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January 16, 2007

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SUBJECT: NOTICE OF APPROVAL WITH DIRECTION
INVESTIGATION REPORT FOR MATERIAL DISPOSAL AREA T,
CONSOLIDATED UNIT 21-016(a)-99, AT TECHNICAL AREA 21
LOS ALAMOS NATIONAL LABORATORY
EPA ID # NM0890010515
HWB-LANL-06-017

Dear Messrs. Gregory and McInroy:

The New Mexico Environment Department (NMED) is in receipt of the United States Department of Energy (DOE) and the Los Alamos National Security (LANS), LLC's (collectively, the Permittees) *Investigation Report for Material Disposal Area T, Consolidated Unit 21-016(a)-99, at Technical Area 21* (Report), dated September 22, 2006 and referenced by LA-UR-06-6506/EP2006-0779. Pursuant to Section III.M.2 of the March 1, 2005 Order on Consent (Order), NMED issues this Approval with Direction for the subject document that includes the following comments and direction to the Permittees. Direction and required actions follow the comments.



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General Comments

- 1) The Permittees state throughout the Report that the DP Canyon slope is not technically part of Consolidated Unit 21-016(a)-99, but could have been directly impacted by site operations. The Permittees are required by the Order and subsequent NMED-approved Work Plans to determine the extent of contaminant releases from SWMUs and AOCs. Because the DP Canyon slope may have been impacted by releases from the absorption beds or other activities at MDA-T, the slope shall be included as part of the Phase II Work Plan. Perhaps most importantly, NMED cannot evaluate a remedy selection without a reasonable determination of the extent of vapor phase contamination. See Required Action #1.
- 2) Sections 3.1.3, 3.1.4, and 3.1.5, on pages 12, 13, and 14 describe the number, depths, and locations of boreholes drilled within the three discrete areas of investigation comprising MDA T (beds/shafts/RWSA, bldg. 21-035, bldg. 21-257). In these sections, the boreholes are referred to by their borehole ID (i.e., BH-37).

Section 4.3, Exploratory Drilling and Sampling, pages 25 and 26, also describes the number, depths, and locations of boreholes, but the boreholes are referred to by their location ID (i.e., 21-25361) in this section.

Table 4.3-1 on page 93 lists the borehole location IDs and their respective depths. To facilitate cross-referencing of borehole ID, location ID, and depth, the Permittees should revise all future submittals accordingly.

Specific Comments

- 1) **Table of Contents, page xi:**

NMED comment: The page numbers for the Tables in the Table of Contents and the Report are off by 73. For example, Table 6.2-5, Organic COPCs for Building 21-035, is listed as appearing on page 110. Instead, it appears in the Report on page 183.

- 2) **Section 3.1.4 Building 21-035, page 14, paragraphs 1 and 3:**

NMED comment: The first sentences of paragraphs 1 and 3 refer to BH-20, and its location near former building 21-035. It appears these sentences should be referring to BH-25, rather than BH-20.

- 3) **Section 3.3.5 Pore Gas Sampling and Downhole Geophysics, page 18, paragraph 2:**

Permittees' statement: "All subsequent samples were collected after removal of the augers using a straddle packer system that isolates a 2-ft interval within the borehole. When the augers were removed, approximately 50 ft of slough was left at the bottom of

each borehole. Because of this sloughing, the second round of pore gas samples collected were started from the second interval of the previous [total depth] TD.”

NMED comment: The sloughing prevented the Permittees from taking the second round of pore gas samples at the TD. NMED does not consider sloughing to be an acceptable rationale for not collecting a pore gas sample at TD. See Required Action #3.

4) Section 4.3 Exploratory Drilling and Sampling, page 26, paragraph 2:

Permittees' statement: “Seven borings, ...and one at location 21-25390 (drilled to 103 ft), were installed around Building 21-257 for initial characterization purposes...”

NMED comment: It appears that the location referred to in the text should be location 21-25389, not 21-25390.

