



Office of Inspector General

Audit Report

Superfund

Environmental Data Quality at Superfund Removal Actions in Region 9

E1SFF7-09-0058-8100223
September 4, 1998



Tucson International Airport PCB Removal

Inspector General Division
Conducting the Audit:

Western Audit Division
Sacramento Branch Office

Region Covered:

Region 9
San Francisco, California

Divisions Involved:

Superfund Division
Policy and Management Division

Cover Photo:

Tucson International Airport PCB Removal
Tucson, Arizona
Photograph by Dan Cox, EPA OIG

September 4, 1998

MEMORANDUM

SUBJECT: Report on Environmental Data Quality at Superfund Removal Actions
in Region 9
Audit Report No. E1SFF7-09-0058-8100223

FROM: Truman R. Beeler
Divisional Inspector General for Audit
Western Division

TO: Felicia Marcus
Regional Administrator
Region 9

Attached is our final report on *Environmental Data Quality at Superfund Removal Actions in Region 9*. The purpose of the audit was to determine if Region 9 had sufficient procedures in place to ensure that environmental data was of known and acceptable quality for Superfund removal actions.

Our audit of five removal actions showed Region 9 did not have sufficient procedures over Superfund removal actions to ensure that environmental data was of known and acceptable quality. Also, the Region did not fully use EPA's scientific planning process, called data quality objectives, to ensure its removal actions and corresponding data collection activities were effective and efficient.

This audit is also part of a national audit of field sampling. Accordingly, the results of this audit will also be included in a national audit report, to be issued in 1998.

This audit report contains findings that describe problems the Office of Inspector General has identified and corrective actions the OIG recommends. This audit report represents the opinion of the OIG and the findings contained in this audit report do not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established EPA audit resolution procedures. Accordingly, the findings described in this report are not binding upon EPA in any enforcement proceeding brought by EPA or the Department of Justice.

ACTION REQUIRED

In accordance with EPA Order 2750, you, as the Action Official, are required to provide us with a written response to this report within 90 days of the report date. For corrective actions planned but not completed by the response date, we need specific milestone dates to decide whether to close this report.

We have no objection to the further release of this report to the public.

If you have any questions, please contact Charles McCollum, Audit Manager, at (916) 498-6530, or Katherine Thompson, Auditor in Charge, at (916) 498-6535.

Attachment

Distribution: Appendix G

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EXECUTIVE SUMMARY

INTRODUCTION

EPA’s Emergency Response Program responds to threats posed by the sudden or unexpected releases of hazardous substances. Region 9’s Emergency Response Office manages the majority of these responses, called removal actions, throughout California, Nevada, Arizona, Hawaii, and the Pacific Islands.

We performed this audit because of known risks to the quality of environmental data. Region 9’s Superfund Program has experienced serious problems with environmental data quality that are likely to continue. Risks to environmental data are significant because data is the basis for EPA’s decision making and enforcement actions.

This audit is also part of a national audit of field sampling. The results of this audit pertaining to field sampling will be included in a national audit report.

OBJECTIVE

The objective of the audit was to determine if Region 9 had sufficient procedures in place to ensure that environmental data was of known and acceptable quality for Superfund removal actions.

RESULTS IN BRIEF

Our audit of five removal actions showed Region 9 did not have sufficient procedures over Superfund removal actions to ensure that environmental data was of known and acceptable quality. Also, the Region did not fully use EPA’s planning process, called data quality objectives, to ensure its removal actions and corresponding data collection activities were effective and efficient.

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|--|
| <p><u>Actions Audited</u></p> <ul style="list-style-type: none">• Casmalia• Cruz Ranch• Dodson Brothers• Sanders Aviation• Tucson Airport |
|--|

Chapter 1: Quality System for Removal Actions Needs Improvement

Our audit of five removal actions showed the Region did not have a quality management plan which adequately documented and described the quality system for removal actions. Further, most of the site-specific quality assurance project plans (QAPPs) we reviewed:

- Were not based on the seven-step data quality objectives (DQO) process;
- Were not designed to prevent and detect inappropriate quality data;
- Did not include defensible or optimal plans for collecting data;
- Were not reviewed or approved by the Region’s Quality Assurance Office; and,
- Were not implemented or monitored.

We believe the main reason the quality system was insufficient was because decision makers did not perceive data quality as a risk to decision making.

Consequently, the Region completed three removal actions without appropriate quality data for decision making. In addition, about 420 samples were analyzed for one removal action that were not used for the decision indicated in the sampling plan.

Chapter 2: Data Quality Objectives Could Improve Removal Planning and Data Collection

The Region undertook removal actions and corresponding data collection efforts without fully using the data quality objectives process, EPA’s systematic planning method.

The DQO process provides two primary benefits: (1) better decisions, because they are based on the scientific method; and (2) more cost-effective sampling for environmental data.

The Region did not use the complete DQO process at the five removal actions we audited because on-scene coordinators were not required to and they were generally unfamiliar with the process. Also, the Region did not have a system in place to support the process.

“Data cannot be evaluated as good or not good until the use of that data has been clearly defined.”

-Principles of Environmental Sampling, Second Edition, 1996

As a result, the Region completed five removal actions, costing more than \$20 million, without sufficiently documenting important decision criteria or alternatives.

The five Superfund removal actions we audited are described in more detail in Appendix B. Appendix C explains the abbreviations we used. Appendix D lists the criteria applicable to data quality and removal actions.

**POSITIVE ACTIONS
TAKEN**

Although we found deficiencies in the quality assurance system for removal actions, we noted that:

- The Region had a quality management plan that was approved by EPA’s headquarters;
- The Region’s quality management plan required QAPPs to be approved by its Quality Assurance Office;
- The Region’s Emergency Response Office had established a “generic” QAPP that provided quality assurance guidance for its removal actions;
- The Emergency Response Office’s technical contractor had a quality management plan that required significant quality assurance activities;
- The Emergency Response Office and Superfund Cleanup Branch had prepared site-specific QAPPs for all the removal actions we audited; and,
- All of the site-specific QAPPs we reviewed required the data to be validated, an important quality assurance activity.

RECOMMENDATIONS

In summary, we recommend that the Regional Administrator:

- Develop a quality management plan for removal actions that includes: (1) responsibilities for quality assurance functions; (2) training requirements; and (3) a selection basis and tracking system for environmental laboratories.
- Require the regional Quality Assurance Office to monitor compliance with quality management plans, including plans for

the Emergency Response Office and its technical contractor.

- Amend the on-scene coordinators' responsibilities for QAPPs to include the development of DQOs and consideration of critical quality assurance activities. Also, ensure responsibilities include QAPP approval, implementation, and monitoring.
- Require the Quality Assurance Office to review and approve all QAPPs, including providing verbal approval at emergency actions, if necessary.
- Require on-scene coordinators to develop DQOs for all removal actions.
- Establish a minimum, mandatory training requirement for DQOs for regional personnel whose duties involve the collection, evaluation, or use of environmental data.
- Adopt a team approach to developing DQOs using facilitators, on-scene coordinators, quality assurance experts, statisticians, and technical experts.

REGION 9 COMMENTS

A draft report was provided to the Region on April 23, 1998, and the Region provided us its draft comments on July 24, 1998. We held an exit conference with regional officials on August 12, 1998 and the Region provided us its final comments on August 21, 1998.

In its final comments, the Region said it:

...is committed to early implementation of the audit recommendations and intends to complete substantially all major milestones in the recommendations before the end of the calendar year.

The Region agreed to develop a quality management plan to address data quality at removal actions. The quality management plan will provide for:

- A graded approach to quality assurance;
- Development of generic quality assurance project plans;
- Approval of quality assurance project plans by the Quality Assurance Office; and,

- Oversight of the implementation of the quality management plan by the Quality Assurance Office.

Also, the Region will initiate a training program to assure that all on-scene coordinators receive appropriate training on data quality objectives. The Region believed that these actions, together with other ongoing efforts, should greatly enhance the management of data quality at removal actions.

The Region said although it still had *“some disagreements with specific conclusions, we do not believe that these disagreements detract from the overall message regarding the need to improve data quality.”* The Region also said that it *“firmly believes that the five removal actions considered in preparation of the report were appropriate and protective of human health.”*

The Region’s response to the audit report recommendations are summarized in Chapters 1 and 2 of our report. The Region’s entire response is at Appendix A.

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CHAPTER 1

Quality System for Removal Actions Needs Improvement

Our audit of five removal actions showed the Region did not have a quality management plan which adequately documented and described the quality system for removal actions. Further, most of the site-specific quality assurance project plans (QAPPs) we reviewed:

- Were not based on the seven-step data quality objectives process;
- Were not designed to prevent and detect inappropriate quality data;
- Did not include defensible or optimal plans for collecting data;
- Were not reviewed or approved by the Region's Quality Assurance Office; and,
- Were not implemented or monitored.

Quality System Weaknesses

- No quality management plan for removal actions.
- DQOs not used to design quality assurance project plans.
- Critical quality assurance activities excluded from plans.
- Plans for collecting data not optimized.
- Plans not reviewed by Quality Assurance Office.
- Plans not implemented.

We believe the main reason the quality management plan and QAPPs were insufficient was because regional decision makers did not perceive data quality as a risk to decision making.

Consequently, the Region completed three removal actions without appropriate quality data for decision making. In addition, about 420 samples were analyzed for one removal action that were not used for the decision indicated in the sampling plan.

BACKGROUND

According to the American national standard, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*, ANSI/ASQC E4-1994, a tiered quality system is recommended that:

1. Describes the entire organization-wide quality system in a quality management plan, and
2. Is supported by QAPPs describing the applicability of the quality system to specific actions.

| Two-Tiered Quality System |
|--|
| <ul style="list-style-type: none"> • Quality Management Plan • Quality Assurance Project Plans |

EPA’s quality system is prescribed in *Policy and Program Requirements for the Mandatory Agency-Wide Quality System*, EPA Order 5360.1, change 1. The order calls for establishing quality systems that fully comply with the American national standard.

Quality Management Plan

A quality management plan should include: (1) responsibilities for management and staff; (2) personnel qualifications and training; and (3) documentation procedures. It should also describe when and how controls will be applied to specific projects. EPA Headquarter’s Superfund Program has a quality management plan and each region is required to develop a quality management plan.

Quality Assurance Project Plan

The American national standard also requires all work involving the generation and use of environmental data to be planned and documented. Typically, this documentation is a project-specific QAPP. Also required by the National Contingency Plan, a QAPP defines in detail how specific quality assurance and quality control activities will be applied to a project.

| |
|--|
| <p><i>“The QAPP is an important part of the EPA Quality System, and is required for all data collection activities that generate data for use by EPA.”</i></p> <p>-EPA’s DQO Guidance, EPA QA/G-4</p> |
|--|

Both the American national standard and EPA’s guidance, QA/G-5, provide requirements and suggestions for preparing QAPPs.

Regional Quality System

Region 9 had a quality management plan. Further, the Region’s Emergency Response Office used two types of QAPPs:

1. **“Generic” plans** that provided guidance for most removal actions.
2. **Site-specific plans** (sometimes called quality assurance sampling plans) that were required for each removal action.

The Region’s Quality Assurance Office was responsible for:

- Reviewing and approving quality assurance documents;
- Conducting audits of environmental data collection activities; and,
- Implementing Agency QA policies.

Chapter 3 provides more information on the Region’s organizational structure.

