Los Alamos
NATIONAL LABORATORY
EST. 1943

Los Alamos National Laboratory/University of California
Environmental Stewardship (ENV)
Remediation Services (RS), MS M992
Los Alamos, New Mexico 87545
(505) 667-0808/FAX (505) 665-4747

National Nuclear Security Administration
Los Alamos Site Operations, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-7203/FAX (505) 665-4504

RECEIVED
APR 29 2005
NMED Hazardous Waste Bureau

Date: April 29, 2005
Refer To: ER2005-0266

Mr. James Bearzi
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303

SUBJECT: RESPONSE TO THE NOTICE OF DISAPPROVAL (NOD) ON THE LOS ALAMOS AND PUEBLO CANYONS INVESTIGATION REPORT

Dear Mr. Bearzi:

Attached is the response to the NOD on the Los Alamos and Pueblo Canyons Investigation Report dated April 2004. Responses to comments fall into two categories; those that are addressed within the response to the NOD, and those that provide general information on how LANL will approach comment resolution in subsequent submittals to the NMED. Once this response to the NOD is approved, LANL will begin conducting the work necessary to address the remaining aspects of the report that are related to the NOD.

If you have any questions or concerns please feel free to contact Danny Katzman at (505) 667-6333 or Katzman@lanl.gov.

Sincerely,

David McInroy, Deputy Program Director
Environment Stewardship Division
Environmental Remediation &
Surveillance Program
Los Alamos National Laboratory

Sincerely,

David Gregory, Federal Project Director
Department of Energy
Los Alamos Site Offices

DM/DG/DK/ds

Enclosure: Response to the Notice of Disapproval (NOD) on the Los Alamos and Pueblo Canyons Investigation Report

Cy:(w/enc)

A. Dorries, ENV-ECR, MS M992
E. Rainey, ENV-ECR, MS M992
D. Gregory, LASO, MS A316
L. King, EPA Region 6
ENV-RS File, MS M992
RPF, MS M707
S-7, MS F674

Cy:(w/o enclosure)
D. McInroy, ENV-RS, MS M992
B. Rich, ADO, MS A104
C. Voorhees, NMED-OB
D. Katzman

Response to
Notice of Disapproval, Los Alamos and Pueblo Canyons Investigation Report,
Los Alamos National Laboratory (LANL), EPA ID #NM0890010515, HWB-LANL-04-006

INTRODUCTION

Contained below is Los Alamos National Laboratory's (LANL's) response to the notice of disapproval (NOD) on the "Los Alamos and Pueblo Canyons Investigation Report" (LAPCIR) (LANL 2004, 87390), from the New Mexico Environment Department (NMED) (2005, 88463). To facilitate review of this response, NMED's comments are included verbatim, and are divided into general and specific categories. LANL's responses follow each NMED comment. The focus of the comments in the NOD is the determination of chemicals of potential concern (COPCs), the collection of additional dioxin and furan data, and a re-evaluation of the human-health risk assessment. The recalculation of the risk assessment and related activities required by the NOD will be provided in one or more future submittals. LANL responses to comments regarding the re-evaluation of the risk assessment provide general information on how the re-evaluation will be conducted so NMED can review the proposed approach. According to an agreement made with NMED on March 7, 2005, the revised risk assessment will be provided in a letter response with necessary attachments rather than as a revision to the original report.

This response contains discussions regarding radioactive materials, including source, special nuclear, and by-product material. The management of these materials is regulated under the Atomic Energy Act and is specifically excluded from regulation under the Resource Conservation and Recovery Act and the New Mexico Hazardous Waste Act. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department in accordance with U.S. Department of Energy policy."

GENERAL COMMENTS

NMED Comment

1. *The results of the statistical analyses to determine distribution and the 95% upper confidence limit (UCL) were not provided. As such, a review of the selection of the appropriate statistical test and derivation of the UCL could not be completed. The Permittees must provide the results for the distribution testing and the UCLs. Also, the Permittees must provide discussions of other statistical parameters and assumptions used in these calculations.*

LANL Response

1. LANL will provide the results of the distribution testing and upper confidence limits (UCLs) as requested, along with discussions of other statistical parameters and assumptions, as appropriate. This analysis will be submitted to NMED as part of the revised risk assessment.

NMED Comment

2. *Many of the values used for food product intake parameters were based upon the 1997 "Exposure Factors Handbook". However, in March 2003, EPA (through the National Center for Environmental Assessment, NCEA) updated Chapters 9, 10, and 11 of the "Exposure Factors Handbook" with the "CSFII Analysis of Food Intake Distributions" (EPA/600/R-03/029). The updated data reveal some*

potential discrepancies in the ingestions rates (e.g., vegetable, fruit, and meat) applied in the risk assessment. The Permittees must revise the risk assessment to incorporate the most current data contained in the "CSFII Analysis of Food Intake Distributions."

LANL Response

2. The data set from which the U.S. Environmental Protection Agency (EPA) derived fruit, vegetable, and meat intake rates for home-produced foods in the Exposure Factors Handbook (EPA 1997, 65597, Chapter 13) is the Nationwide Food Consumption Survey (NFCS), 1987–1988. These data were selected for the exposure calculations because they are specific to a subpopulation of individuals who raise and consume home-produced foods. By contrast, the data related to the Continuing Survey of Food Intakes by Individuals (CSFII) reflect the intake of foods by the general population from all sources. To employ CSFII data in the LAPCIR exposure calculations, one the values for the (unknown) fractions of fruit, vegetables, and meat hypothetically originating "on-site" would need to be specified. Rather than introduce the uncertainty related to this variable into the exposure calculations, it is preferable, and more representative of the pathway being evaluated to utilize specific food-intake data from the NFCS as provided in the 1997 Exposure Factors Handbook. Therefore, no change will be made to the food-product intake parameters included in the LAPCIR.

