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United States Government Department of Energy

# Memorandum

DATE: November 4, 2003

REPLY TO ATTN OF: IG-36 (A03RL018) Audit Report No.: OAS-L-04-03

SUBJECT: Audit of Accelerated Remediation of Tank Waste at Hanford

TO: Roy J. Schepens, Manager, Office of River Protection

## INTRODUCTION AND OBJECTIVE

Millions of gallons of radioactive waste, the result of decades of plutonium production, are stored in underground tanks at the Hanford Site. The tanks hold about 11 million gallons of High-Level Waste and 42 million gallons of Low-Activity Waste that must be treated prior to disposal. The Department's Tri-Party Agreement with the U.S. Environmental Protection Agency and the State of Washington requires that it immobilize all tank waste stored at the Hanford Site by 2028 using a vitrification process to transform the waste into glass.

The Department awarded a $4 billion contract to Bechtel National, Inc. in 2000 to construct and commission a waste treatment plant at the Hanford Site. The plant was designed to mix the waste with glass-forming materials, inject the mixture into a melter, and pour the "vitrified" waste into canisters. The canisters would eventually be shipped to Yucca Mountain for disposal. However, the plant was not designed to meet the Tri-Party Agreement's 2028 immobilization deadline because funding required to build and operate such a facility was considered to be unattainable. Rather, as currently designed, the plant would not complete immobilization until 2046.

In response to recent initiatives to accelerate cleanup across the complex, the Hanford Site revised its waste treatment plan in 2002 to complete immobilization of all tank waste by 2028, as required by the Tri-Party Agreement. The plan was revised to treat between 40 and 60 percent of the site's Low-Activity Waste using at least one of three supplemental technologies—steam reforming, containerized cast stone, and bulk vitrification—thereby accelerating the immobilization process. Initial cost estimates for these treatment technologies range from $900 million to $1.3 billion over the life of the program.

The objective of this audit was to determine whether the Department's current plan for immobilizing the Hanford Site's tank waste is cost-effective.

## CONCLUSIONS AND OBSERVATIONS

The Department's plan might not be the most cost-effective alternative because the plan does not consider an all vitrification approach using ion exchange sulfate removal technology as a viable alternative. In June 2003, the Office of Environmental Management (EM) conducted a review of the immobilization project and concluded that the use of ion exchange sulfate removal equipment could significantly increase production rates for the vitrification of Low-Activity Waste. EM requested that the Office of River Protection (ORP) evaluate the potential benefits that a sulfate removal process could have with respect to the vitrification facility. However, ORP did not perform a formal analysis of the sulfate removal process because it believed sulfate removal would add to the overall complexity and cost of the treatment plant.

Without a complete analysis of the potential benefits available from using an ion exchange sulfate removal process, the Department may spend more than necessary to treat a portion of the Hanford Site's Low-Activity Waste using supplemental technologies. Also, legal and regulatory issues may preclude the use of supplemental technologies altogether. The U.S. Environmental Protection Agency and the State of Washington have accepted vitrification as a proven method of immobilization. However, there are significant concerns with the supplemental technologies currently under consideration. For example, according to a September 2003 study conducted by the contractor responsible for evaluating supplemental technologies, bulk vitrification does not provide sufficient containment of technetium, a highly mobile contaminant, thus allowing it to potentially leach into the groundwater. The study also identified a lack of waste performance data and intrusion concerns regarding the steam-reforming alternative.

Since no formal recommendations are being made in this letter report, a formal response is not required. However, to ensure that the most cost-effective approach for treating Low-Activity Waste is identified, we suggest that you perform a complete analysis of the potential benefits available from use of sulfate removal equipment in the waste treatment plant currently under construction.

## SCOPE AND METHODOLOGY

The audit was performed between November 1, 2002, and September 30, 2003, at the Hanford Site in Richland, Washington. The scope of the audit included a review of planning for construction and operation of the waste treatment plant and the treatment of tank waste at the Hanford Site from May 2002 to September 2003.

To accomplish the audit objective, we reviewed the results of ORP's *Assessment of Low-Activity Waste Treatment and Disposal Scenarios for the River Protection Project*, issued in April 2003; analyzed the most current information available on the technical aspects and estimated costs of treatment alternatives; and held discussions with ORP and Office of Environmental Management program officials.

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. Accordingly, we assessed internal controls and performance measures established under the *Government Performance and Results Act of 1993* related to ORP's planning for treatment of radioactive waste stored at the Hanford Site and construction of the waste treatment plant. 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. In performing this audit, we did not rely on computer-based data.

We discussed the audit results with ORP's Assistant Manager for the Waste Treatment and Immobilization Plant on October 29, 2003.

We appreciate the cooperation of your staff throughout the audit.