**QUALITY
MANAGEMENT
PLAN NEEDED**

Although the Region had a quality management plan, generic QAPPs, and a contractor quality management plan, collectively these plans did not adequately document and describe how quality controls were applied to removal actions. According to the American national standard, ANSI/ASQC E4-1994:

A quality system shall be planned, established, documented, implemented, and assessed as an integral part of a management system for ... implementing ... environmental programs ...

The data quality system suffered because regional decision makers did not believe that data quality posed a significant risk to removal actions. We believe this lack of concern about data quality contributed to systemic weaknesses in the quality system for removal actions. Further, the Region had not required its programs to document their quality systems in quality management plans.

**Region’s Plan Did
Not Address
Removal Actions**

Although Region 9 had a quality management plan, it did not describe a quality system for removal actions in sufficient detail. For example, it did not include:

- Management and staff responsibilities for quality assurance functions, such as developing DQOs and monitoring compliance with QAPPs;
- Minimum training requirements for quality assurance;
- A selection basis for environmental laboratories, such as laboratory audits and performance evaluation samples; and,

“The quality system shall be described in a quality management plan document(s) or quality manual(s) that has been reviewed and approved for implementation....”

**- American National Standard,
ANSI/ASQC E4-1994**

- A tracking system for monitoring laboratory performance.

Further, the Region’s quality management plan excluded important quality controls included in the Superfund Program’s quality management plan.

**Generic QAPPs
Insufficient**

Although the Emergency Response Office and its technical contractor had generic QAPPs that set some quality assurance guidelines, these QAPPs were not substitutes for quality management plans for two reasons:

1. They did not include many of the fundamental aspects of a quality management system, such as responsibilities for quality assurance; and,
2. They did not prescribe a system to control laboratory data quality that included laboratory audits or successful analysis of performance evaluation samples.

Also, these generic QAPPs did not apply to some types of removal actions. For example, the Emergency Response Office’s generic QAPP did not apply to removal actions taken by the Superfund Cleanup Branch, which handled some removal actions.

**Contractor’s
Quality
Management Plan
Not Fully
Implemented**

The Emergency Response Office’s technical contractor had a quality management plan but it was insufficient. The Emergency Response Office used a technical contractor for much of its environmental sampling. However, the contractor’s quality management plan was not effective for several reasons:

1. The contractor’s plan applied only to certain removal actions that were delegated to the technical contractor.
2. The plan was not fully implemented. For example, we found that the contractor had not performed laboratory audits, an important aspect of its quality assurance system, although required by its plan.

“Laboratory system audits will be performed on subcontract laboratories.”

-Technical Contractor’s Quality Management Plan

3. The Region was not checking compliance with the plan. Both the contract and Region’s quality management plan required quality assurance program audits of the contractor. However, none had been done since the contract became effective in December 1995.

**Lack of Plan
Causes Problems**

The lack of an effective, implemented quality management plan caused many of the problems we found with the quality system.

For example, on-scene coordinators lacked extensive training in quality assurance. One of the reasons was that the quality management plan did not specify quality assurance training requirements for on-scene coordinators. Training requirements should be established to ensure on-scene coordinators are qualified to review, approve, and monitor implementation of QAPPs.

The lack of a quality management plan contributed to other problems, such as QAPPs that were absent important quality assurance activities. The following sections explain the adverse impacts caused by ineffective QAPPs.

**DATA QUALITY
OBJECTIVES NOT
USED TO DESIGN
QAPPS**

Our audit of five removal actions found the seven-step data quality objectives process was not used to design QAPPs. As discussed in Chapter 2, on-scene coordinators were not required to develop DQOs.

Setting a data quality objective is the first step in developing an effective QAPP and is critical for effective and efficient data collection efforts. DQOs are needed to determine the type, quantity, location, and quality of sampling necessary for decision-making.

**CRITICAL
QUALITY
ASSURANCE
ACTIVITIES NOT
SPECIFIED**

QAPPs were not effective in detecting inappropriate quality data because they did not include:

- Two or more important quality assurance activities;
- Reporting and assessment criteria for validated or verified data;
- A basis for selecting laboratories; or,
- Approval by on-scene coordinators, in two instances.

As a result, data was not of known or appropriate quality for decision making. Further, tainted data was used to evaluate a possible source of contamination at one removal action.

**Important Quality
Assurance
Activities**

Although the QAPPs we audited required data validation, an important quality assurance activity, only two included a specification for another important quality assurance activity:

Requirement Included in QAPP

| QAPP | Data Validation | Field Audits | Performance Evaluation Samples | Magnetic Tape Audits |
|------------------|-----------------|--------------|--------------------------------|----------------------|
| Casmalia | ● | | | |
| Cruz Ranch | ● | | | |
| Dodson Brothers | ● | ● | | |
| Sanders Aviation | ● | | | |
| Tucson Airport | ● | | ● | |

The American national standard, ANSI/ASQC E4-1994, necessitates consideration of these activities. According to the American national standard, the design process for data collection must consider these activities and develop detailed specifications for them. Also, prior OIG audits have found that a combination of quality assurance activities is needed for an effective design because one activity alone, such as data validation, cannot find many of the known quality problems. Appendix E further explains how these activities can improve data quality.

Along with data validation, field audits and performance evaluation samples should be required when data of higher quality is needed for important decisions, such as deciding if a removal action is complete. Magnetic tape audits should be performed if major deficiencies are found by other methods. For tapes to be available for audit, EPA should include a requirement for magnetic data availability for appropriate analytes in QAPPs and corresponding contracts.

Data Reporting and Assessment Requirements

Although data validation was required, QAPPs did not include data reporting requirements and criteria for assessing validated or verified data. They also did not include reporting or assessment criteria for other types of quality assurance activities, such as performance evaluation samples. As a result, decisions at the Cruz Ranch and Dodson Brothers sites were not based on appropriate quality data.

At the Cruz Ranch site, the QAPP did not specify criteria for determining that screening data was sufficient for verifying contamination

Missing Reporting Requirements

- No procedures for reporting the results of validated data to on-scene coordinators.
- Lack of reporting requirements for performance evaluation and split samples.
- No criteria for determining if data needed to be rejected.

Criteria for Correlating Laboratory and Field Data Not Established

was removed. To ensure contamination was removed, the QAPP called for:

- Screening data taken by field measurements to determine that metal contaminated soil was removed; and,
- Ten percent of the screening samples to be analyzed by a laboratory and validated.

However, the QAPP did not establish criteria for determining if the laboratory's analytical data sufficiently correlated with the field screening data. As a result, no action was taken when EPA's technical contractor found that insufficient samples were taken to correlate the field screening data with the laboratory's analytical data. Thus, the Region concluded that the contamination was removed although it lacked appropriate quality data for such a decision.

*Serious Data
Problems Not
Reported*

At the Dodson Brothers site, EPA's technical contractor found serious problems with the data. However, these problems were not reported to EPA.



Dodson Brothers Site, Montclair, California

Data collected to identify an alleged waste pit was tainted. The removal action included an objective to identify the location of an alleged waste pit. During a week of soil-gas sampling to identify the pit, the doors to a mobile testing laboratory were left open, allowing diesel exhaust to enter the laboratory and contaminate sample analysis equipment. Therefore, the data was tainted.

Because reporting procedures were deficient, the on-scene coordinator was not aware that the data was tainted. A few days after sampling was completed, the contractor identified data problems in a data review report. However, the QAPP did not require the contractor to promptly provide this report to the on-scene coordinator. As a result, the on-scene coordinator was unaware of the data problem. Consequently, the Region's decision that the alleged waste pit did not exist was not based on appropriate quality data.

**Laboratory
Selection Not
Addressed**

As noted in our discussion of quality management plans, the Region's quality management plan and generic QAPPs did not address the basis for selecting environmental laboratories. Further, except for Dodson Brothers site, none of the QAPPs for the sites we audited included the basis for selecting laboratories. Without a laboratory evaluation technique, such as audits or performance evaluation samples, the quality of data produced by a laboratory is unknown.

Audits

Audits are necessary to ensure laboratories are technically qualified, and to identify and prevent data problems. Laboratory audits are designed to identify technical areas which may cause laboratories to improperly identify and quantitate chemicals. To prevent problems, an on-site audit should be done before any samples are analyzed.

*Performance
Evaluation Samples*

Performance evaluation samples are another time-tested method to evaluate a laboratory's ability to analyze a specific sample. EPA uses performance evaluation samples extensively in its contract laboratory program to evaluate laboratory performance.

**Coordinator
Approvals Missing**

We could not substantiate that on-scene coordinators approved QAPPs at two of the removal actions we audited: Casmalia and Cruz Ranch. As a result, it was unclear if these on-scene coordinators agreed the QAPPs should have been implemented.

Evidence of approvals were missing because the Emergency Response Office felt it was unnecessary for on-scene coordinators to indicate approval of QAPPs by their signature.

QAPPs should be approved by on-scene coordinators for several reasons. First, written approvals document that coordinators agree that QAPP provisions are adequate. Second, a signed and dated QAPP provides field and laboratory personnel assurance that they are using an approved, up-to-date QAPP. Third, both the National Contingency Plan and EPA Order 5360.1 require EPA approval of QAPPs.

**PLANS FOR
COLLECTING
DATA NOT
OPTIMIZED**

Three of the five sites we audited had plans for collecting data that were not optimal or defensible. As a result, samples were analyzed at one site that were not used for the decision indicated in the sampling plan. Also, sample designs did not support defensible decision making at two other sites.

Sampling plans document the design for collecting samples and explain the basis for the design. These plans, components of QAPPs, provide specific details about the type, quantity, and location of samples to be analyzed during a removal action. The rationale for taking the samples should be included so that decisions are defensible and appropriately documented.

**Samples Not Used
for Intended
Purpose**

The Region did not use the data from about 420 effluent samples at the Casmalia site for the decision indicated in the sampling plan. As part of its removal action, the Region installed a treatment system for groundwater contaminated by a pesticides and solvents landfill.



Treatment System, Casmalia Resources

Although the system effluent was sampled periodically, sample data was not used for the decision described in the sampling plan: determination of the suitability of the leachate for discharge. Although the first 16 samples were used to determine if the leachate should be discharged, we estimate the Region analyzed about another 420 samples over the four years that were not used for this decision. The Region could not provide us with the cost of the sampling.

Sampling Plans Not Defensible

Sampling plans did not ensure that data needed for defensible decision-making was collected. We found:

- The sampling plan for the Dodson Brothers removal action was incomplete for drawing conclusions about an alleged waste pit as a source of contamination.
- The sampling plan for the Sanders Aviation removal action was incomplete for drawing a conclusion on the remaining risks from DDT or its residues.

In both of these cases, we believe both use of the DQO process and approval of plans by the Quality Assurance Office would have likely eliminated sampling design problems.

QAPPS NOT REVIEWED BY QUALITY ASSURANCE OFFICE

One of the reasons that QAPPs had design deficiencies was because the Region's Quality Assurance Office did not review or approve them. Except for the Sanders Aviation QAPP, none of the project specific QAPPs we audited were reviewed or approved by the Quality Assurance Office.

Reasons for Quality Assurance Review and Approval of QAPPs

- Regional quality management plan requires the Quality Assurance Office's review and approval.
- Regional experts should be included in all quality assurance planning.
- Early Quality Assurance Office involvement would expedite the QAPP review process.

