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July 3, 2001

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RECEIVED

Ms. Eliza Frank
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Reference: Work Assignment No. Y513, 06082.500; State of New Mexico Environment Department, Santa Fe, New Mexico; General Permit Support Contracts; Los Alamos National Laboratories (LANL)-1B; Draft Mesa-Top Material Disposal Area; Review of Supporting Technical Documents Referenced in the Interaction Matrix; Task 03 Deliverable

Dear Ms. Frank:

Enclosed please find the deliverable for the above-referenced work assignment. This deliverable consists of discussion and review of the revised site conceptual model, presented in Section 6.0 of the RCRA Facility Investigation Report for Material Disposal Areas G, H and L at Technical Area 54 (TA-54) of the Department of Energy's Los Alamos National Laboratory, Los Alamos, New Mexico. The deliverable was e-mailed to you on Tuesday, July 3, 2001, at eliza_frank@nmenv.state.nm.us. The deliverable is formatted in Microsoft Word 2000.

The general consensus is that the Revised Conceptual Model for TA-54 is not complete in that it does not identify primary and secondary transport pathways, off-site transport, exposure routes and receptors, or demographics and land use (current and future). In addition, much of the information and assumptions contained within the Model have not been adequately substantiated. A conference, to discuss these issues, between the TechLaw reviewers and yourself is suggested.

If you have any questions, please feel free to contact Ms. Paige Walton at (801) 582-9329.

Sincerely,

June K Dreith

June K. Dreith
Project Manager

32379

Enclosure
cc: Mr. John Keiling, NMED
Mr. James Bearzi, NMED
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TASK 03 DELIVERABLE

DISCUSSION AND REVIEW OF THE REVISED SITE CONCEPTUAL MODEL, PRESENTED IN SECTION 6.0, RCRA FACILITY INVESTIGATION REPORT FOR MATERIAL DISPOSAL AREAS G, H AND L AT TECHNICAL AREA 54 OF THE DEPARTMENT OF ENERGY'S LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO

Los Alamos National Laboratories (LANL)-1B
Draft Mesa-Top Material Disposal Area

Submitted by:

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Submitted to:

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In response to:

Work Assignment No. Y513, 06082.500

July 2001

Review Comments for the Revised Site Conceptual Model,
Section 6.0 of the RCRA Facility Investigation Report
For Material Disposal Areas G, H, and L at Technical Area 54
Department of Energy, Los Alamos National Laboratory
Los Alamos, New Mexico

GENERAL COMMENTS

1. A site conceptual model should depict the types of waste and contaminants, where they are located, and how they are being transported off-site, so that the source and movement of contaminants along various exposure pathways to potential receptors can be identified. The components that make up the conceptual model include the contaminant characteristics, site characteristics (including hydrogeology, land use and demography), exposure scenarios and pathways (EPA 1996 and EPA 1988). The Revised Site Conceptual Model (the Model) seems to stop with the identification of the release mechanisms or sources for contamination. While briefly mentioned, as a whole, The Model does not discuss primary and secondary transport, especially with regard to off-site transport, exposure routes and receptors, nor does the Model discuss demographics and land use (current and future), resulting in an incomplete site conceptual model. Based on the data presented, it is apparent that radiological and possibly chemical contamination may extend beyond the boundaries of TA-54. The Model does not discuss potential migration or impacts to the adjacent land, including tribal lands. For tribal lands where exposure pathways to native populations may be influenced by cultural and ceremonial use of lands adjacent to Los Alamos National Laboratory (LANL) areas, government-to-government communication regarding the adjacent nation's environmental laws may need to be pursued early in the process in order to avoid negative public affairs issues. Potential impacts to all off-site receptors need to address specific exposures or differing rates of exposures in order to assess use of specific resources in the area.

   Reference: EPA 1996, *"Fact Sheet: A Technical Guide to Groundwater Model Selection at Sites Contaminated with Radioactive Substances"*, EPA/540/F-94-025, January.

   Reference: EPA 1988, *"Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA"*, EPA/540/G-89/004, October.

2. LANL has eliminated several chemicals detected at Material Disposal Areas (MDAs) G, H, and L from their respective conceptual site models. Section 6.0 states the *"Environmental Protection Agency guidance (EPA 1989, 8021) for this analysis states that chemical that are infrequently detected and may be artifacts of sampling, analytical or other problems and therefore may not be related to site operations or disposal practices may be eliminated from further consideration"*. However, EPA 1989 also stresses that the rationale for eliminating chemicals from a quantitative risk assessment must be clearly stated and justified. The EPA guidance also states that all chemicals that are positively detected in at least one sample in a given medium should be included in estimating total exposure concentrations in the risk

assessment. The identification of ecological chemicals of potential concern (COPCs) and the nature and extent of contamination based on the selected COPCs is inadequate for each of the areas, as well. Given this, it appears that LANL has eliminated several chemicals without adequate justification. These include:

- MDA G

- Mercury, silver, and selenium detected in surface soils
- Any organic that was not detected in at least 4 of 8 air samples

- MDA H

- Lead and tritium detected in sediments
- Acetone detected at MDA H during surface flux sampling
- Copper detected in the subsurface

- MDA L

- Cadmium, selenium, and silver with reporting limits that exceeded the laboratory background levels
- Plutonium-238 detected in sediments
- Cadmium, mercury, uranium, chromium and barium detected in boreholes 54-1010 and 54-1011

Also, LANL has assumed, without adequate support, that detections of bis-2-ethylhexyl phthalate at MDAs H and L and di-n-butyl phthalate and pentachlorophenol at MDA L are laboratory artifacts. However, unless specific laboratory quality control (QC) data (e.g., blanks and duplicates) can verify that the detection are indeed laboratory artifacts, these chemicals must be considered as potential site contaminants. Specifically, risk assessment guidance would require the inclusion of these chemicals in the risk assessment. Specific comments have been drafted for those sections where additional information is needed to support elimination of chemicals from the Model.

