STAFF EXHIBIT 13

RAS 14580

U.S. NUCLEAR REGULATORY COMMISSION
In the Matter of US Army (Jefferson Proving Ground Site)
Docket No. 40-8838-MLA Official Exhibit No. 13
OFFERED by: Applicant/Licensee Intervenor
NRC Staff Other
IDENTIFIED on Witness/Panel
Action Taken: ADMITTED REJECTED WITHDRAWN
Reporter/Clerk

April 26, 2006

Mr. Alan G. Wilson, Garrison Manager
Office of the Garrison Manager
Department of the Army
1 Rock Island Arsenal
Rock Island, IL 61299-5000

SUBJECT: TECHNICAL REVIEW OF REQUEST FOR AN AMENDMENT TO LICENSE SUB-1435 (DOCKET NO. 040-08838) PROPOSING AN ALTERNATE SCHEDULE FOR THE SUBMISSION OF A DECOMMISSIONING PLAN FOR JEFFERSON PROVING GROUND, MADISON, INDIANA

Dear Mr. Wilson:

I am responding to your letter of May 25, 2005, which forwarded the U.S. Department of the Army's ("Army or licensee") alternate schedule for the submission of a decommissioning plan for the Jefferson Proving Ground (JPG) facility, for U.S. Nuclear Regulatory Commission (NRC) staff review and approval. The alternate schedule request is for a 5-year period to characterize the site and prepare a new decommissioning plan. Subsequently, the Army submitted its responses to action items from a September 8, 2005, public meeting by letter dated October 26, 2005, its Field Sampling Plan and Health and Safety addenda dated November 2005, and its responses to NRC's request for additional information by letter dated February 9, 2006. We have completed the technical review of your request and find, pursuant to 10 C.F.R. § 40.42(g)(2), the alternate schedule for the submission of a decommissioning plan to be acceptable.

NRC anticipates having annual (or more frequent) meetings at NRC headquarters, open to the public, to discuss the Army's progress in completing the site characterization and new decommissioning plan. These meetings should occur prior to the initiation of significant planned field activities, such as determining the number and location of new monitoring wells.

License Condition 13 is added as follows:

> The Army shall submit a decommissioning plan for NRC review and approval under an alternate schedule identified in its May 25, 2005, Field Sampling Plan, its responses to action items from a September 8, 2005, public meeting by letter dated October 26, 2005, its Field Sampling Plan addendum dated November 2005, and its responses to NRC's request for additional information by letter dated February 9, 2006, by the end of 2011 or earlier. The Army will also submit an Environmental Report using the guidance in NUREG-1748 for NRC to use in preparing an Environmental Impact Statement.

All other conditions of the license remain the same. The revised license, which incorporates Amendment No. 13, and the related Safety Evaluation Report, are enclosed.

TEMPLATE = SECY-025

SECY-02

If you have any questions or comments related to this amendment, please contact Tom McLaughlin, of my staff, at (301) 415-5869.

Sincerely,

/RA/

Daniel M. Gillen, Deputy Director
Decommissioning Directorate
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 040-08838
License No.: SUB-1435

Enclosures:
1. License Amendment No. 13
2. Safety Evaluation Report

cc: JPG Distribution List

If you have any questions or comments related to this amendment, please contact Tom McLaughlin, of my staff, at (301) 415-5869.

Sincerely,

/RA/

Daniel M. Gillen, Deputy Director
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Docket No.: 040-08838
License No.: SUB-1435

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OFFICE	DWMEP:PM	DWMEP:SC	OGC	DWMEP:DD
NAME	TMcLaughlin	KGruss	MZobler	DGillen
DATE	11/28/05	11/28/05	4/25/06	4/26/06

OFFICIAL RECORD COPY

Enclosure 1

MATERIALS LICENSE

Amendment No. 13

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and the applicable parts of Title 10, Code of Federal Regulations, Chapter I, Parts 19, 20, 30, 31, 32, 33, 34, 35, 36, 39, 40, 51, 70, and 71, and in reliance on statements and representations heretofore made by the licensee, a licensee is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions

Licensee		
1. U.S. Department of the Army	3. License Number	SUB-1435
	Amendment No.13	
2. Rock Island Arsenal 1 Rock Island Arsenal Rock Island, IL 61299-5000	4. Expiration Date	Until terminated
	5. Docket or Reference Number	040-08838

6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum Amount that Licensee May Possess at Any One Time Under This License
Uranium	Depleted uranium metal, alloy, and/or other forms	80,000 kilograms

9. Authorized Use: For possession only for decommissioning. License renewal applications dated August 29, 1994.

CONDITIONS

10. Authorized place of use:

A. The licensed material shall be kept onsite, for the purpose of decommissioning, in the restricted area known as the "Depleted Uranium Impact Area." This area is located north of the firing line, at the Jefferson Proving Ground, in Madison, Indiana 47250.

B. This license has been transferred from the "The U.S. Department of the Army, U.S. Army Soldier and Biological Chemical Command, Aberdeen Proving Ground, Maryland 21010-5424" to "U.S. Department of the Army, 1 Rock Island Arsenal, Rock Island, Illinois 61299-5000."

11. A. Licensed materials shall be kept under the supervision of the Radiation Safety Officer, who shall have the following education, training, and experience:

1. Education: A bachelor's degree in the physical sciences, industrial hygiene, or engineering from an accredited college or university or an equivalent combination of training and relevant experience in radiological protection. Two years of relevant experience are generally considered equivalent to 1 year of academic study

2. Health physics experience: At least 1 year of work experience in applied health physics, industrial hygiene, or similar work relevant to radiological hazards associated with site remediation. This experience should involve actually working with radiation detection and measurement equipment, not strictly administrative or "desk" work.

3. Specialized knowledge: A thorough knowledge of the proper application and use of all health physics equipment used for depleted uranium and its daughters, the chemical and analytical procedures used for radiological sampling and monitoring, methodologies used to calculate personnel exposure to depleted uranium and its daughters, and a thorough understanding of how the depleted uranium was used at the location and how the hazards are generated and controlled.

B. The licensee, without prior NRC approval, may appoint a RSO provided a) the licensee maintain documentation demonstrating that the requirements of condition 11A are met and b) the NRC is informed of the name of the new RSO by letter to the Regional Administrator, Region III, within 30 days of the appointment.

12. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The NRC's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulation.

A. Letter and attachments for license renewal dated August 29, 1994,

B. Letter dated May 25, 1995,

C. Application with attachments dated September 29, 1995, and

D. JPG Security Plan included with the letter dated December 10, 2003.

E. Request for change of licensing official and signed NRC Form 313 dated November 8, 2004.

13. The Army shall submit a decommissioning plan for NRC review and approval under an alternate schedule identified in its May 25, 2005, Field Sampling Plan, its responses to action items from a September 8, 2005, public meeting by letter dated October 26, 2005, its Field Sampling Plan addendum dated November 2005, and its responses to NRC's request for additional information by letter dated February 9, 2006, by the end of 2011 or earlier. The Army will also submit an Environmental Report using the guidance in NUREG-1748 for NRC to use in preparing an Environmental Impact Statement.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Dated: 4/26/06

/RA/
Daniel M. Gillen, Deputy Director
Decommissioning Directorate
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

DOCKET NO: 040-08838

LICENSE NO: SUB-1435

FACILITY: Jefferson Proving Ground

SUBJECT: SAFETY EVALUATION REPORT FOR ISSUANCE OF AMENDMENT NO. 13 TO MATERIALS LICENSE NO. SUB-1435, DEPARTMENT OF THE ARMY, JEFFERSON PROVING GROUND

INTRODUCTION

The U.S. Department of the Army ("Army or licensee") submitted a request dated May 25, 2005 (see ADAMS ML051520319), for an alternate schedule for the submission of a decommissioning plan for its Jefferson Proving Ground (JPG) facility under 10 CFR § 40.42. The alternate schedule request is for a 5-year period to characterize the site and develop a new decommissioning plan (DP).

