DOE/IG-0461

AUDIT REPORT

GROUNDWATER MONITORING ACTIVITIES AT DEPARTMENT OF ENERGY FACILITIES

FEBRUARY 2000

U.S. DEPARTMENT OF ENERGY
OFFICE OF INSPECTOR GENERAL
OFFICE OF AUDIT SERVICES

February 22, 2000

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman (Signed)
Inspector General

SUBJECT: INFORMATION: Report on "Groundwater Monitoring Activities at Department of Energy Facilities"

BACKGROUND

As a result of activities associated with the production of defense-related nuclear materials, about 600 billion gallons of groundwater have been contaminated at Department of Energy (Department) facilities located throughout the United States. The majority of the contamination is located at the Hanford Reservation, Savannah River Site, Idaho National Engineering and Environmental Laboratory, Los Alamos National Laboratory, Oak Ridge Reservation, and Rocky Flats Environmental Technology Site. The contaminants include solvents, fuels, explosives, metals, and radioactive materials.

To comply with groundwater regulations and to detect the release of contamination, the Department monitored groundwater at 31 sites. Monitoring activities included well installation, sampling operations, and laboratory analyses. These activities cut across several program offices; however, the Offices of Defense Programs and Environmental Management were most involved. We estimated that the Department expended about $51 million on these monitoring activities during Fiscal Year (FY) 1999 and expected to spend about $57 million in FY 2000. Millions more will be spent since monitoring activities at Department locations are to continue for many years. Given current and future Departmental expenditures for groundwater monitoring, this audit was initiated to determine whether these activities were conducted in an economic manner.

RESULTS OF AUDIT

The audit disclosed that some Departmental sites had not adopted innovative technologies and approaches to groundwater monitoring, specifically relating to well installation, sampling operations, and laboratory analyses. Thus, groundwater monitoring activities were not being conducted as economically as possible. We found that information on innovative techniques was not effectively disseminated, evaluated for applicability, and implemented when appropriate. Furthermore, no single Headquarters organization was assigned overall responsibility for ensuring that groundwater activities Departmentwide were as cost effective as possible. As a result, opportunities to reduce operating costs by about $3.6 million annually and to improve groundwater monitoring efficiencies were not realized.

We recommended that the Department designate a Headquarters organization to ensure that field elements are aware of and utilize "best practices" in groundwater monitoring activities. Responsibilities should include, at a minimum, assembling information on innovative technologies and expediting the adoption of such technologies at all Department sites, if appropriate. This organization should also help facilitate the integration of groundwater activities at both the facility and site level. While local preferences need to be recognized, the Department's facilities should avail themselves of the "best practices" in groundwater monitoring procedures throughout the complex.

During the course of the audit, management officials informed the Office of Inspector General that the adoption of some technologies was beyond the control of program managers; that technical analyses are needed to determine the appropriateness of innovative technologies before final decisions are made; and that such judgments must be made by qualified individuals with the approval of regulatory bodies. We recognized these constraints and, therefore, placed final determinations on what economies should be implemented beyond the scope of this review.

MANAGEMENT REACTION

Management generally agreed with the findings and recommendations and indicated that corrective actions were being taken or had been planned. However, this response did not specifically indicate which Headquarters organization had been assigned overall responsibility for future Departmentwide groundwater monitoring activities. See Appendix 3 of this report.

Attachment

cc: Deputy Secretary
Under Secretary

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Overview

INTRODUCTION AND OBJECTIVE

The Department estimates that activities associated with the production of nuclear materials for use in defense related activities have contaminated about 600 billion gallons of groundwater at facilities located throughout the United States. The majority of the contam- ination is located at the Hanford Reservation, Savannah River Site, Idaho National Engineering and Environmental Laboratory, Los Alamos National Laboratory, Oak Ridge Reservation, and Rocky Flats Environmental Technology Site. The contaminants include solvents, fuels, explosives, metals, and radioactive materials.

To comply with groundwater regulations and detect the release of contaminants, the Department monitored groundwater quality at 31 sites. Groundwater monitoring activities included well installation, sampling operations, and laboratory analyses. Management and operating contractors that carried out this work were administered by Department field offices. Although these activities cut across several programmatic offices, the Offices of Defense Programs and Environmental Management funded the preponderance of the groundwater activities at the facilities reviewed. We estimated that the Department expended about $51 million on these monitoring activities during Fiscal Year (FY) 1999 and expected to spend about $57 million in FY 2000. Millions more will be spent as monitoring activities at Department locations are expected for many years in the future.

