Response to the Notice of Disapproval for the Corrective Measures Evaluation Report for Material Disposal Area H, Solid Waste Management Unit 54-004, Los Alamos National Laboratory, EPA ID No. NM0890010515, HWB-LANL-10-100, Dated April 15, 2011

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) comments are included verbatim. The comments are divided into general and specific categories, as presented in the notice of disapproval. Los Alamos National Laboratory's (LANL's or the Laboratory's) responses follow each NMED comment. This response contains data on radioactive materials, including source, special nuclear, and byproduct material. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with U.S. Department of Energy policy.

GENERAL COMMENTS

NMED Comment

1. Technologies versus Alternatives

The concept of a remediation technology versus a remedy alternative is an overarching issue in this version of the CME. Items 10 and 12 of Section VII.D.2 of the 2005 Compliance Order on Consent (Order) state that the Report shall include, respectively:

- *An identification and description of a range of remedy alternatives, and*
- *A detailed evaluation and rating of each of the remedy alternatives, applying the criteria set forth in Section VII.D.4.*

The Permittees have instead provided an identification of a wide range of technologies, many of which are not applicable to MDA H, and have evaluated and rated these technologies against the criteria in Section VII.D.4 of the Order. This is not an effective strategy to ensure the best remedies are selected and does not comply with the requirements of the Order.

A remedy alternative typically includes a combination of various remediation technologies whose combined application will meet the requirements of the criteria set forth in Section VII.D.4. While the remedy alternative may rate highly against these criteria, the individual technologies may rate poorly on their own. For example, evaluating and rating a biotic barrier as a remedy alternative instead of as a component of a cover system is not appropriate. The biotic barrier on its own will rate poorly against the criteria, while an engineered cover system that includes a biotic barrier will likely rate highly.

In Section 6.2 (Screening of Technologies), the Permittees include a number of technologies that are not appropriate for MDA H. While it is important to review all viable technologies against site specific criteria, it is not necessary or appropriate to include technologies in the screening that are specific to situations that are not relevant to MDA H. For example, electrokinetic and electroacoustic soil treatment technologies are not applicable to MDA H because they are specific to the treatment of soils, which are of minimal concern at MDA H. Section 6.1 of the Report states, "Based upon the potentially reactive nature of some of the waste, as summarized in Appendix C, many available

technologies normally considered for remediation of similar shafts fail to adequately meet the remedial action objectives as defined in section 4.7." Following this statement, in Section 6.2, the Permittees include every technology available. These technologies should not be considered in the screening process or included as a part of any remedy alternative. A large amount of effort was spent describing and eliminating 28 different technologies in the screening process. The Consent Order does not require a "laundry list" of all remedial technologies; it simply requires consideration of a range of viable remedy alternatives that are applicable to the site being addressed.

In addition, the Permittees are required to carry through the evaluation process both a "no action" alternative and a "complete removal" alternative. While the "no action" alternative was carried through in the Report, the "complete removal" alternative was dropped in the screening process.

Revise the Report to remove technologies from the screening process that are not applicable to MDA H. Develop remedy alternatives that are applicable to MDA H, and then evaluate and rate these alternatives against the criteria set forth in Section VII.D.4 of the Order. By addressing this overarching issue, the Permittees may minimize the need to address many of the more detailed revision comments herein. Also, carry both a "no action" alternative and a "complete removal" alternative through the evaluation process.

LANL Response

1. The corrective measures evaluation (CME) report has been revised to remove technologies that are not applicable to Material Disposal Area (MDA) H (section 6). Remedy alternatives applicable to MDA H have been developed, evaluated, and rated against the criteria set forth in Section VII.D.4 of the Compliance Order on Consent (the Consent Order) (sections 7 through 9 of the CME). These revisions, based on NMED's comments, have significantly impacted sections 6 through 10 of the report. Additionally, these overarching changes address many of NMED's other comments.

NMED Comment

2. General Lack of Detail

The Report lacks sufficient justification and detail in design that would allow NMED to select and defend a suitable remedy, particularly in Sections 6 through 10 and their related figures and tables. Specific reasoning and rationale in the screening and evaluation of alternatives, and explanations regarding the cost estimates and rankings given in each category of the evaluation are lacking. It is important to provide a basis for all assertions, estimates, and/or assumptions, including specific detail regarding how each alternative will meet the criteria in the Order.

Examples of sections lacking detail include, but are not limited to:

a. In Section 6.2.2.3 (Physical Treatment Technologies, Electroacoustic Treatment), the Permittees state, "In situ electroacoustic soil decontamination is an emerging technology used to decontaminate soils containing organic chemicals." This technology does not appear in the FRTR listing of in situ physical/chemical technologies and it is not defined or described in the text. Although this technology is not appropriate to include in the screening for MDA H (See Comment 1), the technology must be defined and explained in considerably more detail if it is retained.

b. In Section 7.3.5 (Technology S-3c: Construction of a Biotic Barrier), the Permittees state that, "[a] preliminary design concept includes a 1-ft thick layer of cobbles with a minimum 6 in. diameter."

No design basis is provided for the biotic barrier. This is especially important as it relates to the cover thickness, which is the primary driver of both effectiveness and cost.

c. *In Section 7.3.5.1 (Protection of Human Health and the Environment), the Permittees state that "Institutional controls will be implemented to provide access controls, thereby restricting human exposure through excavation. This technology does not prevent infiltration of moisture and subsequent disruption/dispersal of waste. This technology is not protective of human health and the environment." This description appears to contradict the MDA L and MDA G CMEs which state that "[t]his technology is protective of human health and the environment."*

Provide further detail regarding the reasoning and rationale in the screening and evaluation of alternatives and provide explanations regarding the cost estimates and rankings given in each category of the evaluation. Revise the Report to provide a basis for all assertions, estimates, and/or assumptions, including specific detail regarding how each alternative will meet the criteria in the Order.

LANL Response

2. As noted in the Laboratory's response to General Comment 1, sections 6 through 10 of the report have been revised to include additional justification and detail for each alternative. Additional reasoning and rationale in the technology screening, alternative evaluation, and alternative ranking process have also been provided. Additionally, cost estimates and assumptions for each alternative have been revised for clarity.

