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Date: January 9, 1998
 Refer to: EM/ER:98-009

Dr. Robert S. Dinwiddie
 NMED-HRMB
 P.O. Box 26110
 Santa Fe, NM 87502

JAN 1998

**SUBJECT: RESPONSE TO CONDITIONAL APPROVAL UPON
 MODIFICATION FOR THE CANYONS INVESTIGATION CORE
 WORK PLAN (FORMER OU 1049)**

Dear Dr. Dinwiddie:

The Los Alamos National Laboratory's Environmental Restoration Project received a conditional approval upon modification for the Canyons Investigation Core Work Plan and the Response to the Request for Supplemental Information for the Canyons Investigation Core Work Plan. The response to the modifications was due to your office within 30 days of receipt of the letter (January 1, 1998). The Laboratory submitted a request for an extension for submitting the modifications until March 1, 1998. This request was denied. Consequently, the Laboratory's response to the conditional approval is enclosed. The Laboratory will submit the remaining replacement pages (reference EM/ER:97-438, October 30, 1997) by January 23, 1998.

Please call Allyn Pratt at (505) 667-4308 or Bonnie Koch at (505) 665-7202 if you have any questions regarding this extension request.

Sincerely,

Julie A. Canepa, Program Manager
 LANL/ER Project

Sincerely,

Theodore J. Taylor, Program Manager
 DOE/LAAO

JC/TT/ss

Enclosure: Response to Conditional Approval upon Modification for the Canyons Investigation Core Work Plan

12



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**Response to
Conditional Approval upon Modification, Canyons Investigation Core Work Plan
and Response to Request for Supplemental Information**

INTRODUCTION

To facilitate review of this response, the New Mexico Environmental Department's (NMED's) comments are included verbatim. Los Alamos National Laboratory's (LANL's) responses follow each NMED comment. Clean insertable replacement pages incorporating the modifications are attached to this response.

NMED Comment

14. **LANL's Response:** *The referenced sentence in the first paragraph on page 4-2 has been revised to read, "But because surface water is rarely ingested, such water is likely to contribute in only a minor way to the overall exposure of humans to contaminants." [top paragraph, page 4-2]*

RPMP Modification: *DOE/LANL shall completely strike the referenced and revised sentence in the top paragraph of page 4-2 from the Canyons Investigation Core Work Plan (the "Work Plan").*

LANL Response

14. LANL has deleted the referenced sentence from the paragraph. Revised pages 4-1 and 4-2 are attached to this response.

NMED Comment

- 23(a). **LANL's Response:** *...rather than single child and adult American Indian exposure scenarios, a variety of potential exposure conditions...may be evaluated.*

RPMP Modification: *To clarify, DOE/LANL shall, at a minimum, evaluate both children and adult exposure scenarios.*

LANL Response

- 23(a). Comments 23(a) and 23 (b) can both be addressed by the revised text in the second paragraph of Section 5.3.8.1. Revised pages 5-13 and 5-13a are attached to this response.

Both child and adult evaluations are currently included in the American Indian exposure evaluations. From discussions with NMED staff, LANL believes that the comment derives from a lack of information on the complexity of the proposed approach and the need to incorporate evaluations that address the concerns of Accord Pueblos as well as regulators. The evaluations requested by NMED are incorporated within the present approach but form only a subset of the activities and pathways evaluated. The precise components of the evaluation that NMED is most interested in

to represent RME calculations will be discussed and presented in a way that is easily interpreted. However, additional evaluations will address concerns of the Accord Pueblos.

NMED Comment

23(b). **LANL's Response:** ...Although reasonable maximum exposure (RME) estimates may be readily calculated..

RPMP Modification: DOE/LANL shall calculate the reasonable maximum exposure.

LANL Response

23(b). See LANL response 23(a).

NMED Comment

29. **LANL's Response:** ...The DOE retains administrative authority for approving the methodology for radiological assessments...

