Carson Refinery site, and a final RSE report was produced instead of a final RSE-lite report.

## 1.5 SITE-SELECTION AND SCHEDULING FOR THE FULL-SCALE RSE

Upon completion of the four RSE-lites and receipt of comments from the site teams at each of the sites, the RSE team selected the BP Carson Refinery site to receive the full-scale RSE for the following reasons:

- Of the four sites in the pilot project, the BP Carson Refinery site is one of the more complex sites from a hydrogeological perspective.
- Of the four sites, the BP site is the most costly site to operate (largely due to the complexity of the site relative to the three other sites)
- Of the four sites, the BP site would benefit most from an RSE site visit because the infrastructure and activities of an operating refinery greatly influence the remediation activities and the RSE team can provide more relevant recommendations after seeing the site first hand.
- The BP site team (i.e., EPA Region 9 and BP) provided comments on the draft RSE-lite report that merited additional time and data analysis to address.
- There was information that became available after the preparation of the draft RSE-lite report that the evaluation team could consider during the RSE.

The RSE site visit was conducted on August 18, 2005. The draft RSE report was distributed to the site team on November 4, 2005, and a finalized RSE report was distributed to the site team on December 9, 2005.

## 1.6 BRIEF SITE DESCRIPTIONS

The following are brief descriptions of the four sites in the pilot test. Common themes from the RSE-lite and RSE reports are discussed in Section 2.0 of this report.

### Chemko Technical Services, Inc. Facility – Mims, Florida

The Chemko Technical Services, Inc. Facility (“Chemko”) is located at 5325 North U.S. Highway 1 in Mims, Florida. Chemko purchased the property in 1972. Prior to Chemko’s purchase, the facility had been used for fiberglass fabrication as well as heavy equipment repairs. Operations at the Chemko site historically, and currently, consist of metal fabrication and cleaning.

A series of site assessment activities were conducted beginning in 2001, which included delineation of contamination from a drain system, a soil vapor study, geologic borings, monitoring well design and installation, ground water sampling, and surface water sampling. Identification of the Chemko facility as a RCRA Corrective Action site is relatively recent and



initial site assessment was completed in FY 2003. The ground water contaminant plume consisting of tetrachloroethene (PCE) and its breakdown products has migrated beyond the property boundary and has impacted a domestic drinking water well. An interim measure P&T system was installed for source control on the Chemko property in 2004. Monitored natural attenuation (MNA) has been selected as the interim remedy for the downgradient plume, and a point of entry treatment system has been installed at the residence with the impacted well.

#### Engelhard Corporation Facility – Plainville, Massachusetts

The Engelhard Corporation Facility (“Engelhard”) is located at 30 Taunton Street in Plainville, Massachusetts. The facility, which was constructed in the late 1950’s, was primarily involved in the manufacturing/processing of various precious metal products. Environmental investigation and remedial activities have been conducted at the site since the mid 1980’s.

The ground water contaminant plume consisting of tetrachloroethene (PCE) and 1,1,1-trichloroethane (TCA) have migrated beyond the property boundary. EPA and Engelhard signed a 3008(h) Corrective Action consent order in 1993. As a result, a ground water stabilization measure (GSM) P&T system consisting of six deep bedrock extraction wells and a vertical high-density polyethylene (HDPE) barrier membrane was installed and began operating in 1998. The objective of GSM is to contain the plume along the HDPE barrier membrane and establish a gradient reversal to capture contamination that may be present immediately downgradient of the GSM.

#### BP Carson Refinery – Carson, California

The BP Carson Refinery (“BP”) is located at 1801 East Sepulveda Boulevard in Carson, California. Petroleum refining operations have been conducted at the site since 1923. From 1937 through 1945, other parcels of land were purchased and added to the refinery, and refining operations were expanded. The refinery is divided into various geographic areas with total area of approximately 702 acres. Ground water remediation has been ongoing at the refinery since 1977. Recovery of light non-aqueous phase liquid (LNAPL) was the focus of early remediation activities at the refinery. Between 1983 and 1996, approximately 17,000,000 gallons of LNAPL were recovered. A perimeter recovery system was constructed along the refinery’s western boundary between 1994 and 1997 to control potential off-site LNAPL migration, and LNAPL recovery efforts continue to be part of site remedial activities. In the mid-1990s, oxygenates emerged as constituents of concern for drinking water in the Carson area.

