February 26, 2007

MEMORANDUM TO: Brian E. Holian, Director
Division of Nuclear Materials Safety, Region I

FROM: Scott C. Flanders, 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 APRIL 24, 2006, FOR HAMMOND DEPOT SITE

By technical assistance request (TAR) dated April 11, 2006 [ML061010725 and package number ML053500247], the Division of Waste Management and Environmental Protection (DWMEP) was tasked by Region I to approve site-specific derived concentration guideline levels (DCGLs) for the Hammond Depot site [ML060580629]. Based on a review of background documents provided in the TAR, DWMEP generated requests for additional information transmitted to Region I by letter dated May 18, 2006 [ML061370410], which were transmitted to the licensee, Defense Logistics Agency/Defense National Stockpile Center (DLA/DNSC), by letter dated June 8, 2006 [ML061620001]. DWMEP staff reviewed additional information provided by the licensee in letter dated July 19, 2006 [ML062070231], including results of a characterization survey provided by letter dated September 19, 2006 [ML062710160]; and additional information provided following a November 22, 2006, teleconference between the U.S. Nuclear Regulatory Commission (NRC) and the licensee by letter dated January 12, 2007 [ML070160372], and finds the DCGLs calculated for the Hammond Depot site to be acceptable.

It is important to note that the licensee has provided DCGLs for surficial soil contamination only and that it is not appropriate for DLA/DNSC to apply these DCGLs for known contaminated areas significantly thicker than 15 centimeters. However, the pre-remediation subsurface contamination at Hammond Depot is expected to be fairly limited to an average of 0.3 meters in soil located above a monolithic slag layer that underlies the site, and DLA/DNSC expects to completely remove all significant soil contamination above the slag layer. DLA/DNSC did not provide calculations for elevated region DCGLs; thus, if smaller areas of the site have average concentrations above DCGLs, DLA/DNSC must perform additional remediation or calculate elevated area DCGLs to demonstrate compliance with license termination rule criteria.

Enclosure: Basis for Approval

CONTACT: Cynthia S. Barr, FSME/DWMEP
(301) 415-4015

February 26, 2007

MEMORANDUM TO: Brian E. Holian, Director
Division of Nuclear Materials Safety, Region I

FROM: Scott C. Flanders, 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 APRIL 24, 2006, FOR HAMMOND DEPOT SITE

By technical assistance request (TAR) dated April 11, 2006 [ML061010725 and package number ML053500247], the Division of Waste Management and Environmental Protection (DWMEP) was tasked by Region I to approve site-specific derived concentration guideline levels (DCGLs) for the Hammond Depot site [ML060580629]. Based on a review of background documents provided in the TAR, DWMEP generated requests for additional information transmitted to Region I by letter dated May 18, 2006 [ML061370410], which were transmitted to the licensee, Defense Logistics Agency/Defense National Stockpile Center (DLA/DNSC), by letter dated June 8, 2006 [ML061620001]. DWMEP staff reviewed additional information provided by the licensee in letter dated July 19, 2006 [ML062070231], including results of a characterization survey provided by letter dated September 19, 2006 [ML062710160]; and additional information provided following a November 22, 2006, teleconference between the U.S. Nuclear Regulatory Commission (NRC) and the licensee by letter dated January 12, 2007 [ML070160372], and finds the DCGLs calculated for the Hammond Depot site to be acceptable.

It is important to note that the licensee has provided DCGLs for surficial soil contamination only and that it is not appropriate for DLA/DNSC to apply these DCGLs for known contaminated areas significantly thicker than 15 centimeters. However, the pre-remediation subsurface contamination at Hammond Depot is expected to be fairly limited to an average of 0.3 meters in soil located above a monolithic slag layer that underlies the site, and DLA/DNSC expects to completely remove all significant soil contamination above the slag layer. DLA/DNSC did not provide calculations for elevated region DCGLs; thus, if smaller areas of the site have average concentrations above DCGLs, DLA/DNSC must perform additional remediation or calculate elevated area DCGLs to demonstrate compliance with license termination rule criteria.

