U.S. Department of Energy

Office of Inspector General

Office of Audits and Inspections

AUDIT REPORT

The Status of Cleanup at the Department of Energy's Paducah Site

DOE/IG-0937 June 2015

Department of Energy
Washington, DC 20585

June 2, 2015

MEMORANDUM FOR THE SECRETARY

FROM: Gregory H. Friedman
Inspector General

SUBJECT: INFORMATION: Audit Report: "The Status of Cleanup at the Department of Energy's Paducah Site"

BACKGROUND

The Paducah Gaseous Diffusion Plant is located on the Department of Energy's 3,425-acre Paducah Site in western Kentucky, just south of the Ohio River, and about 10 miles west of the city of Paducah. The plant began operating in 1952, supplying enriched uranium for commercial reactors and military defense reactors activities that resulted in radioactive and hazardous chemical material contamination of the Site. In the plant's more than half century of operations, these various materials contaminated the area's groundwater, surface water, soil, and air. In 1988, radioactive and volatile organic contamination was found in the drinking water wells of residences near the Paducah Site. As a result, the Department began an environmental remediation program to identify and remove these hazards from the groundwater, as well as to provide an alternate water supply to affected residences.

The United States Enrichment Corporation operated the plant under a lease agreement with the Department from 1996 until 2013, when enrichment operations ceased, and in 2014, it returned control of the plant to the Department. The Department's Office of Environmental Management has overall responsibility for Site cleanup, and the Portsmouth/Paducah Project Office manages the cleanup being performed by its contractor, LATA Environmental Services of Kentucky, LLC. Under a Federal Facilities Agreement, the Department makes its cleanup decisions in conjunction with other stakeholders, including the U.S. Environmental Protection Agency (EPA) and the Kentucky Department of Environmental Protection (Kentucky), both of which have regulatory responsibilities at the Site.

We initiated this audit to determine whether the Department had achieved its environmental cleanup goals at the Paducah Site.

RESULTS OF AUDIT

While we determined that the Department had achieved some of its cleanup goals, we noted that progress had been delayed on cleaning up some of the facility's key environmental hazards. Notably, work on two of the Site's most significant hazards remains to be completed:

- A remedy for the final phase of the C-400 groundwater cleanup project had not been selected despite more than 2 years of working with the regulators on this matter. Cleanup for this project was originally scheduled for completion in 2010. However, citing technical challenges and disagreements with regulators regarding the cleanup technology, the Department had yet to begin the final phase.

- Remediation plans had not been finalized for the Burial Grounds Operable Unit, also originally scheduled to be completed in 2010. This occurred despite 3 years of discussions with regulators. The Department again cited challenges in determining appropriate cleanup remedies and disagreements regarding the type of contaminants present in the Burial Grounds Operable Unit.

The impact that technical challenges have had on the successful completion of some of the cleanup projects at the Paducah Site was clear. Furthermore, in recent years, budgetary constraints have adversely affected the Department's ability to achieve some of its cleanup goals. However, the lack of progress on these two projects was also due, in part, to the inability of the Department to reach a timely agreement with the regulators on cleanup decisions at the Paducah Site. We noted that the Department failed to fully implement a recommendation made by the Government Accountability Office to utilize external technical peer review groups with environmental cleanup expertise to help resolve disagreements on the appropriate technical approach for cleanup at Paducah. Furthermore, the current dispute resolution process, outlined in the Paducah Site's tri-party Federal Facility Agreement, has not always been effective in bringing about timely resolution of disagreements.

Despite the challenges faced on the projects discussed previously, we did identify several projects the Department had successfully completed since 2004. These projects included removal and disposal of approximately 30,500 tons of scrap metal; treatment of about 1.7 billion gallons of contaminated groundwater, resulting in the removal of over 15,000 gallons of hazardous chemicals; and completion of the decontamination and decommissioning of the C-746-A East End Smelter and the C-340 Metals Plant, both ahead of schedule. The Department also noted in its management response to a draft of this report that it had conducted interim removal actions to dispose of more than 22,000 cubic yards of highly contaminated sediment from the surface water ditches at the Site. Completion of this work helped reduce hazards at the Site; however, more needs to be done.

