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Los Alamos, New Mexico 87544
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Date: August 21, 2006
Refer to: EP2006-0762

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

RECEIVED
AUG 2006
NMED Hazardous Waste Bureau

SUBJECT: SUBMITTAL OF THE RESPONSE TO THE "NOTICE OF DISAPPROVAL FOR REMEDY COMPLETION REPORT FOR SOLID WASTE MANAGEMENT UNIT 33-013, A FORMER STORAGE AREA AT TECHNICAL AREA 33"

Dear Mr. Bearzi:

Enclosed please find two hard copies, with electronic files on CD, of the response to the "Notice of Disapproval for Remedy Completion Report for Solid Waste Management Unit 33-013, a Former Storage Area at Technical Area 33."

Based on the results presented in this response, Los Alamos National Laboratory is requesting a certificate of completion with controls for Solid Waste Management Unit 33-013.

If you have questions, please contact Melanee Shurter at (505) 667-7369 (mshurter@lanl.gov) or Leonard (Tony) Trujillo at (505) 845-5987 (ltrujillo@doeal.gov).

Sincerely,

Andrew Phelps, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

for Leonard A. Trujillo
David Gregory, Federal Project Director
Department of Energy
Los Alamos Site Office

AP/DG/MMS/jr

Enclosure: Two hard copies, with electronic files, of the response to the "Notice of Disapproval for Remedy Completion Report for Solid Waste Management Unit 33-013, a Former Storage Area at Technical Area 33" (EP2006-0755)

4803

Cy: (w/ enc)
M. Shurter, EP-CAP, MS M992 (with CD)
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D. Davenport, ERSS-DO, MS M321 (with CD)
SAFE S-7, MS F674 (unbound copy only)
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L. King, EPA Region 6
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A. Dorries, EP-ERSS, MS M992
G. Dover, EP-CAP, MS M992
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A. Phelps, ADEP, MS J591
D. Gregory, DOE LASO, MS A316
T. Skitbiski, NMED OB
IRM-RMMSO, MS A150

Response to the Notice of Disapproval on the Remedy Completion Report for Solid Waste Management Unit 33-013, a Former Storage Area at Technical Area 33 Los Alamos National Laboratory, NM 0890010515, HWB-LANL-06-013, Dated July 17, 2006

INTRODUCTION

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

GENERAL COMMENTS

NMED Comment

1. *It is unclear from looking at the sample depths shown in Figures 4.1-2, 4.1-3 and 4.1-4 of the Report whether they were collected below the excavation or below ground surface (bgs). Outside the perimeter of the asphalt pad, NMED assumed that 0-0.5 ft. indicates a surface sample; however, two feet of soil were excavated prior to sampling within the asphalt pad, leading to the assumption that the same 0-0.5 ft. interval within the pad as shown in the Figures is actually 2-2.5 ft. bgs. The Permittees must clarify whether the depths of samples collected within the asphalt pad were below the base of the excavation or below ground surface.*

LANL Response

1. The 0–0.5-ft sample depth interval within the asphalt pad footprint is approximately 2–2.5 ft below the current ground surface. In accordance with Section 5.1.2 of the approved "Accelerated Corrective Action Work Plan for Solid Waste Management Unit 33-013, a Former Storage Area at Technical Area 33, Revision 1" (LANL 2005, 88839), 13 confirmation samples were collected from the base of the storage pad excavation from two depth intervals (0–0.5 ft and 2–2.5 ft) at six locations *after the removal of the asphalt pad and soil beneath the pad*. Outside of the asphalt pad footprint, surface samples were collected from 0–0.5 ft. and 2–2.5 ft below the existing ground surface. Section 3.1.1 of the "Remedy Completion Report for the Investigation and Remediation of Solid Waste Management Unit 33-013" (LANL 2006, 92080) describes the collection of confirmation samples following the excavation of the asphalt pad and soil beneath the pad in accordance with the approved accelerated corrective action (ACA) work plan. Since the former storage area excavation was backfilled with approximately 2 ft of clean fill and gravel, the human health and ecological risk assessments evaluated the confirmation sample data collected from the storage area footprint based on the existing sample intervals of 2–2.5 ft. below ground surface (bgs) and 4–4.5 ft bgs based on the current ground surface.

SPECIFIC COMMENTS

NMED Comment

1. Section 4.1.2.5, page 12:

The second paragraph on this page addresses the lateral and vertical extent of tritium found at SWMU 33-013. The Report states that "[c]concentrations [of tritium] increased with depth at three locations within the footprint of the asphalt pad. The Phase I RFI data reported tritium at a concentration of 3342 pCi/g just beneath the asphalt (0-0.5 ft bgs), while tritium's maximum detected concentration after the asphalt and soil removal was 855 pCi/g (2–3 ft bgs). Tritium concentrations will continue to decrease over time because of radioactive decay, i.e., the half-life for tritium is 12.6 years. Based on the Phase I and Phase II RFI and Accelerated Corrective Action (ACA) data, tritium concentrations decreased with depth within the asphalt pad footprint and the vertical extent is defined."

Only two surface samples were analyzed for tritium during the 1993 Phase I investigation, and radionuclides were not included in the analysis during the 1996 Phase II investigation (LANL 2005, 88839). Additionally, the surface samples were removed during excavation. It is therefore appropriate to include the current ACA data in a discussion of nature and extent. The paragraph appears contradictory in that concentrations of tritium both increase with depth within the asphalt pad footprint (at three locations) and decrease with depth generally.