Along with the May 25, 2005, letter, the Army submitted a Field Sampling Plan (FSP), a Technical Memorandum, and a Health and Safety Plan (HSP). Subsequently, the Army submitted responses to action items from a September 8, 2005, public meeting (see ML053120288), a FSP addendum and a HSP addendum (see ML053350356), and responses to the U.S. Nuclear Regulatory Commission (NRC) request for additional information (RAI) (see ML060590379). This Safety Evaluation Report (SER) addresses the Army's request for an extension of time to submit a DP. NRC has prepared an Environmental Assessment (EA) (see ML053130257) in conjunction with the Army's request. The EA was published in the *Federal Register* on March 15, 2006 (71 FR, 13435).

Under 10 CFR § 40.42(g)(2), the Commission may approve an alternate schedule for submittal of a DP if the Commission determines that the alternate schedule is: 1) necessary to the effective conduct of decommissioning operations; 2) presents no undue risk from radiation to the public health and safety; and, 3) is otherwise in the public interest.

SITE DESCRIPTION

The Army tested both conventional ammunition and depleted uranium (DU) projectiles at JPG. JPG is divided into two areas separated by a firing line with an east-west fence separating the area north of the firing line from the cantonment area to the south. A fence system with barbed wire surrounds the entire installation. The area north of the firing line is about 51,000 acres of undeveloped heavily wooded land.

Under NRC license SUB-1435, the Army tested DU projectiles from 1983 to 1994. DU is a byproduct from the enrichment of natural uranium for use in nuclear reactors and nuclear weapons. DU consists of uranium-238 with trace amounts of uranium-235 and is about 0.7 times as radioactive as natural uranium. Potential threats to human health from DU are radioactivity and chemical toxicity, particularly to the kidney. DU is more dense than lead and is shaped into a long pointed projectile and fired at great kinetic energy to penetrate armor. The Army tested 105 mm and 120 mm projectiles by firing them at cloth targets at distances ranging from 1 kilometer to 4 kilometers north of the firing line. The impact area for the DU projectiles is located in the south-central portion of the installation and consists of approximately 2,000

acres (5 kilometers long and 1.6 kilometers wide). Most of the projectiles were fired from the center firing position and struck repeatedly in approximately the same area forming a trench. The trench is more than 3 kilometers from the western boundary of the site. Approximately 70,000 kg of DU remain in the impact area. In addition to the DU, unexploded ordnance (UXO) is present in the impact area.

The land surrounding JPG is rural agricultural and is used mainly for small family farms. There are also several small rural towns surrounding JPG. The majority of the land south of the firing line has been transferred for private, recreational, or commercial use. The Fish and Wildlife Service (FWS) established the Big Oaks National Wildlife Refuge (NWR) in the area north of the firing line in 2000. Under a Memorandum of Agreement between the Army, the Air Force, and FWS, the Army will retain ownership of the land and the FWS will operate the Big Oaks NWR on a 25-year lease with 10-year renewal options.

There are abundant surface water features at JPG including ponds, lakes, streams, and wetland areas. Seven streams and their tributaries drain into the JPG site, generally flowing from northeast to southwest. Big Creek bisects the DU impact area and Middle Fork Creek crosses the southeastern DU impact area boundary.

The groundwater regime at JPG consists of an upper unconfined water-bearing unit composed of glacial deposits and a lower unconfined to semi-confined water-bearing unit composed of Paleozoic limestones and dolomites. The glacial deposits range in thickness from a few feet to approximately 40 feet. This unit is predominantly fine-grained glacial till with some sand lenses. The groundwater flow directions within this unit is similar to the surface water, which is west to southwest across the site.

The underlying unconfined to semi-confined limestone and dolomite water-bearing unit is recharged by infiltration of precipitation along fractures within the glacial till and in areas where the surface water channels are losing water to the groundwater system. Karst features, such as caves and sinkholes, are located along Big Creek within the DU impact area. The groundwater flow is controlled by fractures in the carbonate rocks. The assumed direction of groundwater flow within this unit is also west to southwest.

DOCUMENTARY BACKGROUND

The Army submitted an Environmental Radiation Monitoring (ERM) Plan in 1996, which calls for semi-annual sampling of groundwater, surface water and sediment. NRC approved the 1996 ERM Plan which was then modified by a letter dated August 10, 1999 (see ML993230068), and semi-annual sampling continues to be conducted at the site.