Enclosure: Basis for Approval

CONTACT: Cynthia S. Barr, FSME/DWMEP
(301) 415-4015

<u>DISTRIBUTION</u>:
EPPAD r/f RidsRgn1MailCenter

ML070380566

OFFICE	DWMEP:PA	DWMEP:SC	DWMEP:DD
NAME	CBarr	CMcKenney	SFlanders
DATE	02/8/07	02/21/07	02/26/07

OFFICIAL RECORD COPY

BASIS FOR DERIVED CONCENTRATION GUIDELINE LEVELS APPROVAL

In Response to Technical Assistance Request (Region I)
License No. STC-133, Docket No. 040-00341, Control No. 138087
Site-Specific Derived Concentration Guideline Levels Calculation Review
Defense Logistics Agency, Defense National Stockpile Center
Hammond Depot

Cynthia Barr
January 29, 2007

By technical assistance request (TAR) dated April 11, 2006, the Division of Waste Management and Environmental Protection (DWMEP) was tasked by Region I to approve site-specific derived concentration guideline levels (DCGLs) for the Hammond Depot site. The licensee calculated soil DCGLs of 3.4 picocuries/gram (pCi/g) for natural thorium (Th) and 2.8 pCi/g for natural uranium (U); and building DCGLs of 400 disintegrations per minute/100 square centimeters (dpm/100cm^2) for natural Th and 800 dpm/100 cm^2 for natural U[1]. Based on a review of the "Preliminary Site-Specific Derived Concentration Guideline Levels" report (Boerner et al, 2006), the U.S. Nuclear Regulatory Commission (NRC) staff determined that additional information was needed to approve DCGLs for the site. Requests for additional information were generated to address important parameters (see Table 1 and 2 below) and exposure pathways identified during NRC staff's independent review. The primary pathways of exposure for natural Th and U soil contamination are the external gamma and plant ingestion pathways. Additionally, U could also migrate to groundwater and pose a risk through the drinking water pathway. The primary pathway of exposure for a building occupancy scenario is the inhalation pathway for both Th and U decay chains; therefore, parameters related to dilution of air contamination (e.g., building size and air exchange rate), source available for inhalation (e.g., source area, removable fraction, air fraction), source release rate (e.g., release time), and exposure parameters (e.g., indoor time fraction, breathing rate) are most important to peak dose for a building occupancy scenario.

Requests for additional information addressed uncertainties in the hydrogeological conceptual model for the site and the depth of soil contamination for soil DCGLs. Additionally, several key parameters required further justification due to their significance to peak dose.

---

[1]Although the licensee states that DCGLs apply to natural Th and natural U, the DCGL calculations are surrogate analyses where the limits actually apply to Th-232 and U-238 only. The natural Th DCGL is for Th-232 only, not for the sum of Th-232, Th-228 and Th-230 (but includes the contribution from Th-228 and other progeny assumed to be in secular equilibrium). The DCGL for natural U applies to U-238 only and not for the sum of U-238, U-234, and U-235 (but includes the contributions from U-234 and Th-230 assumed to be in secular equilibrium with U-238; and U-235 decay chain members expected to be naturally present at a ratio of 0.05 the U-238 values).

Enclosure

TABLE 1 SENSITIVE RESRAD PARAMETERS			
Radionuclide	**Parameter**	**Radionuclide**	**Parameter**
Thorium	Distribution coefficients for Th and associated decay products	Uranium	Distribution coefficients for U and associated decay products
	External Gamma Shielding Factor		External Gamma Shielding Factor
	Indoor Time Fraction		Indoor Time Fraction
	Thickness of Contamination		Thickness of Contamination
	Plant Transfer Factor for radium (Ra)		Plant Transfer Factor for Ra and lead (Pb)
	Depth of Roots		Depth of Roots

TABLE 2 SENSITIVE RESRAD BUILD PARAMETERS			
Category	**Parameter**	**Category**	**Parameter**
Uncertain Parameters Related to Room Size Assumption	Floor Area	Uncertain Behavioral and Other Physical Parameters (for a given room size)	Removable Fraction
	Room Height		Area of Source
	Building Exchange Rate		Air Fraction
			Release Time
			Breathing Rate
			Indoor Fraction

The following specific issues were addressed by the licensee.

