July 2008

Performance Indicators for EPA Emergency Response and Removal Actions

Promoting Environmental Results

Through Evaluation

Acknowledgements

This evaluation was performed by Abt Associates Inc. as a subcontractor to Industrial Economics, Incorporated (IEc) for EPA's Office of Policy, Economics, and Innovation (OPEI) under Contract EP-W-04-023 between EPA and IEc. The evaluation team included Shanika Amarakoon and Debra Kemp, Abt Associates Inc., Bill Finan, EPA Office of Emergency Management, and Darlene Byrd and Yvonne Watson of OPEI, as the technical advisors.

This report was developed under the Program Evaluation Competition, sponsored by OPEI. To access copies of this or other EPA program evaluations, please go to the EPA Evaluation Support Division Web site at http://www.epa.gov/evaluate.

Table of Contents

Executive Summary

As part of a commitment to continuous improvement and evaluation, EPA's Office of Emergency Management (OEM) has developed assessment tools related to preparedness of the Emergency Response and Removal Program, but a method for evaluating the outcome of specific emergency responses and removal actions had not been developed. With the support of the EPA Program Evaluation Competition, Abt Associates completed an evaluation to identify and apply a suite of indicators for measuring the success of individual actions to allow for routine and consistent evaluation of responses.

Evaluation Purpose and Audience

The purpose of the evaluation was to assess the outcome of specific emergency responses and time-critical removal actions, by creating an evaluation method that could be applied to emergency response and removal actions conducted in FY2008 and later.

Specifically, the evaluation was designed to answer:

- What do EPA managers and external stakeholders and customers consider as indicators of success for removal actions?
- How do FY2008 emergency responses and removal actions rate against those indicators of success?

Methodology

Abt Associates first developed a logic model for fund-led emergency response and time-critical removal actions. A logic model is a visual, systematic manner of representing the way in which a program or specific aspect of a program works by illustrating the relationships between its resources, activities, outputs, customers, and short-term, intermediate, and long-term outcomes. After completing the logic model, we conducted interviews with EPA personnel, state/local responders, public citizens involved in removal actions, and a representative of the U.S. Coast Guard. The interview discussions focused on what defines success, potential indicators, and external factors that influence success. We also conducted a literature review to identify potential indicators of success for similar programs or activities and how response activities similar to emergency response and removal activities have been evaluated by other organizations.

We compiled, evaluated, and refined a preliminary list of indicators gathered from the interviews and literature review. Indicators were evaluated based on established criteria, such as the link to the logic model, frequency of response, span of control, feasibility, clarity, comparability, and validity. Of these criteria, the link to the logic model (specifically to an outcome), the frequency of response, span of control, and feasibility were the basis for indicator selection as they were found to be the most relevant for refining the indicators. In addition, the number of indicators selected was kept relatively small to keep the data collection burden for a routine assessment reasonable.

For each indicator, Abt Associates identified a rating system to reflect whether a removal action met the indicator fully (rating of 2), met the indicator partially (rating of 1), or did not meet the

indicator at all (rating of 0). In addition, we suggested data sources and possible limitations for each indicator. Abt Associates developed indicator evaluation templates for time-critical and emergency responses to develop a consistent framework for applying the indicators. Next, we tested indicators against 15 emergency response and time-critical removal actions completed between FY2006 and FY2008. These actions were selected from an initial list of 30 potential actions pulled from CERCLIS and/or www.epaosc.net based primarily on the availability of data sources and the need to have a relatively even mix of emergency responses and time-critical removal actions. In addition, the selected actions reflected a range of contaminants, pathways, and incident types. To evaluate the indicators we relied upon information available in pollution reports (PolReps) posted on the internet (www.epaosc.net) and Action Memos available for FY2006. Indicators were revised to provide further clarification on language and/or scope, and placed into one of the following tiers:

- **Tier 1** includes those indicators that are high priority (frequently reported during the interviews) and may be less burdensome to apply given that data may be more readily available.
- **Tier 2** includes lower priority indicators that were not frequently mentioned during the interviews or literature and/or are more burdensome to apply.
- **Tier 3** includes indicators that were deleted or consolidated as they were too burdensome to apply due to the lack of available data or did not seem to add value in assessing the overall outcome of the response.

Findings

Exhibit A presents the revised indicators developed based on the evaluation methodology. Interviewees largely supported that emergency responses (ER) and time-critical removal (TCR) actions should be considered differently for purposes of evaluation. Although there was overlap with the indicators, the priority of the indicators (i.e., whether they fell into the first or second tier) differed for the two categories given the different nature of the responses. For example, the cost effectiveness of the response was less important for emergency responses than time-critical removals, given the need to contain the threat immediately.

Exhibit A: Summary of Indicators

Indicator	Tier	
	ER	TCR
General public expressed satisfaction	1	1
State and local government satisfied with response	1	1
No responders or members of the public were injured during the response	1	1
Completed in a timely manner	1	1
Isolated and controlled contaminant source	1	--
Met immediate need of site to remove contaminant	--	1
Cost effective response	2	1
Communicated effectively with federal, state, and local representatives	2	2
Reporting requirements met and documentation complete	2	2
Site was in condition to allow its pre-action use to continue	2	2
EPA transitions site effectively to another entity, if needed	2	2
Provided or contributed to a long-term solution of cleaning up site to remove contaminant	--	2
Minimized economic impact to community	--	2
Response was justified as per National Contingency Plan	--	2
EPA considered other response options for addressing site	--	2

"--" Denotes indicator is not applicable to response.

In addition, several external factors were identified that may influence the indicators including:

- Timing of a state's request for EPA resources;
- Information provided by state/local responders at the onset of EPA involvement in response;
- Funding/resource constraints (may affect time-critical removal actions as opposed to emergency responses);
- State/local resources and capabilities;
- Statutory authority and limits under CERCLA; and
- Location/stationing of On Scene Coordinators (OSCs) relative to response site.

Overall, 15 indicators were identified, of which 10 applied to emergency responses, 14 applied to time-critical removals, and 9 applied to both. The indicators help to assess community involvement and satisfaction, operational activities, economic impact and site reuse, and the administrative record and reporting. The indicators were largely qualitative in nature, requiring subjective judgment in applying the indicators.

Conclusions

The development of an evaluation method for fund-led EPA emergency responses and time-critical removals yielded several important conclusions.

- Interviewees largely supported that emergency responses and time-critical removal actions should be considered differently for purposes of evaluation given the fact that emergency responses have an immediate threat responders must address. Accordingly, for the emergency response indicators, immediate response actions and short-term needs were categorized as a Tier 1, higher priority indicator.

- Interviewees had diverse opinions on the purview of the program, as well as what constitutes "success." Further, the testing process, as well as the interviews, also illustrates the wide variability of types of actions addressed by the EPA Emergency Response and Removal Program, ranging from mercury clean up in high schools to drinking water contamination.

- Many of the most commonly suggested indicators, including those with a strong link to the logic model, are largely qualitative in nature. To evaluate the indicators as currently written, professional judgment and/or firsthand knowledge of the action is needed to apply indicators and determine the appropriate rating. Given the subjective nature of the indicators and the varying opinions on what constitutes a successful action, it was not feasible to differentiate with certainty between actions that are and are not successful.

- The information required to apply the indicators is not provided in the administrative record, as currently written. To thoroughly evaluate the outcome of removal actions, additional data collection would be needed to fully and accurately apply indicators, such as interviews with OSCs or a customer satisfaction survey.

Finally, the U.S. Coast Guard (USCG) also attempted to develop a similar evaluation tool to evaluate the outcome of responses. However, this effort was abandoned for reasons consistent with the conclusions of this evaluation.

Recommendations

Abt Associates provides the following recommendations, which were discussed with and informed by senior OEM management, based on the findings and conclusions presented in this report:

- Apply the evaluation method in context of performance indicators, which is a more reflective of the identified indicators and the diverse views on what constitutes a successful action.

- Although the rating system developed was initially numeric, given the limited information available to rate indicators and their subjective nature, Abt Associates recommends using a simple plus (+) or minus (-) approach to identify areas of strength and areas needing improvement.

- Solicit feedback from a broad audience on the proposed performance indicators to ensure agreement and consistency on the suite of indicators.

- Use the evaluation method to frame the development of lessons learned reports so that they are consistent, as opposed to the more ad hoc approach used currently.

- Apply the performance indicators to a select subset of removal actions, which could be selected based on a random sampling or a nomination process. The selected data collection approach should provide a balance between the burden of data collection/analysis and the desire for routine evaluation.

- Consider a case-study approach which may involve evaluating one or more removal actions in depth. This would allow EPA to explore further what comprises for a successful action and also address fully the external factors that might influence the outcome of a response as well as more intangible factors.

Chapter 1: Introduction

As part of a commitment to continuous improvement and evaluation, EPA has developed assessment tools related to preparedness of the Emergency Response and Removal Program, but a tool for evaluating the outcome of specific emergency responses and removal actions had not been developed. With the support of the EPA Program Evaluation Competition, Abt Associates completed an evaluation to identify and apply a suite of indicators for measuring the success of individual actions to allow for routine and consistent evaluation of responses.

1.1 Background on the Emergency Response and Removal Program

EPA conducts removal actions under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. CERCLA authorizes an action "whenever (i) any hazardous substance is released or there is a substantial threat of such a release into the environment, or (ii) there is a release or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare." Through its regional programs, the EPA Office of Emergency Management (OEM) undertakes removal actions to address releases or threatened releases requiring prompt response. These removal actions fall into three categories:

- *Emergency responses* are those that warrant immediate attention within hours of the lead agency's site evaluation.
- *Time-critical removal actions* are those that warrant action within six months of site evaluation by the lead agency.
- *Non-time-critical removal actions* are those for which the lead agency, based on a site evaluation, determines that an action is necessary but does not need to be initiated within the next six months.[1]

Emergency responses and removal actions may be funded or led by various parties, including EPA or the Potentially Responsible Party (PRP).

1.2 Evaluation Purpose and Audience

The purpose of this evaluation was to assess the outcome of individual fund-led emergency response and time-critical removal actions. This subset of actions was selected because they require more investment of EPA time and resources than PRP-led actions, and it was presumed that data and information were more likely to be readily available. The evaluation project first required the development of a suite of indicators of successful removal actions, followed by an assessment of how actions completed in Fiscal Year (FY) 2008 rate against those indicators.

[1] U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Superfund Removal Procedures, Revision Number Three, Document #9360.0-03b, (February 1988).

The results of the evaluation will be of interest primarily to EPA staff with responsibility for conducting and managing removal actions. For example, regional Removal Managers and On-Scene Coordinators (OSCs) may use the assessment method to regularly assess removal actions and guide the lessons learned process, and may use the results of the evaluation to improve training and exercises. In addition, EPA Headquarters may use the evaluation results to inform revisions to the Core ER assessment tool[2] or relevant policies, better target resources, and provide information to the public or Congress. The indicators also complement related OEM efforts, such as the development of long-term outcome measures, by providing a broader evaluation of removal program activities. In addition, this evaluation could serve as the basis from which EPA could develop an evaluation framework for PRP-led actions, non-time critical removal actions, or nationally significant incidents.

1.3 Evaluation Questions

In order to focus the evaluation and establish a clear goal, the Evaluation Team identified two specific questions that were of particular interest and drove the methodology:

1. What do EPA managers and external stakeholders and customers consider as indicators of success for removal actions?

2. How do FY2008 emergency responses and removal actions rate against those indicators of success?

To inform the development of the methodology, the Evaluation Team developed a logic model for an emergency response or removal action (Exhibit 1). A logic model is a visual, systematic manner of representing the way in which a program or specific aspect of a program works by illustrating the relationships between its resources, activities, outputs, customers, and short-term, intermediate, and long-term outcomes. It also helps "create a framework for evaluation by identifying questions for each component. These enhance the clarity and usefulness of [the] evaluation by focusing on questions that produce answers of real value for [the program] and [its] stakeholders." The logic model provided the framework for the selection of indicators of success (see Chapter 3).