NMED Comment

3. *Dioxin and furans were not included in the risk assessment. The Permittees state in the Report that an agreement between the Permittees and NMED had been reached to not include these constituents in the risk assessment, as noted in Katzman 2002. This agreement refers to the approach to determining contaminants of concern for the ecological risk assessment. The data that were presented to NMED to illustrate decreasing trends from SWMU 73-002, the likely major contributor of dioxins to Pueblo Canyon, and to justify not including these constituents are incomplete. The data set does not include all of the dioxin and furan congeners. For the six samples collected closest to Pueblo Canyon in three of the drainages leading from the SWMU, the Permittees only present a complete congener list for one sample. In an additional drainage, the sample collected was not analyzed for dioxins and furans. The Permittees state in the aforementioned agreement that they only have post-fire data. Because the data set is not complete, the Permittees are unable to determine which of the dioxins/furans are related to the fire, which is important to know to determine risks from LANL operations. The Permittees must collect additional sediment data and then revise the risk assessment.*

LANL Response

3. LANL did not analyze sediment samples for dioxins and furans before the Cerro Grande fire for several reasons. These analytes were not specified in the Los Alamos and Pueblo Canyons work plan (LANL 1995, 50290) or in modifications to the plan following a notice of deficiency from NMED (LANL 1997, 56421). The plan with these modifications was approved by NMED in 1997 (NMED 1997, 56362). The absence of dioxin and furan data is thus consistent with the NMED-approved work plan. NMED also did not subsequently request that dioxins and furans be added to the analyte suite during the course of the field investigations in Los Alamos and Pueblo Canyons. The dioxin and furan data from Solid Waste Management Unit (SWMU) 73-002 indicate only trace levels of these analytes at the toe of the slope, and therefore minimal chance for recognizable contributions to sediment in Pueblo Canyon.

However, in response to new concerns from NMED, LANL will conduct sampling and analysis for dioxins and furans in Pueblo Canyon upcanyon and downcanyon of the SWMU 73-002 drainages to provide additional data concerning the possible transport of these constituents from this SWMU. Because the greatest potential for the transport of contaminants from this SWMU occurred in the decades prior to the Cerro Grande fire, sampling will be restricted to prefire sediment deposits. This strategy will also avoid potential ambiquity related to the presence of dioxins and furans in ash transported from the Cerro Grande burn area. LANL will collect five samples from each of reaches P-1E and P-2W, the closest upcanyon and downcanyon reaches to this SWMU. If detected, the dioxin and furan data will be included in the revised risk assessment. Recreational, construction-worker, and resource-user soil screening levels (SSLs) will need to be calculated because they are not currently available for dioxins and furans.

SPECIFIC COMMENTS

1. Section 3.0 Scope of Activities

Permittees Statement: "The scope of activities of this report include investigations of sediment, surface water, alluvial groundwater, and biota in the Los Alamos and Pueblo watershed, as presented in the NMED-approved Los Alamos and Pueblo Canyons work plan (LANL 1995, 50290; LANL 1997, 56421), subsequent addenda, and related documents (LANL 1998, 59373; LANL 1999, 65144; Katzman 2002, 73667; LANL 2002, 70235)."

NMED Comment

The investigation activities included in this report do not include all data that NMED needs to determine if corrective measures are required in the Los Alamos and Pueblo watershed. Numerous data have been collected at the Water Quality and Hydrology Group's storm water monitoring stations and at additional locations by the Environmental Restoration Group in these canyons that have not been reported or evaluated in this Report. These data are critical for NMED to determine if contaminants are being transported down canyon and beyond the Facility boundary. Surface water sampling data provided in this report do not provide available information. In addition, the Permittees state in the addendum to the Los Alamos and Pueblo Canyons Work Plan that "[o]ther relevant data collected by the Laboratory Water Quality Group (ESH-18) (e.g., storm water runoff, alluvial groundwater, and sediment) will be used to assess the fate and transport of contaminants and to support the development of an assessment of potential future impacts that may be caused by contaminant migration." The Permittees must submit all relevant storm water monitoring data from Los Alamos and Pueblo canyon watershed, including data from gaging stations. The data must be compared to relevant and applicable DOE-derived concentration guidelines and WQCC standards. The data must include data collected before and after the Cerro Grande fire.

LANL Response

LANL will provide storm water data from Los Alamos and Pueblo Canyons and major tributary canyons (Acid and DP Canyons) for constituent concentrations that exceed applicable standards. The table will include data from the period of record at monitoring stations in the watershed. The data set will represent sampling conducted both before and after the Cerro Grande fire, although some of the sampling stations have no prefire data. For analytes that exceed standards, LANL will also prepare time-series plots to provide a temporal context. These data and associated plots will be provided to NMED in a future submittal.

2. Section 6.1 Data Preparation, pg. 6-1:

NMED Comment

Several organics were eliminated as constituents of potential concern (COPCs) based upon low detection frequencies (less than 5%). It is agreed that this rule of detects is consistent with both Environmental Protection Agency (EPA) and NMED guidance. However, the investigation report references Katzman 2002 as documenting an agreement between LANL and NMED on applying the 5% detect rule. This reference does not address frequency of detects nor the elimination of COPCs based on this rule. In addition, even though the 5% frequency of detects has been approved and applied at other areas within the LANL facility, this does not necessarily mean that the approach is automatically appropriate for other sites. The EPA guidance (Risk Assessment Guidance for Superfund [RAGS], 1989) allows for the elimination of chemicals from a risk assessment if it is detected infrequently (e.g., less than 5% per 20 samples), not detected in other sampled media, and/or if there is no reason to believe the chemical may be present. However, RAGS clearly states that, "chemicals expected to be present should not be eliminated" from the risk assessment. It appears that many constituents that are expected to be present as a result of site activities were eliminated as COPCs based on the 5% detection rule (e.g., plutonium-239). As such, the inclusion of these constituents in the risk assessment is warranted. At a minimum, the risks from these constituents should be evaluated separately, and overall risks, with the COPCs included and the COPCs excluded, should be compared. The Permittees must either revise the risk assessment to include all organic constituents that have been historically present on-site, regardless of detection frequency, or provide specific documentation between LANL and NMED, which references the agreement of the 5% detection frequency specifically addressing the Los Alamos and Pueblo Canyons investigations and risk assessments.

