July 7, 2008

MEMORANDUM TO: John Kinneman, Director
Division of Nuclear Materials Safety
Region I

FROM: Patrice Bubar, Deputy Director **/RA/**
Environmental Protection and
Performance Assessment Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

SUBJECT: RESPONSE TO TECHNICAL ASSISTANCE REQUEST DATED DECEMBER 18, 2007, FOR THE REVIEW OF DOSE MODELING SUPPORTING THE DECOMMISSIONING PLAN FOR THE R-14 RANGE AT ABERDEEN PROVING GROUND

Region I submitted a Technical Assistance Request, dated December 18, 2007, requesting a determination of appropriateness of a site-specific Derived Concentration Guideline Level (DCGL) for depleted uranium contaminated soils at the R-14 Range located at the Aberdeen Proving Ground (APG). This site-specific DCGL was originally approved by the NRC for use by the licensee at the Transonic Range at APG. The licensee provided a description of the development of the DCGL for the R-14 Range in "Determination of the Derived Concentration Guideline Level (DCGL) for R-14 Range Soils" [ML073180601] and provided additional information in response to NRC's Request for Additional Information [ML081480447]. The Performance Assessment Section has completed its review of the licensee-generated DCGLs and has provided a Technical Evaluation Report (enclosed). Based upon this review, staff finds that the licensee-derived DCGL is appropriate, and the use of this DCGL value meets the U.S. Nuclear Regulatory Commission dose criteria for license termination.

If you have any questions regarding this review, please contact Karen Pinkston of my staff. She can be reached at 301-415-3650 or karen.pinkston@nrc.gov.

Enclosure: Technical Evaluation Report

cc: Betsy Ullrich

CONTACT: Karen Pinkston, DWMEP/PAB
(301) 415-3650

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Aberdeen Proving Ground R-14 Range
Technical Evaluation Report
Prepared by: Karen Pinkston, Systems Performance Analyst
June 27, 2008

Background

The Department of the Army is decommissioning the R-14 Range of the U.S. Army Research Laboratory (ARL) located at the Aberdeen Proving Ground (APG). This range was used for the testing of depleted uranium (DU) penetrator rounds and the site has both contaminated structures as well as contaminated surface soils. The licensee intends to use NRC screening criteria for the release of structures, but they intend to use a site-specific Derived Concentration Guideline Level (DCGL) for the release of surface soils. This DCGL was originally developed for use in decommissioning the Transonic Range at APG, an area also contaminated with depleted uranium. The decommissioning plan for the Transonic Range was approved by the NRC in 2001 and the site has subsequently been remediated and released. The licensee performed a dose assessment to demonstrate that the use of the site-specific soil DCGL generated for the Transonic Range is appropriate for the R-14 range. In addition, NRC staff performed an independent analysis to verify that the use of the DCGL value from the Transonic Range for the R-14 Range is appropriate.

Source Term

The radionuclides of interest present at the R-14 Range are U-334, U-235, and U-238 and their progeny. These radionuclides were assumed to have activity fractions of U-234, U-235, U-238 of 0.084, 0.012, and 0.904 in the dose assessment. These activity fractions were based on the isotopic uranium ratios used for shipments of DU waste from APG. No subsurface contamination was observed during the characterization of the site, so the soil contamination is assumed to be limited to the top 6 inches.

While the Transonic Range was also contaminated with depleted uranium, the activity fractions assumed in the dose modeling performed for the Transonic Range differed from those assumed for the R-14 Range. In calculating the DCGL for the Transonic Range, three different activity fraction cases were analyzed and the most conservative DCGL value calculated was selected. The first case was based on the mean activity obtained in all sample results (activity fractions of 0.211, 0.0205, and 0.768 for U-234, U-235, and U-238), the second case was based on the mean of sample results for samples containing more than 1 pCi/g of U-235 (activity fractions of 0.138, 0.0234, and 0.839), and the third case was based on the activity of except those that were from hot spots (activity fractions of 0.222, 0.0193, and 0.788). The second case resulted in the lowest DCGL value, so the DCGL value developed from this activity ratio was selected.