Without meaningful progress in resolving disagreements between the Department and its regulators, additional delays are likely to occur. And, additional delays lead directly to the spiraling cost of completing remediation activities at the Paducah Site. Moreover, because the Paducah Gaseous Diffusion Plant has recently ceased operations, the United States Enrichment Corporation has turned over control of the plant to the Department, which likely will result in a significantly expanded scope of the decontamination work at the Paducah Site in the future. This only highlights the need for timely agreements on cleanup decisions at the Paducah Site. In our view, involving external technical review groups may help to resolve disagreements that arise when evaluating alternative cleanup technologies at the Site.

Accordingly, we have made recommendations that we believe should help move the Department's efforts forward to remediate the environmental hazards at Paducah. We do so with

the full recognition that the interested parties—the Department, the EPA, and the State of Kentucky—have deeply entrenched professional disagreements as to how important aspects of the Paducah work should proceed. And, that moving off these positions may require all parties to compromise and cooperate if progress is to be achieved. However, the end goal, remediation of the facility, is one that all of the parties share, making the effort essential to the public interest.

MANAGEMENT RESPONSE

Management concurred with the recommendations and indicated that it would take actions to address them. However, management remained concerned about some of the information in the report. We consider management's comments responsive to the report's recommendations.

Management expressed concern that we had not recognized the importance of the regulators' role in reaching an agreement on cleanup decisions. Management emphasized that it did not have unilateral authority to issue cleanup decisions and that it engages EPA and Kentucky in all phases of project planning, document development, and execution.

We recognize that the Department and its regulators need to cooperate to make this project work. In this regard, we urge the Department to increase its efforts to resolve the differences with regulators outlined in the body of our report. Management's comments and our responses are summarized in the body of the report. Management's comments are included in Appendix 3.

EPA COMMENTS

EPA also provided unsolicited comments on our report. Their comments, in our view, simply reinforce the need for continued engagement to address the fundamental differences in the Department and EPA's approaches. EPA's comments are included in Appendix 4.

Attachment

cc: Deputy Secretary
Acting Assistant Secretary for Environmental Management
Chief of Staff
Manager, Portsmouth/Paducah Project Office

AUDIT REPORT: THE STATUS OF CLEANUP AT THE DEPARTMENT OF ENERGY'S PADUCAH SITE

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THE STATUS OF CLEANUP AT THE DEPARTMENT OF ENERGY'S PADUCAH SITE

CLEANUP AT THE PADUCAH SITE

In 2004, the Department of Energy (Department) estimated that all environmental remediation scope of work at the Paducah Site would be completed by 2019 at a total cost of $1.6 billion. By 2012, estimated project costs had grown to $3.3 billion due to a number of factors, including scope increases and technical challenges. During this time, to its credit, the Department removed and disposed of more than 30,500 tons of scrap metal and removed more than 15,000 pounds of hazardous chemicals from the ground by treating about 1.7 billion gallons of contaminated groundwater to prevent further off-Site contamination. In addition, with funding provided by the *American Recovery and Reinvestment Act of 2009*, the Department was able to demolish the C-746-A East End Smelter and deactivate the C-340 Metals Plant ahead of schedule. In addition to these actions, the Department noted in its management response that it had conducted interim removal actions to dispose of more than 22,000 cubic yards of highly contaminated sediment from the surface water ditches at the Site. By the end of 2012, however, the Department realized it would not meet its 2019 milestones without a significant increase in its annual funding in the years preceding the deadline. When 2013 budget guidance directed Paducah to plan for level funding for its 5-year budget cycle, the Department and its regulators renegotiated the completion of its remaining environmental remediation milestones to 2032 and estimated that costs could reach $4.6 billion, a $1.3 billion increase.

Our review determined that, although the Department achieved some of its cleanup goals at the Paducah Site, progress had been delayed on two of the most significant environmental hazards remaining on Site. In the Department's 1992 Site-wide investigation of contaminants, several major sources of contamination were identified. Although this contamination had been known for more than 20 years, at the time of our review, remediation had not been completed and, in many cases, planning was still not complete. Specifically, the Department had not yet begun the final phase for remediating environmental hazards caused by contamination at the C-400 groundwater cleanup project, and proposed remediation plans had not been finalized for any of the units contained in the Burial Grounds Operable Unit (Burial Grounds). The Department acknowledged that the cleanup actions have not been completed; however, it noted that the projects have been conducted in accordance with the Department, Environmental Protection Agency (EPA), and Kentucky Department of Environmental Protection (Kentucky) renegotiated and agreed-to priorities and milestones.