LANL Response

The record of communication that documents meetings and agreements between LANL and NMED concerning development of an ecological risk assessment for Los Alamos and Pueblo Canyons (Katzman 2002, 73667) includes a series of attachments consisting of material presented and/or distributed at these meetings. The proposal to use 5% detection frequency criterion for organic chemicals was presented and discussed with NMED personnel on March 18, 2002, (see attached slides 17 and 18 of a PowerPoint presentation given on March 18, 2002, and p. 1 of an accompanying document "Draft Revised Sediment Eco-Screen"). LANL proposes to retain the 5% detection frequency criterion for organic chemicals in sediment and for all analytes in water for the risk assessments in Los Alamos and Pueblo Canyons, although LANL will modify this criterion for the revised risk assessment to retain some analytes that are detected at less than 5% frequency. Specifically, LANL will examine the list of analytes detected at less than 5% frequency and will retain additional chemicals of potential concern (COPCs) if they meet one or more of the following criteria: (1) if the analyte is present in other media in that subwatershed with a detection frequency of ≥5%, and (2) if the analyte is part of a closely related suite containing other analytes present at a detection frequency of ≥5% (e.g., PAHs). The list of analytes that were previously excluded, but that will now be retained, will be included in a revised human-health risk assessment provided to NMED in a future submittal.

3. **Sections 6.2.2.1 Terrestrial Ecological Screen and 6.2.2.2 Aquatic Receptor and Pathway Ecological Screen, pg. 6-5:**

NMED Comment

Individual analytes are not retained as contaminants of potential ecological concern (COPECs) if the hazard quotient (HQ) for the detected result is less than or equal to 0.3. The Permittes must provide justification for setting the screening limit to 0.3. The Permittees must also discuss looking at the overall hazard index (HI) and percent contribution of chemicals to the HI.

LANL Response

This contaminant of potential ecological concern (COPEC) identification rule was originally proposed by NMED in comments of the May 1998 version of the LANL ecological screening methodology document (LANL 1999, 64783) and were incorporated into the current version and screening process. This fraction of a hazard quotient (HQ) was included to identify COPECs that may significantly contribute to a hazard index (HI) even if it has an HQ <1.0. The 1999 version of the screening document contains the approach that has been used in all ecological screening assessments since 1999.

HQs and HIs were considered in formulating the study design of the Los Alamos and Pueblo Canyons ecological risk assessment, as documented in the associated record of communication (Katzman 2002, 73667). The study design focused on COPECs with the highest HQs and receptors and included a series of investigation areas that spanned a gradient of COPEC concentrations from areas with high HIs to low HIs. Here again, COPECs with HQs greater than 0.3 were retained and evaluated as appropriate in determining what constituents to analyze and where to evaluate ecological risk.

4. **Section 6.2.3.3 Evaluation of Tier 2 Sediment COPCs for Human Health Risk Assessment, pg. 6-8:**

NMED Comment

The Permittees do not include europium-152, thorium-228, thorium-230, or thorium-232 in the human health risk assessment. The Permittees claim that available data show that there are no LANL sources for these radionuclides. The document titled Formerly Utilized MED/AEC Sites Remedial Action Program (May 1981) provides data to the contrary. Thorium-232 was detected in samples collected at the former outfall drainages and in Acid and Pueblo Canyons. In addition, europium-152 was detected in samples collected at one of the former outfalls from the former Central Waste Water Treatment Plant (SWMU 0-019). The radionuclide data collected during this investigation should have been included in the human health risk assessment in this Report. Proximity to potential sources is not a valid consideration when there is no other explanation for the presence of these constituents.

LANL Response

As discussed on page 6-8 of the LAPCIR, the radionuclides specified above were identified as Tier 2 COPCs for the human health risk assessment in only two reaches in upper Los Alamos Canyon. The absence of detected values above sediment background values in upcanyon reaches, combined with low detection frequencies, indicated the lack of a clear LANL source in this subwatershed for these analytes (note that the examples provided by NMED pertain to the Pueblo Canyon watershed). LANL therefore believes that the available data support the interpretation that these isolated values do not represent recognizable releases of europium-152, thorium-228, thorium-230, or thorium-232 into the upcanyon

reaches of the upper Los Alamos Canyon subwatershed. However, LANL acknowledges that small quantities of these analytes may have been released from LANL sources into this subwatershed and will include them in the revised human health risk assessment. This revised risk assessment will be provided to NMED in a future submittal.

5. Section 6.3.1 Identification of Surface Water and Alluvial Groundwater COPCs, pg. 6-9:

NMED Comment

In addition to detection frequency, the Permittees should have used other screening criteria to determine organic, inorganic, and radionuclide COPCs in alluvial groundwater, especially because of the interconnection of the surface water with underlying groundwater zones and the possible impact to other groundwater zones from alluvial water contaminants. The applicable criteria may include the EPA Region 6 Tap Water Preliminary Remediation Goals (PRG), the Region 9 Tap Water PRG (if there is not a Region 6 standard), the NMWQCC standards, and the EPA Maximum Contaminant Levels. The Permittees must reevaluate their list of alluvial groundwater COPCs using the applicable standards.

LANL Response

LANL will revise the list of surface water and alluvial groundwater COPCs based on comparisons of maximum detected results to applicable standards. Any additional COPCs will be included in the revised human-health risk assessment, to be provided to NMED in a future submittal.

6. Section 6.3.3.2 Tier 2 Human Health Screen, pg. 6-11:

NMED Comment

The report indicates that all analytes with similar toxicological effects (carcinogens) were eliminated as Tier 2 COPCs for each location and field preparation combination if the HI was less than or equal to 10 for carcinogens. For the Tier 1 screening, using a HI of 10 as the screen was appropriate where the screening action level (SAL) was based upon a risk level of 1E-06. However, for the Tier 2, it appears that regardless of the risk basis of the SAL, a criterion of 10 is being used. This is not appropriate, as a COPC could have an associated risk between 1E-05 and 1E-04, which is above the NMED acceptable target risk of 1E-05. The Permittees must clarify the target risk for the Tier 2 analysis.

LANL Response

To facilitate comparisons, all carcinogen screening levels (Tier 1 and Tier 2) were based on a 1E-6 risk in the human-health risk assessment. An HI of 10 was therefore used to represent the risk based on 1E-5, to be consistent with NMED's target risk level.