According to Figure 4.1-4 in the Report, three of the six samples analyzed within the footprint of the asphalt pad increase in concentration with depth. Outside the footprint two of four samples increase with depth. The Permittees must provide an explanation for defining the vertical extent of tritium at SWMU 33-013 based on the data presented; state that vertical extent is not defined or otherwise resolve the apparent contradiction.

The Report compares the concentrations of COPCs found at the 0–2.5 ft bgs depth interval with industrial Soil Screening Level (SSLs) for inorganic and organic chemicals and to Screening Action Levels (SALs) for radionuclides, and compares the concentrations of COPCs from 0-4.5 ft. bgs depth interval with construction worker SSLs/SALs. The evaluation of risk-based SSLs/SALs for the construction worker scenario is typically based on a depth interval of 0–10 ft bgs. If vertical extent is not defined to at least 10 ft bgs, then evaluation of risk under the construction worker scenario may not be valid. Nevertheless, because the Report proposes completion under an industrial land use scenario, the screening assessment for risk to human health and ecological receptors is acceptable, provided the Permittees notify NMED if there is any change in land use. Unless vertical extent is defined, any construction activities must be limited to a depth of 4.5 ft. bgs.

LANL Response

1. The discussion on nature and extent for tritium is based on the Phase I Resource Conservation and Recovery Act facility investigation (RFI) data, which detected tritium at a concentration of 3342 pCi/g in the soil beneath the asphalt pad. Tritium concentrations associated with releases from the former storage pad were reduced from the levels observed beneath the asphalt pad during the Phase I RFI by the remedy implemented at the site in 2005. All the tritium concentrations reported in the ACA samples are 50% or less than this maximum detected concentration from 1993. Based on the Phase I RFI data and subsequent ACA data, a definite decrease in tritium concentrations with depth has been demonstrated, and vertical extent has been defined within the area of the asphalt pad. Therefore, the

nature and extent of contaminants whose primary source is solid waste management unit (SWMU) 33-013 have been established. The nature and extent of tritium releases from other sources near SMWU 33-013 will be determined as part of the investigation of the Chaquehui Canyon Aggregate Area.

Two major objectives of the ACA were to remove the asphalt pad and soil immediately beneath the pad and determine the nature and extent of contaminant releases from the SWMU and to show that residual contamination at the SWMU does not pose an unacceptable risk or dose based on the current and reasonably foreseeable future land use. These objectives have been met for SWMU 33-013. Based on the operational history of the high-pressure tritium facility at Technical Area (TA) 33, SWMU 33-013 was not the primary source of the tritium detected at and around this site. Tritium is pervasive throughout this area as a result of past operations. Thus, tritium concentrations do not show a consistent and widespread decrease with depth at every location sampled following the ACA. As described in the approved "Accelerated Corrective Action Work Plan for Solid Waste Management Unit 33-013, a Former Storage Area at Technical Area 33, Revision 1" (LANL 2005, 88839) and illustrated in the figures included in the "Remedy Completion Report for the Investigation and Remediation of Solid Waste Management Unit 33-013" (LANL 2006, 92080), the high-pressure tritium facility (former building 33-86) was located less than 50 ft east of SWMU 33-013. The facility processed tritium gas from the mid-1950s until 1990 and had numerous air and wastewater emissions containing tritium. In addition, SWMU 33-002(a), a former septic system, and SWMU 33-002(c), a former seepage pit, received tritium-contaminated wastewater from the former tritium facility. Both SWMUs and their drainlines were located approximately 100 ft southeast of SWMU 33-013. Tritium has been reported in surface samples (0–0.5 ft) and subsurface samples (4 ft to 100 ft bgs) in the immediate vicinity of the septic tank and seepage pit (LANL 1995, 71300; LANL 1997, 57021.7).

The characterization of residual tritium concentrations within the boundary of SWMU 33-013 shows that the residual tritium does not pose an unacceptable risk based on industrial and construction worker exposure scenarios. The results of the assessment under the construction worker scenario are valid and indicate no potential unacceptable risk or dose. Deeper samples were not collected because the nature and extent of releases from the asphalt pad were determined with the data obtained from this ACA. With the exception of one confirmation sample within the asphalt pad footprint, tritium levels detected in the confirmation samples were well below the residential screening action level (SAL) of 750 pCi/g. The maximum detected tritium concentration of 855 pCi/g in sample RE33-05-60779 is orders of magnitude below the construction worker and industrial SALs (320,000 pCi/g and 440,000 pCi/g, respectively). Because dose is below the U.S. Department of Energy's (DOE's) target level of 15 mrem/yr for a construction worker, there are no restrictions to limit the depth of construction activities. Any construction activity will be monitored for tritium to ensure that workers are protected under an occupational exposure.

Confirmation sample data presented in the "Remedy Completion Report for the Investigation and Remediation of Solid Waste Management Unit 33-013" (LANL 2006, 92080) clearly document that the nature and extent of nonradiological chemicals of potential concern (COPCs) have been determined. Therefore, the results of the risk assessment based on the construction worker scenario for these COPCs are valid for the typical exposure depth of 10 ft. With regard to the residual tritium contamination at the site, there is no need to establish controls on the depth of any future excavation activities. Exposure of construction workers to residual tritium contamination at the site, regardless of depth, is an occupational radiological exposure regulated by DOE pursuant to Title 10, Part 835 of the Code of Federal Regulations (10 CFR 835), Occupational Radiation Protection, under authority of the Atomic Energy Act. As a result, controls are currently in place to ensure that exposure of construction

workers to residual tritium is within allowable limits established by 10 CFR 835. These controls are implemented by LANL through Laboratory implementation guidance documents, implementation requirements, and implementation procedures, implementation policies, and notices. Note: The construction of the high bay complex planned for the site has been delayed indefinitely because of lack of funding.