5) Section 4.3.4 Pore Gas Sampling, page 28, paragraph 1:

Permittees' statement: “Two rounds of pore gas sampling were completed on three separate boreholes at locations 21-25262, 21-25263, and 21-25234. Table 4.3-6 lists the 2005-2006 pore gas samples collected. Six different intervals were sampled at location 21-25262 during the first round, and five intervals were sampled at locations 21-25263 and 21-25264. Samples were collected from the same intervals during the second round, except for the TD sample.”

NMED comment: The third borehole location referred to in the first sentence is 21-25264, not 21-25234. In addition, there is some confusion about the number of sampling rounds and respective dates for location 21-25263. Table 4.3-6 (page 101) lists only a single round of sampling for location 21-25263, completed in April 2006. Figure 6.5-2 (page 70) shows two rounds of sampling were completed, one in April 2006 and one in May 2006. The cited text on page 28 of the Report implies that two discrete rounds of sampling were completed for each of the three boreholes. See Required Action # 4.

6) Section 4.3.6 Exploratory Borehole Abandonment, page 29, paragraph 1:

Permittees' statement: “A total of 24 boreholes have been plugged and abandoned; the remaining boreholes will be abandoned upon completion of all pore gas sampling, if undertaken, and when all results have been determined to satisfy the investigation objectives.”

NMED comment: The Permittees do not specify which boreholes remain open and for what purposes. See Required Action #5.

7) Section 6.2.1 Absorption Beds, Disposal Shafts, and the RWSA, page 37, paragraph 3:

Permittees' statement: "The [historical] data showed that activities decreased both laterally and vertically from the locations of highest activity, indicating that the nature and extent of these radionuclides were fully defined. The maximum detected activities for each of these radionuclides were substantially lower in the 2005-2006 data;"

NMED comment: The radionuclides referred to have long half-lives and are not particularly mobile in tuff. The maximum detected activities may be substantially lower in the 2005-2006 data set because the sample locations were further from the area of contamination. Such declarative statements are meaningless without supportive rationale, leaving the reader to conclude that the contaminants have migrated through the subsurface or are simply dissipating over time.

8) Section 6.5 Nature and Extent of Subsurface Vapor COPCs at Consolidated Unit 21-016(a)-99, page 41:

NMED comment: The Report states that the nature and extent of tritium in pore gas has been defined. Figure I-4.2-4 (page I-62) shows a decreasing trend for tritium at location 21-25264 during both pore gas sampling rounds. The same figure shows an increasing trend in tritium for location 21-25262. Location 21-25263 shows a decreasing trend for the first sampling round, then an increase in concentration with depth during the following sampling round at that location.

The following statement from the Report (Section 6.5, p. 41, paragraph 3) is a more accurate description of the data: "As with the VOCs, the general trend of tritium in subsurface vapor is a decrease in activity at the TD of the boreholes; again, there are no clear trends of consistently decreasing activity from the top of the borehole, or from a horizon of highest activity, to the bottom of the boreholes. In addition, tritium shows inconsistent temporal trends between round 1 and round 2 analyses."

Similarly, the concentrations of VOCs in borehole 21-25263 increased at the TD of the borehole during the first round of sampling. The Permittees did not collect a sample at the TD during the second round because of sloughing in the borehole. The Permittees state that there are "no clear trends of consistently decreasing concentrations," and "most chemicals show inconsistent temporal trends between round 1 and round 2 analyses." The nature and extent of contaminated pore gas has therefore not been defined.

9) Section 7.2 Risk Assessment Summary, page 43, paragraph 1:

Permittees' statement: "The potential risks associated with COPCs were assessed under construction worker and industrial scenarios for the consolidated unit; the site was also assessed under a residential scenario for informational purposes only."

NMED comment: The perceived intent of the residential analysis is to determine whether land use controls, limiting the site to industrial use only, are necessary. The

phrase "for informational purposes only" should be revised to indicate that residential analysis is included to establish whether or not land use controls and use restrictions are warranted. NMED asks that the Permittees not use this language in future submittals.