7. Section 6.3.3.3.1 Groundwater, pg. 6-11:

NMED Comment

The text indicates that due to low frequencies of detection, false positives, and potential upgradient sources, some contaminants detected in groundwater are not representative of contaminant releases from the watershed areas. However, a soil-to-groundwater screening (SSL) was not conducted. Typically generic SSLs, based upon a dilution attenuation factor of 20, are compared to the maximum concentrations of detected contaminants in soil to determine whether the level of contaminant could

potentially pose a threat to groundwater. Conducting this analysis would also provide additional justification that the detections in groundwater are not due to contamination present within the watersheds. The Permittees must revise the risk assessment to include an analysis of site concentrations to SSLs.

LANL Response

The data set used for the LAPCIR includes years of data from comprehensive monitoring of surface water and alluvial groundwater in the watershed. These data provide the most direct means of evaluating the potential relation between contaminant concentrations in sediment and concentrations in water and are preferable to estimates based on dilution attenuation factors (DAF). Additionally, monitoring of surface water baseflow and groundwater will be conducted on an ongoing basis as described in the pending "Interim Facility-Wide Groundwater Monitoring Plan" scheduled to be submitted to the NMED in May 2005. The monitoring conducted under this interim plan will be designed to detect potential groundwater contamination from all sources within the watershed, including secondary sources represented by contaminated sediment in the watershed. For these reasons, the risk assessment will not be revised to include a DAF 20 analysis.

8. Sections 6.3.3.3.1 Groundwater and 6.3.3.3.2 Surface Water, pg. 6-11 and 6-12:

NMED Comment

The Permittees eliminated several COPCs based on low frequency of detection. See comment #1.

The Permittees use EPA's 10 times rule to eliminate methylene chloride as a COPC. However, this rule applies to samples in which a constituent was detected and for which an associated laboratory blank contained that same constituent. The Permittees must provide the laboratory reports to show that methylene chloride was detected in the blank samples. In addition, the Permittees are reminded that methylene chloride has been used in LANL processes and should not be eliminated for this reason alone.

LANL Response

LANL misapplied the 10-times rule, and will re-evaluate the methylene chloride data in the revised human health risk assessment, which will be provided to NMED in a future submittal.

9. Section 7.2.2.1 Spatial Distribution & Sources of Radionuclides in Water, pg. 7-27:

Permittees Statement: "Downcanyon detections of strontium-90 in surface water, including at the sampling location LA-Background SW in the background sediment investigation reach, are interpreted to be related to the presence of ash deposited within channel sediments."

NMED Comment

The Permittees cannot use ash deposited in channel sediments as the sole reason for down canyon detections of strontium-90 in surface water, even if it is true that some of these detections could be related to ash deposits since the detections were found upcanyon from laboratory sources as well.

LANL Response

LANL acknowledges that some of the strontium-90 in surface water downstream from SWMUs may have a LANL source, in addition to a source associated with ash from the Cerro Grande burn area.

10. Section 7.2.4 Organic Chemicals in Water, Diesel-Range Organics, pg. 7-39:

NMED Comment

The Permittees state that "the identification of highest detected DRO concentrations in surface water at the head of the canyon, upgradient of the DP Tank Farm, suggests that the low DRO concentrations may be related to runoff from townsite." There is a SWMU (0-027) at the head of DP Canyon. The former drum storage area and aboveground storage tanks are responsible for volatile organic contaminants in the subsurface (>10 feet) and have recently been subject to remediation. Therefore, the presence of DRO at the head of DP Canyon may not be due solely to townsite runoff.

LANL Response

LANL acknowledges that some of the diesel range organic (DRO) detects in DP Canyon upgradient from the DP Tank Farm could have a possible source at SWMU 0-027, in addition to a source in runoff from the Los Alamos townsite.

11. Section 8.2.Site-Specific Human Health Risk Assessment, pg. 8-32:

NMED Comment

The construction worker scenario does not present the worst-case risks to a construction worker for construction activities that may take place in areas other than those identified in this report. Even though the Permittees do not foresee construction activities occurring in areas of contaminated sediments (e.g., flood plains), the Permittees cannot guarantee this will not occur. The Permittees must demonstrate that risks to construction workers in these areas would be less than or equal to the risks currently evaluated. NMED recommends the Permittees work closely with Los Alamos County to identify other areas of potential construction.

NMED agrees that the residential exposure scenario is not a reasonably foreseeable land use for the entire canyon bottom. However, the Permittees are reminded that the future land use may change in any part of the canyon and recommends using this scenario in addition to the extended backyard and trail user scenario at the locations of greatest contamination to further support risk-based decisions.

LANL Response

The locations evaluated for construction worker and other scenarios represent the bounding cases of contamination in these canyons. Risks associated with a construction worker scenario, as well as other supplemental exposure scenarios (including residential), are presented in Appendix E of the LAPCIR for all reaches in the Los Alamos and Pueblo Canyons watershed where Tier 2 COPCs were identified. This inclusion in Appendix E was intended to allow these assessments to be available for decision-makers (including Los Alamos County), as they deem appropriate. LANL will continue to interface with Los Alamos County as requested on all matters related to legacy contamination.

12. Section 8.2.5.2 Carcinogenic Effects, Construction Worker Scenario in Pueblo Canyon, pg. 8-46:

NMED Comment

The Permittees state that "[s]ediment data for carcinogenic organic chemicals were not collected for reaches P-2W, P-2E, and P-3W, in the vicinity of planned construction work for a new wastewater treatment plant." The Permittees offer no explanation for not collecting these data. In the report titled Evaluation of Sediment Contamination in Pueblo Canyon, Reaches P-1, P-2, P-3, and P-4, the Permittees present data for carcinogenic organics detected in all four reaches. Even though aroclor-1260 was the only organic chemical detected in reaches P-2 and P-3, several years have passed and the potential to detect higher and/or different chemicals (from upgradient reach P-1) exists. The Permittees must explain the reason for the incomplete data set.