It is important to note that after consultation with senior OEM management, the evaluation team concluded that applying the indicators identified to removal actions completed in FY2008 (Evaluation Question 2) was not feasible given the qualitative nature of the identified indicators and limited data available. However, the following report describes the methodology used to generate the indicators and discusses in detail why the indicators were not feasible to apply.

1.4 Report Organization

The remainder of this evaluation report consists of the following chapters:

Chapter 2, Methodology, provides a description of the data collection approach used to identify and refine the indicators of success.

[2] The Core ER tool is used by OEM to measure preparedness for a response.

Chapter 3, Findings, summarizes the list of indicators identified and results from testing the indicators against completed removal actions.

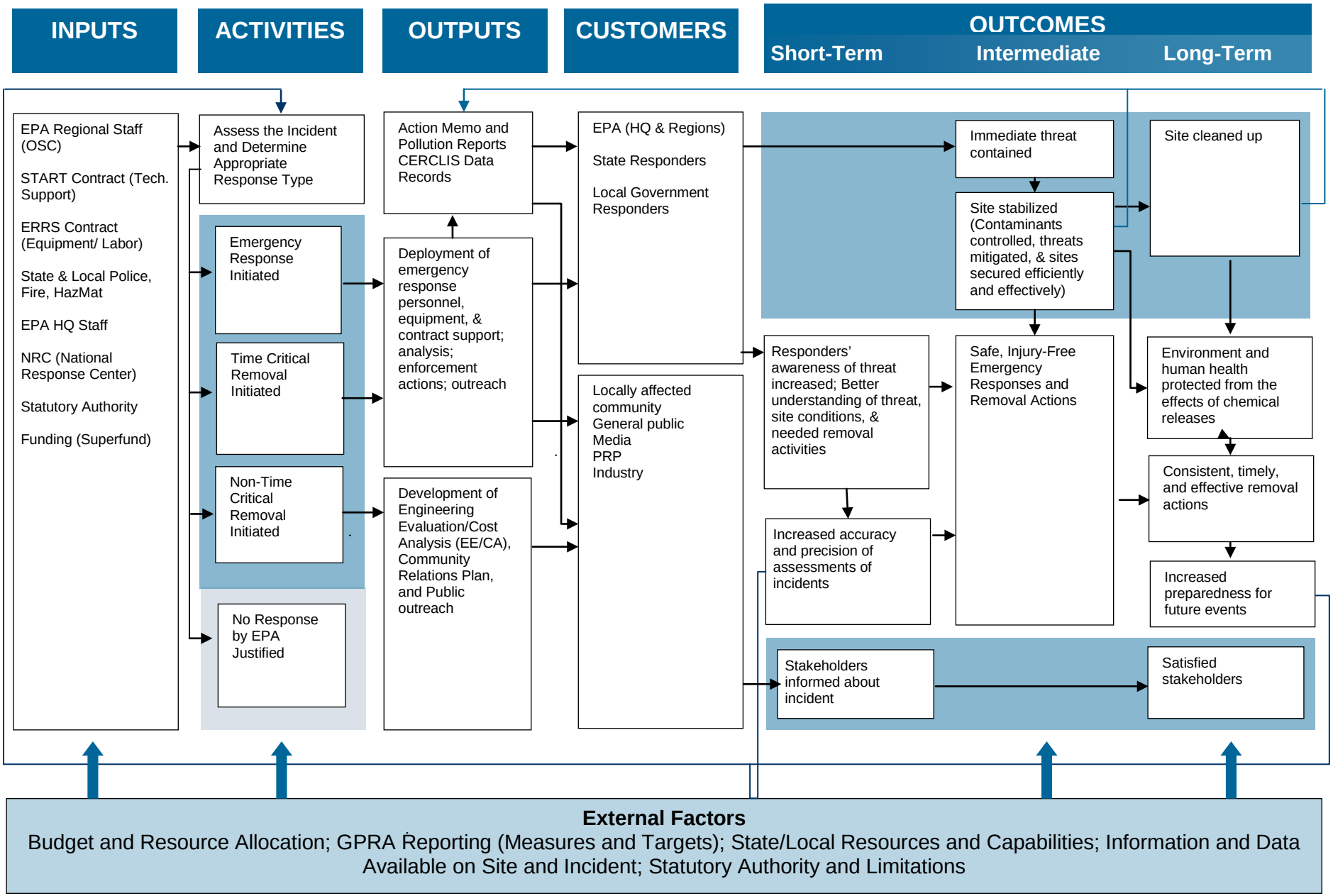
Chapter 4, Conclusions, discusses the suite of performance indicators developed and overarching considerations that resulted from the evaluation.

Chapter 5, Recommendations, presents the implications from the evaluation approach and the next steps for developing the method.

The report also includes several appendices, including a list of preliminary indicators and a summary of the literature review.

Exhibit 1: Logic Model for Fund-Led Emergency Response and Removal Actions

Mission: To mitigate and address threats to public health, welfare and the environment



External Factors

Budget and Resource Allocation; GPRA Reporting (Measures and Targets); State/Local Resources and Capabilities; Information and Data Available on Site and Incident; Statutory Authority and Limitations

Chapter 2: Methodology

This section identifies the methods by which Abt Associates collected the information for the evaluation and describes the potential limitations of the approach. In general, four main steps were proposed: (1) identify and refine potential indicators of success through a literature review and interviews, (2) test the indicators on FY2006, 2007, and 2008 actions, (3) revise the indicators based on the testing results, and (4) apply final indicators to FY2008 actions.

As noted in Section 1.3, after consultation with senior OEM management, the Evaluation Team concluded that applying the indicators developed to removal actions completed in FY2008 (step 4) was not feasible due primarily to the lack of data to apply the indicators. Accordingly, the methodology described below focuses on the first evaluation question – identifying indicators of success for removal actions (steps 1 to 3).

2.1 Review Published Literature

The evaluation team reviewed published literature sources from EPA and other federal and private organizations to identify potential indicators of success for similar programs or activities (Exhibit 2).

Exhibit 2: Document and Description

Document Name	Brief Description
U.S. Department of Homeland Security, Performance Budget Overview, Appendix B, Fiscal Year 2007, Congressional Budget Justification (http://www.dhs.gov/xlibrary/assets/Budget_PBOAppB_FY2007.pdf).	This document presents Government Performance and Results Act (GPRA) goals and performance measures for various Department of Homeland Security programs including the Mitigation and Readiness programs. The measures used in FY2006 for the mitigation and readiness programs are listed in Table 1.
U.S. Department of Health and Human Services, Centers for Disease Control (CDC) and National Institute for Occupational Safety and Health (NIOSH). "How to Evaluate Safety and Health Changes in the Workplace." Prepared by the Intervention Effectiveness Research Team of the National Occupational Research Agenda. March 2004	This National Institute for Occupational Safety and Health (NIOSH) report details a four step program for evaluating the health and safety program present in the workplace. This process includes (1) forming a team, (2) collecting relevant data, (3) analyzing data, and (4) sharing the results. Program effectiveness is measured against indicators that include: ▪ Injury frequency and rates ▪ Workers' compensation costs ▪ Lost workdays and absenteeism due to work-related injuries ▪ Profit and loss ▪ Environment sampling data ▪ Production errors or waste ▪ Cost of preventative measures
Organization for Economic Co-operation and Development (OECD),	This document is designed to serve as a tool to assist industrial enterprises, public authorities, and communities near hazardous locales to develop and implement a means to assess the success of

Guidance on Safety Performance Indicators, Interim publication scheduled to be tested 2003 to 2004 and revised in 2005 (http://www.oecd.org/dataoecd/60/39/21568440.pdf).	their chemical safety activities. The reference provides guidance on how to develop and implement safety performance indicators for programs run by a variety of stakeholders and builds on the *OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response.*
U.S. Department of Labor, Occupational Safety and Health Administration, Safety and Health Program Evaluation Profile (PEP), Appendix B, distributed August 15, 1996 (http://www.osha.gov/SLTC/safetyhealth/pep.html#er).	This document includes performance indicators for emergency response based on Safety and Health Program Management Guidelines pertaining to emergency preparedness and hazard prevention and control. OSHA uses the Program Evaluation Profile (PEP) auditing tool to assess workplace safety and health programs.
U.S. Department of Homeland Security, Homeland Security Exercice Evaluation Program (HSEEP), (https://hseep.dhs.gov/pages/HSEEP_Home.aspx, accessed December 10, 2007).	This document provides a standardized policy, methodology, and language for designing, developing, conducting, and evaluating all exercises. The program includes tools to help exercise managers plan, conduct, and evaluate exercises to improve overall preparedness. For example, the Exercise Evaluation and Improvement Planning (Volume III) presents a methodology for evaluating and documenting exercises and implementing an Improvement Plan (IP). In addition to presenting an evaluation template, a methodology for collecting and analyzing the data and implementing corrective actions based on the results of the evaluation is also presented.
Probst, K. and D. Sherman. "Success for Superfund: A New Approach for Keeping Score," Resources for the Future, April 2004.	This document illuminates the challenges of evaluating an environmental program. Moreover, it focuses on the vital role of indicators in the evaluation process, and the necessity of choosing indicators consistent with program goals. Due to this focus, the document does not specify the ways in which indicators may be measured or quantified. The authors aptly note that "good" indicators are able to *quantify* success, have data that is readily available and support cost-effective evaluation. This document further illustrates the importance of having indicators that evaluate a well-defined goal that is thoroughly understood by all stakeholders.
U.S. Coast Guard, Proceedings of the Marine Safety Council. "Measuring Response: A Balanced Response Scorecard for Evaluating Success." Spring 2008.	This document provides an update of work from the U.S. Coast Guard on measures used to determine success in emergency response. The article notes that traditionally a successful response is measured by activities (e.g., speed in responding, gallons spilled and recovered) versus the outcome of a response (e.g., minimizing consequences to public, environment, property, and economy). The document also describes two types of indicators, leading indicators and lagging indicators. The leading indicator measures preparedness and the lagging indicator measures the actual outcome of the response.
U.S. EPA Office of Solid Waste and Emergency	WISE is a cooperative agreement between the EPA Office of Solid Waste and Emergency Response and the Program for Environmental

Response and the Program for Environmental Policy and Planning Systems of the Institute of Science and Public Affairs of Florida State University, Waste Indicator System for the Environment (WISE), last updated May 8, 2003 (http://www.pepps.fsu.edu/WISE/).	Policy and Planning Systems of the Institute of Science and Public Affairs of Florida State University. The purpose of this agreement is to develop a national set of waste and emergency response indicators that can be used by states, tribes, non-governmental organizations and the private sector, as well as EPA, to describe and understand environmental trends and conditions concerning waste and environmental emergencies. The indicators related to environmental emergencies were based on prevention, preparedness, and actions to stabilize the conditions.

The literature and data sources were reviewed to determine how response activities similar to emergency response and removal activities have been evaluated in the past and by other organizations.

2.2 Conduct Interviews

To solicit feedback on indicators that would be meaningful for evaluating the outcome of removal actions, Abt Associates conducted 18 interviews. As presented in Exhibit 3, the interviewees included 13 EPA personnel, 2 state/local responders, 2 public citizens with knowledge of removal actions, and 1 representative of the U.S. Coast Guard. The interviewees were selected based on recommendations from OEM program staff. By interviewing a cross-section of individuals, we collected information on a variety of perspectives.