Reference: EPA 1989, "*Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part A)*", EPA/540/1-89/002, December.

3. Section 6.1, page 6-1, summarizes the nature and extent of contamination by listing COPCs that were positively identified in "accessible environmental media" or in "inaccessible environmental media." The Model does not define accessible or inaccessible environmental media, but based on the discussion, it is assumed that accessibility is determined by whether a human can touch or pass through a medium, e.g., surface soil, sediment, and ambient air. The segregation of environmental media as accessible or inaccessible is not an industry standard for determining nature and extent of contamination since the technology exists to collect samples from various media, whether or not is readily accessible to humans. It was also established by LANL (reference No. 23) that biotic translocation (buried waste is either brought to the surface by plants or burrowing animals) does contribute to increased surface soil concentrations. The paper concluded that the "*biotic mechanism at MDA G is potentially important in off-site migration and should be considered for the all-pathway dose assessment*", and subsequently, the biotic translocation model was incorporated by LANL

into the Performance Assessment. The contamination at MDAs G, H, and L should not be distinguished by whether the environmental media are accessible or not, since contaminants may move from one medium to another at Mesita del Buey, e.g., soil to rock to groundwater, or soil to surface water runoff to sediments, as evidenced by the biotic translocation paper.

Reference 23: Vold, E.L. and Shuman, 1997, "*A Model for the Biotic Translocation of Buried Low-Level Radioactive Waste to the Ground Surface in the Presence of Surface Erosion*," Los Alamos National Laboratory Report LA-UR-97-84.

4. The discussion of the nature and extent of contamination provides only a general description of detected contamination above background levels and does not adequately document whether COPCs have been properly eliminated. The Model states that detected chemicals with a low frequency of detection are not considered as COPCs and are consequently eliminated from further consideration. It should be noted that it is not acceptable to eliminate a detected chemical solely on the infrequent detection (or low frequency). This approach may preclude the consideration of potential hot spots. COPCs should be evaluated and selected or eliminated to ensure that hot spots are not overlooked. In addition, ecological COPCs should be selected or eliminated based on derivation of the hazard quotient and the nature and extent of contamination associated with hazard quotient exceedances should be thoroughly investigated.

5. LANL should address several additional transport mechanisms before the Model is viewed as encompassing all possible contaminant transport pathways. These include:

   - Treatment of the subsurface solute transport pathway at MDA L;
   - Further consideration of advection in the transport of volatile organic compounds (VOCs) and tritium in the subsurface;
   - Consideration of wet and dry deposition processes for particles and vapors entering the atmosphere from TA-54; and
   - Consideration of exposure of ecological receptors, and possibly humans, through the food chain.

   Further, a clear understanding of the influence of fracture flow on contaminant transport has not been demonstrated. Additional information and discussion on these mechanisms is warranted before the Model is finalized.

6. The complexity of the hydrogeology of the vadose zone of the Bandelier Tuff is discussed in numerous LANL references, including Nos. 5, 14, 15, 16, 17, 19, 20, 21, 22, 24, and 26, which TechLaw staff reviewed previously. The Model, however, oversimplifies the geology and hydrogeology of Mesita del Buey in order to simplify the modeling of contaminant movement through the tuff. Moisture or groundwater in the vadose zone is assumed to 1) evaporate and move upward or laterally from the mesa into the ambient air, or 2) percolate downward through the tuff to the groundwater aquifer. This simplified transport pathway ignores the fracture flow pathway, which is documented in Reference Nos. 5, 15 (pp. 65-92), and 17. Also, the Model does not consider hydraulic barriers, which may be associated with layers of welded tuff (Reference No. 19). Hydraulic barriers may be responsible for the

"vapor phase notch" that is believed be a lateral moisture flux toward the canyon walls [Reference Nos. 15 (pp. 93-109) and 22].

Reference 5: Davenport, D.W. 1993. *Micromorphology, Mineralogy, and Genesis of Soils and Fracture Fills on the Pajarito Plateau, New Mexico*, Texas Tech University PhD dissertation, Lubbock, Texas.

Reference 15: Broxton, D.E. and P.G. Eller, Editors, May 1995. *Earth Science Investigations for Environmental Restoration—Los Alamos National Laboratory Technical Area 21*, Report LA-12934-MS, Los Alamos, New Mexico.

Reference 17: Rogers, D.B. and B.M. Gallaher, 1995. *The Unsaturated Hydraulic Characteristics of the Bandelier Tuff*, Los Alamos National Laboratory Report LA-12968-MS, Los Alamos, New Mexico (Rogers and Gallaher 1995, ER ID 55334).

Reference 19: Reneau, S.L., D.E. Broxton, J.S. Carney, C. LaDelfe, 1998. "*Structure of the Tshirege Member of the Bandelier Tuff at Mesita del Buey, Technical Area 54, Los Alamos National Laboratory*", Los Alamos National Laboratory Report LA-13538-MS, Los Alamos, New Mexico (Reneau *et al* 1998, ER ID 63497).

Reference 22: Vold, E.L., 1997. "*Analysis of Liquid Phase Transport in the Unsaturated Zone at a Mesa Top Disposal Facility*", Los Alamos National Laboratory Report LA-UR-96-320, Los Alamos, New Mexico.

7. In general, the lateral and vertical extent of contamination at MDAs G, H, and L is not clearly discussed or delineated in the figures presented in the Model. The nature of contamination inherently requires the identification of contaminants, as well as their actual concentrations in the sampled medium (e.g., soil, sediment, surface water, and groundwater). The extent of contamination requires a systematic determination of the lateral (areal) and vertical boundaries of the contaminants within the subsurface media, which may be determined through sampling and analysis of the media comprising the unsaturated (vadose) and saturated (aquifer) zones. The Model figures may provide some useful information, however, the nature and extent of contamination would be more readily understood if standard, industry-recognized formats (e.g., concentration contour maps) were used to present LANL's understanding of the contamination found at MDAs G, H, and L. The Model figures are deficient in clearly presenting the nature and extent of contamination. A discussion of specific figures has been drafted in the specific comments section.