- The licensee did not perform a characterization prior to its submittal of a request for DCGL approval for surficial (15 cm) soil contamination. In the “Radiological Scoping Survey of the Hammond Depot” report (Vitkus, 2005), it was acknowledged that gamma readings from sample holes showed a potential for subsurface contamination within the burn cage area. Therefore, NRC requested additional information (Ullrich, 2006) justifying the assumed depth of contamination of 15 cm (Boerner et al, 2006). Following issuance of requests for additional information, the licensee submitted a characterization report (Pecullan, 2006) that showed significant subsurface contamination primarily in an area located south-southwest of the burn cage and rubble pile over an area of approximately 2600 square meters (m^2). The average depth of contamination was estimated by the licensee to be approximately 0.3 m. The slag sampling results demonstrated that contamination had not penetrated into the underlying slag layer. In its January 2007 response (Pecullan, 2007), the licensee stated that it expects to remove all contaminated soil that overlies the slag layer. Should contaminated soil above the slag layer be completely removed, there should be little concern with the validity of the DCGL assumption concerning the depth of contamination. Final survey results should confirm that contamination is not significantly thicker than 15 cm in any significant area of the site.

- Additional justification for the Decontamination and Decommissioning code (DandD) default external gamma shielding factor used in the RESRAD code was needed. The external pathway is the single-most important pathway for surficial U and Th soil contamination and the DandD default value is lower than the RESRAD default and not specific to a single radionuclide or decay chain. In the initial submittal, the licensee did not specifically address the appropriateness of the DandD default value of 0.55 used in the analysis. The licensee provided additional radionuclide-specific support for its selection of the external gamma shielding factor in its July 19, 2006, submittal (Reilly, 2006). NRC finds this justification adequate.

- The licensee did not use the indoor time fraction recommended in NUREG/CR-5512, Volume 3 for residual soil contamination. The indoor time fraction was changed to 0.66 and a revised DCGL calculation provided for total Th and total U in the licensee’s July 19, 2006, submittal of 2.9 pCi/g and 2.5 pCi/g, respectively.

- Additional justification for the distribution coefficients used in the RESRAD analysis was needed. Section 1.3, page 4 of the DCGL approval request (Boerner et al, 2006), discusses the presence of subsurface soil consisting of high pH industrial slag overlying the fine sand and silt aquifer. Because sorption coefficients for this slag layer were not available, the licensee used generic sorption coefficients recommended for sand provided in the literature (Boerner et al, 2006). It was not clear that these values were reasonable or conservative for all U decay chain members for industrial slag. Because in certain circumstances the predicted dose could be significantly higher (low distribution coefficients for certain radionuclides resulted in breakthrough of contaminates to groundwater within the 1000 year simulation period), NRC requested critical evaluation of the appropriateness of the distribution coefficients selected for industrial slag. In its July 19, 2006, submittal (response to comment 4 [Reilly, 2006]), the licensee requested a decrease to the Th distribution coefficient and an increase to the distribution coefficient for U of 100 liters/kilogram (L/kg) for both constituents. However, other U decay chain series radionuclides (e.g., Ra and Pb) could control the peak dose from the groundwater pathway. Therefore, the licensee provided additional justification for its selection of distribution coefficients for Ra and Pb in its January 12, 2007, submittal (Pecullan, 2007) to address additional comments made by the NRC in the November 22, 2006, teleconference. Although it is still not clear that the Ra distribution coefficient is demonstrably conservative based on a review of literature values for slag (e.g., Pickett et al, 1998; Felmy et al, 2002; Shieldalloy, 2005), use of a higher sand distribution coefficient in the contaminated soil horizon above the slag layer is expected to provide sufficient attenuation capacity to mitigate impacts to groundwater even if lower values for the distribution coefficient are selected for the slag layer and aquifer. Furthermore, the licensee provided a compelling argument that contamination has not significantly penetrated the slag layer based on characterization results. Finally, the licensee also showed that based on pre-remediation ratios of U to Th (and assuming the Th and U contamination is co-located and will remain so after remediation), the contribution of U to the total dose is expected to be less than ten percent providing the licensee with a legitimate argument to invoke the ten percent rule to eliminate U from the final status survey. Therefore, for NRC staff concludes that the licensee's selection of distribution coefficients is considered reasonable for the purposes of the soil DCGL calculation in the absence of site-specific information.

- The licensee did not provide sufficient justification for use of the default inhalation rate for the RESRAD-BUILD DCGL calculations. The default inhalation value recommended in NUREG/CR-5512, Volume 3, is 33.6 cubic meters/day (m^3/day) while the default value of 18 m^3/day in RESARD BUILD was used in the licensee's analysis. The licensee corrected the breathing rate and also noted that the default value for the indoor time fraction should have been more appropriately assigned a value of 0.27 in its July 19, 2006, submittal (comment 6 response, Reilly, 2006). The changes to these parameter values offset one another, and the licensee requested continued use of the building DCGLs it proposed in its original submittal.