On-scene coordinators are responsible for approving QAPPs. As part of this process, coordinators should submit QAPPs to the Region's Quality Assurance Office. This office is responsible for reviewing quality assurance documents and has expertise in chemistry, quality assurance, and sample design.

On-scene coordinators told us they did not submit QAPPs to the Quality Assurance Office for review and approval because:

- Removal actions were done quickly and coordinators could not afford the two or three weeks the Quality Assurance Office needed to review and approve QAPPs; and,
- The Quality Assurance Office's suggested changes did not "add any value" to QAPPs.

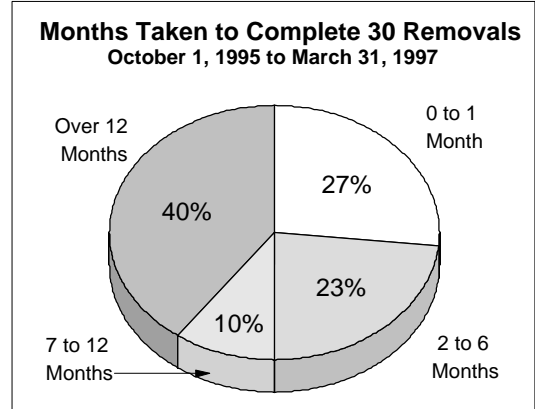
On-scene coordinators and the Quality Assurance Office need to develop a time-sensitive, team approach to combine their expertise to develop

defensible designs for collecting data. These designs are manifested in QAPPs.

Perceived Lack of Time

On-scene coordinators perceived that they did not have enough time for the Quality Assurance Office to review and approve their QAPPs. The main reason cited was that the “time critical” nature of removal actions did not allow time for normal reviews and approvals.

We found that half of the Region’s removal actions in process between October 1, 1995 and March 31, 1997 took more than six months to complete. The five removal actions audited took an average of 26 months to complete. These times ranged from 1 month to more than 4 years.



Thus, we believe it is reasonable to allow the Quality Assurance Office time to review QAPPs. For some extremely short duration removal actions, an expedited procedure may be necessary to obtain the approval of the Quality Assurance Office.

Perceived Lack of Value Added

On-scene coordinators told us the Quality Assurance Office did not significantly improve QAPPs, considering the time investment. However, we found that Quality Assurance Office reviews did identify significant weaknesses in QAPPs. For example, the Quality Assurance Office found that the QAPP for the Sanders Aviation removal action did not include a cleanup level for DDT. The Region should develop an expedited QAPP review process that identifies and resolves significant data quality issues.

PLANS NOT IMPLEMENTED

Although one or more effective quality assurance activities were included in QAPPs, often they were not performed. This was the case with three of the five sites we audited:

QAPP Requirements Not Implemented

| Removal Action | Data Validation | Field Audit | Laboratory Audit | PE Sample |
|------------------|-----------------|-------------|------------------|-----------|
| Dodson Brothers | ● | ● | ● | 1 |
| Sanders Aviation | ● | 1 | 1 | 1 |
| Tucson Airport | ● | 1 | 1 | ● |

I- Not included as a QAPP requirement.

Coordinators Did Not Monitor QAPPs

One of the main reasons QAPPs were not implemented was because on-scene coordinators did not monitor QAPPs and, consequently, were not aware that QA activities were not performed. As noted previously, the Region did not have a quality management plan that identified on-scene coordinator responsibilities for data quality, such as monitoring QAPP implementation. These responsibilities need to be identified and carried out.

Adverse Impacts

For two of the removal actions audited, we concluded that:

- A decision at the Sanders Aviation removal action was not based on appropriate quality data and,
- One objective of the Dodson Brothers removal action was not achieved.

Insufficient Data

Data generated for the Sanders Aviation site at a mobile laboratory was not validated. Therefore, the data was not of appropriate quality for determining the cleanup was complete. This removal action cost about \$2.8 million.

Contrary to the requirements of its QAPP, the Region used test results from a mobile laboratory to confirm that toxaphene was cleaned up. The sampling plan required the regional laboratory to analyze 10 percent of the final samples and the results be validated. However, the results of the laboratory analyses were not validated or provided to the on-scene coordinator. This was because the on-scene coordinator was not monitoring compliance with the QAPP. Consequently, the coordinator did not have sufficient data to determine whether toxaphene-contaminated soil exceeding the cleanup level was left in place.

“Ten percent of the samples must be confirmed with QA Definitive data.”

-Sanders Aviation QAPP



Sanders Aviation Site, Tempe, Arizona

Objective Not Achieved

At the Dodson Brothers site, a QAPP for the removal action included an objective to evaluate the threat to groundwater, but the objective was not done. Although the Emergency Response Office's generic QAPP required a significant QAPP deviation to be documented and explained, the deviation was not explained. Further, the Region did not identify the impact the change had on meeting the DQOs, as required by the generic QAPP. As a result, the Region did not have sufficient documentation to explain why a threat to groundwater, the basis for the removal, was not evaluated.

RECOMMENDATIONS

We recommend that the Regional Administrator:

1. Develop a quality management plan for removal actions that includes:
 - Management and staff responsibilities for quality assurance functions, such as development of DQOs and monitoring compliance with QAPPs.
 - Minimum training requirements for quality assurance.
 - Selection basis for environmental laboratories, including requirements for laboratory audits and performance evaluation samples.
 - A tracking system for monitoring laboratory performance.

- Significant quality controls included in the Superfund Program quality management plan.
2. Require the Quality Assurance Office to monitor compliance with quality management plans including plans for the Emergency Response Office and the technical contractor.
 3. Ensure on-scene coordinator responsibilities for QAPPs include:
 - Development of DQOs.
 - Consideration of critical quality assurance activities and procedures, including data validation, field audits, performance evaluation samples, magnetic tape availability for audits, laboratory audits, data reporting requirements, and criteria for assessing limitations on data use.
 - Formal approval of QAPPs.
 - Implementation of QAPPs.
 4. Have the Emergency Response Office and Quality Assurance Office develop a time-sensitive, team approach for developing defensible QAPPs. Require the Quality Assurance Office to review and approve all QAPPs, including providing verbal approval at emergency response actions if necessary.

**REGION 9
COMMENTS**

The Region agreed with the recommendations and stated it would:

- Develop a program-specific quality management plan for the Emergency Response Office.
- Amend the on-scene coordinators' responsibilities to include the development of data quality objectives and consideration of critical quality assurance activities.

The Emergency Response Office will involve the Quality Assurance Office in "scoping" for quality assurance activities. The Quality Assurance Office will also have the responsibility to review and approve all QAPPs.

In its comments to the draft report, the Region stated that although the audit report has valid areas for improvement:

...the Region does not believe these areas invalidate the appropriateness of the [on-scene coordinators'] judgements under the circumstances present, particularly when one takes into account the specific role of removals in achieving significant risk reduction. Similarly, none of the response actions taken was compromised by any of the alleged deficiencies in the DQO process...

The Region also noted that differences between the remedial and removal programs should be taken into account in assessing the DQO processes followed in the two programs. The Region advised that sampling data may be a relatively small part of the decision matrix for removal actions and serve the purpose of filling in details, rather than defining the basic parameters of a decision. The most quality-critical needs at removal actions typically arise at the end of the project when cleanup confirmation is desired and expected concentrations are lower. This data collection point is well after the most important decisions have been made.

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CHAPTER 2

Data Quality Objectives Could Improve Removal Planning and Data Collection

The Region undertook removal actions and corresponding data collection efforts without using the seven-step DQO process, EPA’s systematic planning process.

Incomplete DQO Process

Casmalia Resources
Cruz Ranch
Dodson Brothers
Sanders Aviation
Tucson Airport

The Region did not use the complete DQO process at the five removal actions we audited because on-scene coordinators were not required to and they were generally unfamiliar with the DQO process. Also, the Region did not have a system in place to support the process.

As a result, the Region completed these removal actions, costing more than \$20 million, without documenting important decision criteria or alternatives.

BACKGROUND

DQOs are precise statements describing the objective of a data collection effort. The DQO **process** is a systematic, scientific method to establish data quality criteria and performance specifications for decision making. The DQO process was developed by EPA to:

- Help define specific questions that an environmental project is intended to answer;
- Identify the decisions that will be made when using the resulting data;
- Define the allowable risk of decision errors in specific and quantifiable terms; and,
- Optimize the design of data collection.

Underlying Principles of DQOs

- All collected data have error.
- Nobody can afford absolute certainty.
- The DQO process defines tolerable error rates.
- Absent DQOs, decisions are uninformed.

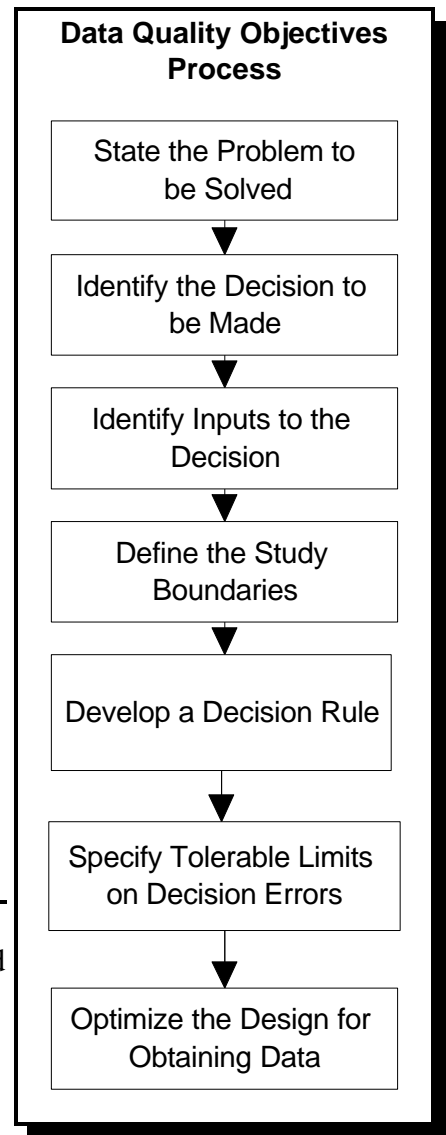
The DQO process provides two primary benefits:

1. Better decisions, because they are based on the scientific method and decision error is reduced.
2. More cost effective data collection efforts, because managers focus on the quantity and quality of data needed for decisions.

EPA's Quality Assurance and Superfund program guidance provide detailed instructions for implementing the DQO process. EPA's 1994 *Guidance for the Data Quality Objectives Process, QA/G-4*, provides a seven-step process to help project managers collect appropriate data. (See box, right.) Also, OSWER publication 9355.9-01, *Data Quality Objectives Process for Superfund*, provides detailed guidance for developing DQOs.

DQOs are an essential element of EPA's quality system. As shown in *The EPA Quality System, QA/G-0*, DQOs are the foundation of EPA's quality assurance planning for projects. Further, the quality management plan for Superfund requires the DQO process for all projects involving environmental data collection.