SPECIFIC COMMENTS

1. Section 6.0, Revised Site Conceptual Model

The first paragraph of Section 6.0 refers to EPA guidance for a particular analysis, but it is unclear what the analysis is or achieves. A citation in parentheses appears to reference the EPA guidance, but the reference list was not available for review to verify the source. Based on the

appearance of the reference (i.e., EPA 1989, 8021), however, the reference may be to *EPA SW-846, Test Methods for Evaluating Solid Waste, Method 8021, Aromatic and Halogenated Volatiles by Gas Chromatography Using Photoionization and/or Electrolytic Conductivity Detectors.* If Method 8021 is the subject of the discussion, then a more recent version than the one available in 1989 should be used. The current version is 8021B, which was released in December 1996 as the second revision of this method. It does not appear that 8021B discusses the information presented in the first paragraph. In any case, the introductory paragraph attempts to attribute data to *"sampling, analytical, or other problems"* in order to remove the values from further consideration. This should not be allowed without considerable justification.

2. Section 6.1, Nature and Extent of Contamination

The document presents a list of (COPCs that were positively identified in accessible environmental media at MDAs G, H, and L. In general, the identification of ecological COPCs and the nature and extent of contamination based on the selected COPCs is inadequate for each of the areas. A frequency of detection table with information considered germane for identifying COPCs has not been presented. Ecological COPCs and the manner in which each potential ecological exposure pathways are considered complete, must include reporting of the maximum detected concentrations and the sample quantitation limit for each analyte. Frequency of detection tables, which present a comparison of the sample quantitation limit to corresponding ecological benchmarks, and comparison of the maximum detected concentration to the corresponding ecological benchmark (or background concentrations for radiological constituents) must be used to determine ecological COPCs. A frequency of detection table for each media should be presented to support the revised conceptual site model.

In addition, the nature and extent of contamination associated with ecological receptors must be documented by presenting the hazard quotient for each chemical. This information should be presented spatially within the ecosystem in order to document that the data have been collected properly to represent worst case and representative ecological exposures.

3. Section 6.1.1, MDA G

a. Section 6.1.1 indicates that polychlorinated biphenyls (PCBs) were detected in soil samples at MDA G and PCB-contaminated wastes were placed in disposal shafts. The discussion further states the *"data do not indicate a release from the PCB disposal shafts. No PCBs were detected in channel sediments on the slopes of the mesa; therefore, the extent of PCB contamination has been established."* This assessment, however, does not consider the potential for direct downward migration of PCBs into the tuff, which seems to contradict the proposed Model. The Model promotes downward percolation of contaminants, while lateral migration is minimized as a transport mechanism. It appears that LANL would like to use either transport mechanism to explain contaminant movement to LANL's benefit. The Model should be revised accordingly.

b. It is indicated that COPCs are positively identified in surface soil, drainage sediment, air, tuff, and pore gas within the subsurface. It is subsequently stated that, "the results of surface water analyses are also introduced to develop the conceptual model". It is not clear why the

surface water migration pathway is not identified as a primary transport media for the Model and why COPCs in surface water are not mentioned in the list presented. Ecological receptors may come in contact with COPCs detected in surface water runoff. While it is recognized that surface water runoff may be subject to rapid evaporation, the migration pathway should be clearly documented to demonstrate that potential ecological exposures associated with this pathway have been evaluated. In addition, it should be clear that sediment samples associated with the surface water runoff migration pathways and depositional areas that may be associated with this pathway have been collected to demonstrate possible worst case concentrations and exposures. The Model should be revised to clarify the influence and importance of the surface water migration pathway and to document that exposures associated with the pathway have been comprehensively evaluated.

4. Section 6.1.1.1, Surface-Media Concentration

Nature and Extent of Inorganic Chemicals in Surface Media

On page 6-2, LANL states that infrequent detections of mercury, silver, and selenium in the surface soils at MDA G are not indicative of a metals release from the subsurface potential release sites (PRSs). It is hypothesized that they are from accidental spills or waste handling activities. While these metals may not be attributable to the subsurface PRSs, they are present and appear to be associated with hazardous waste activities at MDA G. Thus, they may pose a risk to receptor populations. Based on the information presented in the text, it appears that mercury, silver, and selenium should be retained as COPCs associated with MDA G. Additional information would be needed to justify their exclusion from the risk assessment.

Nature and Extent of Organic Chemicals in Surface Media

a. It is indicated that several pesticides may have been disposed of at MDA G, but that it is unusual that past releases would result in the observation of a single chemical. Further statements indicate that methoxychlor residues have been demonstrated to remain in the soil for a maximum of 14 months (National Library of Medicine 1999, 64070). Information on page 6-7 indicates that methoxychlor was detected in approximately 20% of the sediment samples but the source is not known. It should be noted that methoxychlor is the p-methoxy derivative of the insecticide dichlorodiphenyltrichloroethane (DDT). Assuming the information presented by the National Library of Medicine study is accurate, it would appear that either the insecticide may have been applied within the year prior to sampling, or buried waste may somehow have been brought to the surface through erosion or burrowing animals. It is recommended that historical and current application and disposal of this compound be investigated. It should be determined whether methoxychlor may have been disposed in the area or whether the concentrations are related to appropriate applications under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) regulations at the time of application. The manner in which the insecticide should be handled will depend on whether it was applied in accordance to FIFRA or whether it may have been disposed in the area. However, in either case, the detected concentrations should be included in calculation of total risk, both human health and ecological.