C-400 Groundwater and Burial Grounds Cleanup

Despite expending $40 million and 10 years of effort, the Department had not completed the interim remedy for groundwater remediation on its C-400 groundwater cleanup project. In past years, a cleaning solvent containing the hazardous chemical trichloroethylene was used to degrease parts and equipment in the C-400 Cleaning Building. Department officials suspect that leaks and spills from the building caused pockets of this contaminant to migrate down through the soil. Since cleanup began at the C-400 Cleaning Building in February 2003, the Department has encountered technical challenges on the project, including disagreement on the continued use of the initially selected cleanup technology. Although the project was scheduled for completion in 2010 at a total project cost of about $41 million, it has subsequently been split into multiple

phases to allow for the evaluation of different cleanup technologies. The Department spent more than $40 million to complete just the work on an initial treatability study and the first phase of the project. Although the Department noted that it had met its revised milestones, at the time of our review, the final cleanup remedy had not been selected and costs had increased.

Furthermore, despite 3 years of effort, the Department had not finalized plans for remediating environmental hazards caused by groundwater contamination in the Burial Grounds. The Department's Burial Grounds remedial investigation report identified the Burial Grounds as eight solid waste management units comprised of landfills, burial grounds, and other disposal areas. These areas are believed to include significant sources of groundwater contamination at the Paducah Site. At the time of our review, the Department had completed additional characterization activities in these areas and submitted a proposed plan to its regulators for two of the eight units. However, approved remediation plans were not in place for any of these burial units even though the proposed plans for all eight units were originally scheduled to be completed in 2010. The Department noted that based on a regulator request, it had since split the project into separate smaller projects and was meeting the revised milestones.

Dispute Resolution

We recognize the negative impact technical challenges have had on the successful completion of some of the cleanup projects at the Paducah Site. Furthermore, in recent years, budgetary constraints also adversely affected the Department's ability to clean up some of the most hazardous waste still on Site. However, we believe the lack of progress is also due, in part, to the inability of the Department to reach timely agreement with its regulators on cleanup decisions for the Paducah Site. Department officials told us that, in their view, such agreement can only be reached by participation of all parties because the Department cannot act unilaterally. This situation is exacerbated by the fact that the Department has failed to fully implement a recommendation made by the Government Accountability Office (GAO) designed to help provide a more timely resolution of disagreements on the appropriate technical solutions for cleaning up the Site. Furthermore, the current process used to resolve disagreements on project cleanup, outlined in the Paducah Site's tri-party Federal Facility Agreement (FFA), has not always been effective in bringing about timely resolution of disputes.

GAO noted the inability of the Department and its regulators to reach timely resolution of their differences in its report *NUCLEAR WASTE CLEANUP: DOE Has Made Some Progress in Cleaning Up the Paducah Site, but Challenges Remain* (GAO-04-457, April 2004). GAO reported that the Department and its regulators had difficulty agreeing on an overall cleanup approach, as well as on the details of specific projects. We noted that the Paducah Site cleanup has continued to encounter long-lasting disputes over an agreed-upon cleanup solution. For example, the remaining phase of the C-400 groundwater cleanup project had been delayed more than 2 years amid disagreements between the Department and its regulators on the selection of a new cleanup technology. In July 2012, an EPA-recommended vendor provided a plan and an estimated cost for EPA's preferred cleanup remedy. Skeptical of the low-cost numbers cited in the plan, the Department hired a technical expert to attempt to replicate the proprietary results of EPA's expert. When the results could not be duplicated, the resolution process stalled. Concerned with the standstill, Kentucky proposed performing one or more additional treatability

studies on the project prior to selection of a revised remedy for the cleanup. Consequently, despite the initial $8.3 million treatability study and the above efforts to reconcile differences, a second treatability study began in December 2014, with an estimated cost of $4.6 million; however, a final report is not anticipated until December 2015. As a result, the path forward for the remaining phase of the C-400 groundwater cleanup project will not be chosen until the study is completed and the parties have reached a consensus on the results of the study.

