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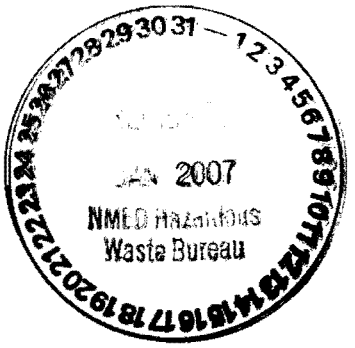

January 26, 2007

DCN 06280.100.ID.003

Mr. David Cobrain
State of New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building One
Santa Fe, New Mexico 87505-6303

Reference: Work Assignment No. 06280.100; State of New Mexico Environment Department, Santa Fe, New Mexico; LANL Risk Assessment Support; Review of the Investigation Report for Mortandad Canyon and Associated Risk Assessment Appendices.

Dear Mr. Cobrain:

This deliverable addresses the above-referenced work assignment and provides risk assessment review comments on the human and ecological risk assessment sections of the Investigation Report (IR) for Mortandad at Los Alamos National Laboratory (LANL) dated October 2006 as well as relevant appendices.

The baseline ecological risk assessment (BERA) is presented in Section 8.1 of the IR while the human health risk assessment (HHRA) is presented in Section 8.2 of the IR. Supporting information located in Appendices B through E was also reviewed as part of the technical review of the risk assessment methodology and results. Certain additional supporting documents (such as the Biota Investigation Work Plan, LANL 2005), which provide screening level ecological risk assessment (SLERA) findings and BERA formulation approaches, were not included in the IR and thus, were not part of this review.

The SLERA identified chemicals of potential ecological concern (COPECs) that required BERA level evaluation. The BERA relied upon biological investigation efforts which were developed based on the application of the eight-step EPA ecological risk assessment process (EPA, 1997). Ecological effects within the BERA were measured using a myriad of assessment strategies including small-mammal trapping arrays, a cavity-nesting bird monitoring network, and bioassay analysis (of both aquatic and terrestrial exposure media). Supplemental studies including nest box surveys, tissue analysis, and plant community biometrics were also folded in as lines of evidence. The combined outcomes from these direct measures along with the standard inferential risk assessment strategies (hazard quotient and hazard index [HQ/HI] measures) provide a compelling weight of evidence evaluation of the risk setting. While marginal to minimal risk conditions were measured with the HQ/HI methods, these findings were not

supported by the ecological effects measures. The strength of this BERA lies within the significant results from the direct ecological effects measures which indicate no risk is occurring to any terrestrial or aquatic receptor group (or individual, as measured for two Threatened and Endangered species). The strategy and findings from this BERA provide substantial and defensible conclusions indicating a lack of ecological risk concern.

The HHRA identified 12 of the 27 reaches that required cumulative risk analysis. The primary exposure scenario evaluated in the HHRA for cumulative risk analysis was the trail user scenario. In addition, a hypothetical residential scenario was also evaluated and presented in Appendix E. Throughout the IR, the risks associated with the trail user scenario are summarized; however, the residential risks are never summarized. The results of the residential risks presented in Appendix E need to be included in the IR to support the need for land use controls (LUCs) to protect future receptors from unrestricted use of this area.

The results for the trail user scenario indicate that all 12 reaches result in cancer risks below the NMED cancer threshold of 1×10^{-5} and target noncancer hazard index (HI) of 1.0. However, one of the 12 reaches, E-1E (effluent in Canyon downcanyon from the TA-50 RLWTF outfall), resulted in a multimedia dose of 44 millirems per year (mrem/yr) which exceeds the target dose of 15 mrem/year; this dose corresponds to a radiological risk of greater than 1×10^{-4} due to external gamma radiation from cesium-137. E-1E is one of the shortest narrowest reaches in the Mortandad watershed and has no developed trails or other features that attract trail users. In addition this reach is also in a part of the LANL with access controls and access requirements and has signs that discourage the specific recreational activity being assessed. Therefore, it is important that the signage be maintained to discourage any human activity at this area.