Exhibit 3: List of Interviewees and Affiliations
EPA Headquarters
Debbie Dietrich, Director, EPA Office of Emergency Management
Dana Tulis, Deputy Director, EPA Office of Emergency Management
Tito Irizarry, Director, OEM Program Operations & Coordination Division
Dana Stalcup, Director, OEM Business Operations Center
Removal Managers
Dennis Carney, EPA Region 3
Chris Fields, EPA Region 10
Division Directors
Keith Takata, EPA Region9
Sam Coleman, EPA Region 6
Cecilia Tapia, EPA Region 7
On-Scene Coordinators
Eric Nold, EPA Region 7
Marc Callahan, EPA Region 10
Greg Ham, EPA Region 3
Mark Durno, EPA Region 5

State/Local Responders
Kerry Leib, Pennsylvania Department of Environmental Protection
John Regan, New Hampshire Department of Environmental Services
Public Citizens
Debbie Roth, President of "Our Live Count" (Community Activist Group), Pennsylvania
Larry Mades, Local Activist, Swift Creek Removal Site
U.S. Coast Guard
Commander Andrew Tucci, Chief, Oil and Hazardous Substances Division, Office of Incident Management and Preparedness

Abt Associates worked with staff at OEM to develop an interview guide to ensure that the interview questions were targeted appropriately. These interview questions are presented in Appendix A. The interviews focused on discussion of indicators of success for fund-led emergency responses and time-critical removal actions. In addition, interviewees provided examples of removal actions they considered successful and those considered not as successful, as well as key factors that led to the respective outcome. In conducting the interviews, Abt Associates complied with the Paperwork Reduction Act and other Office of Management and Budget (OMB) policies on information collection requests.

Interviews were conducted in person for those interviewees located at EPA Headquarters. All other interviews were conducted over the phone. Interview responses and comments are not referenced or attributed to specific individuals in this report, or in other discussions or presentations relating to this project. We believe this approach increased the candor of the answers and opinions provided in the interviews.

2.3 Compile and Refine Preliminary Indicators

Based on the interviews and literature review, a variety of indicators of success were identified and compiled. However, not all the indicators identified by the interviewers, are appropriate for evaluating emergency responses and removal actions. To determine indicators best suited for this evaluation, Abt Associates analyzed the indicators based on the selection criteria described in Exhibit 4.

Exhibit 4: Indicator Evaluation Criteria

Criterion	Description
Link to Logic Model	The indicator has a clear link to the outcome of a response, as illustrated by the logic model of removal actions.
Frequency	Indicator was suggested multiple times by interviewees or in the literature sources.
Span of Control	The program's effect on the indicator is relatively significant and distinguishable from other non-programmatic influences.
Feasibility	The burden and resources needed to gather data are readily available and the measure is relatively easy to execute and maintain.

Clarity	The metric is clear, specific, and easily interpreted.
Comparability	The metric allows for comparisons across regions (or in this case, actions), if appropriate.
Validity	The measure should produce the same results when repeated in the same population and setting. Internal consistency can be ensured for tracking the measure over time.

In refining the sub-set of indicators, Abt Associates considered how best to apply the indicators that were more qualitative in nature. Accordingly, for each indicator we developed a rating system as follows:

- 2 – Meets indicator to a great extent
- 1 – Meets indicator to some extent
- 0 – Does not meet the indicator at all
- Not Applicable – The indicator does not apply to the specific action
- Unknown – The information is not available

The proposed rating system for the indicators is similar in concept to the Core ER evaluation, which is used by EPA to evaluate preparedness for emergency responses.

2.4 Test Preliminary Indicators

After receiving feedback from EPA on the preliminary list of indicators, Abt Associates tested the indicators against 15 completed removal actions from FY2006, 2007, and 2008. These actions were selected from an initial list of 30 potential actions (pulled from CERCLIS and/or www.epaosc.net) based primarily on the availability of data sources and the need to have a relatively even mix of emergency responses and time-critical removal actions. In addition, the selected actions reflected a range of contaminants, pathways, and incident types.

To test the indicators, we relied on available documentation, including Pollution Reports (many accessible online via www.epaosc.net) and Action Memos. However, the Action Memos were only available for FY2006, based on the Removal Action Analysis Project recently completed for OEM. EPA prepares an Action Memo (generally only for Fund-led removal actions) that describes the site's history, current activities, and known threats to human health and the environment. It also contains information on proposed actions to be taken in response to the threat and their respective costs.[3] Pollution Reports (PolReps) are progress reports that document the status of removal actions as they occur. [4] Accordingly, Action memos and PolReps were reviewed to locate information to apply the indicators. Additional data may have been available through interviews with the public and EPA staff involved in the response, but was not collected due to time and data collection limitations.

[3] U.S. Environmental Protection Agency, Superfund Removal Procedures: Action Memorandum Guidance, EPA/540/P-90/004. 1990.
[4] U.S. Environmental Protection Agency, Superfund Removal Procedures: Removal Response Reporting, POLREPs and OSC Reports, EPA 540/R-94/023, 1994.

2.5 Revise Indicators

Based on information collected from the indicator testing exercise, Abt Associates revised the indicators based on the following tiering approach:

- **Tier 1**: The first tier reflects those indicators that are high priority (frequently reported during the interviews) and may be less burdensome to apply given that data may be more readily available.
- **Tier 2**: The second tier includes lower priority indicators that were not frequently mentioned during the interviews or literature and/or are more burdensome to apply.
- **Tier 3**: We propose deleting or consolidating indicators in the third tier as they are too burdensome to apply or do not seem to add value in assessing the overall outcome of the response.

In addition, Abt Associates re-evaluated the proposed rating approach (i.e., scale of 0 to 2) in light of the testing results and data availability issues.

2.6 Quality Assurance Procedures

This evaluation was conducted in accordance with an approved Quality Assurance Project Plan (QAPP), which documents the planning, implementation, and assessment procedures for identifying indicators of success and evaluating removal actions for EPA. The QAPP was written based on the requirements in the Statement of Work and "EPA Requirements for Quality Assurance Project Plans," dated March 2001.

To ensure data quality, information obtained from OEM staff and managers was confirmed and documented, as appropriate. Secondary information on potential indicators was obtained from published documents and was cited, as appropriate. In addition, documents and data used in the evaluation of completed actions either to test the action or conduct the final evaluation of completed FY2008 actions were cited. As noted, these documents primarily included Pollution Reports and Action Memos. Limited data were available through CERCLIS, which is considered the official database for all site and non-specific Superfund data on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), including data on removal actions.

The indicators identified from the data sources were included in the preliminary list of indicators of success. However, limitations of the indicators (e.g,. feasibility of application, available data to the apply the indicators, and clarity) were documented as appropriate. These limitations were considered as Abt Associates narrowed the preliminary list of indicators to develop a final list of indicators to evaluate the completed removal actions. The indicators were refined according to criteria identified in the Abt Associates methodology (e.g., data availability, clarity, span of control). Abt Associates also worked with OEM staff to identify a sample set of removal actions to test draft indicators and to evaluate after the final list of indicators is developed.

Finally, the Abt Associates Technical Reviewer provided quality assurance by evaluating the overall consistency of the data and information presented.

Chapter 3: Findings

This section presents our findings based on the evaluation methodology (discussed in Chapter 2), including the preliminary and revised indicators for evaluating fund-led emergency responses and time-critical removal actions.

3.1 Preliminary Indicators

After completing the interviews, it was clear that the definition of success and related indicators varied depending on a person's experience and perspective. Overall, interviewees agreed that satisfaction of the "customer," including public citizens or state/local responders, was important to consider a response successful. Public citizens emphasized communication as a key indicator. One public citizen noted that the public is satisfied with a response when EPA "does what it says it will do" with respect to the response. Several OSCs noted that addressing the contamination source and protecting public health were the most important. In general, interviewees agreed that time-critical actions should be evaluated separately from emergency responses, given the different nature of the responses. However, some interviewees suggested that additional delineations should be made based on factors such as the location, type of contaminant, or media contaminated.

In addition to the interviews, Abt Associates conducted a literature review to identify potential indicators of success for similar programs or activities (see Appendix B). However, this review did not identify as many relevant indicators as were identified through the interviews. In addition, many indicators presented in the literature review focused more on indicators that measure response preparedness as opposed to the outcome of a response.

The indicators identified based on the interviews and literature review were combined into a single list, with similar indicators combined where appropriate (see Appendix C). The preliminary indicators fell into eight general categories, including (1) protection of human health and the environment, (2) decision to initiate emergency response or removal, (3) operational activities during the response, (4) relationship with the state/local response community, (5) community involvement and satisfaction, (6) economic impact and site reuse, (7) administrative record and reporting, and (8) other. In order to group related indicators, they were placed into these eight categories.

In reviewing the indicators against the selection criteria, the link to the outcome of a response, as illustrated by the logic model for removal actions, was the key criterion by which the indicators were selected for further testing and refinement. As summarized in Exhibit 5, generally, if an indicator was linked to the outcome of a response, it was selected. If, however, an indicator was linked to the outcome of a response and was not selected, it was generally due to several factors, including: (i) a minimal span of control by EPA, (ii) infrequent reference from interviewees and in literature sources, (iii) it was not feasible to apply, and/or (iv) it lacked clarity. For example, the indicator related to the successful implementation of local area emergency planning is linked to the long-term outcome of the response, but it is not as feasible to apply and lacks clarity.

On the other hand, if an indicator was linked to an activity or had no direct link to the logic model and was selected, it was primarily due to the following factors: (i) it was considered an activity that may have a significant impact on the outcome and success of a response, (ii) EPA's span of control of the indicator is complete or significant, and (iii) it was referenced frequently by interviewees and in the literature. For example, the indicator related to the cost effectiveness of the response had no direct link to the logic model, but was within EPA's span of control and was frequently referred to as an indicator of success during the interviews.

Exhibit 5: Summary of General Indicator Selection Process

Linked to Logic Model	Decision: Indicator Selected	Decision: Indicator NOT Selected
Yes	▪ Linked to outcome (short-term, intermediate, or long-term)	▪ Linked to activity ▪ Indicator linked to outcome but it: ✓ Was not within EPA's span of control (minimal or not at all) ✓ Was not referenced frequently by interviewees and literature sources ✓ Was not feasible to apply ✓ Lacked clarity
No	▪ Indicator not linked to logic model or linked to activity, but it was: ✓ Considered an activity which may have a significant impact on the outcome and ultimate success of the response ✓ Complete/significant span of control ✓ Referenced frequently by interviewees and literature sources	▪ No Direct Link

Based on this analysis, which is presented in Appendix C, Abt Associates selected a sub-set of indicators for further refinement and testing (those not shaded in gray), which are referred to as the Preliminary List of Indicators. The table in Appendix C also includes a "justification" statement as to why each indicator was or was not selected. In addition to the selection process described above, the number of indicators selected was kept relatively small to keep the burden of routine evaluation reasonable. Also, some indicators that were similar were combined.

In refining the sub-set of indicators, it was particularly important to consider how best to apply indicators that were more qualitative in nature. In addition, it was important to refine indicators that did not rate well on feasibility, clarity, comparability, and validity, if possible. Accordingly, Abt Associates developed a rating system to consistently apply indicators that were more qualitative in nature (see Section 2.3). Exhibit 6 also denotes the indicators that should apply to only time-critical removals, only emergency responses, or both. Note that the list of indicators includes two outcome measures for the Emergency Response and Removal Program the Office of Emergency Management is currently piloting, which capture indicators that were referenced during the interviews.