External Technical Peer Review Groups

In an effort to resolve these types of disputes, GAO's 2004 report recommended that the Department, in conjunction with EPA and Kentucky, identify external technical peer review groups with environmental cleanup expertise to facilitate timely resolution of any future differences. The use of these external technical peer review groups has been successfully employed by other organizations to resolve technical disagreements. In implementing this recommendation, the Department, EPA, and Kentucky utilized a third-party peer review group on a single occasion, which resulted in successful resolution of a disagreement regarding technical analysis of seismic conditions at the Paducah Site's on-Site landfill. GAO subsequently closed this recommendation after the parties utilized the third party review group in this instance. However, although GAO's recommendation for improving the resolution process was closed after this initial attempt, the Department has experienced nine additional disputes regarding cleanup at the Site since 2010, with at least three involving technical cleanup concerns. Even though these disputes have caused significant delays to cleanup projects at the Site, the Department has not taken effective action to engage an independent entity to help resolve disagreements for disputes involving technical cleanup concerns.

Although the Department had other reviews performed in an effort to reach a consensus on technical aspects of cleanup, such as those performed on the C-400 groundwater cleanup project, these reviews were not always considered external, independent, or mutually agreed-upon by all parties. In some instances, the review groups were comprised of members solely from within the Department and thus were perceived by the regulators as internal peer reviews which did not carry the same merit as an independent review. The use of mutually agreed-upon independent external peer review groups with environmental cleanup expertise could help bring about more timely resolution of impasses on cleanup decisions at the Paducah Site, such as those experienced on the C-400 groundwater cleanup project.

FFA Dispute Resolution Process

Along with the technical cleanup concerns faced by the Department in some of these disputes, we also found that the dispute resolution process followed at the Site was not particularly effective in resolving disagreements in a timely manner. We observed that one dispute on the Burial Grounds remained in informal dispute for more than 8 months before a formal dispute process was invoked, elevating resolution of the dispute to a dispute resolution committee. The Department and its regulators employed the dispute resolution process outlined in the FFA to resolve disagreements on project cleanup. The FFA states that all parties should make reasonable efforts to resolve disputes at the project manager or immediate supervisor level. If resolution cannot be achieved, then an informal dispute process may be invoked. Although FFA

states that an informal dispute shall be limited to 30 days, it also allows for automatic extensions of 15 days if requested by any of the parties, thus allowing the dispute to extend for many months. The dispute resolution committee includes a senior representative from each FFA party. If a unanimous decision cannot be reached, FFA allows for many more extensions of the formal dispute that can further extend the process. In the example mentioned above, the formal dispute for Burial Grounds was extended 4 additional months before it was finally resolved. After a formal dispute is resolved, FFA states the resolution may include an extension to the project milestone date of any length of time determined to be necessary. The resolution of the Burial Grounds dispute split the project into separate smaller projects and extended completion of the next project milestone by 19 months. A more streamlined dispute resolution process may have resulted in a more timely resolution of the Burial Grounds dispute.

Impact on Site Cleanup

Failure to resolve disputes between the Department and its regulators in a timely manner has contributed to project delays and increased costs. For example, the C-400 groundwater cleanup project has been delayed more than 2 years and, at the time of our review, the Department was spending $4.6 million on a second treatability study. Had an independent external peer review been performed that was able to reconcile the differences over the most effective cleanup remedy for the project, the Department may have been able to avoid spending these additional funds. Further, the most recent life cycle cost estimate for environmental remediation activities at the Paducah Site has increased from $3.3 billion to $4.6 billion. This amount remains in question as long as decisions on cleanup remedies have not been finalized. Additionally, further delays beyond 2032 would likely increase remediation costs by at least $55 million per year, the minimum cost to maintain on-Site operations exclusive of cleanup activities. Finally, delayed implementation of cleanup actions could also result in continued safety risks to workers and the public.

RECOMMENDATIONS

We believe several actions are necessary to improve environmental remediation progress at the Paducah Site and ensure cleanup is completed in a timely and cost-effective manner. Accordingly, we recommend that the Acting Assistant Secretary for Environmental Management work with regulators to:

1. Identify an agreed-upon organization(s) or group(s) external to the Department and its regulators that can perform an evaluation of the remedies at the Site and provide recommendations to resolve those that are in dispute; and

2. Evaluate the dispute resolution process outlined in the Paducah Site's tri-party Federal Facility Agreement to determine if the process can be shortened.