Groundwater was not evaluated in the risk assessment because the exposure pathway is incomplete; however, the IR has identified that contaminant concentrations in deeper perched-intermediate or regional groundwater have increased over time, indicating that migration of mobile constituents through the vadose zone and into deeper zones of saturation is occurring. The IR indicates that currently the majority of the mass of the nonsorbing contaminants (i.e., nitrate, perchlorate, and tritium) is located within the vadose zone, particularly beneath the area near and east of the confluence of Mortandad and Ten Site Canyons. As a result of this contaminant migration, the IR recommends conducting additional evaluations to further understand contamination in the intermediate-depth and regional groundwater and to identify potential remedial actions for groundwater.

There were few technical issues noted with the human health and ecological risk assessments. The assessments were conducted consistent with approved methodologies. A spot check of residential screening levels and ecological toxicity equivalency factors was conducted against LANL's EcoRisk database (Version 2.2) and no discrepancies were noted.

This letter deliverable was emailed to you on January 24, 2007 at David.Cobrain@state.nm.us and to Ms. Darlene Goering at darlene.goering@state.nm.us. A formalized hard (paper) copy of this letter deliverable will be sent via mail. If you have any questions, please call me at (770) 752-7585, extension 105 or Ms. Claire Marcussen at (352) 332-0669.

Sincerely,

Jasmine Schliesmann-Merkle

Sincerely,
Jasmine Schliesmann-Merkle
Vice President

Enclosure

cc: Ms. Darlene Goering, NMED
Ms. Claire Marcussen, TechLaw
Ms. Karmen King, TechLaw
TechLaw Files

TASK 2 DELIVERABLE

RISK ASSESSMENT REVIEW OF THE INVESTIGATION REPORT MORTANDAD CANYON LOS ALAMOS NATIONAL LABORATORY OCTOBER 2006

LANL Risk Assessment Support

Submitted by:

TechLaw, Inc.
3920 W. 98th Place
Westminster, CO 80030

Submitted to:

Mr. David Cobrain
State of New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building One
Santa Fe, New Mexico 87505

In response to:

Work Assignment No. 06280.100.0002

January 26, 2007

RISK ASSESSMENT REVIEW OF THE INVESTIGATION REPORT
MORTANDAD CANYON
LOS ALAMOS NATIONAL LABORATORY
OCTOBER 2006

TECHNICAL REVIEW COMMENTS

1. **Investigation Report, Executive Summary, Page vii**

The second paragraph on Page vii summarizes the results of the human health risk assessment (HHRA); however, this paragraph is incomplete because a summary of residential risks is excluded from the discussion. According to Appendix E, the radiation dose associated with exposure to sediments in eight of the reaches far exceed the target dose limit of 15 millirems per year (mrem/yr), which strongly supports the need for land use controls (LUCs) in order to prevent unrestricted use. Inclusion of residential risks in the overall conclusions is important to ensure unrestricted use of the site is prevented in the future.

2. **Investigation Report, Section 8.1.1 Problem Formulation, Page 96**

This subsection describes the process for evaluation of chemicals of potential concern (COPCs) and identification of chemicals of potential ecological concern (COPECs). It is recognized that the various ecological effects measures provide a compelling weight of evidence risk conclusion. An important line of evidence in identifying COPECs is understanding the fate of each COPEC; however, this has not been included in this section. To provide a clear justification of COPEC selection, please summarize in a Table format, the list of COPECs by exposure media and the various lines of evidence used to describe the risk as well as the uncertainties associated with these lines of evidence for each chemical.

3. **Investigation Report, Section 8.1.1.3 Conceptual Exposure Model, Page 101**

This section describes the conceptual pathways associated with the baseline ecological risk assessment (BERA). It appears that the Morandad Canyon watershed would have minimal connectivity to the down-gradient Rio Grande receiving system; however this is not clearly described within this section. Please update the information within the conceptual model to include the potential down-gradient connectivity to the Rio Grande (if it exists) and how this pathway was addressed as part of the BERA.