Terry L. Brendlinger, Director
Environmental Audits Division
Office of Inspector General

cc: Assistant Secretary for Environmental Management
Team Leader, Audit Liaison Team, ME-2
Audit Liaison, Office of River Protection

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**United States Government** Department of Energy

# memorandum

DATE: November 4, 2003

REPLY TO: IG-36 (A03RL018)

SUBJECT: Final Report Package for "Accelerated Remediation of Tank Waste at Hanford"

TO: Linda J. Snider, Director for Planning and Administration (DPA)

Attached is the required final report package on the subject audit. The pertinent details are:

1. Staff days: Programmed n/a Actual n/a

2. Elapsed days: Programmed 364 Actual 368

3. Names of OIG audit staff:

| | |
|---|---|
| Assistant Regional Manager: | Phillip D. Beckett |
| Team Leader (Audit-Control-Point): | Michael R. Kuklok |
| Auditor-in-Charge: | Alan S. Nielsen |
| Audit Staff: | Debbie M. Thomas |
| | Luther A. Hughes |

4. This report has been discussed with OIG Investigations and Inspections personnel.

   Michael Matkowski, Investigations, May 27, 2003
   Rick Curran, Inspections, May 29, 2003

5. Matters to be brought to attention of the IG or AIGA: None

Terry L. Brendlinger, Director
Environmental Audits Division
Office of Inspector General

Attachments:
1. Final Report (3)
2. Monetary Impact Report
3. IGDBMS File Printout

# MONETARY IMPACT OF REPORT NO.: OAS-L-04-03

1. Title of Audit: Accelerated Remediation of High-Level Tank Waste at Hanford

2. Division: Environmental Audit Division (EAD)/ Richland Audit (RLA)

3. Project No.: A03RL018

4. Type of Audit:

| | | | |
|---|---|---|---|
| Financial: | | Performance: | X |
| Financial Statement | | Economy and Efficiency | |
| Financial Related | | Program Results | |
| Other (specify type): | | | |

5. Please report monetary savings identified in the report using applicable columns. Provide additional explanations of audited activities/locations in Section No. 6 - Remarks.

| FINDING | | COST AVOIDANCE | | QUESTIONED COSTS | | | | MGT. POSITION | POTENTIAL BUDGET IMPACT |
|---|---|---|---|---|---|---|---|---|---|
| (A) | (B) Title | (C) One Time | (D) Recurring Amount PerYear | (E) Questioned | (F) Unsup-ported | (G) Unre-solved | (H) Total (E)+(F)+(G) | (I) C=Concur N=Noncon U=Undec | (J) Y=Yes N=No |
| | N/A | | | | | | | | |
| TOTALS--ALL FINDINGS | | | | | | | | | |

6. Remarks: Without performance of an in-depth cost analysis using current information and looking at all options, ORP cannot be assured that it is taking the most cost effective approach for treating and immobilizing Hanford's Low-Activity Waste.

7. Contractor: None
8. Contract No.: None
9. Task Order No.: None

10. Approvals:
Division Director/Date: 11/3/03
Technical Advisor & Date

# POTENTIALLY SENSITIVE INFORMATION

## Letter Report on "Accelerated Remediation of High Level Tank Waste at Hanford"

The following is a list of information considered to be potentially sensitive. **If the information is detailed to such an extent that it would cause or could potentially cause damage to U.S. national security, citizens, or property, it cannot be included in our public reports.** Therefore, when preparing your reports be sure to use this checklist to determine whether the report contains potentially sensitive information.

| CATEGORIES/TYPES OF INFORMATION | YES | NO |
|---|---|---|
| **Facilities** | | |
| ➢ Detailed description and location of facilities to include maps, written directions, drawings, blue prints, photographs and the like | | X |
| ➢ Detailed descriptions and location of storage facilities for nuclear or other hazardous materials | | X |
| ➢ Detailed descriptions and location of personnel or facility support systems (e.g. water supply, electrical supply systems, communications systems, emergency response personnel/equipment) | | X |
| ➢ Detailed descriptions and locations of computer systems used to process, store, and transmit sensitive information. | | X |
| ➢ Environmental Impact Statements that provide the consequences for what is being studied. | | X |
| ➢ Any detailed information pertaining to other sites that has not been reviewed/approved by the other site. | | X |
| | | |
| **Materials** | | |
| ➢ Form and quantity of hazardous materials, (chemical, nuclear, biological) | X | |
| ➢ Vulnerabilities of materials to unauthorized access or destruction. | | X |
| ➢ Consequences of release of hazardous materials | | X |
| ➢ Detailed transportation related information (routes, maps, shipping means, containers). | | X |
| | | |
| **Security/Safety** | | |
| ➢ Detailed plans, procedures, communications, reaction times, capabilities that would allow someone to determine vulnerabilities of the site. | | X |
| ➢ Specific assessments, exercise results, evaluations for a particular site | | X |
| ➢ Specific personnel data identifying security/safety personnel | | X |
| ➢ Specific equipment and its potential uses | | X |
| | | |

