U.S. Department of Energy
Office of Inspector General
Office of Audit Services

Audit Report

Remediation of the Waste Burial Grounds at the Hanford Site

DOE/IG-0743

October 2006

Department of Energy

Washington, DC 20585

October 18, 2006

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman
Inspector General

SUBJECT: INFORMATION: Audit Report on "Remediation of the Waste Burial Grounds at the Hanford Site"

BACKGROUND

In the 1950's and 1960's, operations at the Department of Energy's Hanford, Washington Site generated large amounts of radioactive waste. Hanford established waste burial grounds, designated as sites 618-10 and 618-11, which received nuclear waste from fuel fabrication research and development activities during this period. Based on historical information available about the origin of the waste, the burial grounds, which are approximately four miles from the Columbia River, may contain irradiated fuel fragments, contact and remote-handled transuranic waste, and low-level waste, including some hazardous mixed wastes. Radiation levels at the edge of the burial grounds have been found to have been 100 times the annual radiation dose limit per one hour of exposure.

In 2005, the Department of Energy awarded a "River Corridor" contract to, among other things, remediate the burial grounds at an estimated cost of $136 million; this goal was to be accomplished by 2012. The objective of our audit was to determine if the Department had developed a comprehensive cleanup strategy for the remediation of the 618-10 and 618-11 burial grounds at the Hanford Site.

RESULTS OF AUDIT

While the Department's intent is to fully remediate the 618-10 and 618-11 burial grounds, the audit disclosed that its planned actions did not address all pertinent issues. Specifically, we found that the Department's remediation strategy:

- May produce a waste form or waste package that, in some cases, will not meet the Department's current acceptance criteria for interim storage or disposal; and,

- Did not reflect the cost to prepare the retrieved waste to meet waste acceptance criteria for storage or final disposal.

Regarding waste acceptance criteria, the Department planned to dispose of some of the retrieved waste as low-level waste in Hanford's Environmental Restoration Disposal Facility. However, the Department funded the development of a retrieval technology that is likely to produce a waste form that consists of both transuranic waste and spent fuel fragments which are prohibited at the Disposal Facility, as well as other Department

facilities including the Waste Isolation Pilot Plant in New Mexico. The Department also planned to send retrieved waste to Hanford's Central Waste Complex for interim storage. However, it developed a retrieval technology that is likely to produce a waste form that is too large to meet the Central Waste Complex's acceptance criteria. Similarly, the Department was also uncertain as to whether the retrieved waste would comply with the Complex's permit requirements limiting radiation levels.

Further, although the retrieved waste is likely to require additional processing to meet the waste acceptance criteria, the Department's River Corridor contractor and the Hanford Site do not have the capability to treat these wastes for interim storage and final disposal. Consequently, all such waste will have to be treated at other Departmental facilities. However, the Department's baseline for remediating the burial grounds did not reflect the substantial additional expense to treat, repackage or certify non-compliant waste by other contractors and facilities.

The audit showed that the Department had not fully addressed these issues in its planning process. We found that it had not employed a "cradle to grave" approach to the remediation and disposal of waste in the 618-10 and 618-11 burial grounds. Specifically, the Department did not consider waste acceptance criteria for interim storage and final disposal in developing technologies to retrieve burial ground waste. It also did not ensure that its retrieval strategy was based on accurate and complete waste characterization information. Further, the Department did not ensure that it had agreement with the River Corridor contractor that the scope of work for burial ground remediation included preparing the waste for interim storage or final disposal before entering into the contract. As a result, the Department may incur up to $188 million more than planned to store, monitor and manage waste retrieved from the burial grounds.

We made recommendations to ensure that these issues are addressed as remediation plans for the 618-10 and 618-11 burial grounds evolve.

MANAGEMENT REACTION

Management agreed with the recommendations and is proceeding with efforts to ensure that the solutions for remediating the burial grounds address the concerns presented in the report. We consider management's comments to be responsive to our recommendations.