Exhibit 6: Refined List of Preliminary Indicators for Testing					
Indicator	TCR	ER	Rating System	Data Source	Data Availability and Limitations
Protection of Human Health and the Environment					
Human health protected from contaminant	✓	✓	Outcome measure (Human Exposures Avoided per $1 Million Extramural Resources Expended)	Pollution Report Action Memo OSC Input (best judgment) (See ERR Outcome Measures Handbook, dated May 6, 2008)	Need to determine how EPA would use the measure on a action by action basis to evaluate success
Protection of environment maximized	✓	✓	Outcome measure (Acreage Protective for People)	Pollution Report Action Memo OSC Input (best judgment) (See ERR Outcome Measures Handbook, dated May 6, 2008)	Need to determine how EPA would use the measure on a action by action basis to evaluate success
Decision to Initiate Emergency Response or Removal					
EPA considered other response options for addressing the site: -- That were as or more effective -- That cost less -- That could be completed more quickly	✓		To a great extent / To some extent / Not at all	Action memos (from regions or on epaosc.net)	Action memos are required, but they often vary in the amount of detail included. Action memos can be challenging to obtain (regional records). Amendments to action memos might not be known (except to regional staff) as data in CERCLIS are spotty.
EPA response was justified according to NCP	✓		To a great extent / To some extent / Not at all	Action memo	See above
Operational Activities					
Responded in a timely fashion following notification		✓	To a great extent / To some extent / Not at all	Initial Pollution Report OSC Input (best judgment)	See above. Need to clarify how to define "timely" for consistency across removal actions.
Isolated and controlled contaminant source -- Made no technical mistakes -- Prevented additional releases		✓	To a great extent / To some extent / Not at all	Initial and subsequent Pollution Reports	See above
Met immediate need of site to remove contaminant -- As outlined in action memo or ICS 202 Incident Action Plan	✓		To a great extent / To some extent / Not at all	Initial and subsequent Pollution Reports Administrative Record (ICS Form)	See above Would need to locate forms, as likely

Exhibit 6: Refined List of Preliminary Indicators for Testing					
Indicator	TCR	ER	Rating System	Data Source	Data Availability and Limitations
-- Prevented additional releases					not publicly available through epaosc.net
Provided or contributed to a long-term solution of cleaning up site to standard -- Consistent with NPL activities (if applicable) -- Maximized efficiency if multiple actions were required	✓		To a great extent / To some extent / Not at all	Final Pollution Reports	See above
No public citizens were injured or died during response (different than exposures avoided)	✓	✓	Yes / No	Pollution Reports (All)	See above
No responders were injured or died during response	✓	✓	Yes / No	Pollution Reports (All)	See above
Cost effective response -- Completed within initial budget ceiling	✓		To a great extent / To some extent / Not at all	Pollution Reports (All)	See above.
Completed in a timely manner -- Within one year (statutory deadline) -- Within schedule proposed in action memo	✓	✓	To a great extent / To some extent / Not at all	Pollution Reports CERCLIS (completion date)	Need to clarify how to define "timely" for consistency across removal actions.
Relationship with Response Community					
Coordinated effectively with other government responders (federal/state/local)	✓	✓	To a great extent / To some extent / Not at all	Pollution Reports (all) Input from OSC Input from state/local responders	Input from OSC would require some data collection burden. Regularly collecting input from state/local responders would require an ICR. It might not be possible to adequately address this question without this data collection.
Filled gap in response capability for states/locals -- Manpower -- Expertise -- Equipment -- Funding	✓	✓	To a great extent / To some extent / Not at all	Action memo, supplemented by: Input from OSC Input from state/local responders	Input from OSC would require some data collection burden. Regularly collecting input from state/local responders would require an ICR. It would be possible to address this question without this data collection, as availability of others to respond is an NCP justification criterion addressed in

Exhibit 6: Refined List of Preliminary Indicators for Testing					
Indicator	TCR	ER	Rating System	Data Source	Data Availability and Limitations
					the Action memo.
Community Involvement and Satisfaction					
State and local governments satisfied with response activity	✓	✓	To a great extent / To some extent / Not at all	Pollution Reports (all) Input from OSC Input from state/local responders	Input from OSC would require some data collection burden. Regularly collecting input from state/local responders would require an ICR. It might not be possible to adequately address this question without this data collection.
Communicated effectively with state and local governments (beyond other responders) -- Audience identified and reached -- Information provided was appropriate -- Communication was frequent	✓	✓	To a great extent / To some extent / Not at all	Pollution Reports (all) Input from OSC Input from state/local responders	Input from OSC would require some data collection burden. Regularly collecting input from state/local responders would require an ICR. It might not be possible to adequately address this question without this data collection.
General public satisfied	✓	✓	To a great extent / To some extent / Not at all	Pollution Reports (all) Input from OSC Input from public Positive media coverage	Input from OSC would require some data collection burden. Regularly collecting input from public would require an ICR. It might not be possible to adequately address this question without this data collection.
Communicated effectively with public -- Affected citizens and community groups identified -- Action-specific information provided -- Communication was frequent/consistent -- Questions answered and any issues addressed -- Press coverage correct and positive	✓	✓	To a great extent / To some extent / Not at all	Pollution Reports (all) Input from OSC Input from public Published documents (admin record) Media reports	Input from OSC would require some data collection burden. Regularly collecting input from public would require an ICR. It might not be possible to adequately address this question without this data collection.
Economic Impact and Site Reuse					
Site was in condition to allow its pre-action use to continue	✓	✓	To a great extent / To some extent / Not at all	Pollution Report Information from state/local government on current use of site	Collecting information on use from states/locals would require an ICR. Unclear if PolReps would have such

Exhibit 6: Refined List of Preliminary Indicators for Testing					
Indicator	TCR	ER	Rating System	Data Source	Data Availability and Limitations
					specific information (perhaps if there was an exception).
EPA transitions site effectively to another entity, if needed	✓	✓	To a great extent / To some extent / Not at all	Final Pollution Report	Unclear if PolReps would have such specific information
Minimized economic impact to community -- Avoided or minimized closure of transportation facilities and businesses, to the extent possible -- All affected residents or businesses move back to response site once action is complete	✓		To a great extent / To some extent / Not at all	Pollution Reports Information from state/local government on current use of site Input from OSC	Collecting information on use from states/locals would require an ICR. Information from OSC might be sufficient.
Administrative Record and Reporting					
Reporting requirements met and documentation complete -- CERCLIS -- Administrative record (action memos, PolReps) -- Administrative record provides for a defensible action (if applicable)	✓	✓	Yes / No	CERCLIS, epaosc.net, other?	Would show if data are there, not quality.
Other					
OSC demonstrated good project management and communication skills, including managing expectations	✓	✓	To a great extent / To some extent / Not at all	OSC / RM Feedback	Input from OSC/RM would require some data collection burden. Information would be subjective.
OCS incorporated lessons learned from other responses	✓	✓	To a great extent / To some extent / Not at all	OSC / RM Feedback	Input from OSC/RM would require some data collection burden. Information would be subjective.

3.2 Indicator Testing Results

Abt Associates selected 15 removal actions between FY2006 and FY2008 for testing the indicators and relied upon available information in the Pollution Reports and Action Memos (see Section 2.4 for more information). The review of removal actions and information presented during the interviews revealed the wide variability of actions addressed by the EPA Emergency Response and Removal Program. These actions can range from one-day events to provide air monitoring capability to a local responder during a fire to a multi-year, multi-million dollar effort to address contamination at an abandoned mining site

Based on the testing results, in many cases information was not readily available, resulting in indicators scored as "unknown." In these instances, information was not adequate to determine whether the overall outcome of the response was successful. If the indicator was not applicable it would be marked as such ("NA"). In addition, where an indicator is influenced by an external factor (e.g., funding constraints), this was also noted. Appendix D provides a summary of the indicator testing results for each of the 15 actions used as a test of the preliminary indicators.

Because many of the indicators are qualitative, professional judgment was used to determine the appropriate rating (i.e., 0, 1, or 2). For example, a rating of 2 was applied for the Osage Power Plant removal action (#16) for effective communication with the federal and state government. However, this rating was based on the presence of an interagency agreement and the fact that no complaints were reported in the pollution reports.

Certain indicators may also not be applicable depending on the circumstances of the response. For example, if EPA is only providing air monitoring capability to assist state and local responders during an emergency response, it might not be appropriate to evaluate if the contaminant source was isolated and controlled, given the scope of EPA's role. In addition, external factors outside of EPA's control might also influence the outcome of a particular response. Examples of external factors include:

- Timing of a state's request for EPA resources;
- Information provided by state/local responders at onset of EPA involvement in response;
- Funding/resource constraints (may affect Time-Critical removal actions as opposed to Emergency Responses);
- State/local resources and capabilities;
- Statutory authority and limits under CERCLA; and
- Location/stationing of OSCs relative to response site.

3.3 Revised Indicators

Based on the indicator testing and tiering, Abt Associates revised the indicators for emergency responses and time-critical removal actions (See Exhibits 7 and 8). The first tier reflects higher priority indicators, whereas the second tier reflects lower-priority indicators for assessing the outcome of a response. However, some indicators listed in Tier 1 (high priority indicators) may

be viewed by others as lower priority, Tier 2 indicators. The importance of indicators may vary depending on type of removal action and circumstances.

As noted above, the Tier 3 indicators were deleted or consolidated as they were considered too burdensome to apply or do not seem to add value in assessing the overall outcome of the response. For example, the indicator "communication was frequent" was combined with the indicator for effective communication.

Exhibit 7: Indicators for Emergency Responses
TIER I INDICATORS
Community Involvement and Satisfaction
General public expressed satisfaction with response efforts verbally or in written form o Communicated effectively with public o Press coverage correct and positive
State government satisfied with response o Coordination and communication effective o Filled gap in response capability
Local government satisfied with response o Coordination and communication effective o Filled gap in response capability
Operational Activities
No members of the public were injured or died during response
No responders died during the response
No responder work days were lost as a result of attending to the response
Completed in a timely manner o Within schedule proposed in action memo
Isolated and controlled contaminant source o Made no technical errors o Prevented additional releases
TIER II INDICATORS
Community Involvement and Satisfaction
Communicated effectively with federal officials and/or representatives that are non-responders o Audience identified and reached o Information provided was appropriate o Communication was frequent
Communicated effectively with state officials and/or representatives that are non-responders o Audience identified and reached o Information provided was appropriate o Communication was frequent
Communicated effectively with local officials and/or representatives that are non-responders o Information provided was appropriate o Audience identified and reached o Communication was frequent
Economic Impact and Site Reuse
Site was in condition to allow its pre-action use to continue
EPA transitions site effectively to another entity, if needed

Administrative Record and Reporting
Reporting requirements met and documentation complete o CERCLIS o Administrative record (action memos, PolReps) o Administrative record demonstrates a defensible action (if applicable)

Exhibit 8: Indicators for Time-Critical Removal Actions
TIER I INDICATORS
Community Involvement and Satisfaction
General public expressed satisfaction with response efforts verbally or in written form o EPA communicated effectively with public o Press coverage correct and positive
State government satisfied with response o EPA coordination and communication effective o Filled gap in response capability
Local government satisfied with response o EPA coordination and communication effective o Filled gap in response capability
Operational Activities
Met immediate need of site to remove contaminant o As outlined in action memo or ICS 202 Incident Action Plan o Prevented additional releases
No members of the public were injured or died during response
No responders died during the response
No responder work days lost as a result of attending to the response
Completed in a timely manner o Within one year (statutory deadline), or o Within schedule proposed in action memo
Cost effective response o Completed within initial budget ceiling (report % of total spent)
TIER II INDICATORS
Operational Activities
Provided or contributed to a long-term solution of cleaning up site to remove contaminant o Consistent with NPL activities (if applicable) o Maximized efficiency if multiple actions were required
Community Involvement and Satisfaction (Non-Responders)
EPA communicated effectively with **federal** officials and/or representatives (not responders) o Audience identified and reached o Information provided was appropriate o Communication was frequent
EPA communicated effectively with **state** officials and/or representatives (not responders) o Audience identified and reached o Information provided was appropriate o Communication was frequent

EPA communicated effectively with **local** officials and/or representatives (not responders) o Information provided was appropriate o Audience identified and reached o Communication was frequent
Decision to Initiate Response
EPA considered other response options for addressing site o That were as or more effective o That cost less o That could be completed more quickly
Response was justified as per NCP
Economic Impact and Site Reuse
Site was in condition to allow its pre-action use to continue
EPA transitions site effectively to another entity, if needed
Minimized economic impact to community o Avoided or minimized closure of transportation facilities and businesses, to the extent possible o All affected residents or businesses move back to response site once action is complete
Administrative Record and Reporting
Reporting requirements met and documentation complete o CERCLIS o Administrative record (action memos, PolReps) o Administrative record demonstrates a defensible action (if applicable)

Chapter 4: Conclusions

The development of an evaluation method for fund-led EPA emergency responses and time-critical removals yielded several important conclusions, including varying opinions on the definitions and causes of a successful response. For reasons consistent with the conclusions of this evaluation, the Coast Guard also does not have a method to evaluate the outcome of responses. However, it uses an evaluation tool to evaluate preparedness, similar to EPA's Core ER tool.