NMED Comment

3. Groundwater

Through approval of both the MDA H RCRA Facility Investigation (RFI) Report and Addendum to the RFI Report (April 11, 2003), and review of subsequent vapor monitoring, well installations and upgrades, and in accordance with Section IV.C.1.d of the Order, NMED determined that the Permittees have adequately characterized contamination in the vadose zone at MDA H. While NMED recognizes that that Permittees have recently installed additions to the monitoring well network at Technical Area (TA) 54, the Permittees have not completed characterization of potential groundwater contamination at MDA H. It is crucial that the CME process for waste sites at TA-54 include an accurate description of the groundwater conditions (see Sections VII.D.2 and XI.F.6.b of the Order). This involves presentation of a minimum of four quarters of groundwater data from all existing wells located in the vicinity of TA-54, in addition to other items. (e.g., NMED's September 15, 2010 letter to the Permittees (RE: Clarification of Groundwater Data Requirements [for] Corrective Measures Evaluation Reports (CMEs) at Technical Area 54)). NMED expects that four quarters of monitoring data will be presented by the time it issues its Statement of Basis for its proposed remedy in November 2011.

Assertions claiming an average travel time of several hundred to several thousand years for waterborne contaminants from the surface to the regional aquifer, based on the study by Stauffer et al. 2005, are contradicted by the presence of LANL-generated contaminants in the regional aquifer. These theoretical modeling results provide little value to the remedy selection process. Such references should be removed.

When evaluating the nature and extent of groundwater contamination at MDA H, apply screening protocols implemented to all wells, both downgradient and upgradient, that form the groundwater monitoring network specific to MDA H.

It is not specified in the Report whether or not the water-quality data screened to evaluate the presence of contaminants in groundwater was obtained by contract laboratories, on-site laboratories, or both. State the origin of water-quality data in relevant tables and text. Include the data produced by both contract and on-site laboratories, if not done so already, in the Report.

Update the Report with the latest information obtained from the MDA H groundwater monitoring network, including but not limited to water level measurements, pumping test results, water-quality data, geology and stratigraphy, and other information obtained since this version of the Report. Update relevant text, tables, and figures, including water-table and structure-contour maps, and geologic cross-sections.

LANL Response

3. The CME report and Appendix D were updated to summarize additional groundwater chemistry data that have been collected and analyzed since the previous CME. This analysis includes both upgradient and downgradient wells, including wells R-37, R-40, R-40i, and R-52. In addition, the Laboratory updated the CME by using data from all Technical Area 54 (TA-54) wells to describe the site's hydrogeologic conditions in Appendix E, including additional geologic cross-sections. Additional information was also added concerning the origin of the water-quality data. The Laboratory will continue to collect and analyze groundwater samples from the TA-54 wells and will collect a minimum of four samples from each well in November 2011.

   Text has been added to sections 2.3.4 and 4 to clarify that the predicted long travel times apply to contaminants that are dissolved in pore water.

NMED Comment

4. Screening versus Evaluation

The Permittees have not distinguished between "screening" and "evaluation" in the current Report; "screening" should be used to reduce the number of items carried forward for further consideration, while the numerical ranking of alternatives is an "evaluation."

For example, in Sections 8.3 (Screening of Technologies) and 8.3.4 (Screening Summary), the Permittees incorrectly refer to the process of "evaluation" as "screening." Screening against the Consent Order threshold criteria was performed previously in Section 7. Table 8.3-3 (Screening of Technologies against the Balancing Criteria) contains similar references.

Revise the Report, including titles of Sections and Tables, to properly distinguish between "evaluation" and "screening."

LANL Response

4. As noted in the Laboratory's response to General Comment 1, sections 6 through 10 of the report have been revised. Technologies are identified and screened in section 6. Alternatives are developed and screened in section 7. An evaluation of alternatives is provided in section 8. Tables have been modified as appropriate.

NMED Comment

5. Cover Alternatives

In general, the preliminary design basis for covers in the Report is inadequate for purposes of a CME and final remedy selection. Minimum technical information required for a soil cover in the Report must include a discussion of the following preliminary design details:

a. Cover grading and drainage plan with minimum/maximum slopes,

b. Basis of cover materials specifications (borrow source, hydraulic requirements, potential amendments, etc.),

c. Conceptual design for surface admixture for erosion resistance,

d. Resistance to erosion over the life of the cover system

e. Itemized costs for construction, startup testing, sampling and operation and maintenance (O&M).

The objective of the preliminary design is to provide sufficient detail in design drawings to explain and illustrate the general construction and footprint of the preferred remedy and the design concepts that formed the basis of the remedial alternative cost estimates. Preliminary design drawings must be provided to support the preferred remedy, and may also be necessary to convey information on alternate remedies and associated costs for making comparisons.

Deferring preliminary design details for the proposed ET covers to the Corrective Measures Implementation (CMI) design stage results in insufficient information to justify the remedy selections. In the case of MDA H, the visual depiction of the ET cover has been reduced to a shaded rectangle on a site map (Figure 7.3-1 of the MDA H CME Report). A more appropriate preliminary design was presented in the Permittees' January 4, 2008 "Response to Request for Public Comment – Selection of a Remedy for Corrective Action at Material Disposal Area H, Solid Waste Management Unit 54-004 at Technical Area 54, Los Alamos National Laboratory, Los Alamos, New Mexico" *(2008 Public Comment Letter), referenced by EP2007-0760, in which the Permittees proposed a revised, or enhanced, ET cover, which incorporates a total of 8-feet of material, including a minimum 2.5-ft thick composite capillary break/biointrusion barrier layer.*

In this Report, it appears that the Permittees have down-graded the previously preferred cover described in the 2008 Public Comment Letter by proposing an ET cover with an 18-inch thick gravel admixture over a 3.5-ft. thick infiltration layer and no capillary break or biointrusion layer. This new design provides no protection against biointrusion which is stated as a primary release mechanism in the conceptual site model for MDA H and has been shown to be a significant concern at other LANL sites (e.g., MDA AB).

The Permittees included a "vegetative cover" as an acceptable technology for use at MDA H. The Permittees indicate that the Federal Remediation Technologies Roundtable (FRTR) screening matrix was used to identify the general types of corrective measure technologies; however, in the FRTR, "vegetative cover" is considered synonymous with "ET cover" as an alternate cover technology. Not only must consistent terms be used (the term "ET cover" is preferred), but also the term is directly related to a specified set of performance criteria against which the alternative must be evaluated.