NMED Comment

2. Section D-1.2, page D-3:

In the second paragraph under "Exposure Assessment," the Report states, "[In addition,] if construction activity were to occur and result in the uncovering of contaminated material, the clean fill would serve to decrease the concentrations of COPCs to which the construction worker could be exposed to."

This is not an appropriate argument for addition of the clean fill. Dilution is not an acceptable alternative to minimizing the concentration of contaminants in soil or any other media. Permittees must provide an alternative approach that does not invoke dilution when assessing pathways for exposure and risk to a construction worker.

LANL Response

2. The statement quoted in the comment is part of the uncertainty analysis associated with the risk assessment and is meant to indicate that potential exposure to a construction worker will be less than the measured concentrations, given the current site conditions. It is not meant to imply that the solution to dose or risk is the dilution of the contaminated media. However, to avoid confusion and misinterpretation, this statement will be deleted and the sentence rewritten to read as follows: "If construction activity were to occur and result in the uncovering of contaminated material, exposure would not result in unacceptable risk or dose because concentrations are below screening levels." A replacement page for D-3 that includes the modified sentence in Section D-1.2 is attached.

NMED Comment

3. Section 3.1.1, page 6:

In first sentence on this page states, "Remediation activities at SWMU 33-013 began on June 29, 2006…" The last sentence in paragraph four states, "The excavation activities continued until July 20, 2006…" NMED understands the Permittees to mean 2005 instead of 2006.

LANL Response

3. NMED is correct; remediation activities at SWMU 33-013 began on June 29, 2005, and continued until July 20, 2005. The text in Section 3.1.1, page 6, has been changed, and a replacement page is attached.

NMED Comment

4. Section 4.1.2.1, page 10:

The last sentence in the Section states, "Figure 4.1-2 presents inorganic chemicals above background at SWMU 33-013." NMED understands the Permittees should be referring to Figure 4.1-1.

LANL Response

4. The reference to Figure 4.1-2 in Section 4.1.2.1 on page 10 of the report is correct. Figure 4.1-2 presents inorganic chemicals above background at SWMU 33-013. Figure 4.1-1 shows the 2005 ACA confirmation sample locations at SWMU 33-013.

NMED Comment

5. Section 4.1.2.2, page 10:

The last sentence in the Section states, "Figure 4.1-3 presents the detected organic chemicals at SWMU 33-013." NMED understands the Permittees should be referring to Figure 4.1-2.

LANL Response

5. The reference to Figure 4.1-3 in Section 4.1.2.2 on page 10 of the report is correct. Figure 4.1-3 presents the organic chemicals detected at SWMU 33-013. Figure 4.1-2 shows the inorganic chemicals detected above background in the confirmation samples collected at SWMU 33-013 in 2005.

NMED Comment

6. Section 4.1.2.3, page 10:

The last sentence in the Section states, "Figure 4.1-4 presents the radionuclides detected at SWMU 33-013." NMED understands the Permittees should be referring to Figure 4.1-3.

LANL Response

6. The reference to Figure 4.1-4 in Section 4.1.2.3 on page 10 of the report is correct. Figure 4.1-4 presents the radionuclides detected at SWMU 33-013. Figure 4.1-3 shows the organic chemicals detected in the confirmation samples collected at SWMU 33-013 in 2005.

NMED Comment

7. Figure 4.1-4, page 22:

The boundary lines in the legend for this Figure do not match their appropriate definitions (e.g., the dotted line that should indicate "Fence" is assigned to "SWMU boundary," while "fence" remains undefined. The redline should indicate gas line, not water line.) The Permittees must revise the legend to match the legends in the other Figures of the Report and provide a replacement page for Figure 4.1-4.

LANL Response

7. The legend on Figure 4.1-4 has been corrected to be consistent with the previous three figures, and the replacement page is attached.

NMED Comment

8. Table 4.1-1, page 27:

The SSL for nitrate under all land use scenarios in 1.0E+05 mg/kg (NMED 2005, 90802), not 1E-05 mg/kg as shown in the table. The Permittees must revise Table 4.1-1 accordingly and provide a replacement page for the Table.

LANL Response

8. The nitrate soil screening level in Table 4.1-1 has been corrected to read 1E+05, and the replacement page is attached.

NMED Comment

9. Section D-1.3, page D-5:

The Permittees have agreed to voluntarily provide total radionuclide risk levels in addition to total radionuclide dose. A value for total risk is stated on page D-5 based on comparison with EPA preliminary remediation goals (PRGs); however, the link to the webpage provided for comparison is either misspelled or out-of-date because the page cannot be found. The Permittees must provide a corrected link to the appropriate webpage for comparison to EPA PRGs, and provide an explanation for the derivation of risk based on the data.

LANL Response

9. The *www.* prefix on the webpage address should be deleted. The rest of the web address for the U.S Environmental Protection Agency's (EPA's) preliminary remediation goals (PRGs) for radionuclides is correct (EPA 2005, 91002). A replacement page D-5 with the corrected webpage address is provided as an attachment to this response. No explanation is necessary or required, other than that the total risk estimate is based on a comparison to EPA's PRGs for radionuclides, as presented in the report (with the corrected web address for the PRG concentrations). The equivalent total risk is provided for the decision scenario, which is the basis for the recommendations and conclusions for the site.