4. **Investigation Report, Section 8.1.2.4 Nest Box Studies, Page 106**

The second paragraph of this section introduces the 'occult little brown myotic bat' receptor as a line of evidence for an avian insectivore pathway analysis. This approach is

useful and provides substantial information for the BERA. As such, it should be integrated into the appropriate endpoints for the BERA and be presented consistently throughout the assessment (rather than introduced only within this subsection).

5. **Investigation Report, Sections 8.1.2.10 Rapid Bioassessment Characterization, Page 108 and 8.1.3.7 Aquatic Community, Page 118**

These sections describe the results of the Rapid Bioassessment Characterization efforts completed throughout the watershed. It is not clear if any information gathered from these efforts was found useful for the purposes of the BERA. If the EPA Rapid Bioassessemnt Protocol (RBP) was followed, the measures of 'habitat characterization' taken, and/or in-field benthic macroinvertebrate biometrics should be documented and explained. Please provide additional detail in this section to indicate if any information was gained from these efforts and how was it applied as a line of evidence to the BERA.

6. **Investigation Report, Section 8.1.3 Baseline Ecological Risk Assessment, Page 109**

This section indicates that 'screening of concentrations of COPCs in sediment and water samples...' were a line of evidence in support of the BERA (with a summary of sample collection activities provided in Table 4.2-1). However, the findings from this screen are not presented in any of the risk conclusions. Please include a summary of this line of evidence in the IR with a recommendation that this summary occurs within Section 8.1.3.7 (Pages 118 – 119).

7. **Investigation Report, Section 8.1.3.1 Mexican Spotted Owl, Page 110**

The first paragraph on Page 110 provides compelling information from the pellet analysis for incorporation into the diet modeling approaches. However, the results of the pellet analysis are not presented. It would be useful to have the data results from the pellet analysis in order to understand portion of diet comprised by individual species. Please provide the pellet analysis results within a table format or the appropriate Appendix.

8. **Investigation Report, Section 8.1.3.1 Mexican Spotted Owl, Page 110**

The last paragraph on Page 110 indicates that conservative assumptions regarding methyl mercury content were applied for the tissue (diet) evaluation. It is not clear if it was assumed that the methyl mercury content was equivalent to the inorganic mercury content. Please clarify in all appropriate sections (e.g. Page 113, COPEC Concentration in Worms and Table 8.1-5) and Tables what conservative assumptions regarding methyl mercury content were applied.

9. **Investigation Report, Section 8.1.3.4 Mammalian Invertevore Feeding Guild, Pages 114 and 115**

This last paragraph on Page 114 and the first four paragraphs on Page 115 describe the 'statistical significance' of pent and/or carcass tissue content as compared to sediment

COPEC concentrations. However, statistical significance is not clearly defined for each comparison ($p = 0.07$ for regression for selenium, but is not described for the other COPECs demonstrating a trend in the data). Please update this section to define the level of significance for each parameter.

10. **Investigation Report, Table 8.1-2 Number of Each Species Collected for Analysis in Each Reach in the Mortandad Watershed, Page 287, and Figures 8.1-15 Mean Percent Daily Capture Rate for Small Mammals and 8.1-16 Small Mammals Species Diversity, Page 220**

The information provided within Table 8.1-2 appears to conflict with the bar graphs provided in Figures 8.1-15 and 8.1-16. It stands to reason that the diversity for reach E-1W would yield the highest value having 22 individuals and 5 species. However, the diversity for the LA-BKG reach should be comparable with 31 individuals and 4 species (as compared to M-2W and M-3E with 31 individuals and 3 species, and 37 individuals and 3 species respectively). Yet the diversity measure for the background reach is shown to be much less than E-1W. Please revisit the Shannon-Weaver diversity calculations to determine if there is an error in the values presented and ensure the text, tables, and figures are consistent.