MANAGEMENT RESPONSE

Management concurred with the report's recommendations and indicated that it would take actions to address them. Management stated that it would, in consultation with EPA and Kentucky, identify external peer review groups with environmental expertise in accordance with applicable laws and other requirements to facilitate timely resolution of future differences. In addition, management agreed that the dispute resolution process should be shortened, while remaining in compliance with the FFA.

However, management remained concerned about some of the information in the report. Specifically, management stated that we had not recognized the importance of the regulators' role in reaching agreement on cleanup decisions. Management emphasized that it did not have unilateral authority to issue cleanup decisions. It stated that EPA and Kentucky were engaged in all phases of project planning, document development, and execution. Additionally, management stated that some policy decisions affecting the entire Department complex may take additional time to resolve. Further, management noted that it had identified nine specific technical review groups it believed had successfully contributed to cleanup from 2006 to 2013 and were independent of the Paducah Site, if not external to the Department. Finally, management noted that an Independent Review Team had analyzed the results of the first phase of the C-400 groundwater cleanup project and recommended a cleanup remedy that was not supported by the EPA, thus requiring the need for the second treatability study and resulting 2-year delay on the project.

Management's comments are included in Appendix 3.

AUDITOR COMMENTS

We consider management's comments responsive to the report's recommendations. However, regarding management's position on the nine technical review groups that had conducted reviews at the Site, our report notes that the Department had performed the reviews, but these reviews were not always considered external, independent, or mutually agreed-upon by all parties. Specifically, the C-400 independent review mentioned above was perceived by the regulators as more of an internal peer review and therefore did not carry the same merit as an independent review. We believe resolution of disagreements would be more timely if the Department and its regulators would identify an agreed-upon organization(s) or group(s) external to the Department to perform an evaluation of the remedies at the Site and provide recommendations to resolve those that are in dispute.

OBJECTIVE, SCOPE, AND METHODOLOGY

Objective

The objective of this audit was to determine whether the Department of Energy (Department) had achieved its environmental cleanup goals at the Paducah Site.

Scope

We conducted this audit from July 2012 through May 2015, at the Paducah Site near Paducah, Kentucky. The audit scope of our review included costs and activities related to the environmental cleanup milestones at the Department's Paducah Site. The audit was conducted under Office of Inspector General Project Number A12OR041.

Methodology

To accomplish the audit objective, we:

- Reviewed regulations, directives, contract requirements, and performance measures related to the cleanup of the Paducah Site;
- Analyzed prior audits and reviews related to cleanup at the Paducah Site;
- Reviewed regulatory documents;
- Discussed cleanup activities with Department, regulatory, and contractor personnel; and
- Identified and determined the status of cleanup milestones at the Paducah Site.

We conducted this performance audit in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective. The audit included tests of controls and compliance with laws and regulations to the extent necessary to satisfy the audit objective. Additionally, we assessed the implementation of the *GPRA Modernization Act of 2010* and found that the Department had established performance measures related to completing environmental remediation of legacy and active Sites. 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 rely on computer-processed data to satisfy the audit objective and therefore did not conduct a data reliability assessment.

Management waived the exit conference.

RELATED REPORT

Government Accountability Office

- Report on *NUCLEAR WASTE CLEANUP: DOE Has Made Some Progress in Cleaning Up the Paducah Site, but Challenges Remain* (GAO-04-457, April 2004). The Government Accountability Office (GAO) reported that the Department of Energy (Department) and its regulators had difficulty agreeing on an overall cleanup approach, as well as on the details of specific projects. GAO observed that, over time, those disagreements had undermined trust and damaged the parties' working relationship. To help improve the likelihood that the Department and its regulators would reach timely agreement on the cleanup approach, GAO recommended the Department involve the Environmental Protection Agency and the Commonwealth of Kentucky early in the development of both overall cleanup plans and specific projects to resolve concerns. GAO also recommended the Department, in conjunction with the Environmental Protection Agency and the Commonwealth of Kentucky, identify external technical peer review groups with environmental cleanup expertise to facilitate timely resolution of future differences.