Attachment

cc: Deputy Secretary
Under Secretary of Energy
Under Secretary for Science
Chief of Staff
Assistant Secretary, Office of Environmental Management
Manager, Richland Operations Office

REPORT ON THE REMEDIATION OF THE WASTE BURIAL GROUNDS AT THE HANFORD SITE

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618-10 AND 618-11 BURIAL GROUNDS

Background

In 2005, the Department of Energy (Department) contracted with Washington Closure Hanford to clean up over 210 square miles adjacent to the Columbia River. Part of this effort is to develop a remediation solution for the 618-10 and 618-11 burial grounds. The Department and Washington Closure Hanford are currently assessing various methods for exhuming these burial grounds, including the potential implementation of the two methods funded by the Department's research and development program to retrieve the waste: sleeve encapsulation and in-situ vitrification.

The waste in the burial grounds was disposed of in trenches, vertical pipe units, and caissons. The vertical pipe units were constructed using five 55 gallon drums welded end-to-end and were placed in the ground with approximately five to ten feet of earthen cover. The caissons are 10 feet long with an 8 foot diameter, have angled chutes for waste entry, and were buried with 15 feet of earthen cover.

Under the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) with the State of Washington and the U.S. Environmental Protection Agency, the Department is to submit a report in March 2007, to the Environmental Protection Agency that includes a work plan and schedule for remediating the burial grounds. The plan is required to be consistent with Waste Isolation Pilot Plant Waste Acceptance Criteria for remote-handled transuranic and mixed transuranic waste. Richland management asserts that the Design Solution, originally scheduled to be delivered to the Department on September 30, 2006, by Washington Closure Hanford, is expected to satisfy the intent of this milestone.

Remediation Strategy

Despite ongoing efforts, the Department does not yet have a comprehensive cleanup strategy for remediating the 618-10 and 618-11 burial grounds. The Department selected and funded research for waste retrieval technologies that are unlikely to produce waste forms or packages that meet the Department's waste acceptance criteria for interim storage or final disposal.

Specifically, the Department funded research on two technologies that have significant vulnerabilities.

- The *sleeve encapsulation* approach is likely to produce a final package that is nearly 27 feet long with a diameter of nearly 4 feet. This waste product does not meet the Waste Acceptance Criteria at the Central Waste Complex since the largest item that is acceptable is a 10 foot by 11 foot box.

Additionally, the Central Waste Complex is only permitted to store waste that has been shielded down to contact-handled radiation levels. The vertical pipe units are believed to contain both contact-handled and remote-handled transuranic waste as well as irradiated fuel fragments, and the Department does not yet know the size or amount of shielding that will be required to safely store the waste at the Central Waste Complex.

If waste from the burial grounds cannot be disposed of at the Environmental Restoration Disposal Facility, then it will have to be treated and repackaged in preparation for off-site disposal. However, Washington Closure Hanford does not have the capability to treat these wastes.

- The *in-situ vitrification* retrieval approach of melting the waste is likely to produce a waste stream requiring the Department to develop a new disposition pathway. Specifically, the melted waste will not meet the waste acceptance criteria of the Department's existing disposal facilities. While the contractor asserts that the final product would result in low-level waste that could be disposed of at the Environmental Restoration Disposal Facility, the new waste stream will consist of transuranic waste and spent fuel fragments which are prohibited from being disposed at the Facility. Additionally, spent fuel fragments are not authorized for disposal at the Waste Isolation Pilot Plant.

As an alternative to sleeve encapsulation and in-situ vitrification, the waste could be treated at other Hanford facilities such as the Waste Repackaging and Processing Plant, the T-Plant, or the future M-91 Facility. Nevertheless, the Department's cost baseline does not include the cost for treating, repackaging, and certifying the waste for offsite shipment. Specifically, the Department's project cost baseline estimate for remediating the burial grounds is based on the $136 million River Corridor Closure Contract that limits the disposal options to the Environmental Restoration Disposal Facility or interim storage at the Central Waste Complex.

Project Management

The Department has not fully integrated and coordinated the plans to remediate and dispose of the waste in the 618-10 and 618-11 burial grounds. Specifically, the Department has not ensured that:

- Retrieval technology development efforts fully considered waste disposal requirements;

- Waste characteristics and their impact on eventual disposal of retrieved waste forms were fully understood; and,

- Contract work scope for remediating the burial grounds was fully agreed to by Washington Closure Hanford. The Department is currently working to resolve this dispute with its contractor, Washington Closure Hanford.