LANL Response

The statement in the LAPCIR that "sediment data for carcinogenic organic chemicals were not collected in reaches P-2W, P-2E, and P-3W" was partially incorrect. Data for pesticides and PCBs were collected in reaches P-2W and P-3W, as presented in the 1998 Pueblo Canyon reach report (Reneau et al. 1998, 59159). Instead, the LAPCIR should have stated that data for all carcinogenic organic chemicals were not obtained in these reaches since no semivolatile organic compound (SVOC) analysis was requested. No SVOC data were obtained from these reaches because analyses from upstream and downstream reaches (P-1 and P-4) in 1996 indicated relatively low concentrations of SVOCs. Because of the decreasing downcanyon trends in SVOC concentrations between reaches P-1 and P-4, data from the upstream and downstream reaches were sufficient to bound SVOC concentrations in reaches P-2 and P-3. Therefore, further investigation of SVOCs in the intervening reaches was not necessary.

In a 2002 report assessing potential human health risk in the vicinity of the planned new wastewater treatment plant, the SVOC data from reach P-1, closer to the source, were used to provide a conservative overestimate of potential risk (Tardiff et al. 2002, 73566). This assessment indicated a risk of less than 1E-5 for carcinogens under a residential land-use scenario. This conservative analysis supports the conclusion reached from field investigations that SVOC data for reaches P-2W, P-2E, and P-3W were not necessary to adequately bound potential risk in the LAPCIR.

13. Section B-2.4.4 Conceptual Model for Solute Transport, Surface Water/Groundwater Interaction, pg. B-14:

Permittees Statement: "Data from a direct current (DC) resistivity survey conducted in reach DP-2 indicate that groundwater recharge from alluvium to underlying bedrock does not occur. Results of the geophysical survey and drilling information indicate that the top of the Bandelier Tuff contains copious clay weathering products and provides a barrier to downward migration of groundwater."

NMED Comment

This statement is misleading. Uranium, perchlorate, nitrate, and other contaminants have been detected in intermediate groundwater and in the vadose zone at LANL. Migration to subsurface and communication between the surface and the underlying groundwater zones occurs and is well documented.

LANL Response

In this sentence, LANL did not intend for that statement to imply the absence of potential linkage between alluvial groundwater and an underlying vadose zone or deeper saturated zones. LANL acknowledges that such linkage exists. Instead, LANL meant that the direct current resistivity data indicate the absence of loss of alluvial groundwater to underlying stratum within the DP-2 study reach.

14. Section E-2.1.1 Calculating UCLs, pg. E-3:

NMED Comment

(a) *For lognormal distributions, the lognormal UCL method from Gilbert (1987) was applied. The test in Gilbert (the Land H test) is not always appropriate for every data set. As discussed in EPA 2002 (Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites), the Land H test may not be appropriate for small sample sizes (less than 30) or when the skewness of the data set is high. In these cases, either the Chebyshev 99% or Chebyshev 95% test may be more appropriate. Each data set should be examined and the most appropriate test based on the individual characteristics of the data set should be applied as recommended in EPA 2002, instead of automatically selecting one test for all data sets with lognormal distributions. The Permittees must discuss the appropriateness of the Land H test to each of the data sets. The Permittees will modify the UCL using other tests as warranted.*

LANL Response

(a) Both the Land H method and the Chebyshev method for calculating lognormal UCLs were considered. The Land H method has been criticized for providing high UCL values when the data are from a mixture of distributions or the data have numerous outlier values, often leading to large skew (EPA 2003, 84461). The Chebyshev method for calculating a UCL is offered by EPA as an alternative that provides a more useful UCL than that obtained from the Land method (when the underlying distribution of concentrations is lognormal) (EPA 2002, 85640, p. 12). While the document is not explicit regarding what the authors intend when they state that the Chebyshev UCL is "more useful," one can infer that they are indicating that the lower UCL value provided by the Chebyshev method will provide an exposure point concentration (EPC) that is closer to the center of the data.

LANL made the decision to proceed as follows. The Land H method was used for calculating lognormal UCLs because the bias associated with this method, when applied to small data sets or highly skewed data, will result in larger EPCs. If the UCL exceeds the maximum value for the data set, then the maximum value is used as the EPC, which is consistent with EPA guidance (EPA 1989, 08021). This approach is protective of human health and LANL proposes no changes to the Los Alamos and Pueblo Canyons assessment.

NMED Comment

(b) *When the data fit neither a normal or lognormal distribution, the Permittees applied the Chebyshev Inequality method in determining the UCL. If the data sets have a high degree of skewness, the 95% Chebyshev method may not be as effective in estimating the UCL and a higher confidence coefficient (i.e., 99%) should be used. The Permittees must discuss whether the skewness of each data set was determined and discuss whether a confidence coefficient of 95% or 99% was applied. If skewness was not determined, and all UCLs were estimated based upon a confidence coefficient of 95%, then the UCLs shall be revised and estimated using the appropriate confidence coefficient.*

LANL Response

(b) The Chebyshev Inequality method was applied only to water data that fit neither a normal nor a lognormal distribution. Sediment data that fit neither a normal or lognormal distribution were bootstrapped to obtain an estimate of the mean and variance. The difference in approach is from the way the data are used to estimate EPCs. For water data, EPCs are estimated for each combination of location, field preparation (filtered, nonfiltered), and analyte. The sediment data in each geomorphic unit for an investigation reach are combined using stratified sampling methods to estimate a reach-wide EPC. The stratified sampling method requires estimates of the means and variances for each of the geomorphic units. The Chebyshev Inequality method uses an estimate of the mean and standard deviation for all the data treated as a single population instead of stratifying the data into subpopulations as is necessary to correctly represent the sediment data for the calcualtion of an EPC.

Regarding water data, 11 of the 158 combinations of location, sample preparation, and analyte failed both distribution tests for normal and lognormal distributions. A separate test for skew was not performed for data that fit either a normal or lognormal distribution because skew is one characteristic of data that would cause the data to be different from these distributions. Testing for normality and lognormality incorporates testing for skewness. Of 11 data sets that are neither normally nor lognormally distributed, 3 are skewed, as represented by a standard deviation of the log of the data that exceeds 1. Using the standard deviation of the log of the data to represent skew in the data is a method from the ProUCL Users Guide (EPA 2003, 84461, p. A-5), and referred to in the EPA document "Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites" (EPA 2002, 85640).