MANAGEMENT COMMENTS

Department of Energy
Washington, DC 20585
March 13, 2015

MEMORANDUM FOR RICKEY R. HASS
DEPUTY INSPECTOR GENERAL
FOR AUDITS AND INSPECTIONS
OFFICE OF INSPECTOR GENERAL

FROM: MARK WHITNEY
ACTING ASSISTANT SECRETARY
FOR ENVIRONMENTAL MANAGEMENT

SUBJECT: Management Response to the Office of Inspector General Draft Audit Report, *The Status of Cleanup at the Department of Energy's Paducah Site*

The Department of Energy (DOE) has reviewed the subject February 12 draft report and appreciates the report's recognition that Paducah has achieved many cleanup goals that have reduced hazards at the Paducah Site (Site). We appreciate your taking into account the additional information we provided after issuance of the draft report and feel the report is more complete and much improved. Unfortunately, from DOE's perspective, DOE remains concerned about some of the information in the report.

Recognition of the Importance of Kentucky and EPA in the Process: The report states that DOE failed to fully implement a 2004 Government Accountability Office (GAO) Recommendation to utilize external technical peer review groups with environmental cleanup expertise to help resolve disagreements on the appropriate technical approach for cleanup at the Site. However, the GAO recommended, "DOE . . . in conjunction with Kentucky and EPA, to identify external technical peer review groups with environmental expertise to facilitate timely resolution of any future differences." (Emphasis added.) This is important, as the inclusion of the State of Kentucky and Environmental Protection Agency (EPA) in any solution is fundamental to the process and should be prominently considered in the report. Without unilateral authority to implement such actions, it should not be considered a DOE failure.

Nature of the Disputes: The report does not acknowledge that many of the past and current disagreements are related to policy, legal, and/or regulatory issues, and are often not purely technical issues. The report references nine disputes that have occurred since 2010; with six of the nine disputes primarily related to schedule, regulatory, or legal issues. As such, independent technical review groups were not likely to provide any real utility in resolving legal or regulatory disagreements. When technical issues arose during the dispute process, they were resolved within a relatively short period (one to four months). The parties to the Federal Facility Agreement (FFA) that covers site cleanup, as Governmental Agencies, are bound to abide by those authorities that arise in the laws/regulations that limit or authorize their conduct. These authorities cannot be abdicated to an independent group for settlement. With that said, to the extent there arise disputes that do not implicate those authorities, DOE is extremely supportive of the idea

of third-party assistance in resolving disagreements, such as through the use of independent technical review groups. Please note, the regulators were unsupportive of DOE's recent offer to engage an independent group to address issues currently under dispute because they could not abdicate their authority.

Further, many of the delays in reaching a cleanup decision are driven by disagreements not just related to Paducah, but involve impacts to the entire DOE complex. These broader potential consequences from Paducah cleanup decisions appropriately require significant additional coordination across DOE, which in turn may cause delays in reaching an agreement. The regulators' delays also are driven by this concern.

Timely Agreement on Cleanup Decisions: The report asserts that there is lack of progress at the Site due to DOE's inability to reach timely agreements with its regulators on cleanup decisions. The report should recognize that DOE cannot unilaterally issue a cleanup decision. Much the same as the issues discussed above, DOE reaches cleanup decisions in conjunction with EPA and the State of Kentucky. DOE requests that the phrase "DOE's inability to reach agreements" be removed from the report and be replaced with "DOE, the State of Kentucky, and EPA are unable to reach agreements." DOE engages EPA and the State of Kentucky in all phases of project planning, document development, and execution. DOE, in conjunction with the State of Kentucky and EPA, develops schedules, milestones, and priorities through the FFA-required annual Site Management Plan update.

Movement from 2019 to 2032: The report also indicates that two of the Site's most significant hazards remain to be completed. Although the actions have not been completed, per the schedule established in 2003, the projects identified (C-400 groundwater cleanup and the Burial Grounds Operable Unit) have been and continue to be conducted in accordance with DOE, the State of Kentucky, and EPA agreed-to priorities and milestones. At the time this report was generated, the enforceable milestones had already been revised and approved by DOE, the State of Kentucky, and EPA. Flat funding was the single greatest factor that contributed to extending the milestones and the ultimate environmental remediation completion date from 2019 to 2032. As such, the report should acknowledge that DOE, the State of Kentucky, and EPA worked together and agreed that the program would move forward despite the funding limitations on the agreed-to schedule.

