



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

Audit Report

Accelerated Tank Waste Retrieval Activities at the Hanford Site

DOE/IG-0706

October 2005



Department of Energy

Washington, DC 20585

October 17, 2005

MEMORANDUM FOR THE SECRETARY

FROM:


Gregory H. Friedman
Inspector General

SUBJECT:

INFORMATION: Audit Report on "Accelerated Tank Waste Retrieval Activities at the Hanford Site"

BACKGROUND

In 1998, as part of an effort to manage one of the Nation's largest and most complex environmental remediation projects, the Department of Energy established the Office of River Protection to retrieve, treat, and dispose of tank waste located at the Hanford Site in Richland, Washington. Under its mission, the Office of River Protection is responsible for managing 53 million gallons of highly toxic, high-level radioactive waste stored in 177 underground tanks located within seven miles of the Columbia River. This includes 149 single-shell tanks that are decades beyond their design life. Sixty-seven of these tanks have had confirmed or suspected leaks. Due to these leaks, an estimated one million gallons of waste has been discharged into the soil.

Under the 1989 Tri-Party Agreement (Agreement) between the Department of Energy, the Washington State Department of Ecology and the U.S. Environmental Protection Agency, firm milestones were established for completing the retrieval of the waste from the 149 single-shell tanks. One of the important benchmarks in the Agreement was the retrieval of waste from all of the 16 single-shell tanks located in Hanford's C-Tank Farm by the end of Fiscal Year 2006. The 16 tanks in the C-Tank Farm have the capacity to hold 6,580,000 gallons of waste. In 2003, the Department of Energy's tank farm remediation contractor, CH2M Hill Hanford Group, Inc., estimated that it could complete the removal of the waste in the 16 tanks by September 2006, at an approximate cost of \$90 million.

Virtually all parties involved in this process agree that remediation of the tank farm waste is a high priority and that any delay represents a potential health and safety hazard of significant magnitude. Consequently, we initiated this audit with the objective of determining whether the Department will meet Tri-Party Agreement milestones relating to waste removal at the C-Tank Farm.

RESULTS OF AUDIT

The audit disclosed that, in terms of both schedule and cost, the Department will not meet its Agreement milestone for the retrieval of waste from the single-shell tanks located at the C-Farm. Based on the Department's latest schedule baseline, completion of retrieval



activities in the C-Farm will not be completed until March 2007, or six months after the Tri-Party Agreement milestone. Of greater importance, we examined the path forward for completion of retrieval activities in the C-Farm and we were not encouraged by the likelihood of meeting Departmental schedule or cost goals. For example, the Department's schedule baseline, which is very aggressive, is dependent upon operating 24 hours a day, seven days a week. However, we found that, at the time of the audit, CH2M Hill had not hired any additional personnel needed to enable the contractor to operate on such an expedited schedule. Further, the Department estimated that waste retrieval costs have increased to \$215 million, more than doubling the initial estimate.

We attempted to determine the cause of the schedule delays and cost increases in waste retrieval operations. In our judgment, the Department was overly optimistic about its ability to retrieve tank waste and it had not based its approach on sound retrieval experience and proven retrieval technologies. In addition, the Department had retrieved only limited amounts of tank waste and did not fully consider potential programmatic difficulties when it agreed to the milestones. These difficulties included issues relating to tank vapors, equipment malfunctions, and tank waste characterization.

While this audit focused on activities at the C-Tank Farm, we concluded that our findings have broader implications for the entire tank waste cleanup effort. Specifically, in our view, as a result of tank waste retrieval delays and cost overruns, the Department's ability to meet its Agreement milestone of removing waste from all single-shell tanks by 2018 is in jeopardy. Such action could erode public confidence in the Department's ability to meet its cleanup commitments.

MANAGEMENT REACTION

The Assistant Secretary for Environmental Management (EM) concurred with the recommendations in the audit report. EM's comments and our response are summarized beginning on page 4 of the report and management's verbatim comments are included in Appendix 3.

Attachment

cc: Deputy Secretary
Under Secretary for Energy, Science and Environment
Chief of Staff
Assistant Secretary for Environmental Management

REPORT ON THE ACCELERATED TANK WASTE RETRIEVAL ACTIVITIES AT THE HANFORD SITE

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Tank Waste Retrieval

Tank Waste Retrieval Activities

The Department will not meet Tri-Party Agreement (Agreement) milestones for the retrieval of waste from the single-shell tanks located at the C-Tank Farm within schedule and cost. Based on the current C-Tank Farm retrieval schedule and the amount of waste retrieved to date, the Department will not accomplish its milestone within schedule and cost.