4.1 Indicators for Emergency Responses and Time-Critical Removals Vary

Although there was overlap with the indicators, the priority of the indicators (i.e., whether they fell into the first or second tier) differed. Interviewees largely supported that emergency responses and time-critical removal actions should be considered differently for purposes of evaluation given the fact that emergency responses have an immediate threat responders must address. Accordingly, indicators vary in importance and to some degree scope between the two categories. For the emergency response Indicators, immediate response actions and short-term needs for emergency responses were considered a higher priority (or Tier 1). For example, the cost effectiveness of the response was more important for time critical removals than emergency responses.

4.2 Definitions of "Success" and Opinions on Appropriate Indicators Vary

The Interviewees had diverse opinions on the purview of the program, as well as what constitutes "success," which is reflected in the suite of indicators suggested. For instance, many interviewees agreed that timeliness was an important consideration for emergency and time-critical responses, but there was no consensus on how to assess whether responders were timely (e.g., completed response within one year as required by the statute, or another pre-determined time-frame). Interviewees also had differing opinions on the appropriate scope of actions to be completed by the EPA Emergency Response and Removal Program. Some felt that it was their role to provide a long-term solution to the incident, such that additional work was not required on the site by EPA or others. Alternatively, others felt that EPA should meet the immediate need to contain the contaminant, but move to transition the site to others.

Further, the testing process, as well as the interviews, illustrates the wide variability of actions addressed by the EPA Emergency Response and Removal Program. Actions can range from one-day events to provide air monitoring capability to a local responder during a fire to a multi-year, multi-million dollar effort to address contamination at an abandoned mining site.

Given the diverse opinions and variability of the emergency response and time-critical actions themselves, all the indicators put forward in this report may not be applicable or appropriate for all actions. Similarly, the relative importance (or Tier) of indicators may vary depending on the type of action, not just based on whether the response is an emergency or time-critical response. For example, cleaning a site to allow its pre-action use to continue may be important for actions in commercial or residential areas. Finally, many indicators are influenced by

external factors that are outside of EPA's control (e.g., timeliness of a state's request for assistance).

4.3 Indicators Are Largely Qualitative in Nature

Applying a systematic, objective evaluation framework to emergency response and removal actions is new for OEM, and will require Regions and Headquarters to think about the response actions in new ways and from a variety of perspectives. Many of the most commonly suggested indicators, including those with a strong link to the logic model, are largely qualitative in nature. For example, these indicators include measures of satisfaction and communication, as well as timely and cost-effective completion of actions. To apply the indicators as currently written, professional judgment and/or firsthand knowledge of the action is needed to apply indicators and determine an appropriate rating. This information would require, however, additional data collection beyond what is available in the standard administrative record. Further, to make the indicators more objective would require EPA to make programmatic decisions and set standards on intended outcomes, particularly with respect to time limitations and budget ceilings, which might not be feasible given the variability in actions.

4.4 Information Readily Available to Apply Indicators is Limited

EPA generally completes approximately 200 fund-led removal actions per fiscal year. With the intent of regularly evaluating the outcome of removal actions, action memos and Pollution Reports were the best available documentation containing information on each removal action. However, as described in Chapter 2, it was clear that the required information was not available in these documents to apply the identified indicators. Based on the limited information, we were unable to determine whether the overall outcome of the response was successful. A separate data call or other data collection would be needed to fully and accurately apply indicators. Given these issues, we could not apply the indicators of success to evaluate actions completed in FY2008 and address Evaluation Question 2.

Chapter 5: Recommendations

Based on the conclusions provided in Chapter 3, this chapter presents recommendations for how EPA could use and improve the proposed indicators. The proposed evaluation method, including the indicators, the rating system, and an area for comments, is found in Appendix E.

5.1 Apply Evaluation Method in the Context of Performance Indicators

Given the subjective nature of the indicators and the varying opinions on what constitutes a successful action, it is not feasible to differentiate with certainty between actions that are and are not successful. Similarly, several interviewees made the case that the vast majority of fund-led actions are successful, although some are completed more successfully than others. With that in mind, we recommend that EPA apply the evaluation tool in the context of "performance indicators" rather than "indicators of success" as it is more reflective characterization of the indicators developed.

5.2 Implement Simple Scoring Approach Initially

Although the rating system developed was initially numeric, given the limited information available to rate indicators and their subjective nature, we recommend using a simple plus (+) or minus (-) approach to identify areas of strength and areas needing improvement. This method would essential identify the strengths and areas for improvement for removal actions.

When EPA becomes more accustomed to collecting performance data relating to emergency response and removal actions, a more quantitative and objective approach could be considered. A more quantitative approach would allow for the identification of trends in performance in the future.

5.3 Solicit Feedback from Broad Audience on Proposed Performance Indicators

As noted in Section 3.2 of this report, there is considerable variation in how staff viewed successful actions. Thus, it is critical to share the proposed performance indicators with Regional Removal Managers and Division Directors, as well as On-Scene Coordinators and other stakeholders to discuss and review the content. It is also important that this group consider the programmatic implications of certain indicators, such as completing an action within a given time frame to ensure that the indicators report on what was and was not successful about a given action, and not serve as a policy driver. Agreement and consistency among the regions will be necessary in order to ensure the evaluation results remain as objective as possible.

5.4 Use Evaluation Method to Frame Lessons Learned Documents

Although Abt Associates was unable to apply the proposed suite of indicators to completed FY2008 actions, particularly given the data availability issues, the indicators could be used to inform FY2008 actions if used initially on a regional level. Although the information would be collected largely firsthand from the OSC, the information is a necessary first step to establishing a culture of evaluation within the regional programs and providing the basis for further improvements to the indicators. Similarly, the indicators could serve as a consistent framework

for developing lessons learned documents after specific response actions. This approach would be more consistent as opposed to the more ad hoc approach used currently.

5.5 Select Subset of Removal Actions and Establish Data Collection Approach

To implement the performance indicators evaluation method EPA will need to find a balance between the burden of data collection/analysis and the desire for routine evaluation, such as identifying a subset of actions to evaluate (e.g., mercury responses in schools). One approach would be to select a subset of actions, either randomly or based on recommendations from the regions.

To begin piloting indicators in the Regions, instead of relying on existing documentation, EPA should conduct a primary data collection with Removal Managers, OSCs, and others, within the bounds of ICR requirements. To collect customer satisfaction information, EPA could engage the community involvement coordinators, if assigned to an action. EPA could also explore how to incorporate feedback into public participation policies and requirements, such as those for non-time critical removal actions.

5.6 Consider A Case-Study Approach to Evaluating Specific Actions

Given the considerable variation in emergency response and removal actions, particularly in scope, time, and cost, EPA could complete several case studies to further evaluate emergency response and removal actions. An in-depth case study would highlight the complexities and nuances of a given action, as well as allow for a full explanation of the external factors that might influence the outcome of a response. Consideration of more intangible factors, such as the OSC's relationship with the community and his/her project management skills would also be addressed. This approach would also be less likely to require an OMB-approved Information Collection Request, as long as the same information is not requested from more than nine non-federal personnel (unless the information is routine business information).

Appendix A: Interview Guide

"Good morning. I am _____ [introduce self]."

“This interview is being conducted to get your input about the factors that indicate a successful response. We will use this information to develop indicators of a successful response to evaluate the outcome of removal actions. Our evaluation will include a three step approach to: (1) identify potential indicators of success, (2) refine and test indicators on FY2006, 2007, and 2008 actions, and (3) apply the final set of indicators to FY08 actions.”

"If it is okay with you, I will be tape recording our conversation. The purpose of this is so that I can get all the details but at the same time be able to carry on an attentive conversation with you. [Note that if two interviewers are present a tape recorder may not be needed.] I will be compiling a report that will contain a synthesis of all the potential indicators without any reference to individuals.”

"I'd like to start by having you briefly describe your responsibilities with the emergency response and removal action program and generally what your role is during specific removal actions.” *(Note to interviewer: You may need to probe to gather the information you need, including length of time individual has worked in the program).*

- - - - - -

“As we noted, the purpose of this evaluation is to assess the outcome of specific response and removal actions. Accordingly, based on information from interviews and available documents, we develop indicators to evaluate the outcome of a response. The focus of this evaluation will be on fund-led removal actions, as opposed to nationally significant incidents or removals funded by the potentially responsible party (PRP). In addition, we are focusing on time-critical and emergency responses. However, to the extent information on non-time critical actions will inform the evaluation, please feel free to provide the information.”

“I’m now going to ask you some questions that I would like you to answer to the best of your ability. If you do not know the answer, please say so.”

1. How would you define a “successful” response? Have you had experience evaluating past removal actions. If so, describe how you conducted the evaluation and explain the results.

2. Describe a removal activity of which you were a part that you consider successful. [Indicate to interviewee preference for discussing fund-led emergency response or time-critical actions.]

    a) What was the purpose and context (site-specific) of the removal activity? What type of response was it (emergency, time critical, non-time critical)?

    b) What was your role and responsibilities?

    c) In your opinion, why was it successful? Do you think there are other people/groups that would not agree with you? If so, explain.

d) What factors/conditions led to it having been successful [If interviewee is unsure of factors provide examples, including training, project management capabilities, etc.]? Were these factors external to EPA or outside of its control? Is information related to the factors readily recorded/available and if so where?

e) Although this response was considered successful, could it have been improved? If so, how?

f) In your opinion, what are other 'successful' removal actions and do they share similar factors? Why or why not?

3. Describe a removal activity you worked on that was <u>not</u> as successful as expected or could have gone better [Indicate to interviewee preference for discussing fund-led emergency response or time-critical actions.]

   a) What was the purpose and context (site-specific) of the removal activity? What type of response was it (emergency, time critical, non-time critical)?

   b) What was your role and responsibilities?

   c) What were your initial expectations for completing the response successfully and why were these not met?

   d) What factors/conditions led to the result of the response [If interviewee is unsure of factors provide examples, including breakdown in communication, lack of essential equipment, etc.]? Were these factors external to EPA or outside of its control? Is information related to the factors readily recorded/available and if so where?

   e) Do you think there are other people/groups that would not agree with your assessment of the response? If so, why?

   f) How did the "lessons-learned" from the response affect future removal actions?

4. Is there a specific removal action that you think we should focus on for purposes of the evaluation?

   a) If so, explain.

   b) Do you consider this removal action successful or not?

5. Based on your experience, can you identify a list of success factors?

6. Is there anything else today that I have not directly asked that you think is important for us to consider in our evaluation?

7. Is there anyone else that you think we should talk to/interview regarding the evaluation?

"Thank you for your time. Over the coming weeks, we will be compiling the information we gather from the interview and focus groups. If necessary, would it be possible to contact you, for additional information or clarification?"