Prior Office of Inspector General (OIG), General Accounting Office, and internal reviews identified problems with the Department's groundwater monitoring activities. These reviews identified management problems related to well-drilling technologies, groundwater monitoring activities, quality control procedures for groundwater samples, and integration of groundwater activities. A listing of OIG and other related reports is set forth in Appendix 2.

The objective of this audit was to determine whether the Department's groundwater monitoring activities were being conducted in an economic manner.

CONCLUSIONS AND OBSERVATIONS

The Department's groundwater monitoring activities were not being conducted as economically as they could have been since some sites had not adopted innovative technologies and approaches to well installation, sampling

operations, and laboratory analyses. This occurred in part because innovative groundwater monitoring techniques adopted by some sites had not been effectively disseminated, evaluated for applicability at other sites, and implemented. Furthermore, no single organization was assigned overall responsibility for groundwater activities Departmentwide or held accountable for program cost effectiveness. As a result, opportunities to reduce operating costs by about $3.6 million annually and improve groundwater monitoring efficiencies were not realized.

To improve the cost effectiveness of groundwater activities, the Department should designate a Headquarters organization to ensure that field elements are aware of and utilize "best practices" in groundwater monitoring activities. Responsibilities should include, at a minimum, assembling information on innovative technologies and expediting the adoption of such technologies at other Department sites where appropriate. This organization should also help facilitate the integration of groundwater monitoring activities at facilities throughout the Department.

In our opinion, the matters discussed in this report should be considered when preparing the yearend assurance memorandum on internal controls.

_____(Signed)_____
Office of Inspector General

Groundwater Monitoring Activities

Innovative Approaches Not Always Implemented

The Department can reduce the cost of its groundwater monitoring activities by implementing innovative approaches to well installation, sampling operations, and laboratory analyses. A review of current practices disclosed that some sites had adopted cost savings opportunities, while other sites had not.

Well Installation

A review of FY 1999 well installation costs indicated that such costs ranged from about $3,500 to $213,750 per well. Several factors that affected these installation costs included depth, drilling methods, and construction materials. When control of such factors was feasible and exercised, well installation costs were reduced. Several examples were identified and are discussed below.

Lawrence Livermore National Laboratory (Livermore) expended on average about $40,857 for well installation while Lawrence Berkeley National Laboratory (Berkeley), located about 38 miles away, expended about $10,600 per well. Livermore spent substantially more because it constructed wells with 5 to 12-inch diameter well casings. Berkeley, on the other hand, constructed wells with 2-inch diameter casings. The smaller diameter wells cost less since drilling time was reduced. Livermore officials advised that the primary reason for installing larger diameter wells was sampler preference. Berkeley also used inexpensive polyvinyl chloride (PVC) casings in its wells.

The Nevada Test Site (Nevada) reduced its well installation costs by controlling its drilling schedule. Initially, well drilling activities at the site were shut down on the weekends. Subsequently, officials determined that savings were possible if well drilling operations were continuous until drilling was completed. This approach substantially reduced well installation costs by eliminating shutdown and startup times. A Nevada Operations Office official estimated total savings of $312,000 by using this approach for the six wells scheduled to be drilled at the facility in FY 1999. In FY 1999 about 600 wells were planned to be drilled by the 31 Department sites.

Another indication that sites did not always implement cost-saving technologies was illustrated in a 1994 Office of Environmental Management study. The study reported opportunities for cost reductions related to oversight of well installation activities, drilling services, construction materials,

program management, and regulatory strategy. Because of restaffing and mission changes initiated in FY 1995, only some recommendations from the study to improve operations and reduce costs were implemented.

Sampling Operations

As many as six different techniques were used across the Department to collect groundwater samples. Many program activities used the more costly and traditional three-well purging method to collect samples. Some sites, however, used innovative and less costly methods such as the low-volume sampling (micropurging) method or the Easy Pump©. Further, at the sites visited, sampling frequencies varied from every 14 days to once every 3 years. As a result, sampling costs varied by thousands of dollars depending on the methodology and the frequency of sampling.