The current approach to remediation at the site consists of three parts: a collaborative regional approach to address the regional commingled plume(s), on-site LNAPL management, and on-site remedial measures to control dissolved oxygenate migration from the Northern Tank Farm (NTF), which is part of the main refinery. The collaborative regional approach involves working with the Carson Region Groundwater Group (CRGG) to develop a regional numerical model to determine if the plumes underlying the CRGG properties (including but not limited to the BP Carson Refinery) are “in control” in accordance with the Ground Water Environmental Indicator requirements of the RCRA Corrective Action Program. The onsite approach involves source elimination, source-area characterization and remediation, and ground water recovery for control of the oxygenate plume. The current remediation practices reflect a shift in focus from LNAPL

recovery to also include management of the dissolved phase plume. At the request of the site team, the RSE-lite and RSE focused on the performance of the ground water and LNAPL recovery system to control the migration of the dissolved oxygenate plume.

*Eaton Corporation Facility – Kearney, Nebraska*

The Eaton Corporation Facility (“Eaton”) is located on East Highway 30 in Kearney, Nebraska. The facility covers an area of 365,000 square feet and began operations in 1969 with engine valve manufacturing. Onsite remediation began in 1986 after trichloroethene (TCE) was found in production wells. On April 20, 1993, Eaton Corporation entered into an agreement with the EPA Region 7 to delineate and remediate TCE contamination downgradient of the facility. An interim system began operation in 1996, was reconfigured in 1998 to improve plume capture, and reconfigured again in 2003 to adapt to a change in the direction of plume migration.

The current approach to remediation includes an onsite P&T system to contain the onsite TCE contamination and an offsite P&T system to intercept the downgradient plume. The RSE-lite applies primarily to the offsite P&T system.

## **2.0 SUMMARY OF RSE FINDINGS AND RECOMMENDATIONS**

### **2.1 COMPARISON OF SITE/SYSTEM CHARACTERISTICS**

The four evaluated systems had the following characteristics:

- The primary contaminants of concern at all four sites are VOCs, such as TCE, PCE, and MTBE
- One of the four sites (Engelhard) has dense non-aqueous phase liquid (DNAPL) and one of the four sites has LNAPL (BP)
- Only one of the four sites involves contamination that is present in fractured rock (Engelhard)
- POET systems have been installed at residences for two of the sites (Chemko and Eaton)
- Annual O&M costs for the systems in increasing order are
  - \$50,250 for Chemko
  - \$85,690 for Eaton
  - \$141,000 for Engelhard
  - \$945,000 for BP

### **2.2 COMMON THEMES REGARDING RECOMMENDATIONS FOR IMPROVING EFFECTIVENESS**

Each of the four evaluated sites had recommendations for improving system effectiveness. The recommendations at the four sites pertained to plume capture and further evaluating potential receptors.

- Evaluations pertaining to plume capture or plume control were recommended at all four of the sites. At two of these sites (Chemko and Eaton), the evaluation team believed the current capture might be sufficient but further evaluation of concentration trends and potentiometric surface maps were recommended. At the other two sites (Engelhard and BP), the evaluation team did not see conclusive evidence of plume capture based on data provided, and recommendations were geared toward improving plume delineation and/or considering additional lines of evidence for evaluating plume capture and/or control.
- Further evaluation of potential receptors was recommended at two of the sites. At one site (Chemko), the recommendation was to track results of potable well sampling conducted by the local Department of Public Health. At the other site (Eaton), the recommendation was to remove POETS from two residential wells but to begin routine sampling at two other residential wells.

Other recommendations for improving effectiveness pertained to evaluating MNA at two of the sites (Chemko and BP), evaluating the potential for vapor intrusion (Chemko), sampling at residential wells (Eaton), improving of documentation for the site conceptual model (Engelhard), and increasing the extraction rate (Engelhard).

### **2.3 COMMON THEMES REGARDING RECOMMENDATIONS FOR COST REDUCTION**

Recommendations to reduce costs were provided at all four of the sites. Recommendations in this category generally pertained to modifying ground water monitoring programs and modifying treatment technologies.

The RSE-lite team recommended modifying the monitoring program at all four sites. The suggested modifications included the following:

- Reducing the number of water quality sampling locations was recommended at two sites (Chemko and Engelhard).
- Reducing the sampling frequency was recommended at two sites (Chemko and Eaton).
- Reducing the number of sampling parameters was recommended at one site (BP).
- Requesting a revision in the low-flow sampling procedure to expedite sampling without sacrificing sample quality was recommended at one site (BP).

The RSE-lite team estimated that implementing these recommendations at all four sites could save over \$75,000 per year through reduced monitoring costs, with little or no capital investment.

At the BP site the RSE/RSE-lite team made a recommendation to reduce recovery system O&M labor and another recommendation to reduce labor associated with data evaluation and reporting costs once the system is optimized. The estimated potential savings associated with these recommendations was approximately \$270,000 per year. At the Engelhard site, the RSE-lite team recommended considering the elimination of the metals removal equipment and removal of the liquid phase GAC units, with potential savings of up to \$62,000 per year from reduce material, disposal, and labor costs.