FRTR suggests only two containment technologies: RCRA compliant covers (Subtitle D or C) or alternate/enhanced covers. The proposed 18-inch thick "vegetative cover" layer does not fulfill the

minimum technical requirements for a RCRA Subtitle D solid waste final cover as described in 40 CFR §258.60 (i.e., an 18-inch infiltration layer with maximum 10^{-5} cm/sec hydraulic conductivity and a six-inch erosion layer that supports plant growth).

The ET cover design proposed in the Report is certainly less costly than the design in the 2008 Public Comment Letter, but it is also substantially less protective than the conventional or alternate cover alternatives, which are within the same range of costs. Neither the vegetative nor the ET cover design provides protection against biointrusion.

The Permittees must retain several cover components identified as "technologies" in Section 6.2.1.4 (Surface Barriers) that are better described as individual components of an engineered cover system (i.e., compacted clay layer, biointrusion barrier, and flexible membrane liner). While clay desiccation in arid environments is a valid concern, a RCRA Subtitle C final cover with a compacted clay layer component could be designed with a protective layer (such as a geomembrane) to reduce or eliminate desiccation of the compacted clay layer. Concerns with differential settlement can be addressed through design components that add strength and reduce damage due to settlement of overlying cover components, including additional stress-bearing layers over the waste shafts (e.g., geonet, geotextile, or concrete) and the use of high-strain geomembrane materials (e.g., linear-low density polyethylene). The primary function of a Flexible Membrane Liner (FML) is generally not VOC control, but rather to eliminate vertical migration of moisture and contaminants. It is appropriate to state the potential limitations of FML while acknowledging it as an integral component of a multilayer (i.e., RCRA) cover. A compliant RCRA Subtitle C cover system must be included in the evaluation of alternatives.

Revise the Report to remove all references to the vegetative cover technology, and retain compliant conventional and alternate covers, both of which must include a biointrusion barrier component. Include an evaluation of the design proposed in the 2008 Public Comment Letter, as well as the level of technical information for all preliminary designs, similar to that provided in the 2008 Public Comment Letter.

LANL Response

5. The revised CME has been updated to include conceptual designs in Appendixes G and H for two containment alternatives, including both a multilayer Resource Conservation and Recovery Act–(RCRA-) compliant cover and an alternative evapotranspiration (ET) cover as directed. The new cover alternatives for MDA H were developed to address the remedial action objectives (RAOs) (see section 7). The conceptual designs in Appendixes G and H detail the preliminary design specifications requested by NMED. Design details of the selected cover will be finalized in the corrective measures implementation (CMI) plan.

   The description of the vegetative cover technology in section 6 has been replaced with information on a soil barrier to eliminate confusion with the ET cover. The soil barrier does not satisfy the new RAO of restricting infiltration and was therefore not retained as a cover alternative.

NMED Comment

6. Cost Estimates

Attachment F-1 (Detailed Cost Estimate Report) provided in Appendix F does not include sufficient information to enable NMED to effectively review this attachment. Specific examples include:

a. Vegetative Cover – Direct Costs – Fence Demo and Construction, page 1 of 4. There is no explanation as to how labor amounts were estimated, what the unit cost of labor is, how the materials costs were estimated, or how the equipment costs were estimated. Revise the table or present text to explain how these costs were derived.

b. Vegetative Cover – Direct Costs – Veg Cover, page 1 of 4. The Permittees list under the Item Description column, "Fine grading, for roadway, base or leveling course, large area, 6,000 S.Y. or more," followed under the Quantity column by 1,936 S.Y. It appears that the estimate values used are not appropriate for the quantity of material being graded. Revise the table to resolve this discrepancy.

c. Vegetative Cover – Direct Costs – Veg Cover, page 1 of 4. Geotextile Subsurface Drainage Filtration. There is no geotextile layer associated with the proposed vegetative cover. This line item is also included in the costs for the ET cover, but there is no geotextile layer associated with the ET cover, either. Revise the table to remove unrelated costs.

d. Vegetative Cover – Direct Costs – Veg Cover, page 1 of 4. The Rent Water Truck line item includes costs for labor and equipment, while providing no basis or explanation of how these costs were derived. NMED does not need to see a Gross Unit Price for a line item. Appropriate information includes a unit price for labor, a unit price for materials, a unit price for subcontractors, and a unit price for equipment, and a basis or justification for each unit required. Revise the table to provide the required information.

e. Vegetative Cover – Direct Costs – Veg Cover, page 2 of 4. Craft Distributable – Materials line item states that 219.5 hours are required. There should be no "hours" associated with materials. The Permittees provide no explanation as to what this line item refers. Revise the table and text to provide information as to what this item is.

f. Vegetative Cover – Indirect Costs – Veg Cover, page 2 of 4. Vegetative Mat Design shows a lump sum cost of $84,783. The Permittees provide no basis or explanation of this cost. Revise the table and text to provide the basis and explanation of this cost estimate.

Revise the Report to provide explanations, separate labor, materials, equipment and subcontractor costs, and unit costs for each. An overall unit cost for each line item is not useful. Revise the text of the Report and Appendix F, where appropriate, to include any and all unit costs and assumptions used to develop the cost estimates. Although only a select number of examples are provided herein, provide this information for each and every line item. Either present these data in a more explanatory manner or provide attached explanatory text stating all assumptions, estimations and unit costs for each labor cost, material cost, subcontractor cost and equipment cost for each line item.

LANL Response

6. The alternatives in the revised CME were modified based on NMED's General Comment 1. This resulted in revised cost estimates, which rendered many of the above comments no longer

applicable. However, cost estimates and assumptions for each alternative have been revised for clarity, and Tables 8.2-1 to 8.2-3 (previously Table 8.3-1) have been simplified to show the cost breakdown more clearly. Included in the revision is additional explanation regarding the use of the standard construction cost estimation database, RS Means, which provides for up-to-date labor and materials costs for construction.

Revised cost estimates are provided in Appendix F and are summarized in Tables 8.2-1 to 8.2-3.

NMED Comment

7. Figures

There are several issues regarding figures, figure labels, and figure legends. Ensure that items not shown on figures are not included in the legends, that appropriate contour intervals are utilized (10-ft or 20-ft, but not both), that different contour intervals are distinguishable from one another via linetype and color, and that all figures are reviewed for consistency and completeness.