The three skewed results are for nonfiltered plutonium-239,240 at 21-01811 (LAUZ-1), nonfiltered aluminum at 21-11226 (Reach DP-1C SW), and filtered thallium at LA-00215 (LLAO-1). The aluminum EPC will not change as a result of skew because the 95% UCL exceeded the maximum data values. Consequently, the maximum value is used as the EPC.

The remaining skewed data sets for plutonium-239,240 and thallium results are from alluvial groundwater, which was considered only in the residential exposure scenario. The residential risk results are provided in Appendix E for informational purposes only and are not proposed as a decision scenario.

The plutonium-239,240 data have a skew of 1.38. Following the guidance in the ProUCL User's Guide (EPA 2003, 84461, p. A-30), a 97.5% Chebyshev UCL was estimated. The 97.5% UCL for these data is 1.06 pCi/L versus a value of 0.817 pCi/L for the 95% UCL. The effect of this change in the UCL for plutonium-239 at 21-01811 (LAUZ-1) is to change the radionuclide sum in Table E-5.3-13 for this location from 5.33 to 5.48.

The thallium data has a skew of 1.83. Following the guidance in the ProUCL User's Guide (EPA 2003, 84461, p. A-30), a 97.5% Chebyshev UCL was estimated. The 97.5% UCL for these data is 3.4 µg/L versus an estimated value of 2.59 µg/L for the 95% UCL. The residential risk results for carcinogens and non-carcinogens are presented with and without arsenic in two separate tables. For all data, including arsenic, the change in the thallium UCL at LA-00215 (LLAO-1) results in a change in the noncarcinogen sum for that location from 7.41 to 8.36 in Table E-5.3-13. For the data with arsenic removed, the change in the thallium UCL for this location causes a change in the noncarcinogen sum from 4.58 to 5.53 in Table E-5.3-14.

NMED Comment

(c) When the data are different from both normal and lognormal distributions, the Permittees applied the Chebyshev method. The Permittees must discuss which confidence limit was applied for the test: 95% or 99% and discuss whether the applied confidence limit resulted in a robust analysis of the UCL.

LANL Response

(c) As described in the response to 14(b), the Chebyshev method was applied to water data when the data fit neither a normal nor a lognormal distribution. The 95% Chebyshev UCL was calculated for the 11 data sets that failed the distribution tests. Further analysis provided in 14(b) indicates that these UCLs were robust in 9 of the 11 cases, not being affected by skewness of the data. Based upon the guidance in the ProUCL User's Guide (EPA 2003, 84461, p. A-30), as referenced by the EPA document "Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites" (EPA 2002, 85640), the 97.5% UCL should be calculated for these two cases. Revised UCLs will be included in the revised human health risk assessment to be included in a future submittal.

NMED Comment

(d) The text indicates that when the data are different from both normal and lognormal distributions, the Chebyshev method was applied. The Permittees must discuss whether the data were tested for any other distributions other than normal or lognormal (e.g., gamma distribution). Also, the Permittees must discuss the appropriateness of applying the Chebyshev method to all data sets, versus application of other test methods such as bootstrapping.

LANL Response

(d) All the data sets for this report were tested for their fit to the normal and lognormal distributions. These are commonly occurring distributions for environmental data and represent situations where environmental concentrations are randomly distributed in the environmental media and, in the case of lognormally distributed data, where the environmental concentrations in the media may have resulted from dilutional processes.

In the case where the data fit neither a normal nor a lognormal distribution, testing for fit to other distributions was not conducted. In those cases, one of two approaches was used, depending on whether the data were for water or for sediment. For water data, the Chebyshev method was used. For sediment data, means and variances were bootstrapped. As discussed in the response to 14(b), the difference in approaches was determined by how the results were used to estimate EPCs for water and sediment. Both of these methods are generally accepted by EPA as methods to estimate UCLs for data that depart significantly from normality or lognormality. Other methods of estimating UCLs for data that do not appear to be derived from a normal or lognormal distribution exist, but these other methods do not offer a clear advantage over the methods used in the LAPCIR.

NMED Comment

(e) When the data sets consist of less than three (3) values, the test method listed on pages 141 and 142 of Gilbert (1987) was applied. However, the nonparametric confidence limit for quantiles methodology described in Gilbert is only applicable for data sets with greater than 20 samples. For sample sizes of

less than 20, Gilbert recommends that the Conover method be used. Clarify how the UCL was estimated for these small data sets. Typically with three or fewer values in a data set, the maximum detected concentration is used as the exposure point concentration.

LANL Response

(e) The text of the report is partly in error in that the methods used for nonparametric UCLs are not from Gilbert. It is correct that nonparametric methods were used to estimate the UCL on the median for data sets with less than three values or larger data sets with fewer than three detected values. The methods are from Helsel and Hirsh (1992, 72723, pp. 83-84). (The complete book is available from the U. S. Geological Survey at no cost as a .pdf download at the web site http://water.usgs.gov/pubs/twri/twri4a3/.)

For small sample sizes (n <20), the confidence intervals are estimated using the binomial distribution. For larger sample sizes (n ≥20), a large-sample normal approximation to the binomial distribution is used.

The maximum detected value was used as the UCL for all of the data sets with three or fewer detected values in the LAPCIR human health risk assessment.

15. Section E-5.1.1 Chemical Hazard, pg. E-36:

NMED Comment

(a) The inverse of the mean concentration at the center of a 30-acre square source (Q/C) is listed as 46.84 g/m^2-s per kg/m^3. However, no reference is provided for this value. It is noted that the Q/C for a 30-acre square source in Albuquerque is 43.37 g/m^2-s per kg/m^3 (EPA Soil Screening Guidance, 1996). The Permittees must provide the reference and the rationale for the derivation of the value used for Q/C.