b. It is indicated in the third paragraph of page 6-7 that aroclor-1260 was detected in 5 out of the 77 surface soil samples at concentrations equivalent to the estimated quantitation limits (EQLs). The Model then discusses how the data support that there is no migration in mesa slope and further, that the locations with detected concentrations are not in areas that receive any sheet flow from the PCB disposal shafts. The sample locations and data may support the conclusion, however, the locations of the samples with detected concentrations have not been presented or referenced. Therefore, it is difficult to ascertain whether the locations provided adequate coverage of migration pathways or whether the detected concentrations are above risk benchmarks (i.e., ecological benchmarks). While it is understood that the section is describing surface media contamination, it is not clear whether surface media are representative of locations within possible subsurface-to-surface migration pathway. The data should be presented within the Model or provide references to tables and figures which illustrate how samples are representative of all possible migration pathways.

c. The third paragraph on page 6-7 states, "[t]*he surface soil, sediment, and stormwater data support the conceptual model in that contaminants brought to the surface are transported away from their location of origin by surface water (as either solute or sediment) and decrease in concentration with distance from the source.*" While this may true, the bubble plot figures presented in the Model do not support this concept. The Model should present concentration contour maps of surface soil and sediment concentrations for applicable contaminants.

d. The fourth paragraph on page 6-7 discusses the detection of acetone, 4-isopropyl toluene, and methyl iodide in surface soil samples and attempts to throw out the data since "[t]*he infrequent number of detections and the low concentrations support the interpretation that no release of VOCs to surface media has occurred at MDA G.*" LANL does not indicate how or why the analytes were detected (if there was no VOC release) and does not discuss field or lab blank data to support their contention that there has been no release of volatiles to surface soils.

5. Section 6.1.1.2, Air Contamination

<u>Nature and Extent of Organic Chemicals in Air</u>

The third paragraph under this subject heading (page 6-11) states that "because of the sporadic and high number of trace organic detects (and apparent analytical contamination during this sampling), only compounds that were detected in at least four of the eight samples collected were included in the evaluation of nature and extent". The text should be revised to include a reference to the discussion of the analytical contamination that occurred during the background air sampling. Also, LANL appears to be imposing a detection rate of 50 percent on the inclusion of air data in the Model. This does not appear to be appropriate and requires justification.

Section 6.1.1.2 (page 6-11, fourth paragraph) indicates that acetone and methanol concentration values were not considered "*because of their appearance as method artifacts.*" An explanation is provided, however, it is not supported by quality assurance field or lab blank data.

6. Section 6.1.1.3, Subsurface Media Concentration

Section 6.1.1.3 (page 6-16, second full paragraph) identifies acetone and bis (2-ethylhexyl)phthalate as laboratory contaminants, however, no laboratory blank data is presented to support this claim. Also, "sporadic detections" of trichloroethene and 1,1,1-trichloroethane were considered to be laboratory artifacts, again without lab blank data to support the claim; as a result, these compounds were not considered to be COPCs at MDA G. Similarly, Section 6.1.2.3 argues that trichlorofluoromethane and bis (2-ethylhexyl)phthalate are lab contaminants and were not considered to be COPCs at MDA H.

Section 6.1.1.3 (page 6-16, third full paragraph) identifies two VOC plumes at MDA G, however, the Model does not graphically identify the vertical and lateral extent of either plume through the presentation of concentration contour maps, or the boreholes used to collect the pore-gas data.

7. Section 6.1.1.4, Revised Site Conceptual Model for MDA G

In general, the manner in which the Model and the selection of COPCs is presented does not provide a clear or comprehensive understanding of the primary migration pathways from the sources to exposure media for human and ecological receptors. In addition, the presentation of analytical results used to document migration pathways is not adequate. It is recommended that the Model present the primary and secondary transport media and identify receptor populations on a process diagram, which should clearly identify all potential on- and off-site migration pathways and the exposure media for human, aquatic and terrestrial receptors. The figure should then document whether exposure pathways are considered complete or incomplete.

8. Section 6.1.2.1, Surface Media Concentration

<u>Nature and Extent of Inorganic Chemicals in Surface Soil and Sediment</u>

On page 6-17, LANL presents an argument for eliminating lead detected in sediments on the mesa top at MDA H as an inorganic COPC. Although the lead was detected at levels above the laboratory-wide sediment background level, it was not detected at a level considered indicative of a release when compared to the laboratory-wide soil background level. LANL states that the sediment samples were taken on the mesa top where the medium is more like surface soils than the canyon floor medium represented in the laboratory-wide sediment samples. Reference is made to Environmental Restoration Project 1996, 54462.7 in support of this claim. Based on this logic, LANL has not considered lead a COPC in surface media at MDA H. Additional details are needed in Section 6.1.2.1 to demonstrate that the sediment samples taken at MDA H should be compared to laboratory-wide soil background levels. The differences and similarities among the media under consideration (sediments at MDA H, sediments from the canyon floor background sampling location, soils from the background sampling location) should be discussed. The discussion should address the behavior of lead in each medium. In addition, the Environmental Restoration Project reference should be obtained for review.

At the bottom of page 6-17, LANL presents an argument for excluding cadmium as a COPC in surface soil and sediment at MDA H. The comparison of the average detection limit for site samples to the range of detection limits for soil/sediment background samples in itself is insufficient to support the exclusion. Additional information specific to each sample in question and statistical analyses of the sampling results should be provided.