LANL Response

7. The figures have been revised and edited as applicable.

SPECIFIC COMMENTS

NMED Comment

8. Section 2.3.4, Vadose Zone Hydrology, pages 6-7

Permittees' Statements: *"At MDA H, neutron logging was used to determine volumetric moisture content in three boreholes in 2005 through 2007, 54-01023, 54-15461, and 54-15452 (Figures 2.3-3 and 2.3-4) (LANL 2007, 099140)."*

"This shallow perched zone does not appear to extend beneath MDA H to the south, as evidenced by neutron-log data measured in boreholes 54-01023, 54-15461, and 54-15452 discussed above, but it may be related to higher (although not saturated) moisture content seen in that unit beneath MDA H (Figure 2.3-4)."

NMED Comment: *In both statements above, the Permittees refer to borehole 54-15452. There is no borehole 54-15452 associated with MDA H. The borehole number should be 54-15462. Revise Section 2.3.4 to correct these errors.*

LANL Response

8. The Laboratory concurs. Section 2.3.4 has been revised to refer to the correct borehole: borehole 54-15462.

NMED Comment

9. Section 2.3.4, Vadose Zone Hydrology, pages 8

Permittees' Statements: *"It is uncertain whether the perched-intermediate zones observed at R-40 screen 1, R-51, R-37 screen 1, and R-52 are connected and extend beneath MDA H (Figure D-2.1-2). Such a connection is considered possible given the substantial thickness of the perched zones and their relative high groundwater capacity. However, differences in water chemistry between the different perched-intermediate zones indicate some separation between these groundwater zones, as supported by evidence presented in Appendix E."*

NMED Comment: *The Permittees acknowledge uncertainties regarding the connectivity between and extent of perched-intermediate saturated zones encountered in several wells near MDA H. In addition, in Section D-3.1.3, the Permittees state that the direction of groundwater flow within the perched zones in the vicinity of MDA H is not known but there is a possibility of these perched zones discharging into the regional aquifer downgradient of wells R-40 and R-52, downgradient monitoring wells for MDA H. In such a scenario, any potential contaminants from MDA H that migrate within the perched zones and discharge into the regional aquifer downgradient of wells R-40 and R-52 will not be detected by the existing MDA H groundwater monitoring network.*

Additional information on the extent and interconnectivity of perched-intermediate zones in the vicinity of MDA H is necessary to assure reliable groundwater monitoring for MDA H. See Comment 27.

LANL Response

9. The Laboratory concurs. Section 2.3.4 was updated to include additional information on the extent and interconnectivity of perched-intermediate zones in the vicinity of MDA H. Additionally, the CME report and Appendix D were revised to include groundwater chemistry data that have been collected and analyzed since the previous CME revision. Finally, the Laboratory updated the CME by using data from all Technical Area 54 (TA-54) wells to describe the site's hydrogeologic conditions in Appendix E. The Laboratory will continue to collect and analyze groundwater samples from the TA-54 wells and will collect a minimum of four samples from each well in November 2011.

NMED Comment

10. Section 2.3.5, Regional Aquifer Hydrology and Ground Water Monitoring Network, page 9

Permittees' Statement: *"Regardless of the poor hydraulic communication between the deep and shallow section of the aquifer, it is plausible that the shape of regional water table is influenced by the water-supply pumping at PM-2 in the area southeast of MDA H (near wells R-40, R-20, and R-54) (Figure D-3.2-2, Appendix D). The poor hydraulic communication between the two zones suggests that the dominant transport of potential contaminants would occur within the phreatic zone, but it does not preclude the possibility that lesser migration of potential contaminants would occur between the shallow and deep zones. Between the two zones, the hydraulic gradient has a downward vertical component because of water supply pumping in the deep zone, creating the possibility that downward contaminant migration may occur along highly permeable aquifer features, which create hydraulic connection between the deep and shallow regional aquifer zones (also called "hydraulic windows"). However, such aquifer features and downward contaminant migration have not been directly observed."*

NMED Comment: *The Permittees do not describe the lithology of the confining layer separating the deep confined and shallow unconfined zones. In addition, NMED understands that water supply well PM-2 is no longer in use. Revise the Report to include a description of the lithology of the confining layer and remove rationale based on water supply pumping that is not longer in use.*

LANL Response

10. The Laboratory concurs. Text has been added to section 2.3.5 to describe the separation between the deep confined and shallow unconfined zones and to discuss the current pumping status of supply well PM-2.

NMED Comment

11. Section 2.5, Status of Groundwater Monitoring, page 13

List both upgradient and downgradient wells that form the groundwater monitoring network specific to MDA H.

LANL Response

11. The Laboratory concurs. All wells that form the groundwater monitoring network specific to MDA H are identified in section 2.5. In addition, a table has been added showing the monitoring wells specific to MDA H (Table 2.5-1).

NMED Comment

12. Section 3.2.4, Nature and Extent of Groundwater Contaminants, page 15

In the first paragraph, the Permittees state that well R-20 is part of the downgradient monitoring well network specific to MDA H. In the third paragraph, the Permittees state that well R-20 is not downgradient of MDA H. In Section 2.3.5, last paragraph, the Permittees did not include well R-20 as part of the groundwater monitoring network for MDA H at all. Resolve these discrepancies regarding the role of well R-20, with Well R-20 not part of the groundwater monitoring network for MDA H. Because it is cross-gradient of MDA H, R-20 should be considered an upgradient monitoring well for MDA L.

LANL Response

12. The Laboratory concurs. Section 3.2.4 has been revised and does not include R-20 as a well downgradient of MDA H. Table 2.5-1 was added to the CME to indicate the role of each TA-54 monitoring well in terms of monitoring releases from the TA-54 MDAs.

NMED Comment

13. Section 5.1.2, Groundwater, page 21

When discussing groundwater quality standards, reference Table 5.1-1.

LANL Response

13. The Laboratory concurs. The text has been revised to reference Table 5.1-1 when discussing groundwater quality standards.