Sampling Techniques

The three-well volume purging sampling technique was the choice used at many sites. This technique, the most expensive, required purging volumes of at least three well casings of water from the well before a sample was collected. Because of the potential for contaminants, this wastewater often required treatment that was costly. For example, Idaho National Engineering and Environmental Laboratory (Idaho) officials estimated it would cost about $67,500 to treat 900 gallons of wastewater ($75 per gallon) generated through FY 2000 using this technique.[1]

Two alternatives to the three-well volume purging sampling methods required substantially less purging and therefore less wastewater. Officials at one site estimated that the amount of wastewater was reduced by 98 percent with micropurging. Another alternative, the Easy Pump© method, required no purging prior to sampling. Both methods reduced labor hours required for well sampling by as many as 48 hours in some cases. It was estimated that the average labor cost for sampling was $60 per hour. Thus the reduction in labor time could reduce sampling costs by about $3,000 per well. Additionally, sampling reliability was not affected using these alternative methods.

[1] Efforts to reduce these costs are being explored with state and Federal regulators.

Some program activities at the same facility also used different methods to collect samples. For example, at the Oak Ridge Reservation (Oak Ridge), Defense Programs and Environmental Management funded activities used the micropurging method to collect samples, while the Office of Science activity used the three-well volume purging method. According to Oak Ridge officials, sampling time using the micro-purging method required an average of 45 minutes as compared to as much as 48 hours using the traditional three-well purging method. Additionally, using the micropurging method reduced the volumes of wastewater generated at one well from 182 to 3 gallons and reduced operating costs by about $200,000 annually. After discussing these differences with Office of Science officials at Oak Ridge, we were advised that micropurging would be considered in the future.

Contrasts also existed at two Department sites operated by the University of California. Livermore developed and used the patented Easy Pump© method to collect samples. This method was believed to be more cost effective than the micropurging method since it produced even less wastewater and required considerably less sampling time. Further, sampling reliability was not affected. Despite the economies available from either of the other two methods, Berkeley continued to use the traditional three-well volume purging method for all its sampling because of personal preferences relating to sample reliability. Livermore was the only site in the Department complex that used the Easy Pump© technique.

Sampling Frequency

Sampling frequencies, which significantly impacted sampling costs, varied from bi-weekly to once every 3 years. No general rule existed governing sampling frequency. In most cases, the frequency schedule for collecting samples was determined and agreed upon by the Department and other Federal agencies and state regulators. However, over time and with appropriate approval, sampling frequencies could be adjusted to reduce costs depending on factors such as the stability of sample readings. A scientific computerized methodology to aid in adjusting sampling frequencies was available; however, this technology was used infrequently. Moreover, at least one site continued to sample in accordance with original frequency schemes even though there was no evidence of contamination. Such sampling frequency may not have been necessary.

In 1992 Livermore, with state approval, adjusted sampling frequency at many of its wells with the aid of the Cost-Effective Sampling (CES) methodology. This methodology was an algorithm program that performed a computer-based trend analysis to help determine proper sampling frequency. Based on CES information, Livermore reduced the number of samples taken by 40 percent and realized annual savings of $390,000 in sampling, data management, and analysis.

Although the CES approach was available to all Department sites, we found no other instances where it was actively used to adjust sampling frequencies. The majority of sites advised that professional judgment was used to make decisions regarding sampling frequencies. In the case of the Naval Reactors Facility at Idaho, no adjustments had been made in sampling frequencies in spite of the fact that no contaminants had been detected in the samples. This activity sampled all its wells quarterly and had done so since the wells were installed. When questioned, officials advised that they would consider changing the sampling frequency next year. In FY 1999 the Naval Reactors Facility at Idaho spent about $95,000 for sampling and laboratory analyses and expected to spend a similar amount in FY 2000. Adjusting sampling frequencies could save some portion of the FY 2000 expenditures. Officials at two other sites also advised that the CES approach could be useful in determining sampling frequencies.

Laboratory Analyses

Average fees for sampling and laboratory analysis ranged from $349 to $8,760 per well. The primary reasons for such variances were the sampling frequency and the number and type of contaminants to be tested for in each sample; however, decisions regarding the procurement of laboratory services also impacted these costs. In some instances, these decisions did not appear to be the most economical.

