UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

June 19, 2006

Docket No. 04000341 License No. STC-133
Control No. 138458

F. Kevin Reilly
Director, Directorate of Environmental Management
Defense Logisitcs Agency
Defense National Stockpile
8725 John J. Kingman Road, Suite 3229
Fort Belvoir, VA 22060-6223

SUBJECT: DEFENSE LOGISITCS AGENCY, REQUEST FOR ADDITIONAL INFORMATION CONCERNING APPLICATION FOR AMENDMENT TO LICENSE, CONTROL NO. 138458

Dear Mr. Reilly:

This is in reference to your letter dated February 3, 2006 requesting to amend Nuclear Regulatory Commission License No. STC-133 to approve site-specific derived concentration guideline levels (DCGLs) at the Curtis Bay Depot, Curtis Bay, Maryland. This request was reviewed with technical assistance from NRC staff in the Office of Nuclear Materials Safety and Safeguards. Staff reviewed the DCGL request document "Preliminary Site-Specific Derived Concentration Guideline Levels for the Curtis Bay Depot, Curtis Bay, Maryland", prepared for the Defense Logistics Agency, Defense National Stockpile Center (DLA/DNSC) by the Oak Ridge Institute for Science and Education (ORISE), and other supporting documentation provided with your request. In order to continue our review, we need the following additional information:

1. Comment: The assumption that residual radioactivity in soil is limited to the top 15 centimeters requires additional justification.

   Basis: In section 1.3 (page 3), the text states that the contamination was assumed to be in the top 15 centimeters (cm) of soil based on an evaluation of the site history, including anticipated mobility of thorium in the environment and Oak Ridge Institute for Science and Education (ORISE) scoping survey results. In the "Radiological Scoping Survey of the Curtis Bay Depot" report (Vitkus, 2006), it is acknowledged that a broad area of subsurface contamination exists at the former radiological waste disposal area. Additional justification is needed for the assumption regarding the depth of the contamination which significantly impacts the DCGL calculations. If multiple DCGLs will be calculated based on the soil contamination profile, the licensee should justify the vertical discretization of its DCGL calculations, e.g., surface to 15 cm and subsurface from 15 cm to depth. Knowledge regarding the lateral extent and depth to the clay layer below ground surface would be integral to determining the soil intervals for which DCGLs should be calculated, since the geochemical and hydrologic properties of the shallow confining layer is expected to be different from the overlying surface sediments.

Provide additional information to justify the assumption that contamination is limited to surface soils or provide additional information regarding the intended approach for addressing subsurface contamination.

2. Comment: Sufficient justification for the external gamma shielding factor used in RESRAD is lacking.

   Basis: The external gamma shielding factor of 0.55 selected for use in the RESRAD model to calculate the soil DCGLs for U-238 and Th-232 should be independently verified (e.g., Microshield or Monte Carlo Neutral Particles [MCNP] calculations) to demonstrate that the value chosen is reasonable or conservative for natural thorium and uranium decay series constituents. While the default value of 0.55 in DandD based on NUREG/CR-5512, Volume 4, was used, given the importance of this parameter value and the site-specific nature (radionuclide and building material dependent) of this parameter value, you should provide additional justification for the value selected in its deterministic analysis. While the default parameter distribution in RESRAD is skewed significantly lower (less conservative) with a mean around 0.30, the uncertainty in this radionuclide-specific parameter should be reduced to decrease the uncertainty in the DCGL calculation.

   Perform additional research, modeling, and/or field experiments to justify the selection of the external gamma shielding factor used in RESRAD for the constituents and building materials present at the Curtis Bay Depot site.

3. Comment: The indoor fraction used in the RESRAD is not consistent with the outdoor fraction selected based on NUREG/CR-5512, Volume 3.