RPMP Modification: If mixed waste (i.e., hazardous and radioactive constituents) is present, the Administrative Authority (AA) for the RCRA Hazardous and Solid Waste Amendments, New Mexico Environment Department, retains authority for approval of the radiological assessment methodology.

LANL Response

29. As the issue dealing with radiological assessments is somewhat complex involving DOE, NMED, and UC, further time is necessary to resolve this issue. At such time as this issue is resolved, the ER Project will implement whatever final decision is made.

NMED Comment

34. **LANL's Response:** LANL has developed an ecological risk assessment methodology...

RPMP Modification: Although DOE/LANL has developed an ecological risk assessment methodology, it has not been approved by the AA. DOE/LANL must obtain approval prior to its implementation (such as biotic sampling).

LANL Response

34. Within Section 5.9 in Chapter 5 of the core document, biological evaluations address three different questions. The first two questions, to which this comment refers, evaluate ecological risks to terrestrial and aquatic systems in the canyons. The

approach used in these evaluations will follow directly from the approach to ecological assessment used across LANL. This process is currently under development and has not yet been approved by NMED. Therefore, no detail is provided in the core document on specifics of that approach. However, for ecological questions the final ecological approach for LANL, as approved by NMED, will be followed. Specifics of sampling protocols and necessary approval by NMED will also follow that agreement. A new paragraph has been inserted at the end of Section 5.9. Revised pages 5-39, 5-40, 5-41, and 5-42 are attached to this response.

NMED Comment

35. **LANL's Response:**

35(a). *The need for site-specific biotic sampling to evaluate human health exposures will result from sensitivity analyses performed on the preliminary data from reach sampling..*

35(b). *...As discussed with the AA...this preliminary exposure assessment and identification of **significant contaminants** [emphasis added] and pathways through sensitivity analyses in effect a screening step that will direct further evaluation...*

RPMP Modifications:

35(a). *Sensitivity analyses identify exposure factors which may need further evaluation or the collection of more data. These analyses are valid only if the preliminary data are representative of site conditions. Therefore, it is important that DOE/LANL obtain AA approval for site-specific biotic sampling activities.*

35(b). *DOE/LANL shall determine chemicals of potential concern, pathways, and species contributing to those pathways prior to site specific sampling.*

LANL Response

35(a). The reference to site-specific biota sampling and sensitivity analyses encompasses a variety of activities. In the iterative approach being followed for the canyons analyses, uncertainties around parameter estimates used in estimating tissue concentrations may turn out to be the primary source of uncertainty that make a particular decision unclear. To the extent that available data sources do not allow reduction of that uncertainty, site-specific sampling may be proposed. In those cases, data leading to those decisions will be discussed with the AA and agreement on protocols proposed to reduce uncertainty in biota concentrations will be obtained. In some instances, the identification and quantitation of uncertainties in biota data that are driving decisions may be used to direct sampling efforts in programs not under RCRA authority, such as environmental surveillance activities or activities of the Pueblo environmental departments. Such programs will be discussed with the AA, but it will not be possible to enforce a protocol approval process on these non-RCRA programs. In those cases, any data from those studies incorporated into canyons evaluations will be discussed

with NMED, and appropriate confidence bounds on the data will be derived from those discussions.

- 35(b). For those cases where specific sampling protocols are implemented by the ER Project canyons team, such protocols will identify chemicals of potential concern, pathways, and species contributing to those pathways before conducting site-specific sampling unless otherwise agreed to by the AA.

NMED Comment

37. **LANL's Response:** *These procedures are presently being developed and are addressed by the LANL-wide approach to ecological studies.*

RPMP Modification: *DOE/LANL must obtain AA approval prior to the implementation of the referenced procedures.*

Response

37. Methods for deriving parameters for estimating tissue concentrations of biota in human exposure assessments will be discussed as part of the model development process with the AA. To the extent appropriate, these values will be consistent with those agreed to in the final approach to ecological risk evaluation. In those cases where specific tissues of importance to American Indian exposure scenarios are known to differentially concentrate specific contaminants, appropriate modifications to default values will be discussed with the AA.