NMED Comment

14. Section 6.2.1.1, Vertical Barriers, pages 24-25

NMED generally agrees that vertical barriers are not required at MDA H based on the characterization of environmental impacts at the site, the lack of lateral migration, and the low concentrations of vapor-phase volatile organic compounds (VOCs). NMED also considers the Permittees' previous concerns regarding grout injection emplacements within or near the waste reasonable. Nevertheless, it may be possible to install a slurry wall some distance from the waste (e.g., at the site perimeter) without disturbing it. Re-evaluate the arguments against each type of vertical barrier with regard to the potential adverse affects on the heat-, moisture-, and vibration-sensitive wastes at MDA H.

LANL Response

14. The Laboratory concurs. Sections 6.2.1.1 through 6.2.1.4 have been revised to include more information with regard to why vertical barriers are not appropriate for MDA H.

NMED Comment

15. Section 6.2.1.4, Surface Barriers, pages 27-29

The Permittees have not described how the surface vibrations from construction equipment will be mitigated during installation of soil covers. The prevention of vibrations and waste disturbance was used to eliminate numerous other subsurface technologies, but no explanation was provided as to how these hazards would be addressed during cover installation. Provide assurance that the recommended technology will not result in adverse impacts due to waste instability.

LANL Response

15. The Laboratory concurs. As noted in the Laboratory's response to General Comment 1, sections 6 through 10 of the report have been revised. Additionally, Appendixes G and H (conceptual multilayer RCRA cover design and conceptual ET cover design, respectively) state that all necessary precautions will be taken during the final design so in-place waste will not be impacted during construction of the cover, which includes mitigating surface vibrations from construction equipment.

NMED Comment

16. Section 6.2.1.4, Surface Barriers, page 27

Permittees' Statement: *"Cover system design guidance has also been developed that provides requirements and considerations for implementation at the Laboratory (Dwyer et al. 2007, 096232) and would be applied to the following as appropriate."*

NMED Comment: *The document cited as guidance for cover design was not referenced before in the CME reports for MDAs L and G. Clarify whether this document is a prescriptive standard or requirement for covers at LANL, and whether ET covers, as opposed to low-permeability covers, are a requirement in this document. This document was not reviewed in conjunction with the MDA H CME Report. If the document will be utilized or cited in the next CME revision or in a CMI, provide NMED with a copy for its review.*

LANL Response

16. The Dwyer et al. report (2007, 096232) is a guidance document used by the Laboratory for comparison purposes. It is not currently part of a standard operating procedure for cover design at the Laboratory. Although this document is not referenced in the main text of the MDA H CME report, it is referenced in Appendix H. Therefore, the Laboratory will provide a copy of the document to NMED as part of the administrative record.

NMED Comment

17. Section 6.2.1.4, Surface Barriers, Evapotranspiration Cover, page 28

Permittees' Statement: *"Because ET covers are designed for use in arid to semiarid environments, these covers do not incur subsidence and desiccation."*

NMED Comment: *While the performance of an ET cover is less likely to be compromised by subsidence and desiccation compared to other low-permeability covers, subsidence and desiccation are still possible. At MDA H, the potential for differential subsidence across a 6-ft diameter shaft that has been plugged with concrete should be manageable with appropriate engineering measures. Revise accordingly.*

LANL Response

17. The Laboratory concurs. Section 6.2.1.4 has been revised to remove the discussion of subsidence. Additionally, the "Compacted Clay Cover" and "Multilayer Cover (RCRA Cover)" sections now provide more information regarding the long-term risks associated with desiccation of clay in arid to semiarid environments.

NMED Comment

18. Section 6.2.1.4, Surface Barriers, Biotic Barriers, page 28

Permittees' Statement: *"Installation of horizontal barriers constructed of cobble-sized rocks or pea gravel inhibits deeprooting plants and discourages burrowing animals."*

NMED Comment: *Pea gravel is unlikely to impede burrowing animals or deep-rooting plants. Angular cobbles with a minimum diameter of 4 to 6 inches would be more appropriate. Revise the Report to eliminate pea gravel as a biotic barrier material, or provide justification for its inclusion.*

LANL Response

18. The Laboratory concurs. As noted in the Laboratory's response to General Comment 1, sections 6 through 10 of the report have been revised. The text for the biointrusion barriers in section 6.2.1.4 has been revised with additional justification.

NMED Comment

19. Section 6.2.1.4, Surface Barriers, Flexible Membrane Liner, page 29

Permittees' Statement: *"A properly constructed subgrade and careful installation are required to provide optimal results, which would be difficult to implement with inherent potential for long-term settling of the site."*

NMED Comment: *Differential settling is again cited as a problem with the application of this technology. It is not clear why differential settling would be expected at MDA H, given limited areal extent of the shafts, the plugging of the shafts with concrete, and presumably the careful placement of potentially reactive waste materials within the shafts. Provide further justification that this problem exists at MDA H, or remove it as a basis for eliminating technologies.*

LANL Response

19. See response to Specific Comment 17.

NMED Comment

20. Section 6.2.3, Excavation/Removal Technologies, page 29

Permittees' Statements: *"Potential risks associated with excavation include:*

- *sparks from excavation equipment, abrading uranium components, or handling and adverse interactions of HE or pyrophoric metals;*
- *friction from excavation equipment or handling;*
- *impact/crush from equipment or dropping; and*
- *pinching from equipment or handling."*

"Potential risks associated with excavation include vibration, friction, heat generation, sparks, impact, or crushing of waste."

NMED Comment: *Clarify that sparks, friction, heat, physical impact, pinching, and so on are not the risk, but in a sense the pathway. The risk or "adverse interactions" is actually the instability of the waste materials, described in Appendix C as pyrophoricity, deflagration, and detonation. Revise the Report to clarify this issue.*

LANL Response

20. The Laboratory concurs. Section 6.2.3 has been revised to clarify that the waste at MDA H is sensitive to sparks, friction, heat, physical impacts, pinching, air, and moisture, and significant risks are associated with an excavation as part of a remedial alternative.

NMED Comment

21. Sections 8.3.2.2 and 8.3.3.2, Reduction of Toxicity, Mobility or Volume, pages 45 and 46

Permittees' Statements: *"The vegetative cover technology does not reduce toxicity, mobility, or volume of contaminants."*
"The ET cover technology does not reduce toxicity, mobility, or volume of contaminants."