   Basis: DCGLs for soil were calculated based on an indoor fraction of 0.50 and outdoor fraction of 0.12 (outdoor fraction based on NUREG/CR-5512). The indoor time fraction should be changed to 0.66 for consistency with the outdoor fraction selected from NUREG/CR-5512, Volume 3.

   Confirm that you will use an indoor fraction of 0.66.

4. Comment: Additional justification for the distribution coefficients used in the RESRAD analysis is needed.

   Basis: Section 1.3, page 4, discusses the presence of a subsurface clay layer which serves to mitigate the potential radiological impacts to groundwater. Credit is taken for the expected attenuation capacity of loam and clay subsurface materials during the selection of distribution coefficients for input in the RESRAD computer code used for DCGL calculations. Justification for the generic distribution coefficients (Kds) used in the analysis (Table 3, page 31) appears warranted, e.g., the natural variability in the sorption capacity of subsurface materials and the lateral extent of the clay layer needs to be considered to demonstrate the distribution coefficients selected are reasonable or conservative. Information provided in Section 3.3.2.3 "Groundwater" does not present a compelling argument regarding the potential for groundwater contamination. The Parsons report should be provided (1999). Additionally, analytical data from the

groundwater wells and information regarding future groundwater sampling should be provided to support the statement on page 18 of the DCGL report that "no evidence of groundwater contamination has been identified..." (Boerner, 2006). The selection of distribution coefficients significantly impacts the dose from natural uranium and associated daughters, e.g., the peak dose from natural uranium is over 25 mrem and DCGL is less than 1 pCi/g, if the default distribution coefficients in RESRAD are used. Similarly, the uncertainty associated with the plant transfer factors should also be investigated particularly if the depth of contamination is found to be greater than 15 cm and the plant ingestion pathway becomes more important.

Provide documentation that shows you will reduce the uncertainty or at a minimum consider and manage the uncertainty in the DCGL calculation due to the variability of the distribution coefficients and plant transfer factors used in the analysis.

5. Comment: Clarify the hydrogeologic conceptual model for the site.

Basis: In Section 4.3.2.1 on page 29, you state that the contaminated zone is modeled with no cover down to a depth of one meter and that a clay material is assumed for depths from 1 to 5 meters for the unsaturated zone. However, the list of parameters found in Appendix A and RESRAD input files found in Appendix B reveal that a thickness of contamination of 0.15 cm and an unsaturated zone thickness of 2 meters was used in the RESRAD modeling. Section 4.3.2.1 (page 33) states that the vadose zone thickness is not an important parameter value. However, depending on the magnitude of the variability of the vadose zone thickness across the site, the vadose zone thickness does have a significant impact on the resulting dose for water dependent pathways. Therefore, the thickness of the unsaturated zone would be important for the U-238 DCGL calculation.

The following information is provided in the historical site assessment on page 6 (Abelquist, 2005) suggesting that the parameter value chosen for vadose zone thickness may be conservative:

*"The alluvial Coastal Plain sediments beneath the CBD generally thicken from west to east and are a part of the Lower Cretaceous Potomac Group. In the Baltimore area, the Potomac Group consists primarily of unconsolidated clays, silts, sands, and gravels. A silt-clay facies of the Potomac Formation consisting of shallow clay underlain by a water-bearing sand and gravel unit exists beneath the CBD...At the Depot, groundwater is found in the surficial sediments overlying a shallow clay layer, often as perched conditions. In the western portion of*
*the site, where perched conditions are not present, groundwater is found under unconfined aquifer conditions. Groundwater is found at 11 feet to*

*16 feet bgs [below ground surface] in the eastern portion of the Depot, and 20 feet to 40 feet bgs in the western portion..."*

The lateral extent of the shallow clay is also important information as it affects the appropriateness of the distribution coefficients chosen for the analysis.

Provide additional Information regarding the lateral extent of the clay layer, the hydrostratigraphy, and the range in the depth to groundwater at the Curtis Bay site which is needed to determine an appropriate vertical discretization for the contaminated and unsaturated zones in the RESRAD modeling. If this information is unknown, the uncertainty in these parameters values should be evaluated and justification for the parameter values chosen should be provided.