4.0 CONCEPTUAL MODEL

4.1 Introduction

This chapter summarizes the significant geologic, hydrologic, and biological features, events, and processes operating in the canyon systems that could reasonably affect estimates of human and ecological risk from Laboratory-derived contaminants. This chapter places these features, events, and processes within a conceptual framework that is intended to support a credible human health risk assessment for current contamination conditions and to project trends of possible future impacts. The human health risks will be evaluated, as needed, for Laboratory personnel working in the canyons and for the public occupying the canyons for a variety of purposes. In addition, impacts to the ecological system will be assessed.

The conduct of canyon investigations will involve working with the neighboring Indian Pueblos (Cochiti, Jemez, San Ildefonso, and Santa Clara) to define and evaluate impacts associated with cultural activities and resources valued by the American Indian population. This commitment fulfills part of the Laboratory's responsibility for stakeholder involvement. The approach to evaluating present-day risks is iterative, and this conceptual model does not yet fully reflect American Indian concerns. Section 4.3 discusses how the conceptual model will be revised to reflect investigation data as well as changing risk assessment objectives.

4.1.1 Purpose

The purpose of the conceptual model of contaminant occurrence, transport, and exposure route (hereafter "the conceptual model") is to incorporate known significant features, events, and processes into a comprehensive view of contaminant occurrence and transport that is then used to guide the development of the technical rationale for investigations and evaluations. The conceptual model also articulates the major assumptions (all subject to testing in the canyons investigations), the features that may need to be described more completely and accurately, and the models of processes that may need to be refined to adequately evaluate human and ecological risk. The conceptual model description helps identify the investigations needed to refine impact assessments. Sampling and analysis plans (SAPs) for canyons investigations will be designed to test major assumptions of the conceptual model. Field investigations, laboratory analyses of samples, and data assessments (discussed in Chapter 5 and Chapter 6 of this core document) will enable iterative refinement of the conceptual model, making it progressively more detailed and specific to individual canyons and reaches within canyons.

4.1.2 Relationship of the Conceptual Model to Impact Assessment

The conceptual model describes the potential pathways by which contaminants could be transported from Laboratory sources to potential receptors. It identifies connections among these transport pathways and connections among transport pathways and exposure pathways to humans, other animals, and plants.

The distinction between pathways for long-distance transport and pathways for exposure is important because some media can serve as both, and confusion can arise from the overlap. For example, wind transport is not considered to be a major route for dispersal of contamination (despite the fact that wind can transport contaminated dust from source areas) because the source of fine particulates which can be suspended by wind is limited on the surficial soils of the canyons. Moreover, canyon sediments can be relatively moist and vegetated, which reduces the potential for wind suspension; the sustained high winds needed to cause substantial transport do not normally occur. On the other hand, the inhalation of wind-suspended localized sediment that has been

transported by streams is considered to be a significant pathway of exposure to humans. By contrast, surface water during floods can transport large amounts of contaminated sediments downstream. Thus, surface water is considered to be an important transport pathway, whereas wind is considered to be primarily an exposure pathway. However, definition of both pathways is necessary to determine future impact.

The exposure pathways are part of the human health and ecological risk assessment models described in Chapter 6 of this core document. The selection of potential receptors and exposure pathways defines the structure and assumptions of the assessment models. The conceptual model discussed in this chapter addresses the exposure pathways selected for consideration in the assessment models described in Chapter 6.

The potential human and ecological exposure scenarios for the canyon systems include the following:

- use by Laboratory workers;
- recreational use by the public;
- use by the American Indian population for residential, cultural, and religious purposes, and for farming, ranching, and hunting; and
- habitation by the local biological community, taking into consideration the effects of human occupation.

Chapter 6 describes these exposure scenarios in detail.

Chapter 5 and Section 6.2 of Chapter 6 discuss the methods for interpreting data, including application of recently developed techniques for analysis of spatial uncertainty, that will be used in testing hypotheses of the conceptual model, as well as risk-based decision making.