For example, Nevada used an onsite laboratory to perform sample analyses even though a cost comparison showed that these services were substantially higher than offsite services. Specifically, a cost comparison completed by the contractor determined that the weighted average cost for a sampling analysis was $196 for the onsite laboratory, compared to $134 for the offsite laboratory. Had Nevada used offsite services, direct analyses costs could have been reduced by over $300,000 annually. Nevada officials advised that the decision to use onsite services was based in part on the desire to maintain the capability onsite. Similarly, one program organization at Oak Ridge competitively procured its laboratory analysis services through its

Sample Management Office. Two other program organizations at the same facility, on the other hand, procured laboratory analysis services from the onsite lab even though its costs were higher. Conversely, Argonne National Lab-West at Idaho initially procured analysis services through the Sample Management Office but achieved about $50,000 in savings after procuring laboratory services independently.

In another example, Livermore competitively procured analysis services from offsite laboratories but limited the selection to those laboratories within a 100-mile radius of the site. According to officials, this limitation was necessary to keep samples containing volatile organic compounds cold prior to testing. We noted that other sites used laboratories well beyond 100 miles by packing their samples in dry ice and shipping overnight. Geographic constraints may exclude more cost-competitive laboratories.

The OIG recognized that some of the cost variances were beyond the control of program managers; however, it appeared that many of the more economical technologies were adaptable to other sites. Officials at the sites visited agreed that some technologies could be implemented. In regard to laboratory analyses of samples, we were advised that the number of offsite laboratories has been decreasing over the last 2 years. The effect of this change was not yet clear. However, quality and price was expected to increase. The OIG also recognized that further management study and technical analyses are needed to address analytic concerns and determine the appropriate use of innovative technologies before final decisions are made. These types of decisions require the exercising of technical judgments by qualified individuals possessing scientific knowledge and the approval of regulatory reviewers. Therefore, final determinations on what economies should be implemented by the Department were beyond the scope of this review.

Groundwater Monitoring Requirements

Federal regulations require the Department, as owner and operator of hazardous waste treatment, storage and disposal facilities, to monitor groundwater at its facilities to ensure compliance with regulations and detect the release of contaminants. Department of Energy Order 5400.1 provides

policy and guidance on how to fulfill these requirements and establish a Groundwater Protection Management Program. The Order prescribes that such a program be established to correct existing problems, minimize risks to the environment, and anticipate problems before they occur. This Order also provides that efforts to meet environmental obligations be carried out consistently across the complex and among all field organizations and programs.

Department Order 413.1 requires that all operations be conducted in a cost-effective manner. Federal resources are to be managed effectively and efficiently to achieve intended program results and are to be protected from waste, fraud, and mismanagement. Further, the Government Performance and Results Act requires the creation of long-range strategic plans that define organizations' missions and form the basis for performance measurement.

Overall Responsibility Not Assigned

The Department's groundwater monitoring activities were not conducted in the most economic manner because no single organization at each facility and Headquarters was assigned overall responsibility and held accountable for program cost effectiveness. Specifically, no organization had been assigned responsibility for collecting and disseminating information on cost saving improvements from innovative groundwater monitoring techniques. Further, no organization was responsible for analyzing and evaluating Departmentwide groundwater monitoring data to identify trends in water quality. Such information was needed to meet environmental and economic obligations to be carried out across the Department complex.

At Headquarters, the Offices of Environment, Safety and Health and Environmental Management were the primary programmatic organizations involved with groundwater monitoring activities. Both had limited oversight responsibilities and neither had been assigned overall responsibility for the Department's groundwater monitoring activities. Environment, Safety and Health's responsibility was limited to providing guidance on groundwater monitoring policies to the field. Environmental Management focused primarily on solving groundwater issues brought to their attention by sites requesting assistance. Neither office had the authority to proactively coordinate groundwater monitoring economies and activities in the field. Furthermore, no organization had been assigned responsibility to collect and analyze funding and other groundwater monitoring information. Consequently, Department officials did not know the amount of funds dedicated to groundwater activities.

At the facility level, groundwater monitoring activities were not sufficiently integrated, which caused activities to be less efficient and economical. Several program activities at each facility funded and conducted groundwater monitoring activities. While the goal at most facilities was to integrate all activities, in some cases, these program offices acted independently of each other. No one person or office had been given overall responsibility to ensure the integration of groundwater monitoring activities.

