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Date: October 15, 2007
Refer To: EP2007-0630

James P. Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of Corrective Measures Evaluation Plan for Material Disposal Area G at Technical Area 54, Revision 2

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the "Corrective Measures Evaluation Plan for Material Disposal Area G at Technical Area 54, Revision 2." The revised plan was submitted in July 2007 and has been updated to address New Mexico Environment Department's comments 1, 2, and 3 in letter HWB-LANL-07-022, dated September 12, 2007.

The conceptual site model for Material Disposal Area (MDA) G has been revised and expanded to address concerns identified in NMED's comments and to better explain Los Alamos National Laboratory's current understanding of flow and transport at the site. The revised conceptual site model is presented in the revised corrective measures evaluation (CME) plan. Responses to specific technical issues identified in NMED's comments are provided below.

a) **Monitoring well network evaluation for TA-54:** The MDA G CME plan is strongly tied to the "TA-54 Well Evaluation and Network Recommendations" report, which was submitted to the NMED on October 5, 2007. This report recommends adding five regional and two intermediate-zone monitoring wells (in Pajarito Canyon) to monitor TA-54, including MDAs G, L, and H. These additional monitoring wells will bolster the Laboratory's ability to detect any contaminants that might migrate from MDA G. Text has been added to this revision of CME plan to relate the plan to the planned updated monitoring network.

b) **Peak arrival time to the regional aquifer:** NMED's notice of deficiency (NOD) states that the appendix describing the MDA G groundwater pathway indicates peak breakthrough to the regional aquifer in 750 yr. However, this arrival time is based on the highest

infiltration rate of 10 mm/yr from a probability distribution. The highest infiltration values are assigned very low probability in the MDA G performance assessment (PA). A more reasonable value to look at for infiltration through the proposed vegetated cover would be on the order of 1 mm/yr or less. At these rates, our estimates of peak arrival are closer to 10,000 yr. The proposed sampling of monitoring wells will supply data to test this hypothesis.

c) **Volatile organic compound transport versus liquid-phase transport:** We agree that the analysis presented in the MDA G PA is for liquid-phase transport and does not include vapor transport. We acknowledge that currently uncertainties are associated with transport of volatile organic compounds (VOCs) from the bottom of the Guaje Pumice Bed to the regional aquifer. We believe that the current plans to implement soil vapor extraction (SVE) at MDA G will help greatly in reducing potential negative effects of VOCs at the site because the SVE system will remove the vapor-phase VOC source from within the mesa. Removing the source should resolve the issue. Furthermore, the current plan to install more groundwater monitoring wells around MDA G should allow us to sample the water table and any perched intermediate zones intercepted in Pajarito Canyon to determine if any VOC from MDA G has reached the water table or a potential intermediate perched zone in the canyon. Additionally, the CME plan has been revised to include the results of analysis of transport of water in equilibrium with VOC vapors from the top of the basalt into the regional aquifer. In this analytical calculation, the ratio of the highest measured pore-gas VOC and tritium concentrations at the top of the Cerros del Rio basalt and the groundwater screening criteria were used to calculate dilution ratios necessary to achieve compliance with groundwater screening criteria. These values were compared to dilution ratios obtained from dividing the volume flux of infiltration through the disposal area cover by the volume flux of horizontal groundwater underflow beneath the site. If the groundwater dilution ratios are greater than the concentration ratios required to meet screening criteria, concentrations in groundwater will be below the screening criteria.

The analytical ratio calculation is summarized in the revised CME plan and is presented in Appendix E. The results indicate that groundwater screening criteria in the regional aquifer will not be exceeded for all VOCs and tritium with cover fluxes of 1 mm/yr. Dilution ratios are 10 to 100 times those needed to meet screening criteria for aquifer conductivities ranging from 1E-3 and 1E-2 cm/s, respectively. Maintenance of the cover will ensure that the cover flux is never less than 1 mm/yr for the performance period.