LANL Response

(a) The Q/C value of 46.84 g/m^2-s per kg/m^3 was obtained from Table 3 in Appendix D of EPA's 1996 "Soil Screening Guidance: Technical Background Document" (EPA 1996, 59902). The value is described as a "high-end" estimate for a 30-acre site. This value was selected as representative of a reasonable worst-case condition. The value of 43.37 g/m^2-s per kg/m^3 for Albuquerque, from Table 3 of the main text of the Technical Background Document, differs by approximately 7%. Based on the low contribution of the inhalation pathway to overall risk, this small difference in dust emanation factor would make a negligible difference in risk.

NMED Comment

(b) The equivalent threshold value of wind-speed at seven meters (U_t) is 4.124 m/s. However, no reference is provided for this value. It is noted that U_t for Albuquerque is listed as 11.32 m/s (EPA Soil Screening Guidance, 1996). In addition, no references are provided for the height above the surface (Z) and the surface roughness height (Z_0). The Permittees must provide the references and the justification for use for these parameters.

LANL Response

(b) The threshold wind speed value of 4.124 m/s was calculated according to Equation 4 in Appendix D of EPA's 1996 "Soil Screening Guidance: Technical Background Document" (EPA 1996, 59902). The variables in this equation are threshold-friction velocity and surface-roughness height. The value for threshold friction velocity (0.625 m/s) is the default value specified in Appendix D of EPA's technical background document. The value of surface-roughness height (50 cm) corresponds to a woodland forest (Cowherd and Muleski 1984, 65400, Figure 3-6). Based on the low contribution of the inhalation pathway to overall risk, these small differences in wind speed and surface roughness would make a negligible difference in risk.

16. Table E-5.3-1, Exposure Parameters for Soil and Water Risk Calculations, page E-305:

NMED Comment

(a) The particulate emission factor (PEF) listed for the trail user is based upon the December 2000 version of the NMED Soil Screening Levels (SSL). However, the PEF was updated in the October 2003 version of this document. In addition, the PEF as presented in the NMED document is based upon a source area of 0.5 acres squared, not 30 acres squared, as applied throughout the risk assessment. If the NMED PEF were modified to incorporate a Q/C based on a 30-acre square source, the resulting PEF would be approximately 3.8E09 m^3/kg. The Permittees must revise the PEF for the trail user to reflect the update as listed in the 2003 NMED SSL Guidance and to be based upon a 0.5-acre square source.

LANL Response

(a) The October 2003 version of NMED's Soil Screening Guidance was not referenced because it was available only as a draft at the time the LAPCIR was being prepared. Therefore, the previous value (and the one still in effect) from the NMED 2000 version of the soils screening document was deemed appropriate and consistent with all other assessments being done in the same timeframe. The particulate emission factor (PEF) value from NMED 2000, employed in the trail-user scenario in the LAPCIR, was also selected for consistency with the identical value in the trail-user scenario described in the human health risk assessment for Cañon de Valle (LANL 2003, 77965). As described in Section 8.2.5 of the LAPCIR, the key exposure pathways for contaminated sediments were dermal absorption, incidental ingestion, and external irradiation. Changing the PEF by a factor of four, as suggested in this comment, would have negligible impacts on the trail-user results because inhalation exposure contributes very little to total intake.

NMED Comment

(b) The Permittees must clarify why an adult resident body weight of 60 kg versus the standard 70 kg was used in the radionuclide dose calculations.

LANL Response

(b) The value of 60 kg was used in the dose calculations to convert the food intake data, expressed as daily intake per unit body weight to daily intake. This adjustment is necessary because exposure to ionizing radiation is not quantified as a function of body mass. The value of 60 kg is recommended in Section 9.2.2 of EPA's 1997 Exposure Factors Handbook (EPA 1997, 66597).

17. Table E-5.3-2, RESRAD Input Values for Calculations of RBCs, pg. E-311:

NMED Comment

A different site utilization rate was applied for each of the receptors for the RESRAD modeling versus those used for the chemical risk assessment. It is not clear why different utilization rates were applied. For example, the chemical risk assessment is based upon the assumption that the resident spends 100% of his day at home, while the RESRAD modeling only accounts for 96% of the time. Similarly, the construction worker in the RESRAD modeling is based upon a 5.5-hour day, while the chemical risk assessment is based upon an 8-hour day. The Permittees must clarify these discrepancies in the utilization rates for each receptor.

LANL Response

Site-utilization rates are identical for the radiological and nonradiological analyses, although they are expressed differently because of the constraints of the RESRAD dose assessment software employed in the LAPCIR. The residential site utilization of 96% used in the RESRAD modeling reflects a yearly exposure frequency of 350/365 days, the same exposure frequency as for chemical risk. Similarly, the construction worker on-site time fraction of 0.228 (or an average of 5.5 hr/day for 365 days) is calculated as (8 hr/day x 250 day/yr) / 8766 day/yr, and 8 hr/day and 250 day/yr are used as exposure parameters in the construction worker scenario for nonradionuclides.

18. Table E-5.3-5, Analyte-Specific Parameter Values for Calculating Dermal Absorption and Biotic Uptake, pg. E-315:

NMED Comment

While most of the values provided in the table could be crosschecked, not all values could be verified, as no references were provided. The Permittees must provide the reference used for obtaining each datum listed in the table.

LANL Response

Dermal absorption parameter values were obtained from EPA's "Dermal Risk Assessment Guidance for Superfund" (2001, 71431). Plant-soil concentration ratios (K_{p-s}), fodder-soil concentration ratios (K_{f-s}), and meat-transfer factors (TF_{meat}) for metals and radionuclides were obtained from "A Compilation of Radionuclide Transfer Factors for the Plant, Meat, Milk, and Aquatic Food Pathways and the Suggested Default Values" (Wang et al. 1993, 59979). For organic chemicals, K_{p-s} and K_{f-s} values were calculated according to the methodology described in "Screening Level Ecological Risk Assessment" (SLERA) (LANL 1999, 64783; Equation 4.4) and converted to wet-weight equivalents using a conversion factor of 0.126 for produce (Baes et al. 1984, 59788, Table 2.3) and 0.182 for fodder (Wang et al. 1993, 59979, Table 2). Values of TF_{meat} for organic chemicals were calculated according to methodology described in the SLERA (LANL 1999, 64783; Equation 4.9). Organic chemical octanol-water partition coefficients, used in the SLERA calculation of TF_{meat}, were primarily recommended values compiled in EPA's "Internal Report on Summary of Measured, Calculated and Recommended Log Kow Values" (1995, 59980).