In total, the RSE-lite team provided nine cost-reduction recommendations that, if implemented, could potentially result in cost savings of over \$400,000 per year with little or no capital investment.

### **2.4 COMMON THEMES REGARDING RECOMMENDATIONS FOR TECHNICAL IMPROVEMENT**

Recommendations for technical improvement were provided at two sites (BP and Eaton). At the Eaton site, the RSE-lite team recommended revising the frequency and format of the progress report. At the BP site, the RSE-lite team recommended instituting a specific annual report for

the area of concern and also recommended reconsidering pumping from one of the recovery wells

## **2.5 COMMON THEMES REGARDING RECOMMENDATIONS FOR SITE CLOSURE**

Recommendations for site closure were provided at all four sites but do not necessarily share a common theme.

- At the Chemko site, the RSE-lite team suggested that the current interim remedial action be evaluated for a three-year period to determine if it would be an effective final remedial action.
- At the Eaton site, considering a potential alternative exit strategy was recommended, including the potential for discontinuing pumping if plume stability in the absence of pumping can be demonstrated.
- At the Engelhard site, the RSE-lite team recommended revisiting MNA criteria for the downgradient plume and continuing with a source control remedy. Due to the presence of DNAPL, the RSE-lite team suggested the site team focus on source control/containment, and potentially avoiding costly DNAPL remediation in the bedrock.
- With regard to the BP site, the evaluation team believes the wide-spread presence of LNAPL, the relatively impermeable nature of the water table aquifer, and the potential for future releases suggests that a remedy focused on plume control (through a combination of ground water extraction and MNA) would be more appropriate than a remedy focused on aquifer restoration.

### **3.0 PRELIMINARY FEEDBACK FROM SITE STAKEHOLDERS**

Optimization evaluation recommendations can take several months to evaluate and implement. As a result, given the time constraints of the project, following-up with the site stakeholders to determine which recommendations would be implemented was not part of the pilot project scope of work. It is therefore difficult to determine the impact the evaluations have had at the sites and to evaluate the points of view of the various stakeholders from each site. The following comments, however, were provided to the evaluation team shortly after submitting the evaluation reports. There are more comments from EPA and/or the State than there are from the facility representatives. This should not be construed as a lack of willingness to comment since a formal request for feedback by the project team was not requested.

#### **3.1 PRELIMINARY FEEDBACK FOR THE CHEMKO SITE**

The Florida Department of Environmental Protection (FDEP) communicated the following to the Chemko facility after reviewing the RSE-lite report:

The facility may choose to continue the current interim measure corrective action system as the long-term corrective action system.... A revised groundwater/corrective action monitoring plan should incorporate the recommendations in the EPA RSE-lite Report as well as the Department's monitoring recommendations.

This comment suggests that the monitoring program recommended in the RSE-lite, which involved cost savings for the facility, was considered by FDEP in its direction for the site. In addition, FDEP staff stated to the RSE-lite team, "Thanks for your work on the site. The report was well done and was quite beneficial at this site where the owner had limited resources available for CA [Corrective Action]." This comment indicates that the RSE-lite process may be particularly helpful at sites where evaluation is needed but limited resources are available from the regulatory agency and facility to conduct the evaluation. The facility did not provide feedback to the evaluation team.

#### **3.2 PRELIMINARY FEEDBACK FOR THE EATON SITE**

The EPA project manager for the Eaton site stated the following to the RSE-lite team regarding the RSE-lite process:

Thanks for your efforts at revising and finalizing the RSE-lite report for the Eaton facility in Kearney, NE. The document and response to comments have now been forwarded to the facility. The facility appears receptive to the recommendations contained in the report and I hope to work with their representatives over the next few months to implement most if not all of those recommendations.

In addition, the facility, in responding to the draft report, indicated concurrence with one recommendation to reduce costs and suggested modifications to two of the recommendations pertaining to improving remedy effectiveness. Ultimately, the RSE-lite team agreed with one of the two modifications and incorporated this modification into the final RSE-lite report.

These comments indicate that the RSE-lite recommendations will likely contribute to both a more protective and cost-effective remedy that is agreeable to both the regulatory agencies and the facility representatives.

### **3.3 PRELIMINARY FEEDBACK FOR THE ENGELHARD SITE**

No specific feedback was received for the Engelhard site from the regulatory agency or from the facility.