Nature and Extent of Radionuclides in Surface Soil and Sediment

On page 6-18, LANL presents an argument for eliminating tritium detected in sediments on the mesa top at MDA H from the present-day risk assessment. Although the tritium was detected at levels above the sediment fallout level, it was not detected at a level considered indicative of a release when compared to the soil fallout level. LANL stated that the sediment samples were taken on the mesa top where the medium is more like surface soils than the canyon floor medium represented in the sediment fallout samples. Additional information should be provided in the text to demonstrate that the sediment samples taken at MDA H should be compared to soil fallout levels rather than sediment fallout levels. The differences and similarities among the media under consideration (sediments at MDA H, sediments from the canyon floor, soils where the soil fallout level was determined) should be discussed. The discussion should address the behavior of tritium in each medium.

9. Section 6.1.2.2, Air-Contamination

Nature and Extent of Organic Chemicals in Air

Although acetone was detected in four of five VOC flux samples at MDA H, LANL has excluded it from consideration in the present-day risk assessment. LANL described the detections as "...marginally greater..." than the 4.8 $ng/m^2/min$ detection limit, stated that there was no history of VOC disposal at MDA H, and mentioned that acetone is a common laboratory contaminant. The text should be modified to include a reference to a discussion of the chemicals disposed of at MDA H and possible sources of the acetone should be identified and discussed. Results of any QA/QC samples taken as part of the sampling event should be presented and discussed.

10. Section 6.1.2.3, Subsurface Contamination

Nature and Extent of Inorganic Chemicals in Tuff

At the bottom of page 6-18 LANL states that, although detected above background approximately ten feet below ground surface, copper will not be addressed in the present-day risk assessment. The text further states that the elevated copper levels are possibly a locally enriched zone for one or two metals. This statement is referenced to Stimac, et. al. (1996, 59362). The information in the referenced document relating to possibly elevated levels of copper in the tuff should be summarized in the text. The Stimac reference should be obtained for review.

Nature and Extent of Organic Chemicals in Tuff

The third paragraph on page 6-19 discusses detections of trichlorofluoromethane and bis-2-ethylhexylphthalate in the Tuff below MDA H. The text states that the one detection of trichlorofluoromethane is likely spurious as it was close to its EQL and it was not detected in the surface flux samples. Bis-2-ethylhexylphthalate is thought to be a laboratory contaminant. Again, LANL uses such "...considerations..." as grounds for not including these compounds as COPCs. LANL should provide more evidence in support of ignoring the detections of these compounds in core samples from below MDA H. The text should be modified to include a reference to a discussion of the chemicals disposed of at MDA H and possible sources of these two compounds should be identified and discussed. Results of any QA/QC samples taken as part of the sampling event should be presented and discussed as well. Also, the text should repeat any frequency of detection guidelines that were agreed to by the facility and the governing regulatory agencies for the purpose of identifying and eliminating COPCs.

11. Section 6.1.2.4, Revised Conceptual Model for MDA H

In general, the manner in which the Model and the selection of COPCs is presented does not provide a clear or comprehensive understanding of the primary migration pathways from the sources to exposure media for either human or ecological receptors. In addition, the presentation of analytical results used to document migration pathways is not adequate.

12. Section 6.1.3.1, Surface Media Contamination

Nature and Extent of Inorganic Chemicals in Surface Media

The third paragraph under this heading concludes that metals are not present above background levels in surface media at MDA L. While not detected, three metals (cadmium, selenium, and silver) had associated reporting limits that exceeded laboratory background levels. The text described the range between the detection limits and the background values as "...relatively small..." Further, it was stated that "...the detection limits...were within the ranges of detection limits for Laboratory-wide surface soil and sediment data sets when using comparable analytical methods." However, no numerical ranges, no detection limits, and no background levels were presented. The text should be revised to include the detection limits for the three metals, the background levels, and the detection limits for the background samples. Other information (e.g., site history) related to the presence/storage of metals at MDA L should be provided.

Nature and Extent of Radionuclides in Surface Media

On pages 6-21 and 6-22, LANL presents an argument for eliminating plutonium-238 detected in channel sediment samples on the mesa top at MDA L from the present-day risk assessment. Although plutonium-238 was detected at levels above the sediment background level, it was not detected at a level considered indicative of a release when compared to the soil background level. LANL stated that the sediment samples were taken on the mesa top where the medium was more like surface soils than the canyon floor medium represented in the sediment background samples. To support this claim, reference was made to an Environmental Restoration Project report

(Environmental Restoration Project 1996, 54462.7). Additional information should be provided in the text to demonstrate that the sediment samples taken at MDA L should be compared to soil background levels rather than sediment background levels. The differences and similarities among the media under consideration (sediments at MDA L, sediments from the canyon floor, soils where the soil background level was determined) should be discussed. The discussion should address the behavior of plutonium-238 in each medium.

13. Section 6.1.3.2, Air Concentrations

Section 6.1.3.2 (page 6-22, last paragraph) discusses the detection of several VOCs in ambient air samples at MDA L that were not found in flux measurements. These VOCs include dichlorofluoromethane, chloromethane, n-hexane, trichlorofluoromethane, methylene chloride, benzene, toluene, and xylene. The text states, *"It is suspected that some of these analytes are associated with other ambient sources."* There is, however, no substantive support for this statement (i.e., citation of a study), nor any realistic presentation of the outside source of VOC emissions at MDA L. Also, Reference No. 26 (LANL, 1999, Work Plan for Sandia Canyon and Cañada del Buey) indicates that benzene, bromochloromethane, 1,1,1-trichloroethane, and trichlorofluoromethane were found in pore gas samples collected 523 feet beneath the mesa top at MDA L. Although it is possible that some analytes are "associated with other ambient sources," the similarities between the lists of chemicals detected in the ambient air and at depth preclude simply waving them off as unrelated to releases at MDA L.

> Reference 26: Los Alamos National Laboratory (LANL), September 1999. *Work Plan for Sandia Canyon and Cañada del Buey*, Los Alamos National Laboratory Report LA-UR-99-3610, Los Alamos, New Mexico (LANL 1999, ER ID Number 64617).