# POTENTIALLY SENSITIVE INFORMATION

| | | |
|---|---|---|
| **Assessments** | | |
| ➢ Site specific vulnerability assessments | | X |
| ➢ Site specific safety assessments/analysis | | X |
| ➢ Site specific risk analyses | | X |
| ➢ Specific hazardous assessments (Dispersion models and analyses, accident analyses, or site hazards) | | X |
| | | |
| **Personnel** | | |
| ➢ Specific organization charts or phone lists identifying senior management/key personnel | | X |
| ➢ Specific personal data to include travel plans, meetings and the like | | X |
| ➢ Specific training materials that include sensitive information | | X |
| | | |
| **Programs** | | |
| ➢ Detailed information identifying sensitive programs, special projects, SAPs, WFO | | X |
| ➢ Reports detailing specific activities and/or results from programs and projects | | X |
| ➢ Information pertaining to specific programs at other facilities/sites that has not been cleared with the other sites for publication on a publicly accessible web site | | X |

# *Audit Project Office Summary (APS)*



eport run on: November 6, 2003 11:57 AM

Audit#: A03RL018 Ofc: RLA Title: PLANNING FOR WASTE TREATMENT PLANT AT HANFORD

****** Milestones ******

| | Planned | End of Survey | Revised | Actual | |
|---|---|---|---|---|---|
| Entrance Conference:..... | 01-OCT-02 | | 01-NOV-02 | 01-NOV-02 | |
| Survey:..... | | | 26-FEB-03 | 26-FEB-03 | |
| Draft Report:..... | 31-AUG-03 | | 31-OCT-03 | | |
| Completed (With Report):. | 30-SEP-03 | | 30-NOV-03 | 04-NOV-03 | ( R ) |
| ----------Elapsed Days: | 364 | | 394 | 368 | |
| | | | | Elap. Less Susp: | |

Date Suspended: Date Terminated:
Date Reactivated: Date Cancelled:
DaysSuspended(Cur/Tot): ( ) Report Number: OAS-L-04-03
Rpt Title: Report Type: LTR LETTER REPORT
AUDIT OF ACCELERATED REMEDIATION OF TANK WASTE AT HANFORD

****** Audit Codes and Personnel ******

Class: PER PERFORMANCE
Program: EM Not Found
MgtChall: 032 ENVIRONMENTAL CLEANU
Site: SSA SINGLE-SITE AUDIT
SecMiss: ENV ENVIRONMENTAL QUALIT
PresInit: Not Found

AD: 327 BECKETT
AIC: 617 NIELSEN
Team Ldr: 546 KUKLOK
Tech Adv: 432 GAMAGE

****** Task Information ******

Task No:
Task Order Dt: CO Tech. Rep: , .
Orig Auth Hrs: Orig Auth Costs:
Current Auth: Current Auth Cost:
Tot Actl IPR Hr: Tot Actl Cost:

****** Time Charges ******

| Emp/Cont Name | Numdays | Last Date |
|---|---|---|
| BOUGHTON, J | 0.3 | 16-NOV-02 |
| HOPKINS, F | 0.3 | 30-NOV-02 |
| KUKLOK, M | 26.2 | 01-NOV-03 |
| HUGHES, L | 118.8 | 01-NOV-03 |
| THOMAS, D | 156.9 | 20-SEP-03 |
| NIELSEN, A | 166.8 | 01-NOV-03 |
| Total: | 469.3 | |

# *Audit Project Office Summary (APS)*



Report run on: November 6, 2003 11:57 AM

## Audit History

Audit No: A03RL018 History Date: 06-NOV-03

History Text:

PB/ENTERED COMPLETED WITH REPORT DATE.

# AUDIT DATABASE INFORAMTION SHEET

Project No.: A03RL018

1. Title of Audit: "Accelerated Remediation of Tank Waste at Hanford"
2. Report No./Date OAS-L-04-03/November 4, 2003
3. Management Challenge Area: 032
4. Presidential Mgmt Initiative: N/A
5. Secretary Priority/Initiative: ENV
6. Program Code: EM-1/EM-3
7. Location/Sites: ORP
8. Finding Summary: None

We discussed the audit results with ORP's Assistant Manager for the Waste Treatment and Immobilization Plant on October 29, 2003. Since no formal recommendations are being made in this letter report, a formal response is not required. However, to ensure that the most cost-effective approach for treating Low-Activity Waste is identified, we suggest that you perform a complete analysis of the potential benefits available from use of sulfate removal equipment in the waste treatment plant currently under construction..

9. Keywords:

| | |
|---|---|
| Accelerate | Hanford |
| Analysis | Office of River Protection |
| Bechtel National, Inc | Reduce/Reduction |
| CH2M Hill Hanford Group | Savings |
| Cost | Study |
| DOE | Supplemental Technologies |
| DOE-ORP | Vitrification |
| Effective/Effectiveness | Tank Waste |
| Environmental Management (EM) | Top-to-Bottom Review |
| Federal | Waste Treatment Plant |