Our audit of five removal actions found that the DQO process was not followed. As a result, more than \$20 million was spent on these removal actions without adequately documenting decision criteria or performance specifications for decision making, as shown in the following table:



**REMOVAL
ACTIONS NEED
BETTER
PLANNING**

Missing Decision Criteria At Five Removal Actions

| Removal Action | Missing Decision Criteria | Effect on Removal Actions and Data |
|-------------------|--|---|
| Casmalia | Decision rules, action alternatives, and performance specifications not sufficiently documented. | Missing performance criteria to evaluate action completion. Some unneeded data collected. |
| Cruz Ranch | Decision criteria for correlating data not defined. | Insufficient data to support conclusion that contamination removed. |
| Dodson | Decision criteria and error rate for an alleged source of contamination not defined. | Unquantified risk that a source of groundwater contamination may exist. |
| Sanders | Decision rule for DDT, a contaminant, not defined. | No confirmatory samples to show DDT risks were abated. |
| Tucson | Decision alternatives using risk-based cleanup criteria not fully explored. | Soil unnecessarily removed. Associated sampling unneeded. |

The cost of each removal action is identified in Appendix B.

CAUSES

DQOs were not developed because on-scene coordinators:

- Were not required to develop them.
- Did not have sufficient training or experience developing DQOs.

Also, one coordinator thought the DQO process was not practical at removal actions. Moreover, the Region had not developed a system to support DQO development.

On-scene coordinators did not believe they were required to develop DQOs. However, the Superfund quality management plan, the Region's quality management plan, and the technical

Why DQOs Were Not Used

- DQOs were not considered mandatory.
- Lack of DQO training and experience.
- Perception that DQOs were not practical.
- Process to support DQOs not in place.

**DQOs Not
Considered
Mandatory**

contractor's quality assurance project plan required the DQO process for all sites, as part of project planning. Further, EPA's quality system, as described in QA/G-0, uses DQOs as the foundation of its quality system at the project level.

The DQO process should be required for removal actions to facilitate sound decision making. As discussed below, an abbreviated DQO process could be used for "classic" emergencies.

Training and Experience Insufficient

On-scene coordinators did not have sufficient training and experience with DQOs.

Only two of the five on-scene coordinators whose actions we audited recalled attending a specific training course on the data quality objective process. Only one had used the process. We also found only one of the Region's ten on-scene coordinators attended either of the two DQO courses sponsored by the Quality Assurance Office since December 1994.

The Region needs to establish minimum training requirements on DQOs for project managers and quality assurance experts. On-scene coordinators need to understand the DQO process before it can be implemented.

DQOs Are Practical

One on-scene coordinator felt the DQO process was too lengthy for time-critical removal actions. However, we found:

- Over half the removal actions took over 6 months to complete, as detailed in Chapter 1, affording at least a few days to develop DQOs.
- A "graded approach" to DQOs could be used to tailor the process for removal actions completed in less than 6 months.

DQO guidance recognizes a "graded approach" that bases the level of application according to the intended use and the degree of confidence needed in the results. While the depth and detail of DQO development vary, the process would benefit all removal actions by improving documentation of decisions and activities, fostering communication among participants, and clarifying vague objectives.

The Region may also wish to consider developing "pro-forma" DQOs for classic emergencies or for similar types of recurring projects, such as illegal drug laboratories.

Support Process Needed

The Region did not have a process in place to support DQO development. Successful applications of DQOs have involved a team approach using facilitators to guide the process.

| |
|--|
| <p>Changes Needed to Support DQO Process</p> <ul style="list-style-type: none"> • Require DQOs • Set training requirements • Use a team approach • Designate facilitators |
|--|

Team Approach

The Region needed to implement a team approach for developing DQOs that included on-scene coordinators, the Quality Assurance Office, statisticians, and technical experts. We found these experts usually were not consulted during removal action decision-making. According to quality assurance experts, a problem will have the greatest chance of being solved when a multi-disciplinary team of technical experts can help to recognize all of the important facets of the problem and ensure that complex issues are described accurately.

Facilitators

The Region needed to designate facilitators to guide decision makers through the process. As noted in the following section, one of the success factors in implementing the DQO process was the use of facilitators to keep the process moving and on track.

BEST PRACTICES

The U.S. Department of Energy seems to have been particularly successful implementing the DQO process. It should be noted that Energy has required the use of the DQO process at its environmental projects and operations.

The Department of Energy sponsors a DQO Internet “web” site that explains the DQO process, provides case studies of lessons learned and cost savings, and identifies DQO resources. The address is <http://etd.pnl.gov:2080/DQO/>.

Our audit of *Laboratory Data Quality at Federal Facility Superfund Sites*, issued in March 1997, found that the Hanford Nuclear Reservation had developed an effective DQO implementation procedure. This procedure, shown at Appendix F, involves key decision makers in the development of objectives. The Region should consider implementing many aspects of this procedure.

A key part of Hanford’s DQO process was the use of a facilitator. The facilitator can assist by fostering communication among planning team members and adding objectivity to the decision making process. The facilitator should have a broad range of technical and regulatory expertise and experience in making focused decisions.

RECOMMENDATIONS

We recommend that the Regional Administrator:

1. Require on-scene coordinators to develop DQOs for all removal actions.
2. Establish a minimum mandatory training requirement for DQOs for all regional personnel whose duties involve the collection, evaluation, or use of environmental data.
3. Require on-scene coordinators to attend DQO training.
4. Use a graded or pro-forma approach to develop DQOs depending upon the scope and complexity of the project.
5. Use a team approach to develop DQOs. The team should include QA specialists, samplers, chemists, project managers, risk assessors, toxicologists, data users and statisticians.
6. Designate a DQO facilitator to assist and coordinate team members through the DQO process.

**REGION 9
COMMENTS**

The Region agreed with the recommendations and stated it would:

- Require on-scene coordinators to develop DQOs for all removal actions;
- Establish a minimum DQO training requirement;
- Require on-scene coordinators to attend DQO training;
- Develop site-specific data quality objectives and use generic DQOs in emergency situations;
- Use a team approach to develop DQOs involving on-scene coordinators and the Quality Assurance Office; and,
- Use a trained facilitator to assist in DQO development.

Most of these requirements will be included in the Emergency Response Office's quality management plan, scheduled to be developed by December 31, 1998. All on-scene coordinators will be trained in DQOs by March 31, 1999.

As noted in the Region's comments to Chapter 1, the Region believed none of the response actions were compromised by any deficiencies in the DQO process. It also stated that differences between the remedial and removal programs should be taken into account in assessing the DQO processes followed in the two programs.

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CHAPTER 3

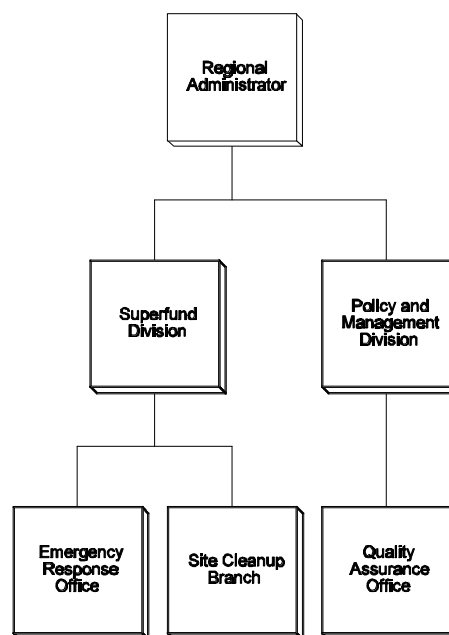
Background

This section provides information on EPA's Emergency Response Program, along with the audit objective, significance of the audit area, scope, and methodology. It also discusses prior audit coverage.

EMERGENCY RESPONSE PROGRAM

EPA's Emergency Response Program responds to threats posed by the sudden or unexpected releases of hazardous substances. This program is carried out by its ten regional offices in close cooperation with a network of federal, state, and local government agencies.

Region 9's Emergency Response Office manages the majority of EPA's responses, called removal actions, throughout California, Nevada, Arizona, Hawaii, and the Pacific Islands. In fiscal 1997, the Office handled a wide range of actions, including cleaning up vinyl chloride contamination in West Oakland. The Office had ten on-scene coordinators and used two contractors for technical support and cleanup services.



The Site Cleanup Branch and the Federal Facilities Branch, also part of the Superfund Division, manage some removal actions at National Priority List sites.

The Quality Assurance Office sets regional quality assurance policies, reviews quality assurance documents, and advises program managers on quality assurance matters.

What Rules Apply?

Removal actions are governed by Superfund legislation, the National Contingency Plan, and EPA procedures.

Superfund Laws

The Emergency Response Program is regulated by Superfund laws: the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act of 1986. These laws gave EPA the ability to respond to uncontrolled releases of hazardous substances, provided for liability of parties responsible for these releases, and established a trust fund to provide for a cleanup when no responsible party could be identified.

National Contingency Plan

The National Oil and Hazardous Substances Pollution Contingency Plan, commonly called the National Contingency Plan, is the Federal government's blueprint for responding to both oil spills and hazardous substance releases.

Once EPA learns of a possible hazardous substance release, it investigates the site, evaluates the threat, and determines the best course of action. First, EPA designates an on-scene coordinator to evaluate the incident and determine the appropriate response agency.

If the on-scene coordinator determines that EPA will take the lead in responding to the incident, he or she will evaluate the urgency of the situation to determine the appropriate level of removal.

All removal actions are not equally urgent. For example, situations involving imminent, catastrophic contamination of a reservoir may require expeditious attention, while situations involving abandoned waste drums may not. Based on the National Contingency Plan, there are three categories of removal actions: emergencies, time-critical actions, and non-time critical actions. (See box.)

Levels of Removal Actions

! "Classic" Emergencies. On-site actions must start within minutes or hours of the determination that an action is needed.

! Time-Critical Actions. Less than six months is available before on-site actions must start.

! Non-Time-Critical Actions. More than six months is available before on-site actions must begin.

All removal actions are not intended to be large-scale, long-term cleanups. The National Contingency Plan set a \$2 million dollar limit and 12-month time limit on removal actions, unless there are extenuating circumstances.

EPA has developed a ten-volume series of guidance documents collectively called Superfund Removal Procedures. These procedures include preparation of an action memorandum, which discusses the removal actions taken, and procedures for ensuring underlying environmental data is sound for decision-making. EPA Order 5360.1 holds regional managers responsible for ensuring quality systems produce data of adequate quality for environmental decisions.

EPA has listed its generic quality assurance references on the Internet. The address is <http://www.epa.gov/region10/www/offices/oea/qaindex.htm>.

AUDIT OBJECTIVE

The objective of the audit was to determine if Region 9 had sufficient procedures in place to ensure that environmental data was of known and acceptable quality for Superfund removal actions.

SIGNIFICANCE OF ENVIRONMENTAL DATA

We performed this audit because of known risks to the quality of environmental data. Region 9's Superfund program has experienced serious problems with environmental data quality that are likely to continue. Risks to environmental data are significant because data is the basis for EPA's decision making and enforcement actions.

According to the American national standard, ANSI/ASQC E4-1994, environmental data is any measurement or information that describes environmental processes or conditions, or the performance of environmental technology. Data is typically collected by sampling and analyzing water, soil, or air for possible contaminants.

Laboratories Create Serious Data Problems

Since 1995, at least five environmental laboratories have had serious, systemic problems with environmental data quality, including falsified data. These laboratories were used by at least 16 Superfund sites in Region 9. For example:

- Extensive fraud was found at one environmental laboratory, resulting in \$5 million of lost data, resampling costs, and associated expenses. The laboratory was used at nine Superfund sites in Region 9.
- Another environmental laboratory, used at four regional Superfund sites, was suspended in 1996 for taking improper shortcuts and falsifying test results. The laboratory received more than \$5 million in government contracts since 1990.