### **3.4 PRELIMINARY FEEDBACK FOR THE BP CARSON REFINERY SITE**

The EPA project manager for the BP Carson Refinery Site provided the following feedback to the evaluation team:

I want to commend Geotrans for the concise analysis contained in the RSE and thank OSRTI and OSW for supporting this effort. I believe the process of evaluating this particular remedial system has been helpful not only for this site, but will have applications for cleanup systems at other refineries and terminals in the LA West Coast Basin.

This statement suggests the value of the RSE-lite and RSE processes to EPA. In providing its comments on the draft RSE report, the BP representative stated, “ARC [BP] believes that the RSE-lite and RSE processes have provided ARC recommendations that will be helpful in ongoing evaluations at the BP Carson Refinery.”

## 4.0 LESSONS LEARNED AND POTENTIAL NEXT STEPS

### 4.1 LESSONS LEARNED

The primary lessons learned are as follows:

- RSE-lites can effectively be conducted at RCRA sites with involvement of both the regulatory and facility stakeholders. Prior to this RSE-lite pilot project, full-scale RSEs had been conducted at RCRA and Fund-lead sites. In this RSE-lite pilot project, RSE-lites provided a similar level of beneficial results for two sites as would be expected from full-scale RSEs, but at lower cost (approximately \$10,000 per RSE-lite instead of \$25,000 per RSE).
- However, the RSE-lite process was not as effective as a full-scale RSE at the Eaton and BP sites for two different reasons. At the Eaton site, the conference call format did not allow sufficient time and face to face communication for the evaluation team and the site team to interact. As a result, several follow-up communications were necessary for the evaluation team to fully understand the perspectives of the various site stakeholders. At the BP site, the refinery infrastructure and variety of ongoing site activities could not easily be communicated through a conference call. For this reason, and others, the BP site was selected for a full-scale RSE, allowing the evaluation team to tour the site and observe site remedial activities.
- In addition to identifying opportunities to improve remedy effectiveness, the evaluations from this pilot program yielded cost-reduction recommendations with potentially substantial annual savings.
- The site-selection process involved EPA project managers nominating sites, and the primary reason for a site nomination was a third party review of remedy effectiveness. By involving only EPA staff in the site-selection process, sites that might benefit from a third-party review for another reason (e.g., cost-reduction or remedy efficiency) may not have been considered for the pilot project.
- The majority of feedback received from the site teams regarding the RSE-lite and RSE processes was provided by EPA or its State counterpart. This might be a result of the EPA project managers nominating the sites for EPA-sponsored reviews. That is, the EPA project manager might be more comfortable than the facility in commenting on the process given that EPA is the regulator and the facility is the regulated party. The facility representatives might participate differently in a process if the review was sponsored by a third-party or co-sponsored by both EPA and the facility.



## 4.2 POTENTIAL NEXT STEPS

The following items are potential next steps that could be taken as a follow-up to this pilot project based on the above-mentioned lessons learned.

- Approximately six months after the end of the pilot project, the progress at each of these sites (and sites in the previous RCRA RSE pilot project) could be evaluated to determine how many of the RSE recommendations were implemented and how implementation of those recommendations has affected the sites. This information could help better judge the long-term value of the third-party reviews at these sites. Feedback from EPA, the State counterpart (if applicable), and the facility representatives would be helpful to in determining the value of the third-party review from these differing perspectives.
- Based on the feedback collected to date, third-party reviews such as RSE-lites and RSEs could continue to provide a benefit to sites in the RCRA Corrective Action Program. The process itself does not require further piloting; therefore, consideration might be given to how third-party reviews could be provided as part of a program. If there is no third-party source of funding for the reviews, funding might be equally provided by all parties involved in the process. That is, the RSE-lites or RSEs could be jointly funded by the EPA, the State (if applicable), and the facility. The topic of joint funding could be raised by EPA to a group of facility representatives suggesting the potential application of RSE-lites or RSEs at the following types of sites:
  - Sites where a remedy has stagnated or has not performed to expectations and additional measures are required
  - Sites where there is disagreement between the regulator and the facility with regard to a remedial approach
  - Sites where the facility is proposing a new or modified remedial approach and both the regulator and the facility see benefit in an independent analysis
  - Sites where a third party could help determine an appropriate level of financial assurance
  - Sites that will be transferred to a State or another party due to bankruptcy settlements
  - Sites where efficiencies and performance could be enhanced with respect to optimizing monitoring, extraction, treatment, etc.
  - Sites where the facility is interested in cost savings and other benefits by applying optimization while maintaining remedy effectiveness
- Although the RSE and RSE-lite process have both been piloted, only one form of site selection has been performed because this project used the same site-selection process as the original RCRA RSE project in 2003. Therefore, it is difficult to determine how RSE-

Lites or RSEs would be received, and what value they would have at sites that were selected through a different process (e.g., nominations from facility representatives).