According to the January 2005 C-Tank Farm Retrieval Schedule for the 100 Series tanks, the Department will not complete retrieval of waste from the tanks until December 2006, three months past the Agreement milestone date of September 2006. Further, as of June 2005, the schedule had slipped an additional three months and retrieval is not scheduled to be completed until March 2007. According to the C-Tank Farm retrieval schedule, retrieval must operate 24 hours a day, seven days a week to meet the revised completion schedule of March 2007. However, operating 24 hours per day, seven days per week will require the hiring of additional personnel. As of June 2005, additional personnel had not been hired to operate the continuous schedule.

In addition to the retrieval schedule, actual retrieval efforts as of June 2005 support the contention that it is unlikely that the Department will be capable of meeting its revised completion schedule of March 2007. Specifically, it took nine months to retrieve 33,000 gallons of waste from the first of two tanks, which is an average of 3,600 gallons per month. Retrieval of approximately 3,000 gallons of waste from the second tank took eight months, which is an average of 375 gallons per month.

In contrast, current completion estimates for the eleven remaining 100 Series tanks require retrieval to be completed in the next 18 months even though each of the remaining tanks contain significantly more than 33,000 gallons of waste. To illustrate, the Department estimates that it can complete retrieval operations for the following tanks at significantly higher retrieval rates than the previously experienced rate of 375 to 3,600 gallons per month, over eight to nine months.

- Tank C-101 contains 88,000 gallons of waste and the Department estimates that it can complete retrieval operations in approximately 56 days, which is an average retrieval rate of 44,000 gallons per month.
- Tank C-107 contains 247,000 gallons of waste and the Department estimates it can complete retrieval operations

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in approximately 98 days, which is an average retrieval rate of 61,750 gallons per month.

- Tank C-102 contains 316,000 gallons of waste and the Department estimates it can complete retrieval operations in approximately 115 days, which is an average retrieval rate of 79,000 gallons per month.

Should retrieval operations increase to a 24 hours per day, seven days per week schedule, more waste could be retrieved. However, as previously stated, as of the time of our audit, employees were not hired or trained to perform the work.

In addition, the schedule to complete waste retrieval from the 200 Series tanks has continued to slip. According to a February 2005 schedule, the final tank in the 200 Series tank sequence was to be completed by August 2005. The latest schedule, dated June 2005, lists a retrieval completion date of January 2006, a delay of five months.

Finally, retrieval activities at the C-Tank Farm are exceeding the established cost estimate. In fact, the cost estimates to complete the retrieval of C-Tank Farm have increased from \$90 million to more than \$215 million as of December 2004. According to the Department, additional funds will be required to complete retrievals of the waste and the closure program will need to reduce work scope to make funds available for the overruns relating to the C-Tank Farm.

Planning and Execution

The Department had not based its retrieval plan schedule and cost estimates on prior experience and current characterization data or taken timely action to ensure that resources are available to meet the established schedule. Specifically, the tank farm contractor developed a Project Execution Plan (retrieval plan) for the Department to guide the retrieval of waste. However, the retrieval plan schedule and related cost estimate did not adequately consider earlier retrieval experience at the site and ensure the tank waste characterization data was accurate. Also, the necessary technological and human resources were not available to ensure that the existing schedule could be met.

Retrieval Experience and Characterization Data

The Department's retrieval schedule and cost estimate was overly optimistic and did not account for problems that were encountered in previous retrieval operations. To illustrate, one of the

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difficulties encountered during previous retrieval operations was waste solidifying in the tank. This delayed retrieval efforts because acid had to be introduced into the process to break up the solids. However, in developing the retrieval schedules and cost estimates, these difficulties were not given adequate consideration. Recent retrieval operations have also been plagued with numerous difficulties. Waste retrieval on one tank, for example, was stopped within five minutes of initiation due to the waste gelling and clogging retrieval equipment. Retrieval operations did not restart until approximately five months later.

Further, the schedule did not include a consideration for known vapor hazards. The Department has been aware of potential vapor hazards since 1986. However, the extent of the vapor hazards and the required use of supplied air were not incorporated into retrieval estimates. In April 2004, after several reports of tank farm workers being exposed to tank vapors, the Department required the use of supplied air for all work being performed in the tank farms. The required use of supplied air for tank farm labor increased costs by approximately 30 percent and further delayed the schedule.

Challenges with waste characterization data contributed to the schedule delays and cost overruns. The waste characterization data for the tanks came from the Department's Best Basis Inventory. The Best Basis Inventory contains the best available estimates for tank waste volume, waste concentration, and inventory. This information is used to determine what type of retrieval technology will be used to retrieve waste from the tanks. The characterization data in the Best Basis Inventory was completed in the mid-1990's and was comprised of legacy information, and was not entirely accurate. In fact, during the retrieval operations of at least one tank, waste to be retrieved was more than double the amount indicated in the Best Basis Inventory. Further, in some cases, the physical properties and flow dynamics of the waste have not reacted as predicted from analytical laboratory waste testing and analysis.