Decommissioning plans were submitted by the Army in December 1999, and June 2001. The NRC staff discontinued review of the 1999 DP, considering it superseded by the 2001 DP. The staff did not accept the 2001 DP during an expanded acceptance review, noting a number of deficiencies, particularly the need for an off-site transport model. In a revised DP dated June 2002, the Army addressed the deficiencies noted by the staff with respect to the 2001 DP. After completing an expanded acceptance review, the 2002 DP was accepted for technical review by the staff. From the initial limited technical review of the 2002 DP, the staff determined that the off-site transport model would need to be validated before NRC could

approve the DP. The inability to validate the model severely limited NRC's options regarding approval of the DP. In subsequent correspondence, the Army noted that the collection of this data could result in an imminent personnel safety hazard because of the presence of UXO. The Army also submitted an Environmental Report in 2002 to update the environmental status of the site (see ML021960089 and ML021960135).

In 2003, the Army requested NRC approval of an alternate schedule under 10 CFR Part 40.42(g)(2) to continue with a possession-only license with a five-year renewal period (see ML030520478). NRC agreed with this approach and informed the Army in a letter dated April 8, 2003 (see ML030850006). The Army then submitted a revised ERM Plan (see ML032731017) to support its license amendment request. NRC staff reviewed the revised ERM Plan and noted that it was not acceptable (see ML042220047). Also, in 2004, NRC requested that, for the off-site transport model, the Army identify the parameters it could not collect due to the UXO (see ML042710122). The Army withdrew its 5-year possession-only license amendment request on July 19, 2005 (see ML052130480).

In its letter dated May 25, 2005 (see ML051520319), the Army said that it would address the risks associated with collecting data in areas containing UXO and wanted to proceed towards decommissioning. The Army provided details of a proposed site characterization plan and requested that NRC amend its materials license to allow for an alternate schedule to submit a decommissioning plan. The Army's May 2005, request, and its subsequent responses to action items and RAIs, and FSP and HSP addenda, are the subject of this SER.

PROPOSED SITE CHARACTERIZATION ACTIVITIES

The Army's stated objectives for the site characterization activities are to: 1) enhance the understanding of the nature and extent of contamination in the DU impact area; 2) enhance the understanding of the fate and transport of DU in the environment: 3) define and verify the Conceptual Site Model; and 4) complete and submit a revised DP in 5 years. In its FSP, the Army proposes a tiered, time-phased approach for site characterization to allow decisions at intermediate milestones regarding the need for collecting additional site data. For biota investigations, the schedule in the FSP shows deer sampling in 2006 with optional deer and other biota (plants, earthworms, birds, mammals, and fish) in 2008. For hydrogeology, the schedule shows fracture trace analysis and an electrical imaging survey to select the locations of new well clusters in 2006 with installation of 10 multi-level well clusters in preferential groundwater flow paths in 2007. Other monitoring equipment installation (precipitation, cave streams, streams, and groundwater levels) is to be done in 2007. Media sampling and analysis is scheduled for 2008. All samples are to be analyzed for isotopic uranium.

The Army's justification for an alternate schedule is that it is needed to characterize the site in order to prepare a new DP which would include license termination under restricted conditions. The Army contends that it is in the public interest to take the additional time to adequately address monitoring deficiencies and allow for more specific information to be gathered from the

site. Further, the Army does not believe that this presents an undue risk from radiation to the public health and safety.

SAFETY EVALUATION

I. Introduction

The staff's safety evaluation consisted of a review of the FSP (with addendum) and the HSP (with addendum). The HSP dealt solely with worker protection in the DU impact area. As such, the staff made no findings regarding the HSP and did not rely on it to reach conclusions regarding the proposed license amendment.

The review of the FSP was supplemented by the public meeting held on September 8, 2005, actions items from that meeting, and the Army's responses to three RAIs issued by the staff. The basis of the staff's review was to determine whether the Army's proposed alternative schedule is in compliance with 10 C.F.R. § 40.42(g)(2). Specifically, whether the alternative schedule is: 1) necessary to the effective conduct of decommissioning operations; 2) presents no undue risk from radiation to the public health; and 3) is otherwise in the public interest.