10) Section 7.2.1, Human Health Risk Screening Assessments, page 44, paragraph 6:

Permittees' statement: "Based on the risk screening assessments, there is no potential for unacceptable dose or risk to human health for the decision scenarios. However, the dose for the construction worker indicates that the potential for exposure must be assessed, and that precautions must be taken, during D&D activities in the vicinity of Building 21-257 to protect workers from elevated cesium-137 levels."

NMED comment: The Permittees have provided evidence to show that there is a potential for unacceptable dose or risk to human health for the decision scenarios. Under the construction worker scenario, the hazard index (HI) for non-carcinogenic contaminants is approximately 3.5 and the total cancer risk from radionuclides is approximately 4×10^{-3} . Under the industrial scenario, the total cancer risk from radionuclides is approximately 9×10^{-5} . These values are above NMED's selected target risk of 1×10^{-5} and HI of one. If construction activities (other than D&D) are going to occur in the future at this consolidated unit, the Permittees will be required to perform corrective actions to eliminate or decrease the risk to construction workers. See Required Action #2.

11) Section I-3.1.1 Inorganic COPCs in Soil and Fill, page I-4, paragraph 2:

Permittees' statement: "The complete list of COPCs for soil and fill is presented in Table I-2.0-1. The frequencies of inorganic chemicals in soils and fill above BVs are presented in Table I-3.1-1. Analytical results are presented in Table I-3.1-2."

NMED comment: Table I-2.0-1 is presented out of sequence in Appendix I. It should appear before Table I-3.1-1, but instead appears after Table I-3.1-4.

12) Section I-3.1.3 Inorganic COPCs in Tuff, page I-4:

NMED comment: The Permittees eliminated calcium, magnesium and potassium as COPCs because they are essential nutrients and reference the 1989 document entitled "Risk Assessment Guidance for Superfund, Human Health Evaluation Manual Part A." While studies have indicated that calcium and potassium are relatively non-toxic, other studies have shown there to be an upper intake limit for magnesium.

The United States Department of Agriculture Food Safety and Inspection Service and the National Academy of Science Food and Nutrition Board have developed upper intake levels (ULs), which should be applied in determining a soil screening level (SSL) that, in turn, should be used in assessing essential nutrients toxicity. If site concentrations of

magnesium are below this SSL, then the concentrations may be eliminated from further consideration in the risk assessment.

The referenced guidance states that “[p]rior to eliminating such chemicals from the risk assessment, they must be shown to be present at levels that are not associated with adverse health effects...Literature values concerning acceptable dietary levels may conflict and may change fairly often as new studies are conducted...In general, only essential nutrients present at low concentrations (i.e., only slightly elevated above background) should be eliminated to help ensure that chemicals present at potentially toxic concentrations are evaluated in the quantitative risk assessment.”

The maximum detected value for magnesium within the 10 ft depth considered for the construction worker scenario is 4,200 ppm (Table I-3.1.4, page I-118). See Required Action #6.

13) Section I-4.1.2.3 Radionuclides, page I-17, paragraph 2:

NMED Comment: Americium-241 is detected in the shallow subsurface in several samples around the former building 21-035. The highest detected concentration (19,982 pCi/g) is in the 5-10 ft interval at location 21-02547. The samples surrounding this location have concentrations of 208 pCi/g (21-02546), 668 pCi/g (21-02609), and 1,730 pCi/g (21-02610). These detections are found in the top 7.5 ft. The second highest detected concentration (19,500 pCi/g) is in the 10-12.5 ft interval at location 21-02541. The samples surrounding this location have detected concentrations between 2.68 pCi/g and 1,120 pCi/g. These detections are found in the top 7.5 ft.

The Permittees conclude that the extent of Am-241 has been defined, yet of the locations discussed above, only 21-02541 has been sampled at more than a single depth interval. The Permittees have not determined that the highest reported detections are, indeed, the maximum detected concentrations. The Permittees concede that “[l]ocations 21-02547 and 21-02541 lack deeper samples to constrain the vertical extent.” The Permittees are basing conclusions on an incomplete data set. See Required Action #7.