Risks Are Likely to Continue

Risks to the quality of data are likely to continue for at least two reasons:

1. Intense competition in the laboratory industry; and,
2. Increasing popularity of small environmental laboratories.

Competition in Laboratory Industry

Intense competition in the environmental laboratory industry is surely a contributing factor to fraud, manipulation, and quality assurance problems.

How does the intense competition impact the quality of environmental data? Some laboratories may manipulate data to keep clients happy. For example, a laboratory may report their client meets EPA requirements, thereby helping their client avoid fines, compliance measures, and more frequent testing.

Another possible motivation for manipulating data: cutting costs. A failed or improperly performed test is sometimes done at the laboratory's expense.

Popularity of Small Laboratories

The increasing popularity of small environmental laboratories have increased the risks to environmental data. Small laboratories typically lack important quality controls, such as an independent quality assurance function; qualified, competent analysts; instruments that are well-maintained; and standard operating procedures.

AUDIT SCOPE AND METHODOLOGY

This section describes the audit scope and methodology, along with prior audit coverage.

We performed our audit in accordance with *Government Auditing Standards* issued by the Comptroller General. Our field work was conducted from May to October 1997. The audit included management procedures in effect as of March 31, 1997.

Scope

This audit resulted from a pilot review of data quality at the Tucson International Airport Superfund site, managed by the Region's Superfund Site Cleanup Branch. This regional site included a removal action. We selected four additional removal actions from those managed by the Emergency Response Office between October 1, 1995 and March 31, 1997, as shown below:

| Site | Reason Selected |
|---------------------------|---|
| Casmalia Resources | This action was the largest within our audit scope. The Emergency Response Office lead the removal action and Superfund monies paid for the action. The Region's technical contractor was responsible for much of the data. |
| Cruz Ranch | The Emergency Response Office lead the removal action and Superfund monies paid for the cleanup. The Region's technical contractor was responsible for data. |
| Dodson Brothers | This removal action was lead, in part, by responsible parties. These parties funded the cleanup and contracted for data collection and analyses. |
| Sanders Aviation | The Emergency Response Office asked us to include this site in our audit. Much of the environmental data was analyzed by the Region's laboratory. |
| Tucson Airport | The Region's Superfund Site Cleanup Branch, responsible for National Priority List sites, oversaw this action. Responsible parties, under EPA order, collected and analyzed data. |

We selected these actions in order to evaluate management controls over environmental data in a variety of funding and contracting situations. We believe these five sites are typical of the removal actions managed by the Region. Appendix B describes these sites in more detail.

From October 1, 1995 to March 31, 1997, Region 9 managed 35 removal actions, excluding those at Federal facilities.

Methodology

This section describes:

- Our assessment of management controls over data quality at removal actions;
- Region 9's and EPA's 1997 Integrity Act Reports, as they relate to management controls over removal actions;
- Analysis techniques we used to assess the adequacy of quality assurance project plans and data quality objectives;

- Evidence considered in reaching our conclusions and documentation limitations; and,
- Our evaluation of compliance with the laws and regulations.

Management Controls Assessment

As part of our evaluation of management controls, we performed a risk assessment. This risk assessment identified the potential threats to data quality and the management controls to address these threats.

Based on this risk assessment and prior audit work, we identified critical management controls (see the box, this page).

The management control weaknesses we found are described in this report, along with recommendations for corrective action. These weaknesses were a significant contributing cause to data quality problems at the sites we audited.

Federal Managers' Financial Integrity Act

In assessing management control weaknesses, we also reviewed:

- EPA's 1997 Integrity Act Report to the President and Congress; and,
- Region 9's Fiscal 1997 Integrity Act Report, issued in October 1997.

In its 1997 Integrity Act Report, EPA reported that it corrected its material weakness with environmental data quality, first reported in 1992. However, EPA's Senior Leadership Council was concerned the Agency would continue to have problems with data

| Management Controls Over Data Quality |
|---|
| 1. Oversight provided by on-scene coordinators. |
| 2. National standards and EPA guidance for data quality. |
| 3. Data quality objectives. |
| 4. Regional quality assurance experts. |
| 5. Quality management plans for the Superfund Program, the Region, and the Superfund technical contractor. |
| 6. Quality assurance project plans designed for the Emergency Response Office and its technical contractor. |
| 7. Site-specific quality assurance plans. |
| 8. Training and experience received by on-scene coordinators. |
| <i>-EPA OIG</i> |

quality across programs. While recommending that the Administrator report this weakness as corrected, it advised that:

“ORD [Office of Research and Development], OARM [Office of Administration and Resource Management] and Office of Policy, Planning and Evaluation (OPPE) will work with the Office of the Chief Financial Officer (OCFO) and other EPA offices and stakeholder organizations to ensure appropriate attention to, and accountability for, the quality of EPA’s environmental data.”

“...the SLC [EPA Senior Leadership Council] is concerned that the Agency may continue to have problems in oversight and control of data quality across programs.”

-Memorandum from the SLC to the Administrator, December 1997

Region 9's Integrity Act Report did not include a management control weakness for data quality at removal actions.

However, the Region identified a vulnerability in quality assurance procedures used by its contractors in subcontracting for laboratory analyses.

Analysis Techniques

In evaluating procedures over data quality, we analyzed data quality objectives and quality assurance project plans.

To analyze their adequacy, we considered EPA and regional guidance, the Superfund quality management plan, and the national standard for environmental data quality. We also compared quality assurance requirements for removal actions to requirements found effective at other Superfund sites.

Compliance with Laws, Regulations, and Guidance

In performing the audit, we tested compliance with the National Contingency Plan and EPA regulations and guidance, including EPA Order 5360.1; QA/G-5, *EPA Guidance for Quality Assurance Project Plans*; and EPA/540/G-90/004, *Sampling QA/QC Plan and Data Validation Procedures*. Our audit of five removal actions found instances of noncompliance, as detailed in Chapters 1 and 2.

Evidence Considered

We also reviewed quality management plans, quality assurance project plans, action memoranda, other site-specific records (such as enforcement orders), and training records provided to us by on-scene coordinators. We considered the Quality Assurance Office’s records relative to training and quality assurance plan review and approval.

We interviewed officials in Region 9's Superfund Division and Office of Policy and Management. These interviews included office directors,

on-scene coordinators, project officers, contracting officer, and quality assurance chemists. We interviewed the Region's technical contractor and contractors for responsible parties.

Data Limitations

The Emergency Response Office informed us that documentation may be lacking in some areas relative to environmental data quality. We believe this lack of documentation may have impacted our ability to accurately assess training provided to on-scene coordinators and to fully evaluate the Region's rationale for decision making at certain sites. When documentation was inconclusive, we interviewed regional officials and considered verbal information.

PRIOR AUDIT COVERAGE

Related EPA OIG audits of environmental data quality have found problems with EPA's oversight of the quality of data used for Superfund decision making. These audits include:

- *Region 8 Needs to Further Strengthen Its Superfund Field Sampling Quality Assurance Controls Activities*, March 25, 1998;
- *Laboratory Data Quality at Federal Facility Superfund Sites*, March 20, 1997;
- *Special Review of EPA Region 9 Data Quality Oversight at the Aerojet Superfund Site*, March 28, 1996; and,
- *Environmental Data Quality at DOD Superfund Sites in Region 9*, September 26, 1995.

APPENDIX A

Region 9 Response to Draft Report



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco

AUG 21 1998

MEMORANDUM

SUBJECT: Environmental Data Quality at Superfund Removal Actions in EPA Region 9
Draft Audit Report No. E1SFF7-09-0058

FROM: *N. L. McGee*
Nora L. McGee, Assistant Regional Administrator
for Policy and Management (PMD-1)

TO: Truman R. Beeler
Divisional Inspector General for Audits
Office of the Inspector General for Audit (IGA-1)

Attached are Region 9's comments on the Draft Audit No. E1SFF7-09-0058, titled *Environmental Data Quality at Superfund Removal Actions in EPA Region 9*. This response provides a substantive position on the recommendations and our corrective action plans.

The Region is committed to early implementation of the audit recommendations and intends to complete substantially all major milestones in the recommendations before the end of the calendar year. Among the steps the Region will take are the following:

- The Emergency Response Office (ERO) and Quality Assurance Office (QAO) will develop a Quality Management Plan (QMP) to address data quality at removal actions;
- The QMP will provide for a graded approach to quality assurance, including development of generic Quality Assurance Project Plans (QAPPs);
- The QMP will provide for formal QAO oversight of ERO's implementation of and compliance with the QMP, including approval of all QAPPs (both generic and site-specific); and
- The Region will initiate a training program to assure that all On-Scene Coordinators receive appropriate training in data quality objectives.

These actions, together with other ongoing efforts, should greatly enhance the management of data quality at Region 9 removal actions. QAO is currently reviewing procedures used by ERO's contractor, Ecology & Environment, and will produce an evaluation in the fourth quarter of FY98. This evaluation will include issues such as laboratory selection, evaluation and oversight.

Region 9 appreciates the efforts of OIG staff in working with the Region to assure that the final report accurately characterizes the removal actions which were examined in the audit. Although we still have some disagreements with specific conclusions, we do not believe that these disagreements detract from the overall message regarding the need to improve data quality. Consequently, we have elected not to include extensive discussions of specific disagreements on specific cases, but to direct our energies to implementation of the recommendations.

Although the draft report has identified specific instances in which data quality or data quality documentation could have been improved, Region 9 firmly believes that the five removal actions considered in preparation of the report were appropriate and protective of human health.

Region 9 believes that the conduct of this audit has also been useful in helping us to identify some ways to improve the manner in which the Region interacts with OIG in the early planning of OIG audits. Early involvement of Regional management can serve a useful function in avoiding the types of miscommunications that appear to have occurred in the early development of prior drafts of the report.

Should you require a more detailed outline of the Region's plans for implementation of the recommendations, please let us know.

Should you or your staff have any concerns or comments, please contact Rich Hennecke, Regional Audit Follow-up Coordinator at 4-1630. Thank you for your cooperation in this project.

Attachments

I. COMMENTS ON REPORT RECOMMENDATIONS

A. Introduction

EPA Region 9 concurs with all of the draft report's recommendations. The recommendations appear to be fully consistent with an improved approach to data quality management in the Emergency Response Office and consistent with the graded approach to quality assurance.

The graded approach to quality assurance of environmental data collection activities is encouraged by Agency policies. This approach determines a logical amount of QA/QC activities for each type of site characterization/cleanup. A removal action generally is a short term action associated with a sense of urgency with the primary purpose of risk reduction while a remedial action generally is a much longer term effort to assess and address virtually all environmental risks at a site. In addition, a removal action is often associated with a much more focused data collection program both in terms of the number of samples as well as the number of analytes in comparison with a remedial action. Because a removal action is usually intended to reduce immediate risk, it could be followed up by a longer term assessment. The graded-approach would call for a streamlined QA/QC program for removal and a more elaborate program for remedial actions.

If one takes the graded-approach even further, a quick emergency response action should have an even more streamlined QA/QC procedure than a non-time-critical (NTC) removal action. Even within the same category, for example NTC removal actions, the level of QA/QC requirements would depend on the Data Quality Objectives (DQOs) for individual sites.

There is a lack of Agency-wide guidance on how to apply the graded approach to different types of Superfund actions, particularly removal actions. This lack of guidance gives rise to the vagueness of how QA/QC requirements apply to removal programs. This vagueness has also caused inconsistency in the application of QA/QC requirements and therefore is potentially a problem larger in scope than just Region 9.