14. Section 6.1.3.3, Subsurface Media Contamination

A greater understanding of the text (and the reported results) would be conveyed if this section included a figure (similar to Figure 6.1-12) illustrating the location of all the boreholes where samples were taken at MDA L.

<u>Nature and Extent of Inorganic Chemicals in Subsurface Media</u>

a. At the bottom of page 6-23, LANL references Figures 6.1-16 through 6.1-18 and Figures E-5.2-2 through E-5.2-6 to illustrate the detection of barium, chromium, cobalt, copper, nickel, uranium, and zinc at consecutive sampling depths. The text states further that other analytes were detected above background levels at discrete locations. These compounds are not identified and the locations of the detections are not shown. A reference to the location of the sampling results or to figures illustrating the results should be provided for the analytes detected above background at discrete locations. In addition, the second paragraph argues that single detections of inorganics above background levels "provided insufficient evidence of a release." The argument does not appear to be justified since a single detection may well be a recent release that has not moved or diffused significantly, or it could be the result of a preferential flow pathway at the level of the borehole sample. The assessment of single-point

detection data should be reviewed throughout MDAs G, H, and L and reconsidered for inclusion in the Model.

b. According to page 6-27, angled boreholes 54-1010 and 54-1011 were drilled beneath the eastern and western portions of Pit A. Detections above background levels were obtained for barium in 54-1011 and cadmium, mercury, uranium, and chromium in 54-1010. The paragraph concludes that these detections are not indicative of a release. However, the discussion is incomplete as no evidence is presented in support of the conclusion. The text should be revised to include or reference the location of information (e.g., site history) related to the presence/storage of metals at Pit A. Other information such as the locations of other detections of these metals at MDA L and QA/QC sampling results should be considered and possible sources of the detections at Pit A identified.

c. The discussion of Shafts 1-28 in Section 6.1.3.3 presents conflicting information within the second paragraph of the subsection on page 6-27. The discussion states, *"Copper and chromium remained elevated at the deepest sampling location (146 ft)."* Two sentences later, the discussion indicates that chromium concentrations decreased to less than the background level at the deeper sampling intervals, which does not appear to correspond with the quoted statement above. The last sentence of the paragraph states that the vertical extent of copper was not established, apparently since it was detected above background at the bottom of the borehole and, therefore, possibly above background at depths below the bottom. A similar claim could be made for chromium since it, too, was detected above background at the bottom of the same borehole. This analysis of inorganic contamination requires further explanation.

Nature and Extent of Radionuclides in Subsurface Media

The discussion of radionuclides in subsurface media at MDA L concludes that other than tritium, radionuclides are not present in the Tuff due to releases from the PRSs. While the text implies that sampling results for radionuclides other than tritium were analyzed to determine if a pattern indicative of a release was present, the analysis is not described. The text should be modified to present the locations of the detections and describe the analyses performed that led to the stated conclusion.

Nature and Extent of Organic Chemicals in Subsurface Media

a. Page 6-28 documents detections of bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, and pentachlorophenol in excess of their respective EQLs. At the end of the first paragraph on page 6-29, LANL states that these detections are artifacts of the laboratory analysis. This statement should be supported by evidence or additional information. Results of any QA/QC samples taken as part of the sampling event should be presented and discussed.

b. Page 6-29, first paragraph, declared the detection of VOCs in tuff to be unreliable near Pit A and Shafts 1-28. LANL argues that the detections were sporadic and also unreliable since VOCs do no adsorb to tuff. Also, the semivolatile organics data was considered to be

laboratory artifacts, but lab blank data was not provided in support of this argument. Technical references should be provided to support the exclusion of this data.

15. Section 6.1.3.4, Revised Site Conceptual Model for MDA L

a. It is unclear whether a subsurface solute transport pathway will be considered at MDA L. The first paragraph of Section 6.1.3.4 states that this pathway will be considered in the analysis of future risk as liquid VOCs may still be present in the MDA L inventory. However, the second paragraph indicates that the future risk assessment will focus on "...vapor-phase transport of VOCs in the subsurface and not aqueous–phase transport." Further, Section 6.1.1.4 states that, although not supported by available data, this pathway will be retained for the analysis of future risks at MDA. The text should be revised to clearly show that the subsurface solute transport pathway will be addressed in the analysis of future risks at MDA L and MDA G and that it will be assessed using consistent methods and criteria.

   In general, the manner in which the revised conceptual site model and selection of COPCs is presented does not provide a clear or comprehensive understanding of the primary migration pathways from the sources to exposure media for human and ecological receptors. In addition, the presentation of analytical results used to document migration pathways is not adequate. It is recommended that the Model present the primary and secondary transport media and identify receptor populations on a process diagram, which should clearly identify all potential on- and off-site migration pathways and the exposure media for human, aquatic and terrestrial receptors. The figure should then document whether exposure pathways are considered complete or incomplete.

b. The second paragraph on page 6-33 states that an analysis was performed to evaluate the potential for VOC flux. The text states that the analysis showed that a 55-gallon drum of trichloroethane would volatilize within a year and would move about 30 meters under continuous saturation. The text should be revised to describe the analysis in detail or provide a reference to the location of such a description, and also be revised to clearly present the conservative assumptions that were used to support the volatilization of the trichloroethane in the subsurface tuff formations. The Nyhan et. al. (1984 6529) analysis discussed in Reference 11 may be one possible source of information.

c. The third paragraph on page 6-33 refers to the Purtymun injection well tests. The text should be modified to include a reference citation for the document(s) that describes these tests.

d. Reference citations should be provided in the text for previous work performed at TA-54 that supports the conclusions stated in the last paragraph under this heading. For example, a reference should be provided to the document that indicates that the tuff may be "...homogeneous media subject to atmospheric pressure variations..."