Appendix B: Summary of Potential Indicators Based on Literature Review

Indicator	Source	Notes
Response organization effectively and efficiently responds to the incident.	USCG	Represents more of a leading indicator as it relates more to preparedness than the outcome of a response.
Damage to the natural environment is minimized	USCG	Consider conducting net environmental benefits analysis on responses types/approaches.
Emergencies that require multiple emergency responses are few or not present	OECD	Response per case may be reported as a raw number.
Damage to property and the economy are minimized	DHS, NIOSH, SFD, USCG, WISE	Minimizing consequences may be used to *define* success (USCG). Examples include: removal, burning or treatment of hazardous substances; relocation of residents; installation of fences to prevent contact with hazardous substances (WISE).
Response is timely and efficient	HSEEP, OECD, SFD	Meeting a set time frame (HSEEP), reducing delay time (OECD), increasing efficiency (e.g. clean-up area per minute) (OECD, SFD) and performing adequate rescue (e.g. fully, partially, no, not applicable scale) (HSEEP) may evaluate emergency programs. This measure is also linked to training effectiveness (OECD).
Injuries and/or fatalities are few and infrequent	NIOSH, OECD, OSHA, WISE, USCG	Injury and/or death rate may be related to the public (OECD, WISE) or responders (NIOSH, OSHA, WISE). Number of deaths and injuries of victims that occur during events are reported to the ATSDR (WISE).
Impact zone size is small	OECD	Impact zone size may be measured by distance from source of chemical travel, or general impacted area
Public response to emergency is favorable	OECD, USCG	Public response may be measured as number of complaints, or number of proactive self-protection measures (OECD). Also noted as: all stakeholders perceive the response as successful (USCG).
Technology is current and supports all aspects of an emergency	USCG	Properly trained responders, members of the regulated community and the potentially affected public may use technology to improve awareness, compliance, health and overall response (USCG).
Individuals or facilities are in compliance with emergency response	DHS, WISE,	Rate of responder compliance and/or percent of general public in compliance are used to evaluate mitigation and readiness programs (DHS). Percent of facilities or equipment

Indicator	Source	Notes
requirements		in compliance measures may also evaluate program success (WISE).
Potentially affected or general public have access to accurate risk data	DHS, SEEP, OECD	Access to risk data is thought to increase public safety (DHS), citizen preparedness (OECD), and facilitate personal protection actions (DHS). Responders may be included in this measure or evaluated as a separate group (HSEEP).
Communities or facilities take increasing action to reduce their risk	DHS, OECD, OSHA, SFD, USCG, WISE	Risk reduction actions may measure readiness programs (DHS, OSHA, USCG), are tied to information access and dissemination (OECD, SFD) and rely on collaboration between public authorities, industry, and communities (OECD, USCG). Analogous measures: number of facilities with risk management plans or response plans (WISE) and community involvement in the decision-making process (SFD).
Responders report being better prepared to deal with emergencies as a result of training	DHS, HSEEP, OECD, OSHA	This measure is used to evaluate mitigation programs (DHS) and HazMat release responses (HSEEP). Effective training may reduce response time, resolve role and responsibility conflicts and improve coordination with public authorities (OECD, OSHA). Analogous measures: percent reduction of conflicts over the roles and responsibilities, percent reduction of complaints from employees regarding lack of information on preparedness and response actions (OECD).
Few or no workdays are lost due to response-related injuries	NIOSH, OSHA	Absenteeism due to response-related injury may be reported as a raw number.
Accidents are infrequent and/or not severe	OECD, WISE	Accident characteristics may be measured through reduction of environmental impacts and property damage from accidents may be measured through frequency (e.g. times per year) or severity (e.g. area of impacted land, vulnerability of impacted land) (OECD), or number of release events recorded in the Emergency Response Notification System (WISE).
Preparedness plan(s) are adequate to meet goals	DHS, OECD, USCG	Plan effectiveness can be measured by the number of deficiencies during a response or test (OECD). A sufficient plan may help avoid/prevent property loss (DHS) and mitigate adverse effects on human health and the environment (OECD). Preventative plans should minimize consequences (USCG).
All the necessary preventative measures are taken to prevent reoccurrence of similar emergencies	DHS, OECD, SFD	Reoccurring accident prevention ties back to adequate training (DHS, OECD, SFD) and plan effectiveness (OECD, SFD).

Key to References

DHS U.S. Department of Homeland Security, Performance Budget Overview, Appendix B, Fiscal Year 2007, Congressional Budget Justification (http://www.dhs.gov/xlibrary/assets/Budget_PBOAppB_FY2007.pdf).

NIOSH U.S. Department of Health and Human Services, Centers for Disease Control (CDC) and National Institute for Occupational Safety and Health (NIOSH). "How to Evaluate Safety and Health Changes in the Workplace." Prepared by the Intervention Effectiveness Research Team of the National Occupational Research Agenda. March 2004

OECD Organization for Economic Co-operation and Development (OECD), Guidance on Safety Performance Indicators, Interim publication scheduled to be tested 2003 to 2004 and revised in 2005 (http://www.oecd.org/dataoecd/60/39/21568440.pdf).

OSHA U.S. Department of Labor, Occupational Safety and Health Administration, Safety and Health Program Evaluation Profile (PEP), Appendix B, distributed August 15, 1996 (http://www.osha.gov/SLTC/safetyhealth/pep.html#er).

SEEP U.S. Department of Homeland Security, Homeland Security Exercice Evaluation Program (HSEEP), (https://hseep.dhs.gov/pages/HSEEP_Home.aspx, accessed December 10, 2007).

SFD Probst, K. and D. Sherman. "Success for Superfund: A New Approach for Keeping Score," Resources for the Future, April 2004.

USCG U.S. Coast Guard, Proceedings of the Marine Safety Council. "Measuring Response: A Balanced Response Scorecard for Evaluating Success." Spring 2008.

WISE U.S. EPA Office of Solid Waste and Emergency Response and the Program for Environmental Policy and Planning Systems of the Institute of Science and Public Affairs of Florida State University, Waste Indicator System for the Environment (WISE), last updated May 8, 2003 (http://www.pepps.fsu.edu/WISE/).

Appendix C: Analysis of Indicators Suggested in Interviews and Literature

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
Protection of Human Health and the Environment										
Human exposures avoided	2	✓	✓	Long-term outcome: Environment and human health protected from the effects of chemical releases	Significant	Yes. See discussion of established outcome measure.	Yes. See discussion of established outcome measure.	Yes. See discussion of established outcome measure.	Yes. See discussion of established outcome measure.	Retain because of span of control, logic model link
Protection of environment maximized (including sensitive areas)	4 (Includes 1 literature source)	✓	✓	Long-term outcome: Environment and human health protected from the effects of chemical releases	Significant	Yes. See discussion of established outcome measure.	Yes. See discussion of established outcome measure.	Yes. See discussion of established outcome measure.	Yes. See discussion of established outcome measure.	Retain because of span of control, logic model link, frequency
Prevented additional releases during a response	1	✓	✓	[no direct link in logic model]	Significant	Yes, to the extent data allows	Need to define parameters	Incident specific	Yes, to the extent that the data sources are complete/ reliable	Combine with "protection of environment maximized"
Wildlife recovered and rehabilitated	1	✓	✓	Long-term outcome: Environment and human health protected from the effects of chemical releases	Somewhat	Yes, to the extent data allows and that EPA is responsible	Need to define parameters	Incident specific	Yes, to the extent that the data sources are complete/ reliable	Delete because of span of control and frequency

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
Action had a net positive impact on the environment	1	✓	✓	[no direct link in logic model]	Minimal	No, data not available	Need to define parameters	Yes, if methodology was developed	Yes, if methodology was developed	Delete because of logic model link, frequency, feasibility; Not a consideration in CERCLA
Decision to Initiate Emergency Response or Removal										
Other response options considered before selection of response method (cost, technical)	2	✓		Activity: Assess the incident and determine appropriate response type	Significant	Yes, to the extent record allows determination	Yes	Depends on specific incident	Yes, to the extent record allows determination	Retain based on logic model link and span of control
Had authority based on NCP criteria	1	✓	✓	Activity: Assess the incident and determine appropriate response type	Complete	Yes, to the extent record allows determination	Yes	Relative to other incidents, but no absolute comparison (yes/no question)	Yes, to the extent record allows determination	Retain based on logic model link and span of control
Had adequate information at onset of removal action	1	✓		Activity: Assess the incident and determine appropriate response type	Somewhat	Yes, to the extent record allows determination	Need to clarify terms (“adequate”)	Relative to other incidents, but no absolute comparison	Yes, to the extent record allows determination	Delete based on span of control and frequency. May be considered an external factor.
Action referred by state	1	✓		[no direct link in logic model]	Minimal	Yes (with some data limitations)	Yes	Yes	Yes, to the extent data source allows	Delete based on logic model link and span of control
Response organization effectively and efficiently responds to the incident.	1 (Includes 1 literature source)	✓	✓	Activity: Assess the incident and determine appropriate	Complete	Yes, to the extent record allows determination	Need to clarify terms. Overlaps with	Relative to other incidents, but no absolute comparison	Yes, to the extent record allows determination	Delete based on overlap with other indicators

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
				response type			other indicators.			
Operational Activities										
Response type driven by sound science	3 (Includes 1 literature source)	✓		Activity: Assess the incident and determine appropriate response type/method	Somewhat	Yes, to the extent record allows determination	Need to define parameters	Depends on specific incident	Yes, to the extent record allows determination	Delete based on span of control, land lack of clarity
Isolated and controlled contaminant source	2 \1		✓	Intermediate outcome: Immediate threat contained	Significant	Yes, to the extent data allows	Need to clarify terms	Yes, with some data limitations	Yes, with some data limitations	Retain based on logic model link and span of control
Met need of site to remove contaminant	5 \1	✓		Intermediate outcome: Site stabilized – contaminants controlled, threats mitigated, and site secured	Significant	Yes, to the extent data allows	Need to clarify "immediate need" and relationship with above indicator	Yes, with some data limitations	Yes, with some data limitations	Retain based on logic model link, span of control, and frequency
Provided or contributed to a long-term solution of cleaning up site to standard	5 \1	✓		Long-term outcome: Site cleaned up	Somewhat	Yes, to the extent data allows	Need to define parameters	Relative to other incidents, but no absolute comparison	Maybe, to the extent record allows determination	Retain based on frequency and logic model link
Responded in a timely fashion following notification	5		✓	Output: Deployment of emergency response personnel, equipment, and contract support	Somewhat	Yes, to the extent data allows	Need to define parameters	Response time depends on the specific incident (even within emergencies)	Yes, with some data limitations	Retain based on frequency and logic model link
Made no technical	1	✓	✓	Intermediate	Significant	If data allows	Need to define	Relative to other	Maybe, to the	Combine with

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
mistakes during response				outcome: Safe, injury-free emergency responses and removal actions		explicit determination	parameters	incidents, but no absolute comparison	extent record allows determination	"isolated and controlled contaminant source"
Met all SMART goals identified in ICS 202 Incident Action Plan	1	✓	✓	Long-term outcome: consistent, timely, and effective removal actions	Complete (if applicable)	Yes, if applicable	Yes (if applicable)	Relative to other incidents, but no absolute comparison	Yes, if applicable	Combine with "met immediate need of site to remove contaminant"
Completed project objectives	1	✓	✓	[no direct link in logic model]	Complete (if applicable)	Yes, if data allows explicit determination (ICS Form?)	Yes	Relative to other incidents, but no absolute comparison	Yes, if data allows explicit determination	Delete based on potential overlap with above.
Maintained safety of public citizens during response	8 (Includes 5 literature sources)	✓	✓	Intermediate outcome: Safe, injury-free emergency responses and removal actions	Significant	Yes. To the extent data allow.	Need to clarify terms	Yes, within certain types of responses	Yes, to the extent data allows	Retain based on frequency, logic model link, and span of control
Protected responder health and safety during response (e.g., no injuries or deaths)	11 (Includes 5 literature sources)	✓	✓	Intermediate outcome: Safe, injury-free emergency responses and removal actions	Significant	Yes, to the extent data allows	Need to clarify terms	Yes, within certain types of responses	Yes, to the extent data allows	Retain based on frequency, logic model link, and span of control
Cost effective	9	✓	✓(?)	[no direct link in logic model]	Significant	Yes, depending on methodology	Need to define parameters	Yes, depending on methodology	Yes, depending on methodology	Retain based on frequency and span of control
Completed within initial budget ceiling	1	✓		[no direct link in logic model]	Somewhat	Yes	Yes	Yes	Yes	Combine with "cost effective"