The licensee provided information regarding the potential significance of the difference of the activity fractions assumed for the Transonic Range and the fractions assumed for the R-14 Range in the May 7, 2008 submittal in response to NRC Requests for Additional Information. The licensee performed calculations of the dose to source ratio and the resulting DCGL using both sets of activity fractions. The RESRAD default parameter values were used with the exception of thickness of the contaminated zone. The dose to source ratios and DCGL values

calculated were nearly identical for both sets of activity fractions, indicating that differences between assumed activity fractions at the Transonic Range and R-14 Range do not significantly affect the results.

Scenarios, Modeling, and Results

The DCGL value developed for the Transonic Range was derived using RESRAD Version 5.82 based on an evaluation of both the resident farmer and industrial worker scenarios. The dose to these receptors was evaluated over a period of 1000 years. Because the residential farmer scenario was found to be more restrictive, the DCGL value generated using this scenario was used. The pathways included in the residential farmer scenario were: direct exposure from contaminated soil, inhalation of contaminated dust, inhalation of radon-222, ingestion of plant foodstuffs grown in contaminated soil and irrigated with groundwater drawn from a well located within the decontaminated area, ingestion of meat from livestock fed fodder grown in the decontaminated area and irrigated with groundwater from the decontaminated area, ingestion of milk from milk animals raised with fodder and irrigation groundwater drawn from the decontaminated area, ingestion of fish from a pond drawing water from the decontaminated area, ingestion of onsite soil, and ingestion of water drawn from an onsite well. The DCGL value calculated for the Transonic Range in this analysis was 230 pCi/g.

The licensee performed a dose analysis using RESRAD Version 6.3 to demonstrate that the use of the DCGL value for the Transonic Range is appropriate for the R-14 Range. In this analysis, the resident farmer scenario was used, and the same pathways were included as in the analysis for the Transonic Range, with the exception of the inhalation of radon-222 pathway, which was suppressed. Site specific parameter values were used in the analysis for the R-14 Range when this data was available. When this information was not available, the parameter values used were selected from NRC and EPA guidance documents when possible. RESRAD default values were used in cases where there was no site specific data and where information was not available in the NRC and EPA guidance documents. NRC staff found that the scenario, pathways, and parameter values selected are acceptable.

The DCGL value calculated for the R-14 Range in this dose analysis was 253 pCi/g. Because the DCGL value for the Transonic Range is lower than the one calculated for the R-14 Range, the use of the Transonic Range DCGL value for the R-14 Range is conservative.

Independent Analyses

NRC staff performed an independent evaluation of the dose to a member of the public using RESRAD to verify the licensee's results. The results obtained by NRC staff were comparable to those obtained by the licensee. NRC staff also performed a sensitivity analysis to determine the sensitivity of the dose to the ratio of radionuclides present in the depleted uranium. Staff found that there was not a significant difference between the dose calculated using the ratio of radionuclides assumed in the calculations for the Transonic Range and the dose calculated using the ratio assumed for the R-14 range.

Conclusion

The NRC staff has reviewed the dose modeling analyses performed for the R-14 Range to evaluate if the use of the DCGL value of 230 pCi/g developed originally for the Transonic Range

is appropriate. The staff concludes that the dose modeling completed for the R-14 Range is reasonable and is appropriate for the exposure scenario under consideration. Staff also concludes that the use of the DCGL value developed for the Transonic Range is appropriate for the R-14 Range due to the similarity in the source material and location of the two ranges and the fact that the Transonic Range DCGL is more conservative than the one calculated for the R-14 Range. The dose modeling analyses performed for the R-14 and Transonic Ranges provide reasonable assurance that the dose to the average member of the critical group is not likely to exceed the 0.25 mSv (25 mrem) annual dose criterion for unrestricted use in 10 CFR 20.1402. This conclusion is based on the modeling effort performed by the licensee and the independent analysis performed by the staff.

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