   Reference 11: Section 3.4 of Appendix G of the draft MDA Implementation Plan, Percolation/Unsaturated Flow - Aqueous-phase transport of contaminants is minimal under

normal unsaturated conditions. The full citation, however, is not listed among the references listed at the end of the document.

Reference 11: Excerpt from Appendix G of the Draft MDA Implementation Plan, Section 3.4, Percolation/Unsaturated Flow - the aqueous-phase transport of contaminants is minimal under normal unsaturated conditions.

16. Section 6.1.4, Summary of COPCs at MDAs G, H and L

Table 6.1-1 presents the chemicals of potential concern (COPCs) evaluated in the risk assessment. The table, however, only lists the radioactive inorganic chemicals (e.g., plutonium and americium), but does not list other metals that are discussed in the text or graphically presented in figures in the Model.

17. Section 6.2.1, Proposed Conceptual Model for MDAs G, H, and L

The first paragraph of this section states that a conceptual site model was formulated for MDA G in the performance assessment and composite analysis (PA/CA) prepared by Hollis et. al. (1997, 63131). This model served as the starting point for the conceptual site model for the RCRA Facility Investigation (RFI) of TA-54. The Hollis reference, or that portion of the reference pertaining to the conceptual site model, should be obtained for review.

18. Section 6.2.1.1, Contaminant Inventories and Disposal Operations

The first full paragraph on page 6-36 provides estimates of the percentage of pit, impoundment, and disposal shaft volume actually occupied by waste. The text reads as if LANL is not confident in any of the estimates. For example, an estimate of 10% is offered for the pit based on "...limited data..." LANL should reference all information sources used to develop these estimates and for disposal units where uncertainty exists, a range of volume occupied should be offered based on the reviewed data.

<u>Vapor Diffusion</u>

The first paragraph at the top of page 6-37 states "The present-day surface fluxes observed at TA-54 are expected to represent the maximum rates of release for most gas-phase contaminants." Further, the text states that "Releases from (the wastes stored at TA-54) have been occurring for long periods of time and appear to have reached, or surpassed, steady-state release conditions. Pore gas concentrations of VOCs at MDA L have been observed to be steadily decreasing over the past 10 years." Finally, the paragraph concludes by stating that "...for tritium the existing inventory will be depleted because of radioactive decay. This alone will result in halving of the inventory about every 12 years." Such statements, and others contained in this paragraph, should be accompanied by references to LANL documents that support the claims. For example, the observed trend in steadily decreasing VOC concentrations at MDA L should be supported with a reference to the appropriate pore gas sampling report.

Erosion and Cliff Retreat

The last paragraph of the section states that laboratory investigators have estimated that it would take approximately 40,000 to 400,000 years for cliff retreat to expose the wastes stored at TA-54. A reference to the document(s) that describes the analysis alluded to in the text should be provided. Reference 15 presented a summary of an analysis of cliff retreat by Reneau (1995, ER ID 50134) at TA-21, however, information specific to the analysis of cliff retreat at TA-54 is required here.

While laboratory investigators have estimated the time it would take for cliff retreat to expose the wastes stored at TA-54, there is no discussion of the timeframe for cliff retreat to influence the fate and transport of vapor contamination beneath the MDAs. It has been noted that the vapor plume below MDA L has extended beyond the facility boundary. A discussion of how cliff retreat affects the loss of VOC vapor to the atmosphere should be provided.

> Reference 15: Broxton, D.E. and P.G. Eller, Editors, May 1995. *Earth Science Investigations for Environmental Restoration—Los Alamos National Laboratory Technical Area 21*, Report LA-12934-MS, Los Alamos, New Mexico.

Leaching

The text states that migration of metals has occurred (to a limited extent) below MDA L. Further, the text points out that the migration is attributed to direct liquid discharges from disposal operations and moisture content data at MDA L shows that residual levels of pore water are similar to those obtained at the rest of TA-54 so no migration is occurring at present. References to LANL documents that identify the probable source of the liquid that led to metals migration and characterize the level of residual pore water at MDA L and the rest of TA-54 should be provided.

19. Section 6.2.1.3, Contaminant Transport Pathways

Vapor-Phase Diffusion

The last paragraph on page 6-39 indicates that subsurface VOC transport may occur by diffusion and advection. Reference 12 concluded that diffusion was the dominant transport mechanism and that advective transport may not be occurring in the Bandelier Tuff. In fact, the modeling study of April 2000 (Reference 31) was performed assuming that all VOC transport was by diffusion. However, AIRNET data showed a seasonal fluctuation in the surface flux of tritium at MDA G. Section 6.2.13 hypothesized that alternating periods of high and low barometric pressure and changes in atmospheric temperature may influence subsurface VOC migration and, thus, flux at the surface. Because advective transport had been discounted in previous analyses References 12 and 31), any analysis that has been performed to investigate the source of the seasonal variation in the surface flux of tritium should be made available for review.

Reference 12: "*Conceptual Model for Vapor Movement at MDAs: Organic Vapor Plume Movement at MDA L*", D.B. Rogers, Water Quality and Hydrology Group, ESH-18. LANL Report LA-UR-00-950. July 19, 1999.

Reference 31: "*Subsurface Vapor-Phase Transport of TCA at MDA L: Model Predictions*", Stauffer, Birdsell, Witkowski, Cherry, and Hopkins. Earth and Environmental Sciences Division, LANL, April 2000.

Dust and Air Dispersion

The second paragraph on page 6-40 discusses the variation in the direction of prevailing winds in the vicinity of TA-54. The text should be augmented to include a discussion of how well the different wind patterns (those on the mesa top and those in the canyon) are understood. Any air dispersion models that may be used to predict the atmospheric transport and dispersion of VOCs emitted from TA-54 into this complex wind field should be identified and discussed.