Region 9 agrees that QA documentation is absolutely essential. The extent of QA/QC program is defined by national guidance, the infrastructure, frame work, and program accountability. In addition, each QAPP and each sampling and analysis plan needs to define the data quality needed and associated QA/QC activities to ensure that adequate data quality is achieved. The needed data quality is usually based on site-specific DQOs. However, in situations where there is insufficient time to develop site-specific DQOs, a set of generic DQOs could be used for the purpose of risk reduction. When generic DQOs are used, rationales for using the generic rather than the site-specific DQOs should be documented.

Region 9 believes that the QA/QC program and QA/QC plan requirements applicable to the Emergency Response Office (ERO) should be more streamlined and more suited for its mission.

Region 9 believes most of the draft audit's recommendations can be met through increased interaction and partnership between the QAO and ERO. Interaction between the QAO and ERO should begin as early as possible in the removal project planning phase. This interaction will add significant value for removal actions for the following reasons:

- a) Input can be provided in a timely manner by the QA Office during scoping meetings. A QA specialist can work closely with a START contractor to quickly plan and document the necessary QA/QC activities before a removal action. In the event of an emergency response where there is no time for planning, it is important for the QA office to be involved from the inception. Even under an emergency or time-critical removal action, an experienced QA professional can provide on-the-spot input and existing standard operating procedures (SOPs) for field sampling and/or analytical methods before the emergency response occurs. Although the Agency must accept less rigorous QA/QC under emergency situations, timely input from the QAO can add substantial value to the quality and the defensibility of the data used in removal actions.

b) The QA specialist could be available by phone during an emergency response action should any questions arise from the field. The QA specialist can provide guidance to the START contractor to complete any QA documentation and data review after the response action.

c) The QA specialist acts as a team player from the beginning of a removal project rather than being limited to involvement in critiquing and reviewing an end product. The early involvement of the QA specialist can actually save time for the OSC by lessening his/her workload for QA/QC review and approval.

B. Comments on Specific Recommendations

See attached table for a summary of Region 9 responses and timelines for corrective action to OIG recommendations.

1-1 Develop a quality management plan for response [removal] actions that includes: (1) responsibilities for quality assurance functions; (2) training requirements; and (3) a selection basis and tracking system for environmental laboratories.

EPA Region 9 Response

EPA Region 9 agrees with this recommendation. Region 9 will develop a QMP for the Emergency Response Office in keeping with the Regional QMP. This QMP will provide the basis for quality assurance activities for ERO and the START contractor. The QMP will be a joint effort by the Emergency Response Office and the Quality Assurance Office and will be approved by both offices. The QMP should also be available for removal actions conducted by the Site Cleanup Branch.

Sampling and analysis plans (SAPs) are sometimes prepared in place of QAPPs. A SAP can contain elements of a sample plan and a QAPP. Thus, monitoring compliance with SAPs should also be included as part of QA functions, including review and approval of SAPs.

Region 9 agrees that some minimum QA/QC training requirements should be defined for OSCs. Training requirements should also be defined for START contract personnel participating in the planning, collection and/or use of environmental data. QA/QC training should include specialized curriculum suitable for removal actions.

The Region-wide QMP contains requirements for laboratory audits and the use of performance evaluation (PE) samples. It also contains a lab audit checklist. In addition, the QAO publication entitled "Best Practices for Detection and Deterrence of Laboratory Fraud" includes recommendations for the selection criteria for environmental laboratories, laboratory audits and the use of performance evaluation samples. The QAO is developing standard operating procedures (SOPs) for the use of PE samples. If the ERO QMP is to address selection criteria for environmental laboratories, including requirements for laboratory audits and performance evaluation samples, this QMP should make reference to the Region-wide QMP and be consistent with existing Regional guidance and SOPs. The QAO can also provide performance evaluation sample studies and conduct on-site laboratory evaluations upon request by the ERO.

With respect to the draft audit report's recommendation for a tracking system for monitoring laboratory performance, there has been a directive from OERR which requires the regions to track non-CLP laboratory performance. A direct way to address this IG recommendation and the fulfill OERR's requirement at the same time is to provide lab performance information into the existing OERR system. The draft report also recommended that the ERO QMP reference the OERR directive.

1-2 Require the regional Quality Assurance Office to monitor compliance with quality management plans, including plans for the Emergency Response Office and its technical contractor.

EPA Region 9 Response

Region 9 agrees that the QAO has responsibility for quality assurance oversight. The existing Region-wide QMP does not explicitly define in what ways and to what extent the QAO is responsible for monitoring the compliance with program specific quality management plans. QAO's specific oversight roles and responsibilities in monitoring ERO's compliance to the QMPs could be outlined in the QMP for removal actions. In addition, the QMP will identify what organizational commitments should be in place to ensure adequate implementation for this oversight. As noted above, the Region agrees with the recommendation that it prepare a QMP for ERO; it would be appropriate to address these specific points in the development of that document.

The QAO in the past has provided support to ERO by performing QA oversight. One example is the QAO's review of the ERO's QA activities as part of the 1995 Regional Quality Management System Review. The review examined compliance with the Regional Quality Management Plan and made recommendations for improvements. The QAO assisted the Quality Assurance Division of ORD in receiving input from several key ERO OSCs during interviews. The resulting report incorporated prospective presentations by the OSCs.

Another example is the assessment initiated by the QAO in 1993 to ascertain whether the ERO's QA oversight of removal actions was adequate. Copies of notes generated by the QAO staff were provided to the OIG upon request at the inception of its audit.

Most recently, three representatives of the QAO initiated an audit of the ERO's START contractor. Started in March, 1998, this audit meets the requirements under both the START contract as well as the Regional QMP and addresses the need for a contract audit pointed out by the IG staff in the early stage of this audit. Additional contractor time commitment by the ERO is necessary before the QAO can complete the audit. The QAO will make recommendations to the ERO concerning the adherence by the contractor to the contract required quality management and project plans.

1-3 *Amend the on-scene coordinators' responsibilities for QAPPs to include the development of DQOs and consideration of critical quality assurance activities. Also, ensuring responsibilities include QAPP approval, implementation, and monitoring.*

EPA Region 9 Response

Region 9 agrees with the recommendation to amend the OSCs' QA responsibilities as outlined. These responsibilities will be included in the ERO QMP.

Although Region 9 agrees with the recommendation to amend the OSC's QA responsibilities, Region 9 also believes that the QAO can provide considerable assistance in helping the OSCs meet those responsibilities. In those instances in which the OSCs are not fully equipped to conduct these QA technical tasks (e.g., data validation, field audits, performance evaluation samples, magnetic tape audits, laboratory audits, etc.), the QAO, which routinely executes these functions, could provide significant support to the ERO.

In addition to participating in scoping sessions and meeting with ERO during the development of QAPPs and DQOs, and reviewing and approving QAPPs, the QAO can assist ERO with difficulties encountered in the implementation of QAPPs by providing any necessary clarifications or needed support. PE samples have proven useful and although ERO has the lead for PE sample submission, QAO has the capacity to purchase and submit double blind samples. Similarly, QAO has the capacity to conduct magnetic tape audits, on-site laboratory evaluations, evaluation of data validation oversight, field audits, and data validation upon request.

1-4 *Have the Emergency Response Office and Quality Assurance Office develop a time-sensitive, team approach for developing defensible QAPPs.*

EPA Region 9 Response

Region 9 agrees with this recommendation.

QAO has designated a contact person for ERO and ERO has designated a lead contact for QAO. ERO will involve the QAO contact in scoping for QA activities. The QAO and ERO will work to develop an agreement in the QMP on how the two offices should interact when performing QA oversight.

Region 9 agrees that a “time-sensitive, team approach for developing defensible QAPPs” can be used that meets the needs of the Emergency Response Office. Although the Agency may need to accept less rigorous QA/QC under emergency situations, timely input from the QAO can add substantial value to the quality and the defensibility of the data used in removal actions. Substantive input can be provided in a timely manner by the QA Office during scoping meetings. A QA specialist can work closely with a START contractor to quickly plan and document the necessary QA/QC activities before a removal action. The QMP developed by ERO and QAO shall include procedures for timely QAO support for those emergency responses where there is no time for planning. Even under an emergency or a time-critical removal action, an experienced QA professional can provide on-the-spot input and existing standard operating procedures (SOPs) for field sampling and/or analytical methods.

1-4 *Require the Quality Assurance Office to review and approve all QAPPs, including providing verbal approval at emergency action sites, if necessary.*

EPA Region 9 Response

The Emergency Response Office will work with the QAO to develop a quality management plan (QMP). The QMP will address the roles and responsibilities of the two offices in reviewing and approving quality assurance and sampling plans prepared by the removal contractor for emergency, time-critical, and non-time critical actions. Under the QMP, the QAO will have the responsibility to review and approve all QAPPs. In order to accommodate the tight time frames under which the ERO frequently operates, the QAO will work with the ERO to develop and approve generic QAPPs for commonly recurring situations.

2-1 *Require on-scene coordinators to develop DQOs for all response actions.*

EPA Region 9 Response

Region 9 agrees with this recommendation. The QMP will state the OSC’s responsibility to develop DQOs for all response actions.

2-2 *Establish a minimum, mandatory training requirement for DQOs for regional personnel, whose duties involve the collection, evaluation, or use of environmental data.*

EPA Region 9 Response

Region 9 agrees with this recommendation. The QAO, in consultation with Superfund management, will set minimum, mandatory training requirements for OSCs and other Regional staff whose duties involve the collection, evaluation or use of environmental data. The QAO will set these requirements by the end of the first quarter of FY99.

2-3 *Require OSCs to take DQO training.*

EPA Region 9 Response

Region 9 agrees with this recommendation and will seek to implement it at an early opportunity. ERO will request that the next annual On-Scene Coordinator Readiness Training Program (RTP) sponsored by the EPA Technology Innovation Office include this type of training. In the event such training is not available at the next annual On-Scene Coordinator Readiness Training Program sponsored by the EPA Technology Innovation Office, Region 9 will make alternative arrangements to assure that this training is provided. The QAO will conduct workshops for OSCs to assure that all OSCs receive training in development of DQOs. These workshops will assure that all OSCs receive early DQO training, in the event that DQO training is not available at the RTP or to accommodate OSCs who do not attend the next annual RTP. At least half of the OSCs will have received DQO

training by the end of the first quarter of FY99, with all OSCs having received DQO training by the end of the second quarter of FY99.

The ERO QMP will outline the OSC's DQO training requirement. The time critical nature of an OSC's tasks requires a special kind of DQO training different from the routine Superfund training. In general, an OSC performs minimal exploratory sampling, but rather judgmental sampling to confirm a known occurrence. Thus, DQO training should be tailored to provide OSCs with the skills to quickly focus on a set of data quality indicators (DQIs) from his/her focused removal goals. An OSC should also be trained to effectively adapt pre-developed/standard sets of DQIs and field SOPs suitable for certain types of emergency or time critical actions. An OSC should also receive DQO training relating to the use of rapid field sampling and analytical tools as these tools lend themselves well to removal applications.

2-4 *Use a graded or pro-forma approach to develop DQOs depending upon the scope and complexity of the project.*

EPA Region 9 Response

Region 9 agrees with this recommendation and intends to address it in the QMP.