During its review, the staff also considered that, during site characterization, the Army will continue to collect semi-annual samples under its current ERM Plan established in 1999. Under the ERM Plan, if any of the pre-established action levels for groundwater, surface water or sediment are exceeded, the Army is required to contact NRC and take corrective measures to reduce the uranium concentration (natural uranium plus DU) below the action level.

II. Adequacy of FSP and Addendum

The staff reviewed the Army's FSP and addendum to determine whether it will lead to an acceptable DP. As discussed below, the staff finds that the proposed site characterization activities are necessary for an acceptable DP and will lead to effective decommissioning operations. Furthermore, these activities will be done without undue risk from radiation to the public health and safety.

A. Groundwater

The Army has proposed to perform the following characterization actions that are relevant to groundwater issues related to the DU impact area:

- fracture trace analysis;
- soil verification;
- electrical imaging;
- precipitation monitoring;
- stream and cave spring continuous stage gauging;
- stream and cave spring flow measurements;
- monitoring well installation;
- continuous water-level (stage) recording of monitoring wells; and
- quarterly monitoring of the groundwater, streams, and caves (that is, analyzing water samples from the groundwater, streams, and caves for DU and/or other parameters; analyzing sediments from the streams and caves for DU and/or other parameters; measuring groundwater levels; and obtaining stream and cave discharges from stage or flow measurements).

The Army has indicated that some of these characterization actions (for example, installation of monitoring wells, stream and cave spring continuous stage gauging, and continuous stage recording of monitoring wells) will be performed in phases where additional work may be performed depending upon the results of previous characterization. The Army has also indicated that the majority of the monitoring wells will be screened in bedrock materials. However, some monitoring wells will be screened in the overlying unconsolidated materials.

While finding the above methodology generally adequate, the staff, in an RAI, requested the rationale for postponing the installation of, and measurements by, stream and cave gauging stations. Additionally, the staff requested information on how low flow or base flow stream and cave values would be collected as well as the rationale for the postponing of the collection of climatic data. In a related RAI, the staff asked for further justification why a phased approach for determining the hydraulic properties of water-bearing units should not be performed.

In its response to the NRC's RAIs, the Army modified its FSP by compressing the time between some work items and by rescheduling other work items. For example, the Army has updated and accelerated the collection of stream and cave spring stage and flow measurement data and the collection of precipitation data by approximately one year. Now these data will be collected prior to the selection of new monitoring well sites instead of after the installation of the new monitoring wells as originally proposed in the FSP.

The Army also stated in its response to the RAIs that it plans to utilize a phased approach for obtaining the hydraulic properties of the water-bearing units. It plans to complete the fracture trace analysis, electrical imaging, and soil verification, and then select and install additional monitoring wells using the information obtained from the aforementioned procedures. After this work is performed, the Army will be able to discuss the merits of developing aquifer pump tests or other procedures for obtaining the hydraulic properties of the water-bearing units with the NRC.

The staff found the Army's proposed approach to groundwater monitoring to be adequate.

B. Surface Water

In order to evaluate the interrelationships between the surface water, cave springs, and the groundwater, the Army will install continuous stage gauging stations on the streams and cave springs at several locations within and adjacent to the DU impact area. The Army will also manually measure the discharge at these stations on a monthly basis for one year and then on a quarterly basis for another year.

As noted, in its response to the RAIs, the Army has accelerated and extended its collection of stream and cave spring continuous stage and flow measurement data for the DP impact area and adjacent JPG site. In an additional RAI, the Army was asked to provide additional information on its approach for determining the recharge to each water-bearing unit. The Army responded by stating that it intends to use the results from the stream and cave spring continuous stage and flow measurement data in estimating recharge from precipitation to the upper water-bearing unit. As mentioned above, the continuous stage measurements for the streams and the cave springs will be useful in siting additional monitoring wells.