  While there is significant uncertainty in the parameters and parameter distributions used to calculate building DCGLs, NRC staff's independent assessment shows the licensee's DCGLs are reasonable and that the licensee attempted to minimize the amount of dilution of air contamination by selecting room sizes that were significantly smaller than the total warehouse area and volume. It is important to note that the floor area is negatively correlated to dose, while competing with the source size which is positively correlated to dose (source size can increase with increasing floor area). A comparison of results for various floor areas and corresponding source areas was made. The higher the floor area, the lower the dose. These results suggest that the increased dilution inherent in a larger room size is of greater magnitude than the increased dose from a larger source area. Therefore, while some of the licensee's selection of parameter values may not be conservative, NRC staff finds that on balance the licensee's analysis is reasonable.

References

Bauer, T.J., and T.J. Vitkus, "Historical Site Assessment of the Hammond Depot, Curtis Bay, Maryland," Environmental Survey and Site Assessment Program, Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee 37831-0117, August, 2005.

Beyeler, W.E., et. al., "Residual Radioactive Contamination from Decommissioning, Parameter Analysis, Draft Report for Comment" NUREG/CR-5512, Volume 3, US NRC, Washington, DC, 20555, October, 1999.

Boerner, A.J., et. al., "Preliminary Site-Specific Derived Concentration Guideline Levels for the Hammond Depot, Hammond, Indiana," Environmental Survey and Site Assessment Program, Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee 37831-0117, January, 2006.

Felmy, A.R., D. Rai, S.A. Hartley, V.L. Legore, "Solubility and Leaching of Radionuclides in Site Decommissioning and Management Plan (SDMP) Slags," Pacific Northwest National Laboratory, Richland, Washington, NUREG/CR-6632 and PNNL-12205, Prepared for Office of Nuclear Regulatory Research, US NRC, NRC Job Code W6409, February 2002.

Pecullan, M.J., "Radiological Characterization Survey, Hammond, License STC-133," Letter to Ms. Ullrich, Rgn I, NRC from M.J. Pecullan, Radiation Safety Officer, Defense Logistics Agency, Defense National Stockpile Center, Fort Belvoir, Virginia, September, 2006.

Pecullan, M.J., "Request for Additional Information Concerning Application for Amendment to License Control Nos. 138087 and 138458," Letter to Ms. Ullrich, Rgn I, NRC from M.J. Pecullan, Radiation Safety Officer, Defense Logistics Agency, Defense National Stockpile Center, Fort Belvoir, Virginia, January, 2007.

Pickett, D.A., J.D. Prikryl, D.R. Turner, J.L. Russell, "Evaluation of Leach Tests for Estimating Release from Slag Sites Subject to Decommissioning–Final Report," Center for Nuclear Waste Regulatory Analyses, San Antonio, Texas, Prepared for US NRC, Contract NRC-02-97-009, April 1998.

Reilly, F.K., "Response to NRC Comments on DNSC/DLA Document 'Preliminary Site-Specific Derived Concentration Guideline Levels for the Hammond Depot, Hammond, Indiana,' Control No. 138087," Letter to Ms. Ullrich, Rgn I, NRC from F.K. Reilly, Director, Directorate of Environmental Management and Safety, Defense Logistics Agency, Defense National Stockpile Center, Fort Belvoir, Virginia, July, 2006.

Shieldalloy Metallurgical Corporation, "Decommissioning Plan for the Newfiled Facility," Shieldalloy Metallurgical Corporation, 35 South West Boulevard, Newfield, New Jersey 08344, Report No. 94005/G-28247 (Rev. 1), October 21, 2005.

Ullrich, B., "Defense Logistics Agency, Request for Additional Information Concerning Application for Amendment to License, Control No. 138087," Letter to F. Reilly, Director, Directorate of Environmental Management, Defense Logistics Agency, Defense National Stockpile from B. Ullrich, Senior Health Physicist, Region I, NRC, King of Prussia, Pennsylvania, June, 2006.

Vitkus, T.J., “Radiological Scoping Survey of the Hammond Depot, Hammond, Indiana,” Environmental Survey and Site Assessment Program, Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee 37831-0117, December, 2005.