RAS 14536

ARMY EXH. # 10

# RESPONSES TO THE NUCLEAR REGULATORY COMMISSION JANUARY 18, 2006, REQUEST FOR ADDITIONAL INFORMATION REGARDING THE PROPOSED FIELD SAMPLING PLAN FOR JEFFERSON PROVING GROUND (LICENSE SUB-1435)

U.S. NUCLEAR REGULATORY COMMISSION
In the Matter of USARMY (JEFFERSON PROVING GROUND)
Docket No. 40-8838-MLA Official Exhibit No. ARMY Exh. #10
OFFERED by: Applicant/Licensee
Intervenor
Other
IDENTIFIED on: Witness/Panel
Action Taken: ADMITTED REJECTED WITHDRAWN
Reporter/Clerk

**Submitted to:**

**U.S. Department of Army**
**Installation Support Management Agency**
**Aberdeen Proving Ground, Maryland**

**Prepared by:**

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USNRC

October 25, 2007 (2:00pm)

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

Docket No. 40-8838-ML

**February 2006**

TEMPLATE = SECY-028

SECY-02

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## QUESTION 1: STREAM AND CAVE GAUGING STATIONS

The Army should provide additional information on its rationale for postponing the installation of stream and cave gauging stations and measurement of stream and cave flows until the new monitoring wells are operable. The Army also should clarify its phased approach for collecting stream and cave flow data based upon the interrelationships of stream flow, cave flow, and groundwater flow. This should include a discussion on how it will decide if low flow or base flow stream and cave values should be collected and on how it will perform these measurements during the phased stream and cave monitoring program if these items are determined to be needed. The Army should also provide additional information on its rationale for postponing the gathering of climatic data and why it is not installing an automated climatic station.

### BASIS

Information on the interrelationships of precipitation, recharge to the groundwater, stream flow, cave flow, and groundwater flow is critical to measuring and understanding the fate and potential transport of depleted uranium at Jefferson Proving Ground (JPG). It is important to gather precipitation, stream flow, cave flow, and groundwater flow data over different flow and climatic conditions.

### REFERENCES

U.S. Department of Army Installation Support Management Activity. 2005. *Field Sampling Plan, Depleted Uranium Impact Area Site Characterization, Jefferson Proving Ground, Madison, Indiana.* Aberdeen Proving Ground, Maryland. May 2005.

Department of Army Installation Management Agency. 2005. *Responses to Action Items Identified at the 8 September 2005 Meeting Between the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Army Regarding NRC License SUB-1435, Jefferson Proving Ground.* Rock Island, Illinois. October 2005.

### RESPONSE

The Army has updated and accelerated the site characterization schedule for collection of cave spring, streams, and precipitation by approximately one year, and increased the time frame and frequency of related data collection activities relative to those plans presented in the 2005 Field Sampling Plan. The discussion below highlights these changes, including the NRC's request for more detail on the Army's approach to this phase of site characterization.

The Army currently is planning to establish cave spring and stream gauge/stage monitoring stations with the installation of station equipment in 2006 (May to July time frame) rather than the 2007 time frame planned originally in the Field Sampling Plan (U.S. Army 2005). Immediately following the establishment of monitoring stations, the Army will collect continuous stage measurements including, but not limited to, the

collection of data during low and base flow conditions. The stage measurements will be completed at the stations using pressure transducers and electronic data recorders. As part of the phased characterization approach, the Army also will collect manual flow measurements that will be used to calibrate stations and develop type curves for the stream gauging stations. This stage data will be collected continuously until at least one hydrologic year of groundwater stage data have been collected. This time frame is anticipated to overlap with well installations in the DU Impact Area in accordance with the Field Sampling Plan (U.S. Army 2005).

Precipitation data from the existing automated weather station maintained by the U.S. Fish and Wildlife Service (USFWS) will be downloaded from the following website http://www.fs.fed.us/raws/. These data are provided through the National Oceanic and Atmospheric Administration (NOAA) Cooperative Institute for Regional Prediction. Mesowest, associated with the University of Utah, manages the data for this (and other) weather stations. The weather station is located on the eastern side of the JPG facility, is automated, and provides continuous precipitation data through a cooperative network.

Data collection, analysis, and reporting on precipitation, cave springs and streams will be conducted simultaneously, beginning in 2006. Stage monitoring will be_conducted continuously with pressure transducers and electronic data loggers and manual flow monitoring will be completed monthly for one year and quarterly for the second year.

## QUESTION 2: APPROACH FOR DETERMINATION OF HYDRAULIC PROPERTIES OF WATER-BEARING UNITS

The Army should provide additional information to justify why a phased approach for determining the hydraulic properties (hydraulic conductivity and storage parameters) of the water-bearing units (both the unconsolidated and limestone units), utilizing aquifer pump test procedures and other approaches, should not be performed at JPG.