For example, three program offices--Environmental Management, Defense Programs, and Office of Science--conducted groundwater activities at the Oak Ridge facility. While Environmental Management and Defense Programs coordinated their activities to some extent, no one office was assigned responsibility for the entire facility. We were advised by the Oak Ridge Operations Office that the facility was working towards integrating all groundwater activities. At Idaho one individual was designated to integrate most portions of the Laboratory's groundwater activities. This integration process, however, did not include the Argonne National Laboratory-West and the Naval Reactor Facility. Further, Idaho officials advised that full integration is not expected to be completed for 10 years. However, there is coordination among all site activities.

During the audit we discussed the need for more centralized management of groundwater activities at both the field sites and Headquarters. Site officials agreed that a spokesperson was needed at the Headquarters level to coordinate these activities, interface with the Environmental Protection Agency, and to address budget matters pertaining to groundwater monitoring activities. We also discussed the apparent need for a more viable method to disseminate technical innovations and resolve different technical opinions. We were advised that technical meetings were held periodically to present innovations to their peers. However, these meetings were ad hoc in nature and no followup of technology implementation was made.

Opportunities To Reduce Cost

Savings and increased efficiencies in groundwater activities can be realized by assigning overall responsibility for groundwater activities, implementing innovative technologies where appropriate, and improving the decision making process. The exact amount of Departmentwide savings that could be realized by implementing identified cost saving improvements could not be determined. However, we estimated that the Department could save about $3.6 million annually by implementing innovative technologies relating to well

installation, sampling operations, and laboratory analyses. For example, as much as $300,000 could be saved if Nevada procured laboratory services competitively. Another $3.3 million could be saved if the remaining sites achieved a similar rate of savings as the sites visited. An additional one-time savings of $67,500 could be realized if Idaho modified sampling techniques at selected wells. Given that Departmentwide groundwater monitoring activities are expected to continue for many years, millions of dollars in additional savings may be possible. Nevertheless, such savings and benefits will not be fully realized until groundwater monitoring responsibilities are assigned at each facility and at the Headquarters level and innovative technologies are effectively implemented.

RECOMMENDATIONS

We recommend that the Chair, Field Management Council:

1. Designate a Headquarters office to be responsible and accountable for groundwater monitoring activities. This office should:

    a. Accumulate information on such activities as well installation, sampling techniques and frequency, and laboratory analysis costs that will be used to identify potential best practices. Data on monitoring results and overall costs should also be collected and used to develop trends in water quality.

    b. Communicate "best practices" to all sites and ensure they are fully evaluated and implemented where appropriate.

    c. Establish a peer review group composed of experts from the field and Headquarters to aid in the technical analysis and adoption of best practices.

    d. Expedite the integration of groundwater monitoring activities at Department facilities.

2. Direct Managers of field offices to:

    a. Give priority attention to integrating groundwater monitoring activities at the facilities for which they have responsibility.

b. Evaluate available innovative technologies for applicability at each site and implement if appropriate.

c. Re-evaluate the make or buy decisions for determining whether the laboratory analyses of groundwater samples are being performed on the most economical and effective basis in view of the quality and quantity of laboratories throughout the country.

MANAGEMENT REACTION

Management generally agreed with the findings and recommendations and indicated that corrective actions were being taken or had been planned. See Appendix 3 of this report.

AUDITOR COMMENTS

Actions taken and planned were generally responsive to the recommendations. However, the response did not specifically indicate which Headquarters organization had been assigned overall responsibility for Departmentwide groundwater monitoring activities and would be accountable for program cost effectiveness in the future. Such a designation is necessary to ensure the timeliness of technical judgments and regulatory approvals.

Appendix 1

SCOPE

The audit was performed from January to November 1999 at Headquarters. Fieldwork was conducted at three sites at the Oak Ridge Reservation, Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, two sites at the Idaho National Engineering and Environmental Laboratory, and the Nevada Test Site.

METHODOLOGY

To accomplish the audit objective, we:

- analyzed budget and other data received from an Information Collection Survey sent to all Department sites that perform groundwater monitoring;
- interviewed Environmental Management and Environment, Safety and Health personnel at Headquarters that either currently or previously participated in groundwater monitoring activities;
- interviewed field personnel specializing in groundwater monitoring; and
- reviewed laws and regulations related to groundwater monitoring.

The audit was performed in accordance with generally accepted government auditing standards for performance audits. It included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. Accordingly, we assessed management controls to ensure the Department's activities were being conducted in an economic manner. Because our audit was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of our audit. We did not conduct a reliability assessment of computer-processed data because only a very limited amount of such data was used during the audit. There were no performance measures specifically applicable to the audit objective. Environmental Management officials waived the exit conference.