4.1.3 Development of the Generic Conceptual Model

A generic conceptual model was developed from the conceptual model in the *Task/Site Work Plan for Operable Unit 1049: Los Alamos Canyon and Pueblo Canyon* (LANL 1995, 50290) because these canyon systems are considered representative of the range of features, events, and processes occurring in the canyon systems of the Pajarito Plateau. Also, these two canyons are currently the focus of ongoing canyons investigations, and new data from these investigations will be used to make initial refinements in the conceptual model. The conceptual model is illustrated in Figure 4-1, which shows Pueblo Canyon and upper Los Alamos Canyon. Key elements of the conceptual model, including descriptions of contaminant transport pathways and mechanisms, are described in Table 4-1.

The conceptual model identifies potential sources of contamination, relevant pathways for transport, and likely pathways for exposure based on current knowledge of the distribution of contaminants in and adjacent to the canyons system. The transport pathway descriptions include the predominant release mechanisms, transport processes, and the contaminated media for each transport pathway. The conceptual model includes those elements that are likely to influence decisions about remediation in the canyon environment. Application of the conceptual model in risk-based decision making is addressed in Section 6.2 of Chapter 6 of this core document.

If uncertainties are acceptable and/or no reduction in uncertainty can be reasonably achieved (the "Yes" path at decision point number 3), the existing level will be deemed "acceptable," and the conceptual model will be refined as required by the data.

5.3.8 Refine Conceptual Model

The objective of this step is to refine the conceptual model and associated assessments of impacts using analysis and interpretation of the available field and analytical data, particularly as it applies to previously identified uncertainties in the model. Refinements may include improved descriptions of horizontal and vertical distributions of contaminants, improved estimates of contaminant concentrations and inventories, and improved descriptions of significant transport processes and time-dependent variations in contamination.

From this step, the investigation process divides into one path leading to the assessment of present-day risk and the second to the assessment of projected risk.

5.3.8.1 Evaluate Estimated Risk

The present-day human health risk will be evaluated using the refined conceptual model and the initial data on COPC concentrations. Contaminant concentrations that exceed background levels will be evaluated in deterministic risk models using maximum observed concentrations and conservative upper-bound parameter estimates to determine which contaminants and exposure pathways present potential human health risks. Those contaminants that present risk exceeding levels of concern in deterministic evaluation will then be evaluated using Monte Carlo techniques based on contaminant concentrations weighted by volume of exposure medium. These simulations will partially provide the basis for defining uncertainties to be addressed in subsequent sampling and analysis (see Section 6.2 and Section 6.4.1 in Chapter 6 of this core document for details).

The first evaluations will focus on the American Indian subsistence scenarios described in Section 6.5 in Chapter 6 of this core document. This special population will serve as an indicator of any potential risk-based concern. The term "American Indian land use scenario" is used to encompass a number of activities consistent with subsistence-based use of the canyons ecosystem by American Indians. Specific activities (including farming, ranching, hunting, and the use of plant, animal, and mineral resources for artistic, ceremonial, and medicinal purposes) are described in Section 6.5.4 of this core document. Exposure assessment activities within a scenario will generally proceed on an activity-specific basis so that individual or population exposures may be aggregated across activities as necessary to address stakeholder concerns.

Therefore, rather than one representative child and adult American Indian exposure scenario, a variety of potential exposure scenarios and their contributing activities will be evaluated. These exposures will include evaluations of both children and adults. The specific components representing a reasonable maximum exposure evaluation for regulatory purposes will be derived in consultation with NMED and will be identified as such in the report. Additional exposure evaluations will also be included to address concerns of the Accord Pueblos.

As human health risk assessment models and parameters are defined, and as additional data on patterns of contaminant distribution are obtained, the human health risk process will be made more selective. This process will eliminate the additional collection of data for analytes that have concentrations above background levels but below levels of potential concern.