The discussion of dust and air dispersion does not mention dry and wet deposition processes for suspended particles and VOC vapors. The discussion in the text should be expanded to address the potential for these two mechanisms to occur once particles are entrained or VOC and tritium vapors are emitted into the air at TA-54.

Biotic Uptake

While the first paragraph of this discussion addresses the possibility of site contaminants entering the ecological food chain, this type of exposure is not included in the preliminary conceptual site models described in Section 6.1.1.4, 6.1.2.4, and 6.1.3.4. The preliminary conceptual site models for MDAs G, H, and L should be reviewed and revised to include the transport of contaminants through the ecological food chain due to exposure of fauna to contaminated plants and surface and subsurface soil contamination. If the hunting or fishing of animals that may have been exposed through the ecological food web is allowed in the vicinity of TA-54, exposure to humans should be considered as well.

20. Specific Comments Related to the Section 6 Figures

As discussed in the General Comments, the Model figures do not clearly present data, which allows the reader to identify or understand the nature and extent of contamination at TA-54. Concerns with specific figures from the Model are outlined below.

- The bubble plots (e.g., Figures 6.1-2, 6.1-3, and 6.1-4) of contaminant concentrations provide some sense of lateral extent to the MDA fenceline, but no indication of vertical extent. Figures 6.1-5 and 6.1-6 indicate the detection of methoxychlor and Aroclor-1260 (a polychlorinated biphenyl), respectively, in specific locations, however, the concentrations are not provided, nor the depth at which the sample was collected (other than "surface soil" and "channel sediment").

- Figure 6.1-5 presents a pie chart that indicates the distribution, on a percentage basis, of the emissions vented to the atmosphere at MDA G. According to the pie chart, Area G-5 generates the greatest percentage of emissions. Figure 6.1-11 presents a pie chart that breaks down the components, on a percentage basis, of the emissions from Area G-5. While interesting, no actual concentration values are presented. Also, the air sampling station locations are not provided on the site plan presented in Figure 6.1-9. There is no attempt to correlate the emissions components with the waste inventory for Area G-5. Further, similar presentations of emission components were not provided for the other areas; a table of actual concentration values could be provided.

- Figure 6.1-13 provides a relative indication of the concentration of vapor phase tritium detected in various boreholes, but not the actual concentration values. Further, the text just below this figure states, *"Figure 6.1-13 illustrates that tritium concentrations were greatest near the disposal shafts in the south-central portion of MDA G (borehole 54-1111)."* This statement, however, does not accurately describe the information presented in Figure 6.1-13. The figure does indicate that borehole 54-1111 has the highest <u>relative</u> concentrations of tritium, but it does not present the <u>actual</u> tritium concentrations, nor does it illustrate the locations of any of the boreholes in MDA G. To confirm the location of borehole 54-1111, the reviewer had to consult Figure 6.1-11 and then Figure 6.1-9, which was referenced to confirm the locations of disposal shafts 150 and 151 near the borehole. Figure 6.1-9 also indicated that disposal trenches A-H were located adjacent to borehole 54-1111, which may indicate that borehole contaminants are from a trench, rather than a shaft, or possibly both. The evaluation of the source(s) of the contamination is either inadequate or not clearly described by the Model.

- Figures 6.1-14, 6.1-16, 6.1-17, and 6.1-18 are similar to Figure 6.1-13 in their presentation of relative concentrations of specific contaminants. None of these four figures presents actual concentration values for tritium, chromium, copper, or zinc, respectively. Also, since site plan maps were not provided in the Model for MDAs H and L, none of the boreholes identified on these four figures could be located within their respective MDA. As with MDA G (i.e., Figure 6.1-13), these four contaminant concentration diagrams are minimally useful. The Model would be greatly improved by inclusion of contaminant concentration contour maps at various for MDAs G, H, and L.

- Figure 6.1-15 presents a pie chart that illustrates the percentages of specific volatile organic compounds (VOCs) found in air emissions at MDA L. While this may provide an interesting indication that 1,1,1-trichloroethane, tetrachloroethene, and trichloroethene make up about 90 percent of the VOC emissions, the figure, as well as Section 6.1.3.2, present no actual VOC concentration values. No plume maps of air emissions were provided for MDAs G, H, and L.

- Figures 6.1-19 and 6.1-20 are the only diagrams in the Model which attempt to graphically present the nature and extent of a contaminant, i.e., trichloroethane, although it unclear if it is the 1,1,1- isomer, the 1,1,2- isomer, or both. The reader can assume that these figures address the 1,1,1-trichloroethane plume discussed in the text on page 6-29. Figure 6.1-19 presents three contaminant concentration contour maps, each at a different

elevation, 6741 feet, 6679 feet, and 6617 feet. Due to the dark background of each contour map (probably in color on the original), it is difficult to see the contours, but possible to identify two or three contours on each map. Only one contour, however, on each map is labeled with a concentration value and the reader is left to guess at the significance of the other contours. Similarly, the three-dimensional presentation of each map is difficult to interpret because the original presentation did not copy well. Even so, one observation can be made: the elevations represented in 3-D range from 5823 to 6791, which means that the three contour levels fit into the upper 20 percent of the elevation range. The details of the 3-D representations are diminished by presenting an additional 800 feet of thickness for no apparent reason. Also, Figure 6.1-19 does not present the total vertical extent of contamination since the lowest elevation represented is 6617 feet, while Figure 6.1-20 provides plume contours for the 6600-foot level. Finally, Figure 6.1-20 is of such small scale that the reader cannot locate the plume relative to borehole locations.

- Figure 6.1-21 presents two cross-sectional representations of the same north-south slice of the MDA L trichloroethane plume. There is, however, no site plan provided to actually locate the cross-section at MDA L. Also, the cross-section does not identify the boreholes used to construct the cross-section; the site plan should also indicate the borehole locations.