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
Completed within statutory limits (1 year, $2 million)	2	✓	✓	[no direct link in logic model]	Somewhat	Yes	Yes	Yes	Yes	Combine with "cost effective" and "completed in timely manner"
Completed within a timely manner (not necessarily 1 year)	7 (Includes 3 literature sources)	✓	✓	[no direct link in logic model]	Somewhat	Yes	Yes	Yes	Yes	Retain based on frequency
Relationship with Response Community										
Coordinated effectively with other government responders (federal/state/local)	3	✓	✓	Short-term outcome: Stakeholders informed about incident	Significant	Yes, to the extent the parameters are clarified and data allows for explicit determination	Need to define parameters	Relative to other incidents, but no absolute comparison	Yes, if data allows explicit determination. Need to consider availability of info from states/locals	Retain based on frequency, span of control, and logic model link
Filled gap in response capability for states/locals	2	✓		Activity: Assess incident and determine appropriate response type	Somewhat	Maybe, data may not be explicit	Need to define "gap" (e.g., expertise, manpower, equipment)	On some level, conclusions could be made on state/local capacity	Maybe, would likely need to contact states/locals	Retain based on frequency and logic model link
Increased awareness of the EPA removal program for states/locals	1	✓		[no direct link in logic model]	Somewhat	No, as data would need to be collected from state/locals	Yes, but need to refine "awareness" change	Yes, If data collection allowed	Maybe, would likely need to contact states/locals	Delete based on logic model link and feasibility

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
Community Involvement and Satisfaction										
State and local governments satisfied	5	✓	✓	Long-term outcome: satisfied stakeholders	Significant	Yes, though to be objective information would need to be collected from state/locals	Need to define parameters/	Yes, if data collection allowed	Maybe, if data were collected from states/locals	Retain based on frequency, span of control, and logic model link
General public satisfied	6 (Includes 2 literature source)	✓	✓	Long-term outcome: satisfied stakeholders	Significant	To some extent with existing sources, though to be objective information would need to be collected from public	Need to define parameters	Yes, if data collection allowed	Maybe, would likely need to contact public	Retain based on frequency, span of control, and logic model link
Communicated effectively with public and media	4	✓	✓	Short-term outcome: Stakeholders informed about incident	Significant	To some extent with existing sources, though to be objective information would need to be collected from public	Need to define parameters	Yes, if data collection allowed	Maybe, would likely need to contact public	Retain based on frequency, span of control, and logic model link
Communicated effectively with state and local governments	5	✓	✓	Short-term outcome: Stakeholders informed about incident	Significant	Yes, though to be objective information would need to be collected from state/locals	Need to define parameters	Yes, if data collection allowed	Maybe, if data were collected from states/locals	Retain based on frequency, span of control, and logic model link
Successful implementation of local area emergency	1		✓	Long-term outcome: Increased	Minimal	No, would need separate data collection effort	Need to define parameters	Depending on data collection method, relative	Yes, if data allows explicit determination	Delete based on span of control and feasibility

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
planning				preparedness for future events		and document review		to other incidents, but no absolute comparison		
Improved EPA image when action was complete	1	✓	✓	Long-term outcome: Satisfied stakeholders	Significant	To some extent with existing sources, though to be objective information would need to be collected from public/states/ locals	Need to define parameters	Depending on data collection method, relative to other incidents, but no absolute comparison	Yes, if data allows explicit determination	Delete based on feasibility and potential overlap with satisfaction indicators above.
Received positive press and/or kudos	1	✓	✓	Long-term outcome: Satisfied stakeholders	Minimal	Yes	Need to define parameters	Relative to other incidents, but no absolute comparison	Yes, if using documented sources	Combine with satisfaction indicators above
Economic Impact and Site Reuse										
Took enforcement action, if appropriate	2	✓	✓	[no direct link in logic model]	Minimal (for the ERR program)	Yes	Yes	Yes	Yes	Delete based on span of control
Pursued cost recovery, if appropriate	2	✓	✓	[no direct link in logic model]	Minimal (for the ERR program)	Yes	Yes	Yes	Yes	Delete based on span of control
Left property in state appropriate for reuse	1	✓		Long-term outcome: Site cleaned up	Somewhat	Yes (assuming information at time EPA demobilized from site is sufficient and no follow-up info is needed	Need to clarify terms “appropriate” and what is meant by reuse (for what type of activity?)	Yes, depending on data collection approach	Yes	Retain based on logic model link (refine as needed)
Allowed for an appropriate transition of the site so that	2	✓		Intermediate outcome: Site stabilized	Significant	Yes (assuming information at time EPA	Yes	Yes	Yes	Retain based on logic model link and span of

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
someone else takes responsibility for its future maintenance or further cleanup						demobilized from site is sufficient and no follow-up info is needed				control.
Implemented adequate post-removal site controls	1	✓		Intermediate outcome: Site stabilized	Significant	Yes, assuming information is included in final PolRep	Need to clarify "adequate"	Relative to other incidents, but no absolute comparison	Yes	Combine with refined version of "Left property in state appropriate for reuse"
Multiple actions not necessary at site	3 (Includes 1 literature source)	✓		Long-term outcome: Site cleaned up	Somewhat	Yes	Yes	Yes (in limited way)	Yes	Combine with "Provided or contributed to a long-term solution of cleaning up site to standard"
Maximized efficiency if multiple actions were required at one site	1	✓		[no direct link in logic model]	Somewhat	Maybe, depending on data available	Need to clarify "maximize efficiency"	Yes, depending on data collection	TBD based on data collection	Combine with "Provided or contributed to a long-term solution of cleaning up site to standard"
Minimized economic impact to community	7 (Includes 5 literature sources)	✓	✓	[no direct link in logic model]	Somewhat	Yes, assuming information is available in source documentation	Need to clarify "minimized"	Relative to other incidents, but no absolute comparison	TBD based on data collection	Retain based on frequency
All affected residents or businesses move back to response site once action is complete	1	✓		[no direct link in logic model]	Minimal	Yes, depending on timeframe (not beyond EPA demobilization)	Yes	Yes	TBD based on data collection	Combine with "minimize economic impact to community"

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
Administrative Record and Reporting										
Reporting requirements met and project closed out	1	✓	✓	Outputs: Action Memo and Pollution Report, CERCLIS data records	Complete	Yes	Yes	Yes	Yes	Retain based on span of control and logic model link
Documentation complete (e.g., action memos, pollution reports)	2	✓	✓	Outputs: Action Memo and Pollution Report, CERCLIS data records	Complete	Yes	Yes	Yes	Yes	Combine with "reporting requirements met"
Administrative record demonstrates a defensible action	1	✓	✓	Outputs: Action Memo and Pollution Report, CERCLIS data records	Complete	Yes, if applicable and data allow determination	Need to clarify "defensible"	Yes	Yes	Delete based on limited applicability and possible overlap with "reporting requirements met"
Other										
OSC demonstrated good project management and communication skills, including managing expectations	4	✓	✓	[no direct link in logic model]	Complete	Yes, if additional data collection is permissible	Need to define parameters	Yes, depending on methodology	Yes, depending on methodology	Retain based on frequency
OSC provided with good experience for future actions and/or nationally significant incidents	1	✓	✓	Long-term outcome: Increased preparedness for future events	Somewhat	Yes, if additional data collection is permissible	Need to define parameters	Maybe, depending on methodology	Maybe, depending on methodology	Delete based on frequency, span of control, and feasibility
OSC made good	1	✓	✓	Short-term	Significant	Maybe,	No	Maybe,	Maybe,	Delete based on

Indicator	Frequency (N = 24)	Relevance		Logic Model Link	Span of Control	Feasibility	Clarity	Comparability	Validity	Justification
		TCR	ER							
decisions that he/she was able to implement				outcome: Better understanding of threat, site conditions, and needed removal activities		depending on methodology		depending on methodology	depending on methodology	frequency and feasibility
OSC demonstrated creativity	1	✓		Short-term outcome: Better understanding of threat, site conditions, and needed removal activities	Significant	Maybe, depending on methodology	No. Need to define "creativity" and consider its relation to other action requirements and legal limitations	Maybe, depending on methodology	Maybe, depending on methodology	Delete based on frequency and feasibility
Incorporated lessons learned from other responses	1	✓	✓	Short-term outcome: Increased accuracy and precision of incident assessments; Long-term outcome: Increased preparedness for future events	Complete	If data allows explicit determination	Need to define parameters	Relative to other incidents, but no absolute comparison	No	Retain based on logic model link and span of control

[1] *An additional 6 interviewees cited more generally that "reduce or eliminate threat from contamination" would be an indicator of success. For purposes of this summary, we have included the related but more specific responses.*

Appendix D: Indicator Testing Results for Individual Actions

Actions Tested									
ID	Action	State	Reg	Year	AM	PR #	Media	Contaminant	Type
4	Southeastern Wood Preserving	MS	4	2008	N	1	Soil	Creosote	TC
5	Columbia Avenue Spill	IN	5	2008	N	8	Soil, air	Lead and benzene	ER
13	Browning Lumber Site	WV	3	2007	Y	21	Soil	Chromated copper arsenate	ER
16	Osage Power Plant	OK	6	2007	N	5	Soil, Air	Asbestos containing material, mercury	TC
20	Monarch Stamp Hill	ID	10	2007	N	4	Soil, surface water	Mill tailings which likely included mercury	TC
21	New Franklin Laundry	ME	1	2006	Y	5	Soil, GW	PCE and TCE	TC
22	New York City Anthrax Sites	NY	2	2006	N	2	Air	Anthrax	ER
23	Pinch Drum Dump Site	WV	3	2006	Y	10	Soil	Naphthalene, toluene, creosol, chromium	ER
24	Cooksey Brothers Landfill Fire	KY	4	2006	N	1	Air	Tires	ER
25	Harvester Square	IL	5	2006	N	3	Soil	Heavy metals, cyanide, acid and caustic liquids, oxidizers, chlorinated solvents, flammable and combustible liquids	TC
26	City Park Needle	LA	6	2006	Y	2	Soil	Radium-225	ER
27	Tamora Groundwater	NE	7	2006	Y	1	GW	Carbon tetrachloride	ER
28	Bueno Mill and Mine Site	CO	8	2006	Y	1	Surface water	Heavy metals	TC
29	Olivina Avenue Mercury Spill	CA	9	2006	N	1	Soil	Mercury	ER
30	Yakima Reservation Pesticide Dump	WA	10	2006	Y	1	Soil	Aldicarb	ER

Indicator Testing Results for Emergency Responses									
Abt ID		5	13	21	22	26	27	29	30
Operational Activities									
1	Responded in timely fashion following notification	Unk	2	0	2	2	1	2	2
2	Isolated and controlled contaminant source o Made no technical errors	1, EX	Unk	Unk	Unk	Unk	Unk	Unk	Unk
	o Prevented additional releases	2	Unk	2	2	2	Unk	Unk	1
3	No members of the public were injured or died during response (different than human exposure avoided)	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
4	No responders died during the response	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
5	No responder work days were lost as a result of attending to the response	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
6	Completed in a timely manner o Within one year (statutory deadline) (report time period)	0	0	0	2	2	1	2	2
	o Within schedule proposed in action memo	Unk	0, EX	NA	Unk	2	Unk	Unk	2
Relationship with Response Community									
7	Coordinated and communicated effectively with other government responders o **Federal** government	NA	NA	NA	Unk	NA	Unk	NA	Unk
	o **State** government	NA	Unk	1	Unk	Unk	Unk	NA	Unk
	o **Local** government	NA	Unk	1	Unk	NA	Unk	2	Unk
8	Filled gap in response capability for states/locals o Manpower	Unk	1	Unk	Unk	Unk	Unk	2	Unk
	o Expertise	Unk	1	Unk	Unk	Unk	1	1	Unk
	o Equipment	Unk	1	Unk	Unk	Unk	Unk	Unk	Unk
	o Funding	Unk	0	2	Unk	2	Unk	Unk	Unk
Community Involvement and Satisfaction									
9	Government satisfied with response activity o **Federal** government	NA	NA	NA	Unk	NA	Unk	NA	Unk
	o **State** government	NA	Unk	Unk	Unk	Unk	Unk	NA	Unk
	o **Local** government	NA	Unk	Unk	Unk	NA	Unk	Unk	Unk
10	Communicated effectively with **federal** officials and/or representatives that are non-responders o Audience identified and reached	NA	NA	NA	Unk	NA	Unk	NA	Unk
	o Information provided was appropriate	NA	NA	NA	Unk	NA	Unk	NA	Unk
	o Communication was frequent	NA	NA	NA	Unk	NA	Unk	NA	Unk
11	Communicated effectively with **state** officials and/or representatives that are non-responders o Audience identified and reached	NA	Unk	Unk	Unk	Unk	Unk	NA	Unk
	o Information provided was appropriate	NA	Unk	Unk	Unk	Unk	Unk	NA	Unk
	o Communication was frequent	NA	Unk	Unk	Unk	Unk	Unk	NA	Unk