REFERENCES

Baes, III, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor, 1984. "A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture," ORNL-5786, Oak Ridge National Laboratory, Oak Ridge, Tennessee. (Baes et al. 1984, 59788)

Cowherd, C., Jr., and G.E. Muleski, September 1984. "Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites," prepared for the U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, by Midwest Research Institute, Kansas City, Missouri. (Cowherd and Muleski 1984, 65400)

EPA (U.S. Environmental Protection Agency), December 1989. "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)," Interim Final, EPA 540/1-89/002, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1989, 8021)

EPA (U.S. Environmental Protection Agency), April 10, 1996. "Internal Report on Summary of Measured, Calculated and Recommended Log K_{ow} Values," EPA Environmental Research Laboratory, Athens, Georgia. (EPA 1995, 59980)

EPA (U.S. Environmental Protection Agency), May 1996. "Soil Screening Guidance: Technical Background Document," EPA/540/R-95/128, OSWER Directive 9355.4-17A, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C. (EPA 1996, 59902)

EPA (U.S. Environmental Protection Agency), August 1997. "Exposure Factors Handbook, Volume II – Food Ingestion Factors," EPA/600/P-95/002Fb, Office of Research and Development, U.S. Environmental Protection Agency, Washington, D.C. (EPA 1997, 66597)

EPA (U.S. Environmental Protection Agency), September 2001. "Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment," Interim Review Draft, EPA/540/R/99/005, OSWER 9285.7-02EP, PB99-963312, September 2001," U.S. Environmental Protection Agency, Washington, DC. (EPA 2001, 71431)

EPA (U.S. Environmental Protection Agency), December 2002. "Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites," OSWER Directive 9285.6-10, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC. (EPA 2002, 85640)

EPA (U.S. Environmental Protection Agency), June 2003. "ProUCL User's Guide," NERL-LV 20-049. U.S. Environmental Protection Agency, Environmental Sciences Division, Las Vegas, Nevada. (EPA 2003, 84461)

Helsel, D.R., and R.M. Hirsch, 1992. "Statistical Methods in Water Resources," *Studies in Environmental Science* 49, Elsevier, Amsterdam, The Netherlands. (Helsel and Hirsch 1992, 72723)

Katzman, D., September 26, 2002. "Los Alamos/Pueblo Canyon Surface Aggregate Report Record of Communication #1," Los Alamos National Laboratory memorandum from D. Katzman (EES-9) to the New Mexico Environment Department, Los Alamos, New Mexico. (Katzman 2002, 73667)

LANL (Los Alamos National Laboratory), November 1995. "Task/Site Work Plan for Operable Unit 1049: Los Alamos Canyon and Pueblo Canyon," Los Alamos National Laboratory document LA-UR-95-2053, Los Alamos, New Mexico. (LANL 1995, 50290)

LANL (Los Alamos National Laboratory), July 7, 1997. "Final Response to the NOD for Los Alamos and Pueblo Canyons Work Plan (Former OU 1049)," Los Alamos National Laboratory letter (EM/ER:97-250) to B. Garcia (NMED-HRMB) from J. Jansen (Program Manager, LANL/ER Project) and T.J. Taylor (Program Manager, DOE/LAAO), Los Alamos, New Mexico. (LANL 1997, 56421)

LANL (Los Alamos National Laboratory), December 1999. "Screening Level Ecological Risk Assessment Methods, Revision 1", Los Alamos National Laboratory document LA-UR-99-1405, Los Alamos, New Mexico. (LANL 1999, 64783)

LANL (Los Alamos National Laboratory), September 2003. "Phase III RFI Report for Solid Waste Management Unit 16-021(c)-99," Los Alamos National Laboratory document LA-UR-03-5248, Los Alamos, New Mexico. (LANL 2003, 77965)

LANL (Los Alamos National Laboratory), April 2004. "Los Alamos and Pueblo Canyons Investigation Report," Los Alamos National Laboratory document LA-UR-04-2714, Los Alamos, New Mexico. (LANL 2004, 87390)

NMED (New Mexico Environment Department), June 3, 1997. "Approval of Los Alamos and Pueblo Canyon RFI Workplan (Operable Unit 1049), Los Alamos National Laboratory (LANL) EPA ID NM0890010515," New Mexico Environment Department letter to T. Taylor (Project Manager, DOE/LAAO) and J. Jansen (Project Manager, LANL) from R. Dinwiddie (Project Leader, NMED), Santa Fe, New Mexico. (NMED 1997, 56362)

NMED (New Mexico Environment Department), March 14, 2005. "Notice of Disapproval, Los Alamos and Pueblo Canyons Investigation Report, Los Alamos National Laboratory (LANL), EPA ID#NM0890010515, HWB-LANL-04-006," New Mexico Environment Department letter to David Gregory (Federal Project Director, DOE/OLASO) and G. Pete Nanos (Director, LANL) from James Bearzi (Chief, NMED-HWB), Santa Fe, New Mexico. (NMED 2005, 88463)

Reneau, S., R. Ryti, M. Tardiff, and J. Linn, September 1998. "Evaluation of Sediment Contamination in Pueblo Canyon: Reaches P-1, P-2, P-3, and P-4," Los Alamos National Laboratory document LA-UR-98-3324, Los Alamos, New Mexico. (Reneau et al. 1998, 59159)

Tardiff, M.F., S.L. Reneau, and R.A. Perona, June 2002. "Assessment of Sediment Contamination in the TA-74-1 West Land Transfer Sub-Parcel," Los Alamos National Laboratory document LA-UR-02-0329, Los Alamos, New Mexico. (Tardiff et al. 2002, 73566)

Wang, Y.Y., B.M. Biwer, and C. Yu, August 1993. "A Compilation of Radionuclide Transfer Factors for the Plant, Meat, Milk, and Aquatic Food Pathways and the Suggested Default Values for the RESRAD Code," Argonne National Laboratory, Environmental Assessment and Information Sciences Division, Argonne, Illinois. (Wang et al. 1993, 59979)