Region 9 believes that each QAPP and each sampling/analysis plan needs to define the data quality needed and associated QA/QC activities to ensure that adequate data quality is achieved. The needed data quality is usually based on site-specific DQOs. However, in emergency situations, it is conceivable that a set of generic DQOs can be used for the purpose of risk reduction. When generic DQOs are used, a rationale for using the generic rather than the site-specific DQOs should be documented.

Furthermore, because of the nature of time-critical response actions, there may be insufficient time to develop site-specific DQOs. Region 9's QAO has the necessary expertise and will assist in the development of generic DQOs, FSPs, and lab and field SOPs. For non-time critical response actions, Region 9 recommends development of standardized DQOs, QAPPs, FSPs and SOPs. Once contacted, the QAO will help develop, review, and adopt such plans at scoping meetings.

2-5 *Adopt a team approach to developing DQOs using facilitators, on-scene coordinators, quality assurance experts, statisticians, and technical experts.*

EPA Region 9 Response

Region 9 agrees that a team approach is appropriate to developing DQOs. A team approach involving OSCs and QAO is particularly appropriate. A QAO representative would always be part of the assembled team which develops DQOs. The team approach to DQOs will be outlined in the ERO QMP.

2-6 *Designate a DQO facilitator to assist and coordinate team members through the DQO process.*

EPA Region 9 Response

Region 9 agrees that the use of a facilitator could help to ensure that all perspectives and input from the team members are considered and will identify a trained facilitator to assist in DQO development.

II. COMMENTS ON DRAFT REPORT DISCUSSION

This section contains comments on the development and use of data at removal sites. The Region believes it is important to appreciate the distinctive role of removal actions in significant risk reduction, rather than final cleanup which is the goal of the remedial program.

Although the Draft Report's comments are valid in identifying areas for improvement, the Region does not believe that they invalidate the appropriateness of the OSC's judgements under the circumstances present, particularly

when one takes into account the specific role of removals in achieving significant risk reduction. Similarly, none of the response actions taken was compromised by any of the alleged deficiencies in the DQO process.

The Region believes that it is important that differences between the remedial and removal programs should be taken into account in assessing the DQO processes followed in the two programs. DQO guidance outlines a strategic planning approach to preparation for data collection activities. It recognizes that the specific approach to be followed depends in large measure on a number of parameters and that no single level of documentation or certainty is required for all situations. It is a flexible tool that can be adapted to specific problems and situations. To cite only a few examples that may be appropriate for time critical removals, the Final Guidance recognizes that:

- “[T]he depth and detail of DQO development will depend on the complexity of the study.” Final Guidance at p. 5.
- “[T]he DQO Process is a flexible planning tool that can be used more or less intensively as the situation requires.” Final Guidance at p. 5.
- “[N]ot every problem can be evaluated using probabilistic techniques.” Final Guidance at p. 7.
- The available budget needs to be taken into account. “If no design will meet the limits on decision errors within the budget or other constraints, then the planning team will need to relax one or more constraints.” Final Guidance at p. 39.
- “Every step of this guidance may not be applicable to data collection activities where specific decisions cannot be identified, such as studies that are exploratory in nature.” Final Guidance at p.4.

The draft report states that “...data is the basis for EPA's decision making...” In fact, particularly so for the removal program, sampling data may be a relatively minor part of the decision matrix, and serve the purpose of filling in details, rather than defining the basic parameters of a decision. In a given site specific situation, historical information, visual observation and professional judgment may be much more important to decision making than the acquisition and evaluation of sampling data. Many EPA decisions are made in a complex decision matrix, of which sampling data are only one part.

Removal assessments are typically non-comprehensive, and are conducted with the intent of finding the points of most concern to determine whether the action threshold should be crossed; subsequent assessment work is then conducted as needed to fill in the details of the response. A typical drum site assessment may involve sampling only a few drums that are flagged based on observation and judgment. If an action is subsequently taken, it is likely that the remaining majority of the drums will receive only categorization for purposes of bulking and transport.

The most quality-critical data needs at removal actions typically arise at the end of the project, when cleanup confirmation is desired and expected concentrations are lower, well after the most important ERO decisions have been made. Even this may be a non-factor when we are not pursuing a complete cleanup, but instead are focussing on high hazard/high concentration substances, with the intent of leaving residual contamination to be dealt with by another agency or program.

**Region 9 Removal Program/ QA Office OIG Audit Recommendation
Implementation Schedule**

| Recommendation | Region Response | Corrective Action/ Target Date |
|---|------------------------|--|
| 1-1 Develop a QMP | Agree | ERO and QAO will develop ERO QMP by end of first quarter FY99. |
| 1-2 Require QAO to monitor compliance with QMP | Agree | ERO QMP to outline QAO oversight of Compliance by end of first quarter FY99. |
| 1-3 Specify OSC QAPP responsibilities | Agree | ERO QMP will specify OSC QAPP responsibilities by end of first quarter FY99. |
| 1-4 ERO and QAO develop a Team approach for QAPPs | Agree | ERO QMP will outline team approach by end of first quarter FY99; QAO to review and approve all QAPPs (including generic QAPPs to help meet ERO needs). |
| 2-1 Require OSCs to develop DQOs | Agree | ERO QMP will outline graded approach to DQO development by end of first quarter FY99. |
| 2-2 Set minimum DQO training requirement for all regional personnel | Agree | ERO QMP will outline OSC's DQO training requirements by end of first quarter FY 99; QAO will set requirements for other programs by end of first quarter FY99. |
| 2-3 Require OSCs to attend training | Agree | DQO training for OSCs will be provided by QAO by the end of first quarter FY99. OSCs will be required to attend. Over half of OSCs to be trained by end of first quarter and all OSCs to be trained by end of second quarter FY99. |

| | | |
|-----------------------------------|-------|---|
| 2-4 Use graded approach for DQOs. | Agree | Graded approach to DQOs will be outlined in ERO QMP; including time critical as well as non-time critical removals. |
| 2-5 Use team approach for DQOs | Agree | Team approach to DQOs will be outlined in ERO QMP by end of first quarter FY99. |
| 2-6 Use DQO facilitator | Agree | A DQO facilitator will be designated for ERO DQO development by end of first quarter FY99. |

APPENDIX B

Removal Actions Audited

Casmalia Resources Santa Barbara County, CA

Casmalia Resources was a hazardous waste treatment, storage, and disposal facility which began operations in 1973. Until operations ceased in 1989, the site accepted all types of commercial and industrial wastes including pesticides, solvents, polychlorinated biphenyls (PCBs), metals, acids, caustics, cyanide, and oil field wastes.

EPA inspected the site in March and July 1992 and observed the exposure of landfill wastes and seepage of liquids from a perimeter source control trench. This trench was designed to collect contaminated groundwater from the landfills.

Response Action Taken

The removal action, taken between August 1992 and October 1996, included:

- Controlling landfill erosion by installing drainage channels and by grading and seeding of landfill slopes;
- Installing and operating a treatment system for contaminated groundwater pumped from the control trench; and,
- Disposing of concentrated contaminants pumped from the pesticides and solvents landfill off the site.

In September 1996, a settlement was reached with some of the responsible parties and they assumed some site stabilization work.

Responsible Parties

Region 9's Emergency Response Office was responsible for initiating the removal action including evaluating site conditions, developing a site stabilization plan, and implementing the plan.

EPA technical contractors assisted the on-scene coordinators in the performance of the removal action. An EPA cleanup services contractor was responsible for

carrying out the removal actions including installing and operating the on-site treatment system.

Sampling was performed by contractors. The technical contractors were responsible for compiling sample results and performing data validation.

Cost of Removal Action

EPA estimated the responsible parties would spend about \$30 million to stabilize the site under current agreements. Through January 1998, EPA had collected about \$2.3 million from responsible parties for cleanup costs. EPA's cost for the action was about \$17 million.

**Cruz Ranch
Auburn, CA**

Cruz Ranch was the location of an unpermitted electroplating operation. An EPA inspection found various hazardous chemicals stored on the site and an area of soil with elevated levels of chromium.

Inhaled chromium is a suspected human carcinogen. Chronic exposure to chromium may produce adverse effects on the liver, kidney, gastrointestinal and immune systems.

Removal Action Taken

The removal action, conducted in November 1996, consisted of:

- Excavation and disposal of 85 cubic yards of chromium-contaminated soil;
- Removal of drums and containers containing metal solutions and corrosive acids and bases; and,
- Sampling of a water well and septic tank on the property for metals, volatile organic compounds and amenable cyanide.

Responsible Parties

Region 9's Emergency Response Office was responsible for conducting the site assessment, developing proposed actions, and completing the removal action.

EPA's technical contractor assisted the on-scene coordinator during the site assessment and removal action by developing the sampling plan, collecting samples, performing data validation and preparing final reports.

EPA's cleanup services contractor was responsible for the removal of chemical containers, and excavation, removal and backfill of contaminated soil.

Cost of Removal Action

According to the modified action memorandum, the estimated EPA cost of completing the removal action was \$100,000.

**Dodson Brothers Oil
Company
Montclair, CA**

The Dodson Brothers Oil Company site is located in Montclair, San Bernardino County, California. From 1975 to 1982, the company recycled oil without a permit, accepting spent solvents and other industrial wastes. These wastes were then illegally treated, stored, and disposed of on the site.

Although not listed on the Superfund National Priorities List (NPL), the site was determined to be of NPL-caliber based on preliminary hazard ranking system analysis. Perchloroethylene (PCE), trichloroethylene (TCE), and trichloroethane (TCA) were among some of the contaminants found in elevated concentrations in the soil at the site. These carcinogens are listed as hazardous substances under the Resource Conservation and Recovery Act (RCRA).

Removal Action Taken

EPA's Emergency Response Office first performed an assessment and then oversaw the removal of an underground tank and contaminated soil. The Emergency Response Office worked on this project from May 1994 to February 1997.

In August 1994, EPA's technical contractor conducted an assessment to identify the contents of an underground storage tank and the extent of soil contamination.

From September 1995 to July 1996, the responsible parties took the removal action. This action removed and disposed of an underground tank and its contents, and excavated and disposed of contaminated soil. Also, the excavations were backfilled.

Responsible Parties

The pre-removal assessment was funded by the EPA, but the removal action was funded by responsible parties both voluntarily and under an EPA administrative order.

Cost of Removal Action

EPA's cost for the removal action was about \$250,000. Region 9 did not track the funds spent by responsible parties cleaning up the site.

**Sanders Aviation
Tempe, AZ**

The Sanders Aviation site is located in Tempe, Arizona. The Sanders Aviation Company was an aerial applicator of pesticides from 1951 to 1984. A number of pesticides were stored, mixed, and disposed of on-site, including toxaphene and DDT. Both of these pesticides are known animal and probable human carcinogens, and are listed as hazardous substances under the Resource Conservation and Recovery Act (RCRA). DDD and DDE, derivatives of DDT, were also detected on the site.

Removal Action Taken

In 1994, the State of Arizona requested that EPA clean up the Sanders Aviation site because of pesticide contamination. EPA's Emergency Response Office worked on this site from October 1994 through January 1997. The removal action included tests of various treatment technologies, pre-removal site assessments, and a removal action involving excavation and treatment of about 25,000 tons of contaminated soil. The treated soil was subsequently used as backfill.

Responsible Parties

EPA determined that the potential responsible party lacked adequate financial resources for the cleanup. The removal action was funded by the EPA at a cost of about \$2.8 million.