REFERENCES

EPA (U.S. Environmental Protection Agency), November 2005. "EPA Region 6 Human Health Medium-Specific Screening Levels," U.S. Environmental Protection Agency document, Dallas, Texas. (EPA 2005, 91002)

LANL (Los Alamos National Laboratory), September 1995. "RFI Report for Field Unit 2 Operable Unit 1122 TA-33, MDA K, PRSs 33-003(a), 33-004(a), 33-007(c), 33-009, 33-011(d), 33-013, 33-016, and 33-017," Los Alamos National Laboratory document LA-UR-95-36254, Los Alamos, New Mexico. (LANL 1995, 71300)

LANL (Los Alamos National Laboratory), September 1997. “RFI Report for Potential Release Sites, 33-002(b, c), 33-003(b), 33-004(k), 33-006(a), 33-008(a, b), 33-011(d), 33-013, 33-017,” Los Alamos National Laboratory document LA-UR-97-2944, Los Alamos, New Mexico. (LANL 1997, 57021.7)

LANL (Los Alamos National Laboratory), April 2005. “Accelerated Corrective Action Work Plan for Solid Waste Management Unit 33-013 at Technical Area 33, Revision 1,” Los Alamos National Laboratory document LA-UR-05-2601, Los Alamos, New Mexico. (LANL 2005, 88839)

LANL (Los Alamos National Laboratory), March 2006. “Remedy Completion Report for the Investigation and Remediation of Solid Waste Management Unit 33-013,” Los Alamos National Laboratory document LA-UR-06-1218, Los Alamos, New Mexico. (LANL 2006, 92080)

NMED (New Mexico Environment Department), August 2005. “Technical Background Document for Development of Soil Screening Levels, Revision 3.0,” New Mexico Environment Department–Hazardous Waste Bureau and Ground Water Quality Bureau, Santa Fe, New Mexico. (NMED 2005, 90802)

Attachment

Replacement Pages for the March 2006 "Remedy Completion Report for the Investigation and Remediation of Solid Waste Management Unit 33-013" (ER2006-0046)

Sampled media were placed into preassigned sample containers [provided by the Sample Management Office (SMO)], in the field and stored on ice in accordance with the most current version of SOP-1.02, "Sample Container and Preservation" as specified in the approved ACA work plan (LANL 2005, 88839). Samples remained in field-team custody until they were delivered to the SMO for shipment to off-site laboratories for analysis in accordance with the most current version of SOP-1.03, "Handling, Packaging, and Shipping of Samples." All samples were field screened on-site by LANL's Health Physics Operations (HSR-1) Group for alpha, beta, and gamma activity before transporting and releasing them to LANL's SMO. To document sample handling, chain-of-custody (COC) forms were completed for all samples and are provided in Appendix C. Sample analyses were requested in accordance with the Laboratory's statement of work for analytical services (LANL 2000, 71233).

Field screening for VOCs was conducted in conjunction with the confirmation sample collection at the site in accordance with SOP-06.33, "Headspace Vapor Screening with a Photo Ionization Detector." Headspace VOC screening was performed for all confirmation samples using a HNU PI101 photoionization detector (PID) equipped with an 11.7-eV lamp; the results are recorded on SCLs provided in Appendix B.

Samples were also collected for QA/quality control (QC) purposes in accordance with the most current version of SOP-1.05, "Field Quality Control Samples." Field duplicates were collected to evaluate the reproducibility of the sampling technique. Field trip blanks were used to evaluate sample exposure to other VOCs. Table 3.1-1 presents a summary of QA/QC samples collected during the ACA investigation of SWMU 33-013 by sample location, sample type, media, and the analyses requested. A postinvestigation geodetic survey was conducted to confirm the exact sampling locations (Appendix B). The postinvestigation geodetic surveys were performed in accordance with SOP-03.11, "Coordinating and Evaluating Geodetic Surveys" and are provided in Appendix B.

Results of the ACA confirmation sampling for SWMU 33-013 are provided in Appendix C and summarized in section 4.1. A detailed description of the ACA investigation and remediation activities conducted at SWMU 33-013 is provided below.

3.1.1 Detailed Description of the ACA

Before initiation of activities at SWMU 33-013, the footprint of the asphalt pad was surveyed, marked, and measured. No utilities were present under the footprint of the pad or within areas to be disturbed during activities associated with the removal, sampling, and restoration of SWMU 33-013. The undisturbed pad area was photographed before initiating the removal and sampling activities (Appendix A). The undisturbed pad area was also screened for beta/gamma and alpha radiation. Results of the radiation screening are provided in Appendix B. No radioactivity above twice the local (TA-33) background was measured during the screening. In accordance with NMED's approval-with-modifications letter dated April 25, 2005 (NMED 2005, 90159), the following information is included to support use of twice the local background level as an action level during soil removal. The factor of two is used as a conservative indicator of the natural variability of background radiation across the laboratory. The LANL 2001 environmental surveillance report states that "thorium and uranium concentrations across the Pajarito Plateau range from 0.7 0 3.0 pCi/g and potassium-40 concentrations range from 12.0 to 30.0 pCi/g; these concentrations result in terrestrial radiation from 50 to 150 mrem/year," (LANL 2001, 73876). This factor-of-three variation is also documented in the DOE report entitled "An Aerial Radiological Survey of LANL and Surrounding Area," (DOE 1998, 91432). Therefore, HSR-1 determined that a factor of twice the local background would be a conservative environmental screening criterion and is the rule-of-thumb followed by radiation screening technicians throughout the Laboratory.