The Army will use results from the stream gauging program to estimate recharge from

precipitation by two stream flow hydrograph analysis methods. The Army intends to apply two U.S. Geological Survey computer programs to compute the recharge to the upper water-bearing unit using site stream flow data (Risser et al., 2005).

In an RAI response, the Army stated that it will extend the stream and cave spring continuous stage gauging so that it coincides with continuous water-level (stage) recording of monitoring wells for a minimum of at least one hydrologic year. The Army plans to use six wells from the new and existing monitoring wells for continuous recording of water levels for this program. The results of these data (i.e., stream and cave spring flow, groundwater levels, precipitation, and recharge) will be used in whole or in part to determine the interrelationships between groundwater, cave spring flow, stream flow, precipitation, and recharge, which will provide useful information pertaining to the potential transport of DU.

The staff found the Army's proposed approach to surface water monitoring to be adequate.

C. Biota Sampling

The Army has proposed in its FSP and FSP addendum to collect deer tissue samples from areas outside the DU impact area and from within the DU impact area. Ten deer will be sampled in the DU impact area, 10 deer from the area surrounding the DU impact area, and 10 deer from background locations for a total of 30 deer samples. All samples will be analyzed for isotopic uranium in order to detect DU. If DU is detected, additional deer sampling may be conducted in 2007 and another addendum to the FSP will be submitted to NRC.

If DU is detected in deer samples or from other abiotic media such as surface water, then biota such as plants, earthworms, fish, small birds, and small mammals will be sampled for DU. The Army would submit an addendum to NRC and sample these biota in 2007. If DU is detected in these biota, another round of sampling is proposed for 2008.

The staff found the Army's proposed approach for biota sampling to be adequate.

D. Soil

Both soil sampling and surface soil scans (gamma walkover scans) are proposed in the Army's FSP. The purpose of the soil sampling and surface scans are to: 1) identify areas of elevated DU for collection of biased samples; 2) locate DU penetrators for excavation, collection, and analysis; 3) establish background DU concentrations in surface and subsurface soils for both Cincinnati and Cobbsfork soil types; 4) verify the boundaries of the DU impact area; and, 5) verify the areal and vertical extent of contamination in the DU impact area.

Soil sampling will be at predetermined background and DU impact area locations. Surface and subsurface soil sampling will be conducted at each location. Additional soil sampling will be done directly beneath DU penetrators to support the analysis of penetrator corrosion rate and the determination of soil distribution coefficient (K_d).

The staff found the Army's proposed approach for soil sampling to be adequate.

E. Sediment

Sediment samples will be collected by the Army within the top 15 centimeters from the banks of the two major surface water creeks that traverse the DU impact area, namely Big Creek and Middle Fork Creek. Sediment samples will be collected at the entrance, midpoint, and exit of each creek within the DU impact area. Locations will be selected where the surface water is low or where deposition is most likely. In addition, accessible portions of both sides of the creeks will be scanned with the equipment and methods used for soil sampling. Additional samples will be taken at locations of elevated activity.

The staff found the Army's proposed approach for sediment sampling to be adequate.

F. Determining Distribution Coefficients (K_d Study)

The Army proposes to determine the individual annual exposure to residual contamination using the RESRAD model. The Army notes than an important input parameter for simulating radionuclide leaching from the contaminated soil is the soil distribution coefficient or K_d. The Army needs to determine the site-specific value of K_d for DU for its calculation of on-site radiation exposure and for calculating the potential off-site transport of DU. The K_d factor is defined as the partition of the solute in the soil matrix and soil water, assuming that equilibrium conditions exist between the soil and solution phases.

The Army further notes that because of its dependency on many soil properties, the value of K_d for a specific radionuclide in soil can range over several orders of magnitude under different conditions. Therefore, the Army proposes that site-specific K_d factors for the isotopes of uranium found in DU will be measured in a laboratory using biased soil samples collected from the DU impact area. American Society for Testing and Materials (ASTM) method D 4319-83, *Standard Test Method for Distribution Ratios by the Short-Term Batch Method,* will be followed for the laboratory K_d measurement. The Army states that this method is recommended in the RESRAD data collection manual (Yu et al. 1993).