11. **Investigation Report, Section 8.2 Human Health Risk Assessment, Page 125**

This section indicates that the risk characterization is based on the sum of fraction (SOF) method for evaluating the potential for additive effects with COPCs that are classified as noncarcinogens, carcinogens, or radionuclides; however, the acronym, SOF, is not spelled out. The acronym is spelled out in Appendix A, sum of fractions; however, it should be defined at the first mention in the text.

12. **Investigation Report, Section 8.2.2 Data Collection and Evaluation, Page 126**

Section 8.2.2 refers the reader to Section 6 for a description on how sediment data were separated into reaches and how sediment data within reaches were combined for the comparison of contaminant data maxima with background values (BVs). However, this information could not be located in this section. Please include a reference to the appropriate locations in the RI that describes how the sediment data were separated into reaches as well as combined within reaches as a basis for selecting COPCs.

13. **Investigation Report, Section 8.2.6.1 Data Collection and Evaluation, Page 132**

This section indicates that no BVs are available for surface water. This imparts a substantial source of uncertainty due to the inability to distinguish COPCs in surface water from background or the site. However, the uncertainties could be reduced by comparing upgradient samples to screening levels to provide perspective on upgradient versus site-related contributions to surface water contamination. Please clarify whether upgradient samples were collected and if so, provide an analysis of these samples to determine if a constituent is representative of upgradient or downgradient conditions.

14. Investigation Report, Section 8.2.1 Problem Formulation, Page 126

The first paragraph on Page 126 indicates that a residential exposure scenario was evaluated as a supplemental exposure scenario for comparison purposes only without providing a clear description on what purpose this information serves. Similar statements are made throughout the HHRA. The reason a residential scenario is included as a hypothetical future land use is to determine the need for LUCs or other type of institutional controls (ICs), in the event land use were to ever change from current uses. Please clarify throughout the HHRA that the residential scenario must be evaluated to determine the need for LUCs/ICs for preventing unrestricted use of the property.

15. Investigation Report, Section 8.2.5 Risk Characterization, Pages 131-132

Sections 8.2.5.1 Noncarcinogenic Effects, 8.2.5.2 Carcinogenic Effects, and 8.2.5.3 Radiation Dose do not include the summary of the noncarcinogenic effects, carcinogenic effects, or radiation dose associated with the residential scenario although this scenario was evaluated in the HHRA in Appendix E. It is understood that the residential scenario is not a decision scenario for the determination of further investigation or corrective action. However, this scenario is evaluated to determine the need for land use restrictions. Based on a review of Appendix E, the cumulative cancer risks are at or below the NMED target risk level of 10^{-5} (NMED 2006, 92513) and the cumulative noncancer hazard indices (HIs) are close to the NMED target of 1.0. However, the radionuclide dose in eight reaches exceeds the target dose limit of 15 mrem/year. In addition; the doses ranged from 16 to 1017 mrem/yr with seven of the eight reaches significantly above the target limit of 15 mrem/year. Based on these results, the reaches present an unacceptable risk under an unrestricted land use scenario and therefore justifies the need for LUCs at these areas. Please summarize the results of the residential scenario to accurately reflect the results of the risk assessment presented in Appendix E.

16. Investigation Report, Table 8.2-11 Summary of Trail User Risk Assessment Results, Page 311

This table indicates that the radionuclide dose associated with sediment and surface water at reach E1-1 is 43.7 mrem/yr and 0.25 mrem/yr, respectively, for a total dose of 44 mrem/yr for the reach. The text in Section 8.2.5.3 Radiation Dose also cites 44 mrem/yr for the reach as a total dose. However, Table 8.2-12 indicates that the radionuclide dose associated with sediment at reach E1-1 is 51.2 mrem/year. The Executive Summary and Section 9.0 Conclusions and Recommendations (second paragraph on Page 137) indicates the calculated dose for reach E-1E is 52 mrem/yr (corresponding to a radiological risk of approximately 2×10^{-4}). Please correct the tables and/or text to ensure consistency throughout the document with respect to communicating the total dose calculations for reach E1-1.