Remediation activities at SWMU 33-013 began on June 29, 2005, and included using a front-end loader to excavate and remove base coarse covering the pad that had been placed over the entire fenced area previously occupied by the tritium facility (Building 33-86). The base coarse layer ranged in depth from approximately 3 in. to 6 in. and consisted of what appeared to be a mixture of soil and recycled concrete and asphalt. The removed base coarse layer covering the asphalt pad was placed in Duraliner super sacks with a 6yd^3 capacity for transportation and disposal.

The asphalt pad had severely deteriorated and lacked any physical integrity. Over much of the site, the asphalt was distinguishable from the base coarse material placed on top of it and the soil beneath it by color only. The deterioration made the visual inspection of the pad difficult since it all appeared as discolored soil, but the discoloration was uniform throughout the pad. Photographs were taken of the pad after the base coarse was removed (Appendix A); the layer of base coarse was approximately 3 in. thick. The uncovered pad was radiologically screened and the results are provided in Appendix B. No radioactivity above local background was measured on the uncovered asphalt pad.

The asphalt pad (asphalt, discolored soil and aggregate) was excavated and placed in super sacks for transportation and disposal; the asphalt pad layer was approximately 6 in. thick. The excavated area was visually inspected for staining and none was observed. The soils under the pad were dry and there were no free liquids. An additional 6 in. of soil was then removed from beneath the discolored soil and also placed in super sacks for transportation and disposal. The waste bags were placed in the low-level waste (LLW) staging area to await disposal.

A radiation survey was performed on the bottom, sides and perimeter of the excavated area, and one location in the center quadrant of the excavation revealed activity slightly above two-times local background. An additional 2–3 in. of soil was removed from this area and placed in another super sack for transportation and disposal. The area was rescreened and was below two-times local background. Because a confirmation sample was already slated for this location (confirmation sample location 33-24734), none of the planned confirmation sampling locations were adjusted. The excavation activities continued until July 20, 2006, and resulted in a total excavated area of approximately 51 ft x 53 ft x 2 ft deep and approximately 540 yds^3 of removed soil, base coarse, and asphalt.

Since there was no visible evidence of staining, no bias was applied in locating the confirmation sampling locations. Sampling locations were laid out as specified in the approved ACA work plan (LANL 2005, 88839; NMED 2005, 90159). In accordance with comment #4 of NMED's notice of disapproval on the ACA work plan (NMED 2005, 88205), RFI sample locations AAA2036 and AAA2037 (LANL 2005, 88839) were surveyed in and were designated as confirmation sampling locations 33-24738 and 33-24739, respectively.

Confirmation samples collected at SWMU 33-013 were submitted to the SMO for shipment to off-site contract laboratories for analysis of VOCs, SVOCs, target analyte list (TAL) metals, PCBs, high explosives (HE), perchlorates, tritium, isotopic uranium, isotopic plutonium, gamma spectroscopy, alpha spectroscopy for americium-241, strontium-90, cyanide, and nitrates. In addition, field duplicates were collected and submitted for the same suite of analyses. Table 3.1-2 presents a summary of all confirmation samples collected during the ACA at SWMU 33-013 by location identification (ID), sample ID, sample type, corresponding sampled depths, media, and the requested analyses. All sample results are presented in Appendix C and summarized in section 4.1.

Immediately upon collection, soil from each sampled interval was placed in a closed glass container, and after 10 minutes the headspace was measured for VOCs, using a PID. No VOCs were detected using this field screening. All field-screening results obtained during the confirmation sampling at SWMU 33-013 are provided on SCLs (Appendix B). Before removing the samples from the site for shipping, the samples