Indicator Testing Results for Emergency Responses									
Abt ID		5	13	21	22	26	27	29	30
12	Communicated effectively with **local** officials and/or representatives that are non-responders o Audience identified and reached	NA	Unk	Unk	Unk	NA	Unk	Unk	Unk
	o Information provided was appropriate	NA	Unk	Unk	Unk	NA	Unk	Unk	Unk
	o Communication was frequent	NA	Unk	Unk	Unk	NA	Unk	Unk	Unk
13	General public expressed satisfaction with response efforts verbally or in written form	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
14	Communicated effectively with public o Affected citizens and community groups identified o Action-specific information provided o Communication was frequent/consistent o Questions answered and any issues addressed o Press coverage correct and positive	Unk	Unk	Unk	1	Unk	Unk	Unk	Unk
Economic Impact and Site Reuse									
15	Site was in condition to allow its pre-action use to continue	2	1	2	2	1	Unk	1	2
16	EPA transitions site effectively to another entity, if needed	NA	Unk	NA	0	NA	NA	NA	NA
Administrative Record and Reporting									
17	Reporting requirements met and documentation complete o CERCLIS	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
	o Administrative record (action memos, PolReps)	0	1	1	0	1	1	0	1
	o Administrative record demonstrates a defensible action (if applicable)	1	1	1	2	1	1	1	1
Other									
18	OSC demonstrated good project management and communication skills, including managing expectations	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
19	OSC incorporated lessons learned from other responses	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk

Indicator Testing Results for Emergency Responses								
	Abt ID	4	16	20	23	24	25	28
Decision to Initiate Response								
1	EPA considered other response options for addressing site o That were as or more effective o That cost less o That could be completed more quickly	Unk	Unk	Unk	0	Unk	Unk	1
2	Response was justified as per NCP	2	2	2	2	2	2	1
Operational Activities								
3	Met immediate need of site to remove contaminant o As outlined in action memo or ICS 202 Incident Action Plan	Unk	Unk	Unk	2	Unk	Unk	1
	o Prevented additional releases	1	1	2	2	2	2	2
4	Provided or contributed to a long-term solution of cleaning up site to remove contaminant o Consistent with NPL activities (if applicable)	1	1	2	2	2	2	1
	o Maximized efficiency if multiple actions were required	Unk	2	Unk	NA	NA	NA	Unk
5	No members of the public were injured or died during response (different than human exposure avoided)	Unk	Unk	Unk	Unk	Unk	Unk	Unk
6	No responders died during the response	Unk	0	Unk	Unk	Unk	Unk	Unk
7	No responder work days lost as a result of attending to the response	Unk	Unk	Unk	Unk	Unk	Unk	Unk
8	Cost effective response o Completed within initial budget ceiling (report % of total spent)	Unk	Unk	Unk	2	Unk	Unk	Unk
9	Completed in a timely manner o Within one year (statutory deadline) (report time period)	2	0	2	2	2	2	1
	o Within schedule proposed in action memo	Unk	Unk	Unk	NA	Unk	Unk	Unk
Relationship with Response Community								
10	Coordinated and communicated effectively with other government responders o **Federal** government	NA	2	2	NA	NA	NA	Unk
	o **State** government	Unk	2	Unk	Unk	Unk	NA	Unk
	o **Local** government	NA	NA	2	Unk	2	Unk	Unk
11	Filled gap in response capability for states/locals o Manpower	Unk	2	Unk	Unk	1	Unk	Unk
	o Expertise	Unk	2	Unk	Unk	1	Unk	Unk
	o Equipment	Unk	Unk	Unk	Unk	1	Unk	Unk
	o Funding	Unk	Unk	2	Unk	Unk	Unk	Unk
Community Involvement and Satisfaction								
12	Government satisfied with response activity o **Federal** government	NA	Unk	Unk	NA	NA	NA	Unk
	o **State** government	Unk	Unk	Unk	Unk	Unk	NA	Unk
	o **Local** government	NA	NA	Unk	Unk	Unk	Unk	Unk
13	Communicated effectively with **federal** officials	NA	2	Unk	NA	NA	NA	Unk

	and/or representatives that are non-responders o Audience identified and reached							
	o Information provided was appropriate	NA	2	Unk	NA	NA	NA	Unk
	o Communication was frequent	NA	2	Unk	NA	NA	NA	Unk
14	Communicated effectively with **state** officials and/or representatives that are non-responders o Audience identified and reached	Unk	Unk	Unk	Unk	Unk	NA	Unk
	o Information provided was appropriate	Unk	Unk	Unk	Unk	Unk	NA	Unk
	o Communication was frequent	Unk	Unk	Unk	Unk	Unk	NA	Unk
15	Communicated effectively with **local** officials and/or representatives that are non-responders o Audience identified and reached	NA	NA	Unk	Unk	1	1	Unk
	o Information provided was appropriate	NA	NA	Unk	Unk	Unk	Unk	Unk
	o Communication was frequent	NA	NA	Unk	Unk	Unk	Unk	Unk
16	General public expressed satisfaction with response efforts verbally or in written form	Unk	Unk	Unk	Unk	Unk	Unk	Unk
17	Communicated effectively with public o Affected citizens and community groups identified o Action-specific information provided o Communication was frequent/consistent o Questions answered and any issues addressed o Press coverage correct and positive	Unk	Unk	Unk	Unk	Unk	Unk	Unk
Economic Impact and Site Reuse								
18	Site was in condition to allow its pre-action use to continue	Unk	2	2	2	1	2	Unk
19	EPA transitions site effectively to another entity, if needed	NA	NA	NA	NA	NA	NA	NA
20	Minimized economic impact to community o Avoided or minimized closure of transportation facilities and businesses, to the extent possible	Unk	Unk	Unk	NA	1	2	NA
	o All affected residents or businesses move back to response site once action is complete	NA	NA	NA	2	2	NA	NA
Administrative Record and Reporting								
21	Reporting requirements met and documentation complete o CERCLIS	Unk	Unk	Unk	Unk	Unk	Unk	Unk
	o Administrative record (action memos, PolReps)	0	0	0	1	0	0	0
	o Administrative record demonstrates a defensible action (if applicable)	1	1	1	1	1	1	1
Other								
22	OSC demonstrated good project management and communication skills, including managing expectations	Unk	Unk	Unk	Unk	Unk	Unk	Unk
23	OSC incorporated lessons learned from other responses	Unk	Unk	Unk	Unk	Unk	Unk	Unk

Appendix E: Performance Indicator Templates

Performance Indicators for Fund-Led Emergency Responses

Action Name _____

Region: _____ **SSID:** _____

Start and Completion Dates _____ **OSC(s):** _____

	Performance Indicator for Fund-Led Emergency Response	Rating (+/-)	Comments
TIER I INDICATORS			
Community Involvement and Satisfaction			
1	General public expressed satisfaction with response efforts verbally or in written form o Communicated effectively with public o Press coverage correct and positive		
2	**State** government satisfied with response o Coordination and communication effective o Filled gap in response capability		
3	**Local** government satisfied with response o Coordination and communication effective o Filled gap in response capability		
Operational Activities			
4	No members of the public were injured during response		
5	No responders died during the response		
6	No responder work days were lost as a result of attending to the response		
7	Completed in a timely manner o Within schedule proposed in action memo		

	Performance Indicator for Fund-Led Emergency Response	Rating (+/-)	Comments
8	Isolated and controlled contaminant source o Made no technical errors o Prevented additional releases		
TIER II INDICATORS			
Community Involvement and Satisfaction (Non-Responders)			
9	Communicated effectively with **federal** officials and/or representatives that are non-responders o Audience identified and reached o Information provided was appropriate o Communication was frequent		
10	Communicated effectively with **state** officials and/or representatives that are non-responders o Audience identified and reached o Information provided was appropriate o Communication was frequent		
11	Communicated effectively with **local** officials and/or representatives that are non-responders o Information provided was appropriate o Audience identified and reached o Communication was frequent		
Economic Impact and Site Reuse			
12	Site was in condition to allow its pre-action use to continue		
13	EPA transitions site effectively to another entity, if needed		
Administrative Record and Reporting			
14	Reporting requirements met and documentation complete o CERCLIS		
	o Administrative record (action memos, PolReps)		
	o Administrative record demonstrates a defensible action (if applicable)		

Other comments relevant to an evaluation of this action: _____

Performance Indicators for Fund-Led Time-Critical Removal Actions

Action Name _____

Region: _____ **SSID:** _____

Start and Completion Dates _____ **OSC(s):** _____

	Performance Indicator for Fund-Led Time-Critical Removal Actions	Rating (+/-)	Comments
TIER I INDICATORS			
Community Involvement and Satisfaction			
1	General public expressed satisfaction with response efforts verbally or in written form o EPA communicated effectively with public o Press coverage correct and positive		
2	**State** government satisfied with response o EPA coordination and communication effective o Filled gap in response capability		
3	**Local** government satisfied with response o EPA coordination and communication effective o Filled gap in response capability		
Operational Activities			
4	Met immediate need of site to remove contaminant o As outlined in action memo or ICS 202 Incident Action Plan o Prevented additional releases		
5	No members of the public were injured or died during response		
6	No responders died during the response		
7	No responder work days lost as a result of attending to the response		
8	Completed in a timely manner o Within one year (statutory deadline) (report time period) or o Within schedule proposed in action memo		
9	Cost effective response o Completed within initial budget ceiling (report % of total spent)		

	Performance Indicator for Fund-Led Time-Critical Removal Actions	Rating (+/-)	Comments
TIER II INDICATORS			
Operational Activities			
10	Provided or contributed to a long-term solution of cleaning up site to remove contaminant o Consistent with NPL activities (if applicable) o Maximized efficiency if multiple actions were required		
Community Involvement and Satisfaction (Non-Responders)			
11	EPA communicated effectively with **federal** officials and/or representatives that are non-responders o Audience identified and reached o Information provided was appropriate o Communication was frequent		
12	EPA communicated effectively with **state** officials and/or representatives that are non-responders o Audience identified and reached o Information provided was appropriate o Communication was frequent		
13	EPA communicated effectively with **local** officials and/or representatives that are non-responders o Information provided was appropriate o Audience identified and reached o Communication was frequent		
Decision to Initiate Response			
14	EPA considered other response options for addressing site o That were as or more effective o That cost less o That could be completed more quickly		
15	Response was justified as per NCP		
Economic Impact and Site Reuse			
16	Site was in condition to allow its pre-action use to continue		
17	EPA transitions site effectively to another entity, if needed		

	Performance Indicator for Fund-Led Time-Critical Removal Actions	Rating (+/-)	Comments
18	Minimized economic impact to community o Avoided or minimized closure of transportation facilities and businesses, to the extent possible o All affected residents or businesses move back to response site once action is complete		
Administrative Record and Reporting			
19	Reporting requirements met and documentation complete o CERCLIS		
	o Administrative record (action memos, PolReps)		
	o Administrative record demonstrates a defensible action (if applicable)		

Other comments relevant to an evaluation of this action: _____

_____