NMED Comment: *In both the MDA L and the MDA G CMEs, the Permittees state that both the vegetative cover and the ET cover "will reduce mobility of waste by controlling erosion and infiltration but will have no impact on reduction of toxicity or volume." Resolve this discrepancy.*

LANL Response

21. The Laboratory concurs. As noted in the Laboratory's response to General Comment 1, sections 6 through 10 of the report have been revised. Specifically, the "Reduction of Toxicity, Mobility, or Volume" discussion in section 8 of all three CME reports has been revised to clarify that both the multilayer RCRA cover and the ET cover will reduce mobility of waste by controlling erosion and infiltration but will have no impact on reduction of toxicity or volume.

NMED Comment

22. Figure 2.3-5, TA-54 Groundwater Monitoring Network…, page 67

Make the distinction between regional and intermediate wells.

LANL Response

22. The Laboratory concurs. Figure 2.3-5 has been revised to distinguish between regional wells and intermediate wells.

NMED Comment

23. Figure 9.0-1, Refined Conceptual Site Model, page 73

NMED Comment: *This figure suggests that the pathways from the biointrusion/erosion and biointrusion/leaching primary release mechanisms would be broken by the recommended ET cover. However, it is evident that the ET cover alternative as described in the Report would not break these pathways, since it only includes 3.5 ft of infiltration layer, 1.5 ft of topsoil/gravel admixture, and no biotic barrier. This aspect further illustrates the need for a biotic barrier in the ET cover design. Either include a biotic barrier in the ET cover design, or reconcile the figure accordingly.*

LANL Response

23. The Laboratory concurs. Alternative 2B (section 7.3.3) now includes a biointrusion barrier as part of the conceptual design.

NMED Comment

24. Table 5.1-1, Summary of Regulatory Criteria and Cleanup Levels, page 103

The regulatory criteria listed in the Table for groundwater are incomplete. Update the Table to include all regulatory criteria described in Section 5.1.2.

LANL Response

24. The Laboratory concurs. Table 5.1-1 has been revised to include all regulatory criteria described in section 5.1.2.

NMED Comment

25. Section D-2.1-1, Bandelier Tuff, Guaje Pumice Bed (Qbog), page D-4

Permittees' Statements: *"Site investigations indicate that saturated conditions do not occur in the Guaje Pumice Bed at TA-54."*

NMED Comment: *This statement is inconsistent with Figure D-2.1-2 and Section 2.3.4, where the Permittees state that "the lower perched zone [at well R-51] is located between depths of 502 and 568 ft bgs in the stratigraphic sequence that includes the Guaje Pumice Bed, Puye Formation , and uppermost part of Cerros del Rio basalt." Resolve this discrepancy.*

LANL Response

25. The Laboratory concurs. The statement in the current section E-2.1 (previously section D-2.1-1) has been revised to state, "Site investigations in the vicinity of TA-54 indicate that saturated conditions occur in the Guaje Pumice Bed only at well R-51 (Figure E-2.1-3)."

NMED Comment

26. Section D-3.1.2, Monitoring Wells, page D-11

Permittees' Statements: *"However, screen 1 has a high barometric efficiency of around 94%. Screen 2, on the other hand, has a barometric efficiency of about 58%, suggesting unconfined or partially confined conditions at both screens. It is somewhat surprising that the lower screen has higher barometric efficiency than the upper screen."*

NMED Comment: *The statements above are contradictory. Revise as appropriate.*

LANL Response

26. The Laboratory concurs. The error has been corrected in what is now Appendix E (previously Appendix D).

NMED Comment

27. Section D-3.2.2, Preliminary Water-Table Map Based on July-September 2010 Data, page D-16

The Permittees state that regional groundwater beneath MDA H flows in northeastward direction. However, the water table map provided in Figure D-3.2-2 shows the possibility of an eastward groundwater pathway that will not be monitored by any of the existing wells downgradient of MDA H. Additional information on groundwater flow direction and hydrogeology east of MDA H is necessary to ensure reliable groundwater monitoring.

While this information is crucial for long-term detection monitoring at MDA H, it does not affect NMED's ability to select an appropriate remedy. Periodic vapor-sampling results indicate little potential for VOCs to migrate to groundwater at concentrations that could result in exceedances of applicable cleanup goals. In addition, VOC concentrations have generally declined in the vapor monitoring wells at MDA H over time.

Nevertheless, to provide ensure adequate detection monitoring, present a work plan for the installation of a regional aquifer monitoring well east-southeast of MDA H, approximately halfway between wells R-37 and R-40. If one or more perched-intermediate zones are encountered during drilling of the regional aquifer monitoring well, submit a work plan to NMED for installation of a well intersecting the perched aquifer(s) near the regional well. This work plan must be submitted no later than ten days after reaching the total drilling depth of the regional well. The work plan for the regional well must be submitted to NMED no later than ***May 13, 2011*** *and the well must be completed no later than* ***December 30, 2011****.*

LANL Response

27. The Laboratory concurs. The adequacy of the groundwater monitoring network around MDA H was analyzed, and the analysis is presented in Appendix E. The analysis concluded that there is a potential data gap to the east-southeast of MDA H. A new regional groundwater monitoring well is proposed as part of the long-term monitoring requirements in section 10 of the CME report. Additionally, NMED's letter, dated August 19, 2011 (NMED 2011, 205983), suspended the requirement that the Laboratory submit a drilling work plan for a groundwater monitoring well at MDA H. The letter went on to state NMED will reevaluate the need for the well after it reviews the MDA H CME report.

NMED Comment

28. Figure D-2.1-1, Locations of perched-intermediate and regional wells in the vicinity of TA-54, page D-21

Create an additional cross-section, tracing generally east-west and crossing through wells R-51, R-37 and R-34. Include this cross-section as a new figure in Attachment D.

LANL Response

28. The Laboratory concurs. A new cross-section (B-B') has been included in Appendix E (previously Appendix D) as Figure E-2.1-3.

NMED Comment

29. Figure D-2.1-2, North-south cross-section A-A' near MDA H, page D-22

a. Show the projected location of alluvial well CDBO-6 and the perched groundwater zone that occurs in the vicinity of that well within unit Qbt.

b. The Figure depicts a perched zone at borehole SHB-2, while Section 2.3.4 describes the same perched zone as occurring at borehole SHB-4. Resolve this discrepancy.

c. The Figure shows similar water levels in wells R-37 and R-52 for the perched zone at the base of Tb4. However, based on information in Section D-3.1.2, the water levels in this perched zone were measured at about 700 ft bgs in well R-52 and about 900 ft bgs in well R-37. Resolve this discrepancy.