Technological and Human Resources

A lack of technological and human resources will also impact the Department's ability to meet its schedule for retrieving tank waste. Recent retrieval operations in one tank were halted because the tank had been retrieved to the limits of the existing technology. Alternate retrieval technologies are currently being evaluated. A CH2M Hill Hanford Group, Inc. official expects that testing of this new technology could take up to one year.

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Also, the contractor has yet to acquire the necessary human resources to meet the established retrieval schedule. Currently, the contractor has not implemented its plan to operate waste retrieval activities on a 24 hour schedule and estimates that it will take approximately 18 months to train the additional personnel. However, as of June 2005, the contractor had accounted for all of its funding for Fiscal Year 2005 and did not anticipate hiring additional personnel. In fact, the contractor laid off many of its staff design engineers and support personnel in June 2005.

Despite these numerous obstacles encountered during retrieval operations, the Department's retrieval schedules remain overly optimistic. In fact, the Department has not adjusted the retrieval schedules to reflect past or recent retrieval experience.

Long Range Cleanup Plans

As a result of tank retrieval schedule delays and cost overruns, the Department's ability to meet its Agreement of removing waste from all single-shell tanks by 2018 is in jeopardy. In addition, fines could be imposed for missing Agreement milestones. Finally, missing Agreement milestones could erode public confidence in the Department's ability to meet its cleanup commitments.

RECOMMENDATIONS

We recommend that the Assistant Secretary for Environmental Management (EM):

1. Revise the waste retrieval plan to include a cost and schedule estimate that is based on recent retrieval experience, and testing and evaluation of retrieval technologies;
2. Based on the updated plan, prepare and submit a Baseline Change Request; and,
3. Notify regulators that the existing milestones are not likely to be achieved and establish new milestones based on more accurate estimates.

MANAGEMENT REACTION

The Assistant Secretary for EM concurred with the recommendations in the audit report. In addition, management stated that it recognized that significant challenges have been encountered with the retrieval actions performed to date, and that these challenges pose a risk to meeting the Hanford Federal Facility and Consent Order commitments. To that end, the Office of River Protection

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(ORP) continually seeks to improve upon operational performance. For example, retrieval was recently completed on tank C-202, the second of the C-200 series. Retrieval on C-202 was completed in 43 calendar days, a sharp improvement over the approximate 270 calendar days required for C-203. The cumulative operational experience amassed from completing retrievals currently ongoing will provide a solid basis for planning subsequent retrievals beyond 2006. A revised retrieval plan will be completed after resolution of related issues on the Waste Treatment Plant and the tank farm contract. Management also stated that it routinely briefs regulators, on at least a monthly basis, on the status of C Farm retrievals.

Management comments are included in their entirety in Appendix 3.

AUDITOR COMMENTS

We consider management's comments responsive to the report's recommendations. While we recognize the operational performance in completing the retrieval of 1,032 gallons of waste from tank C-202 (688 gallons per month), this retrieval rate will require significant improvement in order for the Department to meet Tri-Party Agreement milestones for retrieving waste from the remaining C Farm waste tanks by September 2006.

Appendix 1

OBJECTIVE

The objective of this audit was to determine whether the Department will meet Tri-Party Agreement milestones to retrieve waste from the single shell tanks located at the C-Tank Farm within schedule and cost.

SCOPE

The audit was performed from September 2004 to August 2005, at the Hanford Site in Richland, Washington. The scope of the audit covered the Office of River Protection's tank waste retrieval activities.

METHODOLOGY

To accomplish the audit objective, we:

- Obtained and reviewed planning documents for tank waste retrieval activities;
- Researched Federal and Departmental regulations;
- Reviewed findings from prior audit reports regarding tank waste retrieval activities;
- Reviewed the CH2M HILL Hanford Group Inc. contract with the Office of River Protection; and,
- Interviewed key personnel in the Office of River Protection and the Office of Environmental Management.

The audit was performed 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. Specifically, we tested controls with respect to the Department's oversight. 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. Also, we considered the establishment of performance measures in accordance with the *Government Performance and Results Act of 1993* as they related to the audit objective. Finally, we did not rely on computer-processed data to accomplish our audit objective.

Management waived the exit conference on September 14, 2005.