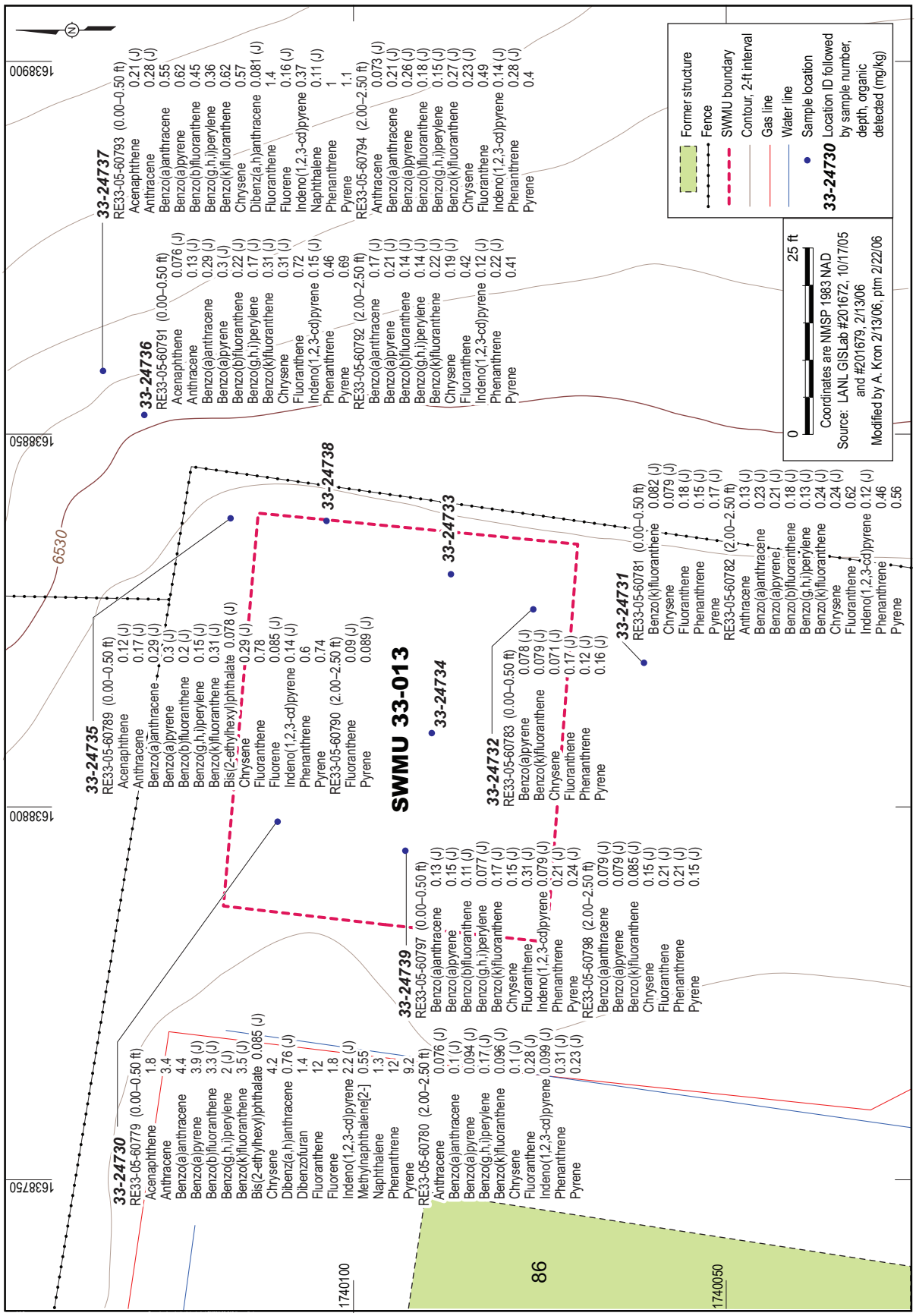

Figure 4.1-3. Organic chemicals detected at SWMU 33-013 (in mg/kg)

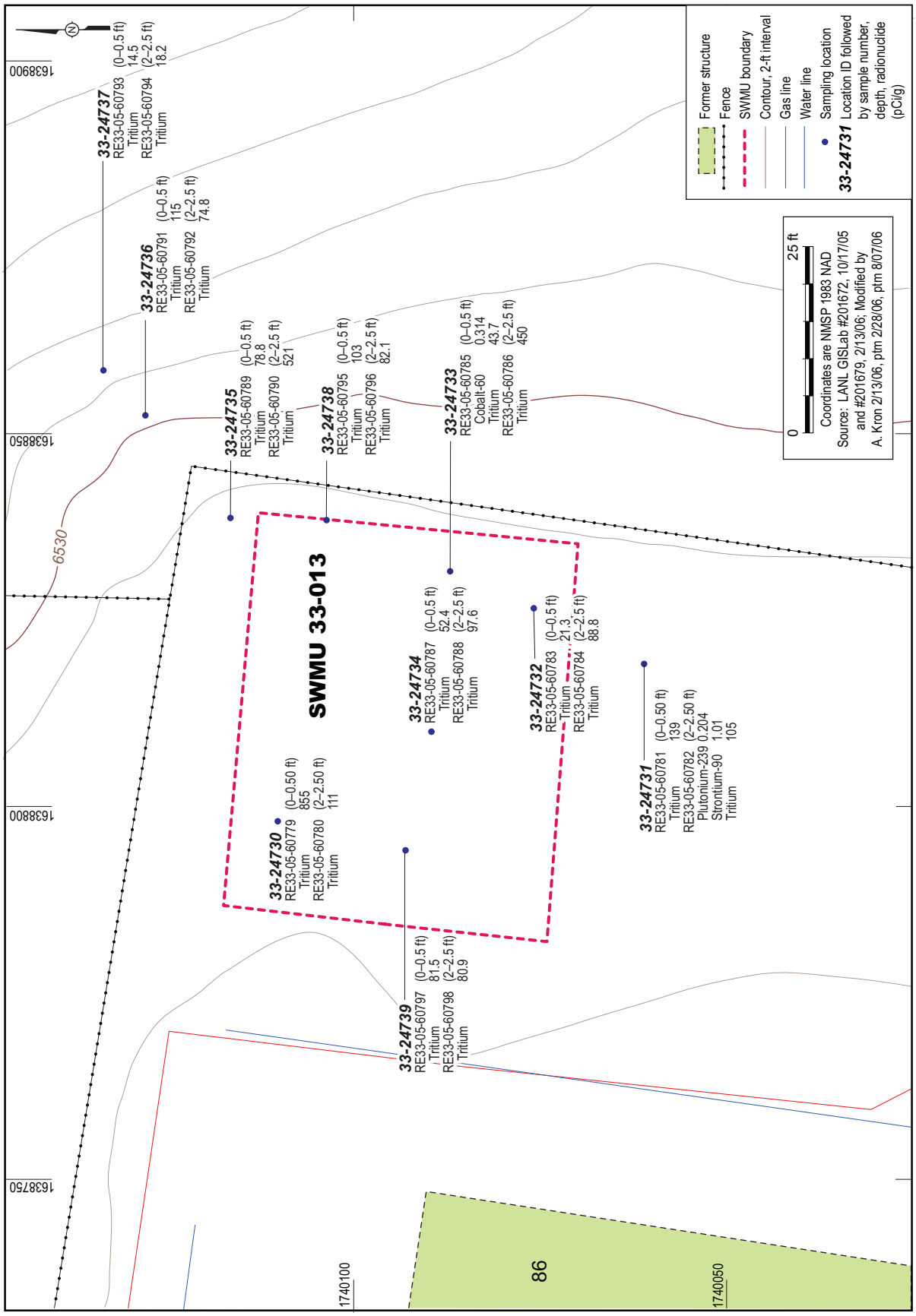

Figure 4.1-4. Radionuclides detected at SWMU 33-013 (in pCi/g)