LANL Response

29. The Laboratory concurs. Additional cross-sections have been added to Appendix E (previously Appendix D) that are not aligned with A-A' in the previous CME. Cross-section C-C' (Figure E-2.1-4) now shows the perched groundwater in Bandelier Tuff at alluvial well CDBO-7 and correctly shows well SHB-4 (not SHB-2). In addition, cross-sections B-B' and C-C' show R-37 and R-52 water levels that agree with the text in Appendix E (Figures E-2.1-3 and E-2.1-4).

NMED Comment

30. Figure D-2.1-5, Alkali-silica diagram…, page D-25

A gray arrow, described in the Figure caption, is missing. Include the missing element of the Figure.

LANL Response

30. The Laboratory concurs. The gray arrow has been included in renumbered Figure E-2.1-9.

NMED Comment

31. Figure D-2.1-6, Structure contour map…, page D-26

The 5700 ft contour line for the base of Cerros del Rio volcanics (Tb4) near well R-39 is not in agreement with the contact elevation at that well, and contour lines near well R-38 do not reflect the contact elevation at that well. In addition, the structure contour map of the base of Tb4 does not correspond to the base of Tb4 on the geologic cross-sections in Figures D-2.1-3 and D-2.1-4. Reconcile the differences.

LANL Response

31. The Laboratory concurs. Figures throughout Appendix E (previously Appendix D) have been corrected so the contour lines and contact elevations are consistent throughout the figures. The cross-sections (Figures E-2.1-2 through E-2.1-8) and the structure contour map for the base of the Cerros del Rio volcanic series (Tb4 and Tvt2b) (Figure E-2.1-10) in Appendix E have been created from the same geologic framework model and are now consistent. Small differences among the

cross-sections and structure contours occur when wells are projected a short distance to the cross-sections.

NMED Comment

32. Figure D-2.1-7, Structure contour map…, page D-27

The Figure shows three different numerical values for the contact elevation of the top of Tb4 at well R-39 and two numerical values for the contact elevation at well R-22. Remove erroneous numbers and correct the contour lines if necessary. In addition, the structure contour map for the top of Tb4 does not correspond to the top of Tb4 on the geologic cross-section in Figure D-2.1-2. Reconcile the differences.

LANL Response

32. The Laboratory concurs. Figure E-2.1-11 (previously D-2.1-7) has been corrected to include only one contact elevation for the top of Tb4 at wells R-39 and R-22. The cross-sections (Figures E-2.1-2 through E-2.1-8) and the structure contour map for the top of the Cerros del Rio volcanic series (Tb4 and Tvt2b) (Figures E-2.1-11) in Appendix E have been created from the same geologic framework model and are now consistent. Small differences among the cross-sections and structure contours occur when wells are projected a short distance to the cross-sections.

NMED Comment

33. Figure D-2.1-8, Hydrostratigraphy at the regional water table…, page D-28

The Figure shows the Tschicoma dacite flow (Tvt2b) at the regional water table beneath the southeast end of TA-54. This information is inconsistent with other geologic maps, cross-sections and text in the Report, all of which consistently show or describe Tb4 at that location. Reconcile the discrepancy and ensure that all geologic and stratigraphic information presented in the Report is consistent.

LANL Response

33. The Laboratory concurs. Figures throughout Appendix E (previously Appendix D) were corrected so that geologic information is consistent throughout the figures.

Figure D-2.1-8 is now numbered E-2.1-12 in the revised document. Figure E-2.1-12 shows both compositional groups of Cerros del Rio lavas (i.e., Tb4 and Tvt2b). The following text has been added to Appendix E-2.1 to clarify:

> The lava flows range in composition from basalt to dacite, with the more silicic rock types (dacites) occurring at the base of the volcanic pile (oldest units) and less evolved flows (tholeiites and alkali basalts) at the top (youngest units) (Figure E-2.1-9). The more mafic portions of the Cerros del Rio volcanic series (compositions ranging from basalt through trachyandesite in Figure E-2.1-9) are labeled Tb4 on the geologic cross-sections (Figures E-2.1-2 to E-2.1-8). Dacite lavas form a compositionally distinct volcanic feature near the east end of TA-54 and are labeled Tvt2b on the cross-sections (Figures E-2.1-2 and E-2.1-8).

NMED Comment

34. Figure D-3.2-2, Preliminary water table map…, page D-30

a. Correct discrepancies between groundwater contours and water levels in wells R-13, R-19, R-44, R-50, and R-53.

b. State the pumping status of water-supply wells PM-2 and PM-4 at the time the water level data were collected. If there are discernable differences in groundwater flow direction in the vicinity of MDA H, depending on the pumping status of water-supply wells, provide separate water table maps for each scenario.

LANL Response

34. The Laboratory concurs. Figure E-3.2-2 (previously D-3.2-2) has been revised to resolve discrepancies among groundwater contours and water levels in wells R-13, R-19, R-44, R-50, and R-53.

    Appendix E (previously Appendix D) has been revised to discuss the pumping status of water-supply wells PM-2 and PM-4.

NMED Comment

35. Table D-3.1-1, Estimates of Effective Aquifer Hydraulic Properties…, page D-31

Define abbreviations "T" and "S" in Table heading.

LANL Response

35. The Laboratory concurs. Table E-3.1-2 (previously D-3.1-1) has been revised to define "T" and "S" in the table heading.

NMED Comment

36. Section E-3.2, Geochemical Performance of Monitoring Wells, pages E-6 and E-7

Reevaluate the representativeness of water-quality data from monitoring wells at MDA H using the criteria specified in the NMED's March 25, 2011 letter Approval with Modification, 2010 Interim Facility-Wide Groundwater Monitoring Plan.

LANL Response

36. The Laboratory concurs. The Laboratory follows a protocol for evaluating the geochemical performance of monitoring wells that is based on criteria specified in NMED's March 2011 letter of approval with modification for the 2010 Interim Facility-Wide Groundwater Monitoring Plan (NMED 2011, 201467). This evaluation is presented in Appendix D and uses geochemical trends to evaluate the reliability of water-quality data.