PRIOR REPORTS

- *Investigations of Allegations Involving Occupational Medical Services and Tank Farm Vapor Exposures at the Hanford Site* (OIG Case I04RL003). The OIG investigation did not substantiate criminal misconduct relating to alleged cover-ups of vapor readings. OIG Special Agents initiated an investigation that reviewed the potential cover-up of ammonia vapor readings at the tank farms by employees of CH2M Hill Hanford Group, Inc. It was alleged that high exposure readings were either not documented or were misrepresented. However, the OIG believes action needs to be taken to ensure that Industrial Hygiene Technicians take vapor exposure readings in a timely manner following reported exposure incidents at the tank farms and document exposure readings in appropriate reports.
- *CH2M Hill Hanford Group, Inc. and United States Department of Energy, Office of River Protection, Richland, Washington* (HETA #2004-0145-2941, July 2004). The National Institute for Occupational Safety and Health (NIOSH) was asked to evaluate personal protection and health risks for employees exposed to vapors from tank waste. The NIOSH report concluded that, while there was adequate data and technology to characterize tank waste, concentrations in the head space vapors are subject to change. Also, exposure data for workers were limited in quantity and quality and were not kept in an easily accessible database. Further, exposure monitoring is often done hours after an accidental release is identified, limiting the utility of the sample to determine true potential exposure. In addition, the report found that CH2M Hill Hanford Group, Inc.'s written respiratory protection program failed to address ammonia, an agent of concern. Finally, a previous NIOSH report made recommendations to improve Department data collection and analysis to better understand potential health effects in Hanford and other Department site workers; however, these recommendations had not been implemented.

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United State Government

Department of Energy

memorandum

DATE: September 2, 2005

REPLY

ATTN OF: EM-22 (Kurt Juroff, 202-586-1027)

SUBJECT: Draft Report on "Accelerated Tank Waste Retrieval Activities at the Hanford Site"

TO: George W. Collard, Assistant Inspector General for Audit Operations

We appreciate the opportunity to review the draft Office of Inspector General audit report on "Accelerated Tank Waste retrieval Activities at the Hanford Site." The Office of Environmental Management (EM) concurs with the recommendations. The planned corrective actions are:

- 1. *Revise the waste retrieval plan to include a cost and schedule estimate that is based on recent retrieval experience, and testing and evaluation of retrieval technologies.*** Consistent with the concern identified in the report regarding limited retrieval experience, EM believes the best course of action is to revise the baseline for retrieval when additional meaningful operational data is obtained on the tank retrievals currently ongoing. We remain committed to meeting the Hanford Federal Facility and Consent Order (HFFACO, also known as the Tri-Party Agreement) obligations to complete C Farm retrieval by September 2006. We recognize that significant challenges have been encountered with the retrieval actions performed to date, and that these challenges pose a risk to meeting the HFFACO commitments. To that end, the Office of River Protection (ORP) continually seeks to improve upon operational performance. For example, retrieval was recently completed on tank C-202, the second of the C-200 series. Retrieval on C-202 was completed in 43 calendar days, a sharp improvement over the approximate 270 calendar days required for C-203. The cumulative operational experience amassed from completing retrievals currently ongoing will provide a solid basis for planning subsequent retrievals beyond 2006. A revised retrieval plan will be completed after resolution of related issues on the Waste Treatment Plant and the tank farms contract.
- 2. *Based on the updated plan, prepare and submit a Baseline Change Request.*** A Baseline Change Request will be prepared in conjunction with the revised cost and schedule estimate developed per Recommendation 1 above. It will be submitted for Department of Energy approval within three months of completion of Recommendation 1 actions.
- 3. *Notify regulators that the existing milestones are not likely to be achieved and establish new milestones based on more accurate estimates.*** EM does not believe any milestone changes are immediately necessary. As an alternative, we believe the best course of action is to defer revision of the existing milestones for C Farm retrieval until additional operational data is obtained on the tank retrievals currently ongoing. The benefit of this approach, as your report acknowledges, is that it would allow ORP to better address the concern with improved retrieval experience. Based on the cost and schedule estimate developed per Recommendation 1 above, EM will either maintain the existing milestones or establish new milestones, as appropriate. The regulators are already aware of the status

of C Farm retrievals and the technical challenges ORP must overcome to meet its HFFACO commitments. ORP routinely briefs the regulators, on at least a monthly basis, on the status of C Farm retrievals.

We appreciate the opportunity to provide this information for your consideration. Please include our comments as appropriate in your final report.

If you have any further questions, please call me at (202) 586-7709 or Mr. Mark Gilbertson, Deputy Assistant Secretary for Environmental Cleanup and Acceleration, at (202) 586-0755, or Mr. Howard Gnann of the Office of River Protection at (509) 376-5365.


James A. Rispoli
Assistant Secretary for
Environmental Management

cc: R. J. Schepens, ORP

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