6. Comment: Examine the significance of parameter values related to the plant ingestion pathway.

Basis: Section 4.3.2.1, Page 34, "Ingestion Parameter", states that the significance of dietary and non-dietary parameters on the DCGL determination is minimal, since the external dose pathway dominates the dose. However, the plant ingestion pathway and the plant transfer factor for Ra-228 is actually one of the most important parameter values when the depth of contamination is increased. The plant ingestion pathway may have been less significant in the licensee's analysis, since the depth of contamination was assumed to be 0.15 m, thereby, minimizing the contribution of this pathway to the peak dose. As discussed in Item No. 1 above, the thickness of contamination requires further justification, as it significantly affects the results of the analysis and the importance of the plant ingestion pathway.

Determine the significance of parameters affecting the plant ingestion pathway through additional sensitivity and uncertainty analysis consistent with its finding with respect to Item No. 1 above.

7. Comment: DLA/DNSC did not provide sufficient justification for use of the default inhalation rate for the RESRAD-BUILD DCGL calculations.

Basis: The default inhalation value recommended in NUREG/CR-5512, Volume 3, is 33.6 $m^3$/hr while the default value of 18 $m^3$/day in RESARD BUILD was used in the licensee's analysis.

Justify your use of the default value for the inhalation rate in RESRAD BUILD, or modify your selection of the inhalation rate in RESRAD BUILD.

8. Comment: DLA/DNSC did not differentiate between or discuss the potential exposure pathways for deconstructed building materials, e.g., concrete pads and debris piles, compared to residual contamination associated with buildings and/or soil contamination.

Basis: You provided survey data for deconstructed building materials in the radiological scoping survey report (Vitkus, 2006). However, in Section 4.3 (page 28) of the DCGL report (Boerner, 2006), you explain that many concrete pads have been left in place at the site but that the concrete pads were not modeled. Similarly, no modeling was performed for building debris. The ultimate disposition of these materials is not clear. Furthermore, the potential for migration and transfer of residual contamination associated with these materials to nearby soil media also exists, e.g, migration through cracks in degraded concrete pads, via surface runoff, or through atmospheric dispersion of contamination initiated by the collapse and degradation of building materials. Since

the exposure pathways for degraded building materials will be significantly different than they are for contaminated soils and building surfaces, it should be explained how these materials will be handled as part of the overall decommissioning strategy for the site.

Provide additional information regarding the final disposition of building materials and debris for the Curtis Bay site. If building materials will remain on-site, you need to consider development of site-specific DCGLs for these building materials and/or demonstrate why other site-specific DCGLs are bounding. Also, provide additional information regarding the potential for migration and transfer of residual contamination from degraded building materials to nearby surface soils and sediments at the Curtis Bay site.

Current NRC regulations and guidance are included on the NRC's website at www.nrc.gov; select **Nuclear Materials; Medical, Academic, and Industrialc Uses of Nuclear Material;** then **Toolkit Index Page.** Or you may obtain these documents by contacting the Government Printing Office (GPO) toll-free at 1-888-293-6498. The GPO is open from 7:00 a.m. to 8:00 p.m. EST, Monday through Friday (except Federal holidays).

We will continue our review upon receipt of this information. Please reply to my attention at the Region I Office and refer to Mail Control No. 138458. If you have any technical questions regarding this deficiency letter, please call Steve Hammann at (610) 337-5399.

If we do not receive a reply from you within 30 calendar days from the date of this letter, we will assume that you do not wish to pursue your application.

Sincerely,

***Original signed by Elizabeth Ullrich***

Betsy Ullrich
Senior Health Physicist
Commercial and R&D Branch
Division of Nuclear Materials Safety

cc:
Michael Pecullan, Deputy Manager, Radiation Protection Program

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