Table 4.1-1
Inorganic Chemical Concentrations above Background Values at SWMU 33-013

Sample ID	Location ID	Depth (ft)	Media	Cadmium	Calcium	Cyanide (total)	Mercury	Nitrate	Perchlorate
Soil Background Value[a]				**0.4**	**6120**	**0.5**	**0.1**	**na[b]**	**na**
Industrial Soil Screening Level[c]				**564**	**na**	**22,700**	**340[d]**	**1E+05**	**790[d]**
Construction-Worker Soil Screening Level[c]				**154**	**na**	**6190**	**927[e]**	**1E+05**	**na**
Residential Soil Screening Level[c]				**39**	**na**	**1560**	**23[d]**	**1E+05**	**55[d]**
RE33-05-60779	33-24730	0.00–0.50	Soil	—[f]	10600 (J)	0.55 (U)	—	0.85	0.0007 (J)
RE33-05-60780	33-24730	2.00–2.50	Soil	—	—	0.6 (U)	—	0.67	0.00019 (J)
RE33-05-60781	33-24731	0.00–0.50	Soil	—	—	0.62 (U)	—	2.7	—
RE33-05-60782	33-24731	2.00–2.50	Soil	—	7990 (J)	0.61 (U)	—	1.1	—
RE33-05-60783	33-24732	0.00–0.50	Soil	—	—	0.54 (U)	—	0.43	—
RE33-05-60784	33-24732	2.00–2.50	Soil	—	6850 (J)	0.6 (U)	—	2	—
RE33-05-60785	33-24733	0.00–0.50	Soil	—	—	0.56 (U)	—	2.4	—
RE33-05-60786	33-24733	2.00–2.50	Soil	—	6960 (J)	0.58 (U)	—	1	—
RE33-05-60787	33-24734	0.00–0.50	Soil	—	—	0.6 (U)	—	2.5	—
RE33-05-60788	33-24734	2.00–2.50	Soil	—	—	0.61 (U)	—	2.3	—
RE33-05-60789	33-24735	0.00–0.50	Soil	—	—	0.58 (U)	—	—	—
RE33-05-60790	33-24735	2.00–2.50	Soil	—	—	0.56 (U)	—	0.32	—
RE33-05-60791	33-24736	0.00–0.50	Soil	0.58	—	0.52 (U)	0.12 (U)	3.6	—
RE33-05-60792	33-24736	2.00–2.50	Soil	—	6750 (J)	0.53 (U)	—	1.5	—
RE33-05-60793	33-24737	0.00–0.50	Soil	—	—	0.52 (U)	—	1.5	—
RE33-05-60794	33-24737	2.00–2.50	Soil	—	—	0.52 (U)	—	-	—
RE33-05-60795	33-24738	0.00–0.50	Soil	—	—	0.58 (U)	—	2.1	—
RE33-05-60796	33-24738	2.00–2.50	Soil	—	—	0.58 (U)	—	—	—
RE33-05-60797	33-24739	0.00–0.50	Soil	—	—	0.56 (U)	—	—	—
RE33-05-60798	33-24739	2.00–2.50	Soil	—	—	0.57 (U)	0.14	0.42	—

Note: All units are mg/kg.

[a] Background values from LANL (1998, 59730).

[b] na = Not available.

[c] SSLs are from NMED (2005, 90802) unless noted otherwise.

[d] Screening values for outdoor worker from EPA Region 6 (2005, 91002).

[e] SSL for elemental mercury from NMED (2005, 90802).

[f] — = Not detected or detected below background value.

Table 4.1-2
Detected Concentrations of Organic Chemicals at SWMU 33-013

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene[a]	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Chrysene
Industrial Soil Screening Level[b]				**31.9[c]**	**1.93[c]**	**23.4**	**2.34**	**23.4**	**21.3[c]**	**234**	**1370**	**0.955[c]**
Construction Worker Soil Screening Level[b]				**31.9[c]**	**1.93[c]**	**212**	**21.2**	**212**	**21.3[c]**	**2120**	**4660**	**0.955[c]**
Residential Soil Screening Level[b]				**31.9[c]**	**1.93[c]**	**6.21**	**0.621**	**6.21**	**21.3[c]**	**62.1**	**347**	**0.955[c]**
RE33-05-60779	33-24730	0.00–0.50	Soil	1.8	3.4	4.4	3.9 (J)	3.3 (J)	2 (J)	3.5(J)	0.085(J)	4.2
RE33-05-60780	33-24730	2.00–2.50	Soil	—[d]	0.076(J)	0.1(J)	0.094(J)	—	0.17(J)	0.096(J)	—	0.1(J)
RE33-05-60781	33-24731	0.00–0.50	Soil	—	—	—	—	—	—	0.082 (J)	—	0.079(J)
RE33-05-60782	33-24731	2.00–2.50	Soil	—	0.13(J)	0.23(J)	0.21(J)	0.18 (J)	0.13(J)	0.24(J)	—	0.24(J)
RE33-05-60783	33-24732	0.00–0.50	Soil	—	—	—	0.078(J)	—	—	0.079(J)	—	0.071(J)
RE33-05-60789	33-24735	0.00–0.50	Soil	0.12(J)	0.17(J)	0.29(J)	0.3(J)	0.2 (J)	0.15(J)	0.31(J)	0.078(J)	0.29(J)
RE33-05-60790	33-24735	2.00–2.50	Soil	—	—	—	—	—	—	—	—	—
RE33-05-60791	33-24736	0.00–0.50	Soil	0.076(J)	0.13(J)	0.29(J)	0.3(J)	0.22 (J)	0.17(J)	0.31(J)	—	0.31(J)
RE33-05-60792	33-24736	2.00–2.50	Soil	—	—	0.17(J)	0.21(J)	0.14 (J)	0.14(J)	0.22(J)	—	0.19(J)
RE33-05-60793	33-24737	0.00–0.50	Soil	0.21(J)	0.28(J)	0.55	0.62	0.45	0.36	0.62	—	0.57
RE33-05-60794	33-24737	2.00–2.50	Soil	—	0.073(J)	0.21(J)	0.26(J)	0.18(J)	0.15(J)	0.27(J)	—	0.23(J)
RE33-05-60795	33-24738	0.00–0.50	Soil	—	—	—	—	—	—	—	—	—
RE33-05-60797	33-24739	0.00–0.50	Soil	—	—	0.13 (J)	0.15(J)	0.11(J)	0.077(J)	0.17(J)	—	0.15(J)
RE33-05-60798	33-24739	2.00–2.50	Soil	—	—	0.079(J)	0.079(J)	—	—	0.085(J)	—	0.15(J)