Technology Development

The Department did not ensure that retrieval technology development efforts fully considered whether the waste forms produced by the technologies could be disposed of at existing disposal facilities such as the Waste Isolation Pilot Plant. The technology development contracts only addressed demonstration of retrieval technologies and did not include the requirement that resulting waste forms be consistent with disposal requirements. Consequently, the developed technologies are likely to produce waste forms that do not meet disposal facilities' waste acceptance criteria, and may require treatment and repackaging before they can be certified for disposal.

Waste Characterization

Additionally, in selecting retrieval technologies, the Department did not fully consider the impact of the waste characteristics on the disposal of the retrieved waste form. As of December 2005, the Department had not taken all available steps to locate historical records detailing characterization information relating to the waste in the burial grounds. The existing records, which have been recreated from interviews and using process knowledge based on the origin of the waste, are limited and often contradictory. Because of incomplete characterization data, the Department funded the development of retrieval technologies that could result in a waste form that may not meet the waste acceptance criteria of existing disposal facilities without further processing. The Office of Environmental Management acknowledged in the *February 2002 Top-to-Bottom* review that uncertain work scope results when contamination levels are not known or understood, or vulnerable technologies are selected.

During our audit, the contractor initiated a document request and is currently conducting an extensive document search in an attempt to locate characterization information. Nearly 3,000 radiation survey records have been located and are currently being reviewed.

However, the records provide information on radiation dose levels, but do not provide specific information on waste isotopes that were disposed of at the burial grounds.

Contractor Work Scope

Further, the Department and Washington Closure Hanford do not agree on the overall scope of work for the burial grounds. Washington Closure Hanford asserts that the Department was aware that its contract proposal only called for the retrieval and transportation of the waste to the Central Waste Complex, and did not include the costs to treat and repackage the waste to allow it to be shipped to the Waste Isolation Pilot Plant. Washington Closure Hanford assumed that the treatment and repackaging of the waste was to be a Government Furnished Service. The Department does not agree and responded that the costs associated with waste packaging, shipping, treatment, and storage/disposal are to be borne by Washington Closure Hanford. As previously noted, the Department's baseline for remediating the burial grounds is based on the Washington Closure Hanford contract and does not contain additional costs for further processing of the waste for disposal.

Additional Costs

As a result, the Department may incur approximately $188 million more than planned to store, monitor, and manage waste retrieved from the burial grounds. Specifically, it could cost the Department up to $188 million more to treat, repackage, and certify retrieved waste to meet the waste acceptance criteria. Although the Department is basing its current $136 million baseline cost estimate for remediating the burial grounds on the Washington Closure Hanford contract, a 2001 Record of Decision included the cost for preparing the waste for disposal, and it estimated the cost to be $324 million to fully remediate the burial grounds.

RECOMMENDATIONS

We recommend that the Assistant Secretary for Environmental Management:

1. Manage the remediation of the 618-10 and 618-11 burial grounds as a "cradle-to-grave" project by integrating and coordinating retrieval technologies with waste disposal requirements; and,

2. Revise the Department's baseline to accurately quantify the risks associated with remediation of the 618-10 and 618-11 burial grounds from the "cradle-to-grave."

We recommend that the Manager, Richland Operations Office:

1. Continue to conduct research on historical records containing waste characterization information for the waste in the burial grounds and incorporate results into the Design Solution.

MANAGEMENT REACTION AND AUDITOR COMMENTS

Management agreed with the recommendations in the draft report and expects that the Washington Closure Hanford Design Solution, to be delivered to the Department by January 2007, will provide the information necessary to address recommendations 1 and 2. The design solution will allow the Office of Environmental Management to more fully develop a "cradle-to-grave" project management approach for remediation of the 618-10 and 618-11 burial grounds. With regard to the recommendation made to the Richland Operations Office, the historical records research is continuing and the results will be incorporated into the Design Solution. The Office of Environmental Management stated that they will not complete the actions necessary to fully address the recommendations any earlier than July 2007.

Management's comments are responsive to our recommendations and are included in their entirety in Appendix 2.