5.3.8.1.1 Decision Point Number 4

Are the data uncertainties acceptable for risk assessment?

At this step, a judgment is made as to whether the available data and the uncertainties in the data at appropriate spatial scales (see Section 6.2 and Section 6.4.1 in Chapter 6 of this core document) for risk assessment will enable a defensible assessment of the present-day human health risk.

prospective long-term order of well installation. However, it is technically prudent to perform the activities in an annual iterative process of data collection, review, and reassessment to take full advantage of all new information and data before locating and installing subsequent wells. This approach will ensure that characterization activities and well installation are optimized. The need for installation of subsequent wells (alluvial, intermediate perched zone, or regional aquifer wells) will always depend on data and information gained from the previously installed wells and on the interpretation of the data from those wells.

5.7.6 Expected Results of Groundwater Investigations

The expected outcomes of the activities described in the Hydrogeologic Workplan (LANL 1996, 55430) are

- refined understanding of the hydrogeologic framework at the facility, including recharge areas, hydraulic interconnections, aquifer geochemistry, flow paths, and flow rates, which are synthesized by modeling simulations;
- information sufficient either to design and implement a detection monitoring program that meets applicable requirements and/or to demonstrate that monitoring requirements can be waived; and
- defined areas of existing or potential groundwater contamination and the potential pathways of contaminant transport from the surface to the regional aquifer, with predictions of directions and rates of movement and risk based on modeling simulations.

As a result of this characterization effort, if it is determined that enhanced groundwater monitoring is necessary, an interdisciplinary Laboratory group will develop a proposed amendment to the Groundwater Monitoring Plan for submittal to the appropriate regulatory agency(ies).

5.8 General Technical Approach for Surface Water Investigations

Surface water investigations in the canyons are presently being developed as part of the Laboratory's Watershed Management Program Plan (WMPP). The WMPP will provide a detailed framework for integrating and coordinating surface watershed activities at the Laboratory. No canyon surface water sampling is planned until the WMPP is completed.

The specific WMPP objectives are to

- integrate the activities of different Laboratory organizations to ensure a unified approach to surface water protection and to prevent duplication of effort;
- establish an information system in which all surface water-related data will be stored and which will be accessible to Laboratory organizations and stakeholders;
- address the requirements of the HSWA Module, the Clean Water Act, and other relevant federal and state environmental requirements;
- provide enhanced surface water documentation to support Laboratory-wide environmental impact statement development, as requested by the Site-Wide Environmental Impact Statement Project Office or DOE in accordance with the requirements of the National Environmental Policy Act; and
- maintain ongoing surface water protection activities and address new issues as they occur.

The WMPP will describe a program that has the following goals:

- document the surface water resource with respect to quantity and quality;
- design and implement a surface water monitoring program to support resource management concepts and comply with applicable environmental laws and regulations;
- implement a management program for surface water protection and contamination abatement, which includes specific Clean Water Act and New Mexico Water Quality Act requirements and other relevant regulatory requirements;
- summarize and identify watershed areas that may not meet New Mexico Water Quality Standards or other regulatory requirements;
- develop strategies for controlling sources of surface water contaminants and/or excessive erosion and sedimentation;
- integrate relevant aspects of Laboratory programs described in the GPMPP, the Threatened and Endangered Species Habitat Management Plan, and the Natural Resources Management Program Plan; and
- develop a watershed management work plan.

5.9 General Technical Approach for Biological Investigations

The objective of biological investigations in the canyons systems is to assess the impact of Laboratory-derived contaminants on environmental and human receptors. The objective will be achieved by examining the three components of the ecosystem summarized below.

- Ecosystem receptors (including selected species and biological communities) which are likely to be affected by Laboratory-derived contaminants will be studied. The selected species include threatened or endangered species, or surrogates for these species if examination risks further threat. The biological communities to be studied represent broad units of the ecosystem and include the aquatic, soil, plant, and animal communities.
- Wetlands, which are a critical regulated environment, will be included in the biological investigation. Wetlands are a sensitive habitat for many species, and their evaluation is integral with the aquatic community evaluation.
- The potential impact on human receptors of Laboratory-derived contaminants in plants and animals that are either part of the diet of or used in American Indian tribal ceremonies will be assessed.