NMED Comment

37. Section E-3.3, Screening Protocol for Groundwater Data, page E-7, number 1

Groundwater background values for MDA H must be based on analyte concentrations in an upgradient portion of the groundwater monitoring network specific to MDA H and in those downgradient or cross-gradient MDA H wells where contamination has not been detected.

LANL Response

37. A clarification: The Laboratory concurs with NMED's comment. However, implementation of this screening protocol is deferred until newly completed wells have reequilibrated to predrilling geochemistry. Presently, area-specific monitoring group background values are not available, and background values from the Groundwater Background Investigation Report, Revision 3, are used as screening levels in Appendix D. The reliability assessment in Appendix D summarizes the status of upgradient wells and downgradient, or off-gradient, MDA H wells that are candidates for defining area-specific background values.

NMED Comment

38. Section E-3.3, Screening Protocol for Groundwater Data, page E-7, number 1

For the naturally-occurring analytes that do not have numerical background values based on UTLs, use the lowest Practical Quantitation Limits (PQLs) achievable by the most recent EPA and industry accepted extraction and analytical methods for these analytes as their first-tier screening levels.

LANL Response

38. A clarification: The Laboratory concurs that screening levels are needed for those analytes that do not have numerical background values that are based on upper tolerance limits (UTLs). However, implementation is deferred until the most recent Groundwater Background Investigation Report has been updated in response to the NMED's July 2011 letter of approval with modifications for the Groundwater Background Investigation Report, Revision 4 (NMED 2011, 204539), particularly for the cases in which the data do not meet the statistical criteria for UTL calculations. Screening levels for these analytes will be established in accordance with U.S. Environmental Protection Agency (EPA) guidance.

NMED Comment

39. Section E-3.3, Screening Protocol for Groundwater Data, page E-8, number 2, third bullet

The screening protocol described in this section is inconsistent with the cleanup level protocol presented in Section 5.1.2, in which EPA regional tap water screening levels (adjusted to a 10-5 excess cancer risk) are used only if there are no NMED tap water screening levels established for a contaminant of interest. Use the screening protocol presented in Section 5.1.2 uniformly.

LANL Response

39. A clarification: The screening protocol for groundwater (section 5.1.2) has been revised to be consistent with that used in the current Interim Facility-Wide Groundwater Monitoring Plan and has been implemented uniformly in Appendix D.

NMED Comment

40. Section E-3.4, Screening Results for Organic COPCs, page E-9

a. List all organic analytes that were detected below their respective PQLs where the PQLs were above the corresponding screening levels.

b. List all organic analytes that were not detected and where the PQLs were above the corresponding screening levels.

LANL Response

40. The Laboratory concurs. A new table (Table D-4.2-3) has been included in Appendix D listing organic chemicals (1) detected below their respective PQLs, but above corresponding screening levels, and (2) not detected but with PQLs above the corresponding screening level.

NMED Comment

41. Section E-3.5, Screening Results for Inorganic COPCs, pages E-10 and E-11

Discuss detections of radionuclides other than tritium in groundwater monitoring wells specific to MDA H. If there were no detections of radionuclides (other than tritium) above background levels, state so. If there were such detections, either include these detections in appropriate tables in Appendix E or create separate tables for radionuclides.

LANL Response

41. A clarification: For informational purposes only, Appendix D now includes a separate table (D-4.3-3) summarizing detections of radionuclides in TA-54 groundwater monitoring wells, including those specific to MDA H.

NMED Comment

42. Section E-3.6, Tritium Detections, page E-11, first paragraph of the section, first sentence

Permittees' Statement: *"Tritium activities in the monitoring wells are all far below the EPA MCL of 20,000 pCi/L; the majority of water samples are below detection."*

NMED Comment: *20,000 pCi/L is an average annual concentration of tritium assumed to produce a dose of 4 mrem/year, which is the EPA MCL for beta particle and photon radioactivity. If two or more radionuclides are present, the sum of their annual dose from beta particle and photon radioactivity must not exceed the MCL of 4 mrem/year. Therefore, if tritium coexists with other beta- and/or photon-producing radionuclides, the maximum allowable tritium concentration will be less than 20,000 pCi/L. Revise this statement accordingly.*

LANL Response

42. A clarification: The statement has been deleted, and no reference to a maximum contaminant level for tritium is included in the text.

NMED Comment

43. Tables E-3.4-1 to E-3.6-1, pages E-42 to E-59

For each Table, specify in the Table caption whether the Table presents all analytical data collected since well construction or only data collected within a specific timeframe.

LANL Response

43. The Laboratory concurs. Table titles have been edited to specify the time frame of the analytical data included in the table. Additionally, this information is now provided in Appendix D.

NMED Comment

44. Table E-3.5-1, Statistical Summary of Inorganic COPCs…, pages E-50 to E-56

a. Provide PQLs for all analytes in the Tables.

b. Some second-tier screening levels in the Table are incorrect. For example, the correct screening level for zinc is 10,000 µg/L (NM GW Std) and not 180 µg/L (EPA Tap RSL). Review all screening levels for their conformance with the screening protocol.

LANL Response

44. The Laboratory concurs. The referenced tables have been revised accordingly. Additionally, this information is now provided in Appendix D.

NMED Comment

45. Table E-3.6-1, Average and Maximum Tritium Activities…, page E-59

Define the acronym "MDA" used in the column header.

LANL Response

45. The Laboratory concurs. Table E-3.6-1 has been replaced with Table D-4.3-3, and the acronym "MDA" is not used in the table.

REFERENCES

Dwyer, S.F., R.E. Rager, and J. Hopkins, April 2007. "Cover System Design Guidance and Requirements Document," Los Alamos National Laboratory document LA-UR-06-4715, Los Alamos, New Mexico. (Dwyer et al. 2007, 096232)

NMED (New Mexico Environment Department), March 25, 2011. "Approval with Modification, 2010 Interim Facility-Wide Groundwater Monitoring Plan," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 201467)

NMED (New Mexico Environment Department), July 25, 2011. "Approval with Modifications, Groundwater Background Investigation Report, Revision 4," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 204539)

NMED (New Mexico Environment Department), August 19, 2011. "Response, Request to Withdraw the Requirement for the Drilling Work Plans for Material Disposal Areas G and H," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 205983)