Other Report Concerns: The report added some acknowledgement of the positive impacts from the significant cleanup activities that have been conducted, but did not include treatment of over three billion gallons of contaminated groundwater and removal of over 22,000 cubic yards of highly contaminated sediment from the surface water ditches conducted as interim removal actions with full regulatory cooperation.

The report repeatedly indicates that Paducah has not utilized external technical review groups. While independent of the Paducah Site, if not external to DOE, we identified nine specific technical review groups to the Office of Inspector General that have successfully contributed to the cleanup from 2006 to 2013.

The report states that the C-400 groundwater cleanup project has been delayed more than two years amid disagreements between DOE and the regulators on the selection of the technology to remediate the groundwater. The current treatability study, which is different than the 2006 study, is being conducted to gain actual field data to resolve the technical issues on the proper technology and reach agreement. Specifically, an Independent Review Team analyzed the results of the first phase of the C-400 groundwater cleanup project and determined that the thermally enhanced removal technologies, which EPA recommended, are poorly matched with remediation of the deep aquifer and recommended heating technology not be utilized; hence, the need for the study and the delay.

Response to Recommendations: DOE intends to take the following actions in response to the report recommendations and will continue to work to get the agreement of regulators at EPA and the State of Kentucky.

1. Identify external groups to assist: DOE, in consultation with Kentucky and EPA, will identify external technical peer review groups with environmental expertise in accordance with applicable laws and other requirements to facilitate timely resolution of future differences. DOE will continue to engage the regulators in an effort to utilize other external groups in this regard to the extent EPA and the State of Kentucky will support this initiative.

2. Shorten the dispute resolution process: DOE agrees that dispute resolution process should be shortened, while remaining in compliance with the FFA. DOE will continue to engage EPA and the State of Kentucky to identify streamlined processes in this regard.

DOE appreciates the opportunity to submit this response for inclusion in the final audit report. If you have any questions, please contact me or Mr. Mark Gilbertson, Deputy Assistant Secretary for Site Restoration, at (202) 586-0755.

cc: Monica Regalbuto, EM-2.1
Candice Trummell, EM-3
Mark Gilbertson, EM-10
William Levitan, EM-10

EPA Comments

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

MAY 12 2015

Debra K. Solmonson, Director
Eastern Audit Division
Office of Inspector General, IG-37
200 Administrative Road
Oak Ridge, Tennessee 37830

Dear Ms. Solmonson:

The U.S. Environmental Protection Agency Region 4 appreciates the opportunity to review the Draft Audit Report on "The Status of Cleanup at the Department of Energy's Paducah Site" and concurs with many of the findings. As the report indicates, technical challenges and budgetary constraints have negatively impacted completion of remediating significant sources of soil and groundwater contamination. For the C-400 Building project, electrical resistance heating (ERH) was unsuccessful in remediating volatile organic compounds (VOCs) sources, including Dense Non-Aqueous Phase Liquids (DNAPL) ganglia and high concentrations of dissolved phase Trichloroethylene (TCE), in the Regional Gravel Aquifer (RGA). Subsequently, the Department of Energy (DOE) proposed *in-situ* chemical oxidation (ISCO), including emulsified zero-valent iron (E-ZVI), as the preferred remedy in a draft revised Proposed Plan (December 2011). In correspondence dated January 10, 2013, the EPA disagreed with the use of ISCO given the presence of DNAPL and total TCE mass present at the C-400 Building. The EPA's subject matter experts (SMEs) indicated that ISCO/E-ZVI was not successfully implemented at sites with similar conditions with DNAPL/TCE mass. The EPA recommended that Steam Enhanced Extraction (SEE) be the preferred remedy because this technology has been demonstrated to be effective in reducing the volume of DNAPL/TCE at sites with similar conditions. Further, SEE is anticipated to be a permanent remedy that is effective in the long-term, unlike ISCO/E-ZVI. The DOE ultimately agreed to conduct a SEE Treatability Study after a recommendation from the Commonwealth of Kentucky. However, the project was further delayed pending receipt of permission for the SEE Treatability Study (TS) from DOE Headquarters.