Appendix 2

REPORTS RELATED TO GROUNDWATER MONITORING

Since 1983, the Office of Inspector General, General Accounting Office, and Department of Energy program offices had issued at least eight reports identifying opportunities for the Department to improve its groundwater monitoring activities. Listed below is a synopsis of the issues addressed in those reports.

Office Of Inspector General Reports:

- *Audit of Richland Operations Office Site Characterization Program*, (DOE/IG-0368, March 20, 1995). Richland agreed to have 80 percent of low-level waste sample analyses performed within 25 miles of Hanford which increased sample analysis costs by about $46 million. Economic analyses of the alternatives were not prepared as required.

  Audit of the Groundwater Remediation Plans at the Savannah River Site, (ER-B-96-02, June 11, 1996). The site did not have a Land Use Plan showing the intended future uses of land and groundwater. Without such a plan, groundwater in certain areas was classified at a higher cleanup level than might have been necessary.

- *Audit of Groundwater Monitoring at Hanford*, (WR-B-97-03, November 11, 1996). Richland's groundwater program was mission essential but was not performed at the least cost to the Department. Work performed by the principle contractors overlapped, resulting in duplicative groundwater monitoring activities.

- *Audit of the Savannah River Site's Quality Control Program for Groundwater Sampling*, (DOE/IG-0405, May 20, 1997). The contractor required more quality control analyses than necessary to ensure that groundwater sampling results were accurate and precise.

General Accounting Office Reports:

- *Federal and State Efforts to Protect Ground Water*, (GAO/RCED 84-80, February 21, 1984). GAO concluded that a comprehensive national groundwater protection policy did not exist; however, six Federal laws addressed specific contamination problems. The extent of the problem was unknown because no comprehensive national database or monitoring program existed.

- *Nuclear Waste: Hanford's Well-Drilling Costs Can Be Reduced*, (GAO/RCED-93-71, March 1993). Hanford site contractors had implemented many of the cost-savings measures to reduce well drilling costs included in a 1990 study, but other actions were still needed that included: (1) adopting, where appropriate, faster and less expensive well drilling technologies; (2) using the well-drilling program's work force more efficiently; and (3) centralizing the management of the well drilling program to improve its effectiveness.

- *Department of Energy: Information on the Tritium Leak and Contractor Dismissal at the Brookhaven National Laboratory,* (GAO/RCED-98-26, November 4, 1997). Groundwater samples revealed concentrations of tritium that were twice the allowable federal drinking water standards. Officials concluded that tritium had been leaking from a reactor storage pool for as long as 12 years without the Department's or Brookhaven National Laboratory's knowledge. The resulting controversy about both Brookhaven National Laboratory's handling of the tritium leak and perceived lapses in the Department's oversight led to termination of the contractor in May 1997.

Office Of Environmental Management Study:

- *Well Installation and Abandonment Study: Key Observations and Summary Report;* November 1994. Significant cost variability occurred within the Department of Energy system in well installation costs.

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United States Government **Department of Energy**

memorandum

DATE: January 20, 2000

REPLY TO ATTN OF: EM-22 (P. Beam, 3-8133)

SUBJECT: Draft Report on "Audit of Ground Water Monitoring Activities"

TO: Phillip L. Holbrook, Assistant Inspector General for Audit Services

This memorandum is in response to your November 30, 1999, request to the Chair, Field Management Council, for a review and comment on the subject audit. The report is generally accurate in its assessment that ground water monitoring efforts can be conducted more economically and clearly supports the statement that a determination of economies was beyond the scope of this report.

You requested DOE actions in response to the audit recommendations or alternative actions taken. I believe the seven lettered provisions of recommendations are worthwhile. Actions to address the recommendations are currently underway or planned. A detailed discussion is attached. These actions improve the integration and efficiency of complex-wide ground water monitoring. I will distribute the final report to all sites for information and applicable follow-up.

If you have any additional questions or concerns, please feel free to contact me or have your staff contact Paul Beam of my staff at (301) 903-8133.

Carolyn L. Huntoon
Assistant Secretary for
Environmental Management

Attachments

IG Report No. DOE/IG-0461

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4. What additional actions could the Office of Inspector General have taken on the issues discussed in this report which would have been helpful?

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