14) Section I-4.1.2.3 Radionuclides, page I-17, paragraph 2:

Permittees’ statement: “The highest plutonium-238 activity (9.13 pCi/g) occurred in a surface sample collected in the middle of the sampling area location (21-25272). Activity decreased to 3.8 pCi/g in the 0.5-1.0 ft sample interval at the location. In general, plutonium-238 decreased in activity with depth in the slope drainage and outwardly from the center of the slope. The nature and extent of plutonium-238 have been defined.”

NMED Comment: The Permittees have not defined extent of plutonium-238 contamination relative to background values. Half the sample locations are surface

samples only. The other half of the sample locations are two depths only: surface and 0.5-1 ft. See Required Action #8.

15) Executive Summary, Appendix J, Risk Assessments, page J-iii, paragraph 5:

Permittees' statement: "The results of the human health screening assessments indicate no potential unacceptable risk, hazard, or dose to an industrial worker within the consolidated unit and a recreational user on the DP Canyon slope. These two scenarios are the decision scenarios for this investigation and indicate that no further investigation or corrective action is necessary."

NMED comment: If no further investigation or corrective action were deemed necessary, then a CME would not be recommended as the next step in the investigation. The results of the risk assessments consider current assumptions only. Control of the known sources of contamination and the potential for continued migration of mobile contaminants will be addressed in a CME. In addition, the construction worker scenario will be the decision scenario for any planned D&D construction activities in the vicinity of building 21-257. Currently, results of the human health screening assessment exceed DOE's target dose limit for the construction worker and the HIs for non-radiological constituents.

16) Section J-2.2, Historical Analytical Data, page J-3, paragraph 1:

Permittees' statement: "The Phase I RFI data of acceptable quality based on the data quality assessment presented in Appendix B of this report were used in the human and ecological risk screening evaluations."

NMED comment: Appendix B of the Report is a glossary. Appendix G contains the data quality assessment.

17) Section J-3.3, Human Health Receptors and Pathways, page J-7, paragraph 2:

Permittees' statement: "The potentially complete pathways for human exposure to surface soil and tuff are dermal contact, inhalation of vapors and/or fugitive dust, incidental soil ingestion, and external irradiation. Exposure pathways for pore gas are incomplete."

NMED comment: An evaluation of pore gas data with respect to the potential for migration to groundwater was provided in the assessment. However, justification for exclusion of the evaluation of the vapor intrusion pathway was not provided. Under an industrial scenario, the vapor migration into indoor air pathway should be identified as a complete exposure route and evaluated using a vapor intrusion model, such as the Johnson and Ettinger model. For future submittals, the Permittees should provide additional lines of evidence for determining that the pore gas data are not applicable to the risk assessment as a source for indirect exposure via inhalation; otherwise, the data should be used in a quantitative evaluation of this pathway.

18) Table J-4.1-4, Consolidated Unit 21-016(a)-99, Toxicity Equivalency for Dioxin, page J-58:

NMED comment: NMED notes that the toxicity equivalency factors (TEF) applied were based upon the World Health Organization's (WHO) 1998 data. WHO has recently re-evaluated the dioxin/furan TEFs and has recently released revised TEFs (*The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds* ToxSci Advance Access published July 7, 2006). The use of the more recent TEFs does not result in a significant difference in overall risks for dioxins/furans and actually is reflective of a slightly lower risk (revised risk 3.78E-07 versus LANL calculated risk 3.97E-07). At this time, no revision is necessary, but the Permittees are asked to note these updated TEFs for future assessments.

19) Table J-4.1-7, Consolidated Unit 21-016(a)-99, Residential Radionuclide SAL Comparisons, page J-59:

NMED comment: The calculated residential dose for Consolidated Unit 21-016(a)-99 is several hundred times the target dose limit, indicating that controls should be in place to track the land use and ensure that land is used only for non-intrusive industrial use. In the event that land use changes, for example to construction and/or residential use, additional characterization, remediation, and risk assessment would be required, as described in Section III.Y of the Order.