The staff notes that RESRAD is a computer code used by NRC and licensees to determine annual on-site exposure and potential off-site transport (Yu et al., 2001). The staff further notes that the assumption that rapid equilibrium is reached between the dissolved and sorbed concentrations of a chemical species, and that these two concentrations are linearly related through the K_d factor, is a potential problem with all K_d models and is not specific to JPG (see U.S. EPA 1999). K_d models are used frequently by NRC and NRC licensees to predict radionuclide transport. Appropriate models can be developed if sufficient site-specific information and/or conservative assumptions are used.

The staff finds that the adsorption/desorption tests that the Army plans to perform in the FSP can form an adequate basis for a K_d model. Uranium transport is sensitive to the redox potential (Eh) and pH. The staff concludes that the Army can form a sound model using K_d values by characterizing the range of Eh and pH values they expect in groundwater, or by making conservative assumptions about Eh and pH. The Army will base the expected effects of Eh and pH either on direct adsorption/desorption tests or on a combination of site-specific samples and literature values. The staff finds either approach acceptable.

In summary, the staff found the Army's proposed approach for determining K_d to be adequate.

G. Corrosion and Dissolution Data Collection

The Army is going to determine the site-specific corrosion rate of the DU penetrators in the DU impact area in order to predict the potential for migration of DU into the subsurface, groundwater, and surface water. One of the Army's first tasks in determining the corrosion rate is to find out what oxidation state the uranium is in since the tetravalent oxidation state (IV) is much less soluble than the hexavalent (VI) oxidation state (Colon et al., 2001, NUREG/CR-6705). At least 24 penetrators will be collected from both Cincinnati and Cobbsfork soil types and scrapings obtained from the corrosion layer. The scrapings will be shipped by the Army to a laboratory to identify specific mineral phases. Soil mineralogy, including uranium and iron content, will be determined from soil samples collected from the location of penetrator removal. Uranium mobility in soil is affected by iron oxides in the soil and other parameters such as pH, soil texture, and the soil's reduction/oxidation status.

Representative penetrators will be selected by the Army for leachability testing based on the results of the corrosion product identification. The results of the leachability tests will be used to estimate the penetrator corrosion/dissolution rate which represents the combined effects of a number of site-specific parameters.

The staff found the Army's proposed approach for determining the penetrator corrosion and dissolution rate to be adequate.

In summary, the activities described by the Army in its FSP and addendum as supplemented in its follow-up responses, should provide adequate site characterization information such that the Army could submit an acceptable DP within 5 years and are therefore necessary for the effective conduct of decommissioning operations.

CONCLUSIONS

The Army proposes an alternate schedule for the submission of a DP. The Army's proposed alternate schedule for the submission of a DP shows that all site characterization activities and development of a new DP will be completed and submitted to NRC for review and approval by the end of 2011 or earlier. No radiation exposure to any member of the public is expected, so public exposure would, therefore, be less than the applicable public exposure limits of 10 CFR Part 20. The Army has acknowledged that there is risk to human health and safety from UXO in placing the wells and gathering the site-specific data in the areas with UXO. However, the Army has indicated that it will take precautions in its planning and implementation of site characterization to mitigate the risks from UXO.

The staff notes that JPG is a complex site that requires more complex characterization to create a valid DP. Accordingly, extending the date for completion of site characterization and submittal of a new DP on that schedule is reasonable and does not pose a safety hazard. In addition, the EA, developed in parallel with this SER, concluded that the site characterization activities will not result in a significant adverse impact on the environment.

Based on the considerations discussed above, the NRC staff concludes that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by the

proposed site characterization activities and alternate schedule for submittal of a DP; and (2) such activities will be conducted in compliance with NRC regulations. The staff also concludes that it is in the public interest to take the additional time to adequately address monitoring deficiencies and allow for more specific information to be gathered from the site.

REFERENCES

American Society for Testing and Materials, 1992. *Standard Test Method for Distribution Ratios by the Short-Term Batch Method (D 4319-83).* In *1992 Annual Book of ASTM Standards,* Sec. 4: Construction, Vol. 8: Soil and Rock; Dimension Stone; Geosynthetics, ASTM, Philadelphia, PA.