Appendix 1

OBJECTIVE

The objective of this audit was to determine if the Department of Energy (Department) has developed a comprehensive cleanup strategy for the remediation of the 618-10 and 618-11 burial grounds at the Hanford Site.

SCOPE

The audit was performed from September 2005 to May 2006 at the Hanford Site in Richland, Washington. The scope of the audit covered the remediation strategy of the 618-10 and 618-11 burial grounds managed by the Richland Operations Office.

METHODOLOGY

To accomplish the audit objective, we:

- Obtained and reviewed planning documents for remediation of the 300-FF-2 Operable Unit, which includes the 618-10 and 618-11 burial grounds;
- Researched Federal and Departmental regulations;
- Reviewed findings from prior audit reports regarding remediation of burial grounds;
- Analyzed the Washington Closure Hanford contract with the Richland Operations Office;
- Evaluated the *Acquisition Plan for Technology Development In-Situ Transuranic Waste Delineation and Waste Removal at Hanford 618-10 and 618-11 Burial Grounds*, January 23, 2003, issued by the Office of Science and Technology;
- Analyzed the Department's contract with North Wind, Inc. managed by the National Environmental Technology Laboratory and conducted under the Office of Science and Technology; and,
- Interviewed key personnel in the Richland Operations Office, Office of Science and Technology, and the Office of Environmental Management.

The audit was conducted in accordance with generally accepted Government auditing standards for performance audits and included tests of internal controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. We assessed internal controls established under the Government Performance and Results Act of 1993 related to the Richland

Operations Office's planning for remediation of the 618-10 and 618-11 burial grounds at the Hanford Site. Because our review 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 limited amount of computer-processed data was used during the audit.

We held an exit conference with management on September 14, 2006.

United States Government Department of Energy

Memorandum

EM-53 (Ethan Merrill, 301-903-8185)

Office of Environmental Management Response to the Office of Inspector General Draft Audit Report *Remediation of the Burial Grounds at the Hanford Site*

George W. Collard, Assistant Inspector General for Audit Services Performance Audits, Office of the Inspector General

Thank you for your memorandum, dated July 28, 2006, providing the Office of Inspector General's draft audit report on the remediation of the burial grounds at the Hanford Site and the opportunity to provide comments on the subject report. In general, the Office of Environmental Management (EM) agrees with the recommendations made in the draft report. However, we would like to re-emphasize several facts associated with the Washington Closure Hanford (WCH) contract and the EM technical approach for remediation of the 618-10/11 Burial Grounds.

EM recognizes the high degree of technical and cost uncertainty as well as the project risk associated with the 618-10/11 Burial Grounds remediation. Indeed, it was these factors that, in large part, drove the current contracting approach for the Burial Grounds remediation. At this time, a final decision on the remediation strategy for the 618-10/11 Burial Grounds has not been reached. WCH is in the final stages of delivering a proposed design solution for remediation as stipulated in the contract. The design solution will address: (1) characterization and analysis results from any field investigations; (2) analysis and selection of any retrieval and packaging technologies; (3) engineering analysis; (4) proposed waste disposal pathways; (5) identification of required Government-Furnished Services and Information; and (6) a schedule and cost estimate to perform the field work. WCH is expected to deliver the design solution by January 2007 and the Richland Operations Office will have 90 days to evaluate the submittal. Additionally, WCH is only contractually authorized to develop the design solution at this time as the actual 618-10/11 remediation workscope is covered by a separate section of the contract and would only be authorized upon approval of the design solution.

It is expected that the WCH design solution will provide the information necessary to address the recommendations made in the draft report and allow EM to more fully develop a "cradle-to-grave" project management approach for remediation of the 618-10/11 Burial Grounds. The design solution will also be used to address the recommendations made to the Assistant Secretary for Environmental Management. With regard to the recommendation made to the Richland Operations Office, the historical records research is continuing and the results will be incorporated into the design solution. EM will not complete the actions necessary to fully address the recommendations any earlier than July 2007.

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Should you or your staff have questions or comments regarding EM's actions to address the recommendation contained in the draft report, please contact Mr. Jay Rhoderick, Director, Office of Project Management Oversight at (301)-903-7211.

J. F. Surash
Deputy Assistant Secretary for
Acquisition and Project Management
Office of Environment Management

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