## BASIS

The hydraulic properties of the water-bearing units are needed to understand the rate of groundwater flow and storage of groundwater. Both are important factors that impact the fate and potential transport of the depleted uranium at JPG. A phased approach for obtaining the hydraulic properties of the water-bearing units permits the Army to determine these parameters and to evaluate whether additional data should be obtained.

## REFERENCES

U.S. Department of Army Installation Support Management Activity. 2005. *Field Sampling Plan, Depleted Uranium Impact Area Site Characterization, Jefferson Proving Ground, Madison, Indiana.* Aberdeen Proving Ground, Maryland. May 2005.

Department of Army, Installation Management Agency. 2005. *Responses to Action Items Identified at the 8 September 2005 Meeting Between the U.S. Nuclear Regulatory*

*Commission (NRC) and the U.S. Army Regarding NRC License SUB-1435, Jefferson Proving Ground.* Rock Island, Illinois. October 2005.

**RESPONSE**

The Army plans to complete a fracture trace analysis, electrical imaging (EI) survey, and soil verification assessment to support the selection of proposed well locations prior to well installation. Each of these phases is designed to provide additional site information and data that will be used to refine and validate the conceptual site model (CSM) and support subsequent characterization planning. As stated by NRC staff in the basis for this question, "a phased approach for obtaining the hydraulic properties of the water-bearing units permits the Army to determine these parameters and to evaluate whether additional data should be obtained."

Following the completion of these proposed study phases, long-term pumping testing of the aquifer will be considered using the then current CSM and supporting site data, such as information on transport mechanisms and groundwater/surface water interrelationships. An appropriate and useful aquifer test can not be defined or designed in complex karst aquifers a priori without the placement and construction of a monitoring network providing basic information and data on the aquifer system. The Army, therefore, will evaluate the merits of including aquifer testing and will discuss this and any other issues/options with NRC staff at the periodic/annual meetings with Army staff as described in the Field Sampling Plan after the results of the aforementioned studies.

**QUESTION 3: WATER-BEARING UNIT RECHARGE**

The Army should provide additional information on its approach or approaches for measuring, calculating, or estimating recharge to each water-bearing unit. The Army should also discuss the parameters that it will use to determine recharge to each water bearing unit.

**BASIS**

The measurement of recharge to each water-bearing unit and the movement of this water through the soils and the unsaturated zone provide important information on the fate and potential transport of the depleted uranium at JPG.

**REFERENCES**

U.S. Department of Army Installation Support Management Activity. 2005. Field Sampling Plan, Depleted Uranium Impact Area Site Characterization, Jefferson Proving Ground, Madison, Indiana. Aberdeen Proving Ground, Maryland. May 2005.

Department of Army Installation Management Agency. 2005. Responses to Action Items Identified at the 8 September 2005 Meeting Between the U.S. Nuclear Regulatory

Commission (NRC) and the U.S. Army Regarding NRC License SUB-1435, Jefferson Proving Ground. Rock Island, Illinois. October 2005.

**RESPONSE**

To estimate the recharge to the aquifer, the Army will use two stream flow hydrograph analysis methods. These methodologies are the stream flow hydrograph separation analysis, and recession curve displacement techniques.. The Army intends to apply these two methods to JPG data using the U.S. Geological Survey's (USGS's) computer programs, PART and RORA (USGS 2005). These analysis methods will provide a "direct" measure of the recharge to the aquifer.

The stream flow hydrograph separation method is a graphical method used to separate surface water and interflow from groundwater base flow. An arithmetic plot of stream flow records against time is generated, and the base flow volume is determined by measuring the percentage of the total area under the curve. This produces an average annualized groundwater recharge rate for the time frame measured. Recharge fluctuates depending on the amount and distribution of rainfall, requiring a comparison to historical rainfall distribution records to determine an expected range of recharge rates for 10-year low, average, and 10-year high precipitation years. The PART computer program provides an automation of the stream flow hydrograph separation procedure. The PART program has reportedly been widely used for stream flow hydrograph analysis in the eastern United States and the software is available at no charge from the USGS (http://water.usgs.gov/ogw/part/)

The RORA computer program uses a recession-curve displacement method to estimate groundwater recharge from storm periods recorded on the stream flow hydrographs (i.e., this method is not a stream flow hydrograph separation technique). This computer program, available at no charge from the USGS (see http://water.usgs.gov/ogw/rora/), has been used to estimate recharge.

**REFERENCES**

Unites States Geological Survey. 2005. *Estimates of Ground-water Recharge Based on Streamflow-Hydrograph Methods: Pennsylvania*: Open-File Report 2005-1333.