**Tucson International
Airport
Tucson, AZ**

In 1982, EPA added the Tucson International Airport Superfund site to the Superfund National Priorities List. The site has been the subject of extensive EPA investigations since then.

As a part of a remedial investigation, polychlorinated biphenyl (PCB) contamination was found in a residential area adjacent to the site. PCBs are very stable chemicals with a heavy oil-like consistency used for insulation in transformers, capacitors, switches, and voltage regulators.

People exposed to PCBs in the air for a long time have experienced irritation of the nose and lungs, and skin irritations, such as acne and rashes. Some studies have shown that babies born to women who consumed PCB-

contaminated fish had problems with their nervous systems at birth.

Removal Action Taken

In October 1996, EPA issued an unilateral administrative order to five responsible parties for a time-critical removal action of PCB-contaminated soil. EPA ordered the parties to remove the PCB-contaminated soil in the residential property and in an nearby drainage system on the airport property. EPA used a removal action, instead of an NPL remedial action, to hasten the cleanup.

About 10,000 tons of PCB-contaminated soil was excavated and was transported to landfills in Arizona and California. The excavation took place from March to May 1997.

Responsible Parties

Since the site was on Superfund's National Priorities List, the cleanup was being managed by Region 9's Superfund Cleanup Branch. Its Emergency Response Office was not involved in this action.

The responsible parties hired a technical contractor to oversee the removal of contaminated soil. The technical contractor collected the confirmation samples during the removal action and submitted the samples to a subcontract laboratory for analysis.

Cost of Removal Action

The responsible parties paid about \$685,000 for the removal action; EPA oversight costs were about \$27,000.

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APPENDIX C

Abbreviations

| Abbreviation | Name |
|---------------------|---|
| ARARs | Applicable or relevant and appropriate cleanup requirements |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| DDD | Dichlorodiphenyldichloroethane |
| DDE | Dichlorodiphenyldichloroethylene |
| DDT | Dichlorodiphenyltrichloroethane |
| DQO | Data quality objectives |
| NCP | National Contingency Plan |
| PCB | Polychlorinated biphenyl |
| PE | Performance evaluation (samples) |
| QA | Quality assurance |
| QAPP | Quality assurance project plan |
| QC | Quality control |
| RCRA | Resource Conservation and Recovery Act |
| SARA | Superfund Amendments and Reauthorization Act |

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APPENDIX D

Laws, Regulations, Directives, and Guidance

| Title | Description |
|------------------------|--|
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act of 1980 |
| SARA | Superfund Amendments and Reauthorization Act of 1986 |
| ANSI/ASQC E4-1994 | American National Standard, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (prepared by the American Society for Quality Control) |
| 40 CFR Chapter 1, §300 | National Oil and Hazardous Substances Pollution Contingency Plan |
| EPA Order 5360 | EPA Quality Manual for Environmental Programs |
| EPA Order 5360.1 | Policy and Program Requirements to Implement the Mandatory Quality Assurance Program |
| EPA QA/G-0 | The EPA Quality System |
| EPA QA/G-4 | Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objectives Process |
| EPA QA/G-5 | Guidance on Quality Assurance Project Plans |
| EPA QA/R-5 | EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations |

OSWER Directives and Publications

| OSWER Directive or Guidance | Title |
|-----------------------------|--|
| 9360.4-01 | Superfund Removal Procedures: Quality Assurance/Quality Control Guidance for Removal Activities |
| 9360.3-02 | Superfund Removal Procedures: Guidance on the Consideration of ARARs During Removal Actions |
| 9355.9-01 | Data Quality Objectives Process for Superfund, Interim Final Guidance |

APPENDIX E

Definitions of Quality Assurance Activities

Data Validation

Data validation is a method for ensuring laboratory data is of known quality. It involves reviewing data against a set of criteria to provide assurance that data is adequate for its intended use.

EPA has data validation guidelines, known as national functional guidelines, for its own contract lab program. According to EPA guidelines, data validation includes a review of documentation such as raw data, instrument printouts, chain of custody records, and instrument calibration logs.

Field Audits

Field audits evaluate compliance with procedures for sample identification, sample control, chain-of-custody, field documentation, and sampling operations.

Laboratory Audits

Laboratory audits are on-site audits designed to identify technical areas which may cause laboratories to improperly identify or quantitate chemicals. Audits normally evaluate a laboratory's technical expertise, standard operating procedures, facility and equipment sufficiency, and possible sources of sample contamination.

On-site audits provide additional insight into a laboratory's facility, equipment, personnel, and operating procedures. It is often beneficial to perform an on-site audit when the laboratory is being considered for work for which it does not have performance history with the customer.

Magnetic Tape Audits

Audits of magnetic media are used to detect manual changes in the electronic copy of the raw data and inconsistencies between the electronic copy and paper copy. These audits are done in conjunction with data audits to reconstruct an analytical run.

Electronic data, often in the form of magnetic tapes, is an output of laboratory analyses. By obtaining magnetic tapes (or other

electronic data) from a laboratory, audits can be conducted to help determine:

- ! If the laboratory is complying with its contract;
- ! The integrity of the laboratory's computer systems; and,
- ! The appropriateness of any software editing.

Electronic tape audits are usually limited to gas chromatography and mass spectrometry (GC/MS) data generated by certain electronic systems. Tape audits are not currently available for inorganic data or radio nuclides.

Performance Evaluation Samples

Performance evaluation (PE) samples are prepared by "spiking" a known concentration of chemicals into a contaminate-free media, such as water or soil. PE samples can be administered by two methods: "blind" or "double-blind." When a PE sample is blind, the laboratory is aware the sample is a PE, but does not know the chemical concentration levels.

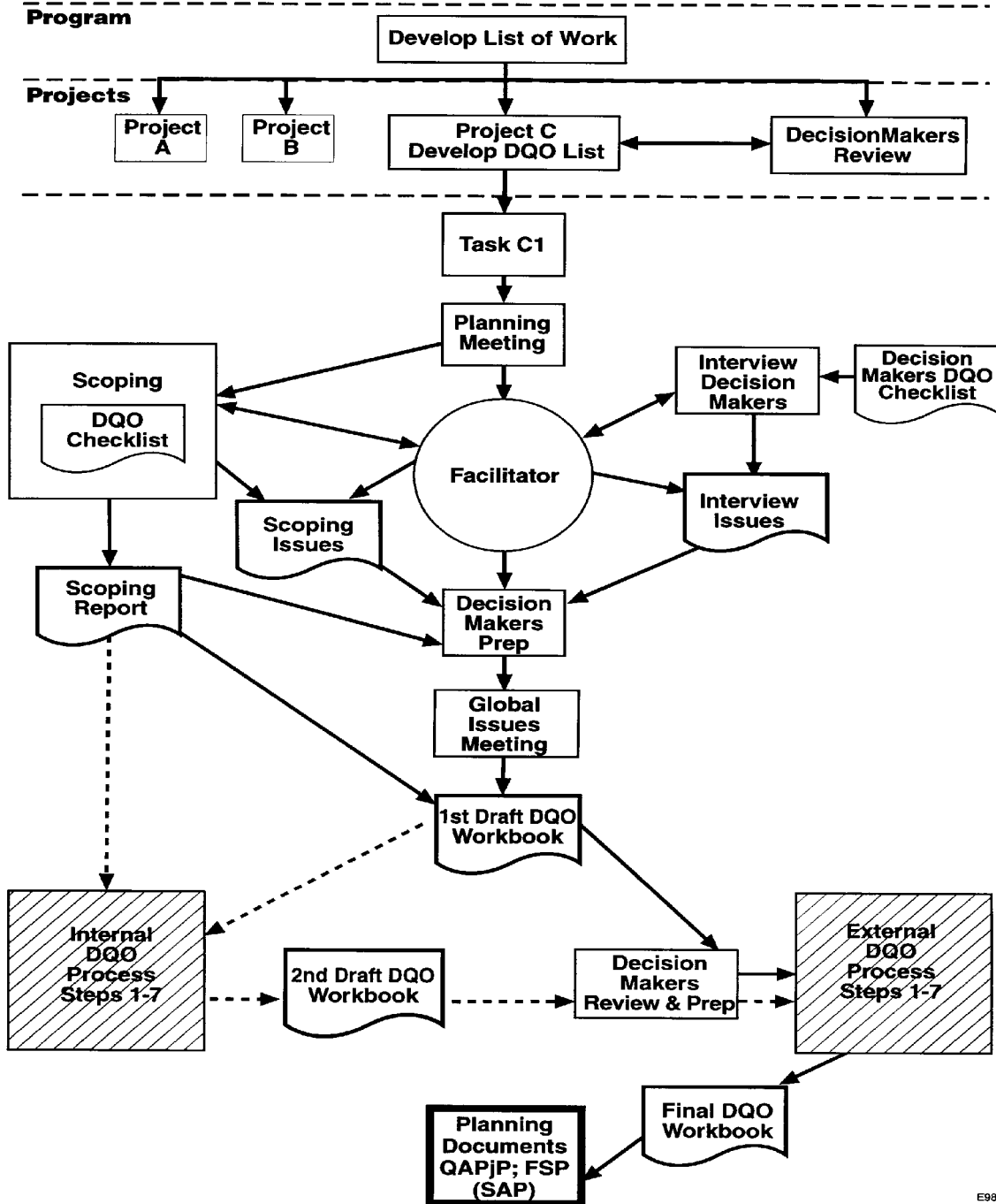
When a sample is double-blind, the PE sample is submitted as part of a field sample shipment, so that the laboratory is not only unaware of the concentration levels, it is also unaware that the sample is a PE. A laboratory's analysis of PE samples is used to evaluate its ability to produce accurate results.

Split Samples

Split samples are samples collected in the field which are divided into two samples. One sample is sent to the contract laboratory and the other one is sent to an independent laboratory. The results from the two laboratories are then compared and the differences are analyzed. Split samples can be used to verify the use of proper analytical methodology and to detect unusual data trends.

APPENDIX F

Hanford's "Best Practice" for Data Quality Objectives



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This chart was prepared by Hanford Nuclear Reservation's environmental restoration contractor (ERC), Bechtel Hanford, Inc.

Data Quality Objectives Web Site

The Department of Energy has a web site with DQO case studies of lessons learned and cost savings, along with DQO resources. Its address is http://etd.pnl.gov:2080/DQO/case_studies.html.

APPENDIX G

Report Distribution

| Distribution | Individual or Activity |
|-----------------------------|---|
| Office of Inspector General | ! Acting Inspector General (2410) |
| EPA Headquarters | <ul style="list-style-type: none"> ! Assistant Administrator for Research and Development (8101) ! Assistant Administrator for Solid Waste and Emergency Response (5101) ! Comptroller (2731) ! Associate Administrator for Regional Operations and State/Local Relations (1501) ! Associate Administrator for Congressional and Legislative Affairs (1301) ! Associate Administrator for Communication, Education, and Public Affairs (1701) ! Director, National Center for Environmental Research and Quality Assurance (8201) ! Agency Followup Official (2710) ! Agency Followup Coordinator (2724) |
| Region 9 | <ul style="list-style-type: none"> ! Regional Administrator ! Director, Superfund Division (SFD-1) ! Assistant Regional Administrator, Policy and Management (PMD-1) ! Chief, Emergency Response Office (SFD-6) ! Regional Quality Assurance Officer (PMD-3) ! Office of Communication and Government Relations (CGR-1) ! Audit Followup Coordinator (PMD-4) |

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