It is important to note that, since 2013, the EPA has recommended full-scale implementation of the SEE remediation technology at C-400. The EPA's recommendation was based upon the high likelihood of success in addressing the contamination using SEE, the time lost by conducting a smaller scale TS effort prior to full scale implementation and the costs associated with the step-wise approach and time delays. For example, the cost for implementing the TS has escalated substantially since scoping began in 2013. The DOE's original cost estimate was around $1.1 million, but the estimate doubled by the design phase. As of October 2014, the DOE's estimate of the cost to implement the TS has increased substantially from $2.2 million to $5.1 million, surpassing an estimate provided in 2012 by an expert SEE contractor for full-scale SEE implementation. After learning of the substantial cost increase, the EPA asked that the project be delayed so that the Federal Facility Agreement (FFA) parties could reexamine costs, understand

the logic for the substantial increase and also re-consider full-scale implementation of the SEE at C-400. The SEE contracting expert demonstrated to the FFA parties that the required steam zone could be achieved to address the contaminant mass through full-scale implementation of SEE in a cost effective manner and likely within the same time period required for the smaller scale TS and without a substantial increase in costs. Despite this demonstration, the DOE initiated the C-400 Phase II small scale SEE Treatability Study on April 8, 2015.

The EPA disagrees that an outside independent peer review group would have been useful in determining the best path forward for the C-400 Building remedy. The EPA's SMEs have expertise in the application of technologies regularly used at Superfund sites across the nation and have been involved in the multi-party discussions on remedy selection for Phase II at the C-400 Building.

Despite the DOE's role as the lead agency for the Paducah Gaseous Diffusion Plant (PGDP) cleanup, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP), the EPA has joint remedy selection authority for this National Priorities List facility. Under CERCLA, these remedial decisions must (at a minimum) be protective of human health and the environment and comply with legally applicable or relevant and appropriate environmental requirements. As stated in the PGDP FFA, the DOE shall conduct response actions in compliance with CERCLA, the NCP and consistent with EPA guidance. Many of the disputes that have occurred at PGDP were a result of both the EPA's and Kentucky's comments on Primary documents identifying deficiencies related to: compliance with CERCLA and the NCP; missing facts regarding the contamination conditions that are important to the decision-making process; and/or inconsistencies with the EPA's policy and guidance. The deficiencies in the DOE documentation required revision to these documents, resulting in time delays that escalated the cost of cleanup.

The EPA is committed to overseeing the cleanup of the PGDP under the FFA and believes that the inter-agency agreement, especially with respect to disputes, does not need to be modified. The dispute provisions in the PGDP FFA are consistent with most FFAs across the country and are designed to facilitate resolution of disagreements among the parties in an expeditious manner. There are situations such as the Burial Grounds Operable Unit (BGOU) project Feasibility Study (identifying remedial alternatives for 7 Solid Waste Management Units), however, where dispute resolution has taken many months. The time delays are a function of the DOE document quality, as reflected in the number of comments (over 100), from the EPA and Kentucky. The delays are exacerbated by the time that the DOE and its contractor have taken to respond to regulator comments, as well as the number of meetings needed to reach a mutually acceptable resolution. An external technical facilitator was beneficial in the past on other cleanup projects in the DOE complex, including a previous effort on the BGOU project at PGDP. With the expectation of avoiding time consuming and costly disputes, the EPA is supportive of involving a qualified technical facilitator, rather than an external peer review group, in circumstances where the FFA parties are faced with numerous and/or difficult issues to resolve.

Despite the number of disputes, the EPA believes that there has been progress in the cleanup of the PGDP. Significant decisions will be facing the FFA parties soon, such as the one to build an on-site waste disposal facility for CERCLA remediation waste and another to address the sources of the groundwater contamination. The EPA looks forward to working collaboratively with the DOE and Kentucky in effort

to reach timely cleanup decisions that comply with CERCLA and the NCP and ensure long-term protection of human health and the environment.

If you have questions or require additional information, please contact me at 404-562-8599.

Sincerely,

Franklin E. Hill, Director
Superfund Division

cc:
Arthur Collins, EPA R4
Don Rigger, EPA R4
Rich Campbell, EPA R4
Julie Corkran, EPA R4
Jon Richards, EPA R4
David Buxbaum, EPA R4
Jennifer Tufts, EPA R4

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