d) **Pooled water at the top of the basalt:** The NOD states that the appendix describing the MDA G groundwater pathway indicates that water is pooled at the interface between the Guaje Pumice Bed and the basalt. No occurrences of pooled water on top of the Cerros del Rio basalt have been observed beneath the mesa at MDA G, including in the five boreholes advanced into the top of the basalt during 2007. Furthermore, simulations in a 2005 Stauffer report, cited in the CME plan, show that although there are increased saturations at the pumice/basalt interface resulting from changes in material properties, even at the highest infiltration rate of 10 mm/yr, the maximum simulated saturation at the interface is 70% and

does not lead to ponding. Measured water contents from recent boreholes around MDA G show that the volumetric moisture content of this horizon is in the range of 10% to 20%. Assuming that the porosity of the Guaje Pumice Bed is 66%, these measurements correspond to a saturation of 15% to 30%. Based on the simulations in the MDA G PA, these saturations indicate equilibrium with a downward liquid flux of less than 1 mm/yr. However, identifying perched zones will be an important goal during the drilling of the five new groundwater monitoring wells.

e) **Lateral transport along the top of the basalt toward Pajarito Canyon:** We agree that the dip of the top of the basalt towards Pajarito Canyon may play a role in lateral transport if significant water saturations are found on this interface. However, measurements from recent boreholes show that saturations along this interface are very low (15% to 30%). Liquid transport is controlled by the relative permeability of the water in unsaturated rock, and relative permeability decreases significantly at low percent saturation. In addition, the unsaturated hydraulic gradient is vertically downward. Thus, our current conceptual model for transport beneath MDA G does not include a significant component of lateral transport at the top of the basalt.

f) **Worst-case scenario:** NMED's comment identifies rapid transport of VOCs in the liquid phase through the basalt to the regional aquifer as a worst-case scenario and indicates that this worst-case scenario is likely to occur. The Laboratory agrees that this mode of transport constitutes a worst-case scenario, but based on the information provided above, this scenario is not likely. The evaluation of alternatives in the CME report should be based on the most likely scenario, not the worst case, but should provide for contingencies in the event that site conditions change, resulting in the worst-case conditions. There is no field observation or modeled prediction of water perching on top of the basalt beneath MDA G.

Comment #2:

Position of the regional water table: We agree with NMED's comment that the location of the water table in the conceptual model figure is incorrect. The figure was out of date and has been revised to show the water table location occurring in the Cerros del Rio basalt. Also, as part of the monitoring well discussion, a figure showing the most recent geologic interpretation of the subsurface at MDA G has been added to the revised work plan.

Comment #3:

SVE pilot test: The work plan for the SVE pilot test at MDA G will be submitted to NMED on October 25, 2007. The points NMED has made in its comments will be incorporated into the work plan. Especially important will be the measurements of downhole air permeability at MDA G, because the current measurements are from nearly a kilometer away at MDA L. We are also interested in determining the dual continuum effects, whether they result from fracture matrix interactions or from the presence of lower permeability layers in the tuff. By correctly designing the test, we should be able to answer these questions and thus have a defensible model for predicting long-term VOC plume behavior and its likely response to SVE. The work plan will evaluate control of tritium in off-gas emissions.

If you have any questions, please contact John Hopkins at (505) 667-9551 (johnhopkins@lanl.gov) or Frank Bosiljevac at (505) 845-5746 (fbosiljevac@doeal.gov).

Sincerely,

Susan G. Stiger, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

SGS/DRG/GLD/JKH/:sm

Enclosures: 1) Two hard copies with electronic files - "Corrective Measures Evaluation Plan for Material Disposal Area G at Technical Area 54, Revision 2" (EP2007-0630)

Cy: (w/enc.)
Neil Weber, San Ildefonso Pueblo
Frank Bosiljevac, DOE-LASO, MS A316
John Hopkins, EP-CAP, MS M992
EP-CAP File, MS M992
RPF, MS M707 (with two CDs)
Public Reading Room, MS M992

Cy: (Letter and CD only)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-OB, White Rock, NM
Peggy Reneau, EP-ERSS, MS M992

Cy: (w/o enc.)
Tom Skibitski, NMED-OB, Santa Fe, NM
Bonita Eichorst, DOE-LASO (date-stamped letter emailed)
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