For aspects of biological investigations that address ecological questions, the final approach to ecological investigations at the Laboratory, as approved by NMED, will be followed. For biological investigations that address biota as a vector for human exposure, data needs will be determined by (1) identification and quantification of major uncertainties, (2) development of protocols to obtain necessary data either through the ER Project or from other biological sampling programs, and (3) discussion and agreement with NMED on final protocols if implemented by the ER Project or on appropriate confidence bounds for data from other sources.

5.9.1 Ecosystem Receptors

An integrated ecological risk investigation approach for the ER Project is presently under development, and it will be implemented after DOE, regulator, and stakeholder approval. The first two objectives described above will be addressed by the Laboratory-wide ecological risk

investigations. The third objective will be addressed as part of canyons investigations, and the data will support human health risk for scenarios related to American Indian use. These data will also be used as a source for future site-wide ecological risk investigations. The appropriate level of detail for ecological risk assessments has not yet been determined.

Environmental sampling to evaluate exposure to ecological risk receptors will not be proposed until the assessment endpoints (see Chapter 6 of this core document for details on assessment endpoints) and their exposure units have been agreed upon with the regulators, with appropriate input from stakeholders. Negotiations are underway between the Laboratory, DOE, EPA, NMED, and the Accord Pueblos to define the assessment endpoints, exposure units, exposure models, and risk models. In addition, Laboratory personnel and subcontractors have worked and will continue to work with the Accord Pueblos to help define appropriate risk scenarios for the American Indian population in the vicinity of Los Alamos Canyon and Pueblo Canyon. When an agreement has been reached, a preliminary assessment using available data will be conducted to assess uncertainties and identify sensitive parameters in the models. The canyon- or canyon aggregate-specific SAPs will focus on collecting data for the most sensitive and uncertain parameters identified for the ecological risk assessment.

The sediment, groundwater, and surface water investigations described above will provide important data for the ecological risk assessment. For example, hydrogeologic and geomorphic units are natural sources of environmental heterogeneity within exposure units and they may form natural boundaries between some exposure units. Therefore, mapping and characterizing heterogeneous units will provide essential data to ecological exposure assessments.

5.9.2 Wetlands Investigation

Because stream flow occurs seasonally for extended periods of time, or even continuously in some canyon reaches, identifiable wetlands are present in some canyon systems. An inventory of wetlands is in preparation by the Environmental Assessments and Resource Evaluations group (ESH-20) as part of an ongoing survey of the canyons of the Pajarito Plateau. Until the wetlands have been delineated, discrete sampling in the investigations will be limited.

The biological evaluation of wetlands will be performed in collaboration with a US Fish and Wildlife Service investigation of water quality in the canyon systems of the Pajarito Plateau. Sediment and water sampling will be deferred to the Fish and Wildlife Service investigation, although sediment and surface water samples collected in the concurrent investigations described in this chapter will be used to plan future sampling efforts.

5.9.3 Biological System Contributors to Human-Health Risk

Exposure pathways for assessing human-health risk include the ingestion of fish, wildlife, native plants, and domesticated plants (see Section 6.5 in Chapter 6 of this core document). Sampling in canyons is proposed to determine the bioconcentration and potential impact of native plants, garden produce, game animals, and domestic livestock on human exposure.

American Indian populations gather wild edible plants and other plants used for ceremonial purposes. The Indian Pueblo representatives will be consulted to define significant species routinely gathered in each canyon. Because of the ceremonial significance of some of these species, sampling will be conducted by Accord Pueblo representatives. Exact sampling locations may not be disclosed. Detailed information on specific species and usage will be collected by tribal members and transmitted to the technical team in summary form to preserve cultural sensitivities.

REFERENCES FOR CHAPTER 5

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