Colon, C. F. Jove, Brady, P. V., Siegel, M. D., and Lindgren, E. R. NUREG/CR-6705. *Historical Case Analysis of Uranium Plume Attenuation.* Sandia National Laboratory, Albuquerque, NM. February 2001.

Federal Register 59, pages 36026 and 36028. *Timeliness in Decommissioning of Materials Facilities.* July 15, 1994.

ML993230068. *Letter Forwarding Revised Environmental Radiation Monitoring (ERM) Plan for Jefferson Proving Ground.* August 10, 1999.

ML021960089. *Environmental Report Jefferson Proving Ground, Madison, Indiana, Final Report, Table of Contents-Appendix A, Exhibit A.* June 30, 2002.

ML021960135. *Environmental Report Jefferson Proving Ground, Madison, Indiana, Final Report, Appendix A, Exhibit B-Appendix C.* June 30, 2002.

ML030520478. *U.S. Army, Aberdeen Proving Ground, Request for Alternate Schedule for Submittal of Decommissioning Plan for Termination of Jefferson Proving Ground.* February 4, 2003.

ML030850006. *Letter to John Ferriter, U.S. Army, Concerning the Status of Jefferson Proving Ground Decommissioning.* April 8, 2003.

ML032731017. *Transmittal of Environmental Radiation Monitoring Plan for License SUB-1435, Jefferson Proving Ground.* September 30, 2003.

ML042220047. *Jefferson Proving Ground Meeting Report of 07-28-2004.* July 28, 2004.

ML042710122. *Request for Details About Parameters Needed for Off-Site Transport Models for Jefferson Proving Ground.* October 5, 2004.

ML050330496. *Response from the Army About a Revised Environmental Monitoring Plan for Jefferson Proving Ground and Parameters that Cannot be Collected Due to the Presence of Unexploded Ordnance.* January 31, 2005.

ML051520319. *Letter from the Army Requesting an Alternate Decommissioning Schedule for*

the Decommissioning of Jefferson Proving Ground and Transmitting a Technical Memorandum, Field Sampling Plan, and Health and Safety Plan. May 25, 2005.

ML053120288. *Army Response to Action Items from September 8, 2005, Meeting on Jefferson Proving Ground.* October 26, 2005.

ML053350356. *Letter Transmitting Field Sampling Plan Addendum, Including Laboratory Analytical Procedures, and Health and Safety Addendum for the Proposed Jefferson Proving Ground Site Characterization.* November 16, 2005.

ML060590379. *Army Response to NRC's Request for Additional Information About the Jefferson Proving Ground Field Sampling Plan.* February 9, 2006.

ML053130257. *Environmental Assessment Related to Issuance of a License Amendment of U.S. Nuclear Regulatory Commission Materials License No. SUB-1435.* March 6, 2006.

NUREG-1757, Vol. 1, Rev. 1. *Consolidated NMSS Decommissioning Guidance: Decommissioning Process for Materials Licensees.* September 2003.

Risser, D. W., Conger, R. W., Ulrich, J. E., and Asmussen, M. P. 2005. *Estimates of Ground-Water Recharge Based on Streamflow-Hydrograph Methods*: Pennsylvania: U.S. Geological Survey, Open-File Report 2005-1333, page 30.

U.S. Environmental Protection Agency (EPA). 1999. *Understanding Variation in Partition Coefficient, K_d, Values.* EPA 402-R-99-004A. August 1999.

Yu, C., Loureiro, C., Cheng, J.-J., Jones, L. G., Wang, Y. Y., Chia, Y. P., and Faillace, E. 1993. *Data Collection Handbook to Support Modeling Impacts of Radioactive Material In Soil.* Argonne National Laboratory, Argonne, IL.

Yu, C., Zielen, A. J., Cheng, J.-J., LePoire, D. J., Gnanapragasam, E., Kamboj, S., Arnish, J., Wallo III, A., Williams, W. A., and Peterson, H. 2001. *User's Manual for RESRAD Version 6.* Argonne National Laboratory, Argonne, IL.