Required Actions

- 1) The Permittees must submit characterization data from additional investigative work at MDA T. This additional work must be contained in a Phase II Work Plan for the site, submitted to NMED for its review and acceptance. The Permittees must include a proposed date for completion for the required Phase II activities in the Work Plan. The Phase II Work Plan must incorporate the following elements:
 - A) Sample Locations: The Permittees must resample (continuing to appropriate reportable depths) the locations for which contaminants, (e.g., Pu-239 and Am-241), increase with depth; example locations are 21-02568 and 21-01862. In addition, because surface conditions may have changed due to recent storm runoff and the December 2006 water main leaks at TA-21, the Permittees must resample those locations on the DP Canyon slope identified as having the three highest surface concentrations of Pu-239: 21-01642, 21-25274, and 21-25272; and in addition, investigate any new sediment deposits.

NMED notes that surface samples were only collected at approximately half the locations on the DP Canyon slope, limiting any discussion of vertical extent at those

locations. The Permittees must sample locations at a minimum of three depths where possible, including one at the soil/tuff interface.

- B) Sampling Methods/Intervals: Samples may be collected using spade-and-scoop or hand-auger methods to a depth of four feet. The Permittees must collect a minimum of three samples from each location, including one sample at the soil/tuff interface, to determine vertical extent.
 - C) Analytical Suites: Samples should be analyzed for Am-241, isotopic plutonium by alpha spectroscopy, nitrate, and perchlorate.
- 2) Decontamination and decommissioning of building 21-257 is scheduled for next year (Report, page 5). NMED notes that the data set evaluated for human health risk under the construction worker scenario in the vicinity of building 21-257 significantly exceeds (greater than 25 times) DOE's target dose limit of 15 mrem/yr. If a screening level risk assessment were to be applied to the entire consolidated unit under the construction worker scenario, the potential total estimated dose to the construction worker would be greater than 9,000 mrem/yr for the consolidated unit vs. 397 mrem/yr for the area around building 21-257. In addition to the dose calculation under the construction scenario, the Permittees must also provide the human health risk assessment and cite appropriate references regarding the precautions that will be taken during D&D to protect construction workers from receiving unacceptable dose levels in the Phase II Investigation Report.
 - 3) The Permittees must remove the slough from the boreholes and collect pore-gas samples from the TD, similar to the additional work performed at MDAs U and V. The samples must be analyzed for both tritium and VOCs and included in the Phase II Investigation Report.
 - 4) The Permittees must clarify the dates and depths of pore gas sampling for each of the three boreholes described in the Report, and submit this information with the Phase II Work Plan.
 - 5) The Permittees must identify which boreholes remain open, and which should remain open until such time as NMED determines a need for additional vapor monitoring. The Permittees must, in the interim, install a packer to limit vapor migration in the borehole until further sampling is completed. This information must be included in the Phase II Work Plan.
 - 6) The Permittees must calculate an SSL to assess magnesium toxicity, so that a quantitative approach can be developed for evaluating essential nutrients above background for risk

assessment purposes. This information must be included in the Phase II Investigation Report.

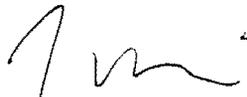
- 7) The Permittees must resample the following borehole locations (to be proposed in the Phase II Investigation Work Plan) at adequate depths to determine the vertical extent of Am-241 in the subsurface:

21-02547
21-02546
21-02541
21-02543
21-02544
21-02539
21-02609
21-02610

- 8) The Permittees must resample at appropriate depths and locations (to be proposed in the Phase II Work Plan) to adequately determine the vertical and lateral extent of Pu-238 contamination relative to background.
- 9) The Permittees must submit a Phase II Investigation Report that presents the results of the newly acquired data and provide revised versions of any conclusions that change as a result of the supplemental investigation (e.g., risk assessment).

The Permittees must submit the Phase II Work Plan within thirty (30) days of your receipt of this Notice. If you have any questions, please contact Mark Cummings of my staff at (505) 476-6043.

Sincerely,



James P. Bearzi
Chief
Hazardous Waste Bureau

cc: M. Cummings, NMED HWB
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