D-1.2 Uncertainty Analysis

The analysis for human health is subject to uncertainties associated with data evaluation, exposure assessment, and toxicity values. Each or all of these uncertainties may affect the assessment results.

Data Evaluation

Data evaluation uncertainties may include errors in sampling, laboratory analysis, and data analysis. Although concentrations used in this risk assessment were less than estimated quantitation limits for some COPCs, data evaluation uncertainties are expected to have little effect on the assessment results. The J (estimated) qualification of detected concentrations of some organic COPCs does not affect the assessment.

Another data evaluation uncertainty relates to the use of the 95% UCL as the representative concentration for each COPC. Use of the 95% UCL may result in an overestimation of risk for analytes that have elevated detection limits. Use of the maximum detected concentration or maximum concentration for some COPCs also overestimates the exposure to contamination. The maximum detected concentration or maximum concentration were used when only a few detected concentrations were reported or the detection limits exceeded background values (e.g., cyanide and mercury). Receptors would not be exposed to these concentrations across the site.

Exposure Assessment

The receptors used in the assessment are subject to exposures in a different manner than the exposure assumptions used to derive the SSLs/SALs. Assumptions for the industrial SSLs are that the potentially exposed individual is a Laboratory worker who is outside for 8 h/d for 225 d/yr (NMED 2005, 90802) and spends the entire 8 h on-site within the contaminated area. Because it is unlikely that the worker is within the contaminated area for the entire work day, the screening assessment overestimates the exposure. As a result, risk, hazard, and dose may be overestimated. Similarly, the construction worker is assumed to be exposed for one year, which may over- or underestimate exposure to the worker.

Of the 10 locations sampled, six locations were at the bottom of the asphalt pad excavation. These sampling locations are now covered by 2 ft of clean fill and base coarse and do not provide complete pathways for exposure to a Laboratory worker. If construction activity were to occur and result in the uncovering of contaminated material, exposure would not result in unacceptable risk or dose because concentrations are below screening levels.

The use of C_{sat} values in the screening assessment to compare with representative concentrations does not accurately reflect the potential risk to receptors. If used as the screening value in a risk-based assessment, the Csat value substantially underestimates the potential risk to receptors (often by orders of magnitude). For the organic COPCs with C_{sat} values at SWMU 33-013, none are liquid at ambient temperature. Therefore, a risk-based SSL should be calculated, absent the inhalation pathway. This pathway is a minor contributor to potential risk because the COPCs are solid at ambient temperatures and does not substantially affect the SSL. The risk-based SSLs calculated using this approach may slightly underestimate the potential risk.

Assumptions underlying the exposure parameters, routes of exposure, amount of contaminated media available for exposure, and intake rates for routes of exposure are consistent with EPA-approved parameters and default values (NMED 2005, 90802; EPA 2005, 91002). In the absence of site-specific data, several upper-bound values for the assumptions may be combined to estimate exposure for any one pathway, and the resulting risk estimate can exceed the 99th percentile. Therefore, uncertainties in

the assumptions underlying the exposure pathways may contribute to risk assessments that exceed the reasonably expected range.

Toxicity Values

The primary uncertainty associated with the screening values relates to derivation of screening values from EPA toxicity values (reference doses [RfDs] and slope factors [SFs]) (EPA 2003, 76870; EPA 1997, 58968). Uncertainties were identified in the following three areas with respect to the toxicity values: (1) extrapolation from other animals to humans, (2) extrapolation from one route of exposure to another route of exposure, and (3) interindividual variability in the human population.

The SFs and RfDs are often determined by extrapolation from animal data to humans, which may result in uncertainties in toxicity values because differences exist in chemical absorption, metabolism, excretion, and toxic response between animals and humans. The EPA takes into account differences in body weight, surface area, and pharmacokinetic relationships between animals and humans to minimize the potential to underestimate the dose-response relationship. However, more conservatism is usually incorporated in these steps.

The SFs and RfDs often contain extrapolations from one route of exposure to another. The extrapolation from the oral route to the inhalation and/or the dermal route is used in the derivation of some screening values. Differences in chemical absorption and/or toxicity between the two exposure routes could result in over- or underestimation of risk or hazard.

For noncarcinogenic effects, the amount of human variability in physical characteristics is important in determining the risks that can be expected at low exposures and in determining the no observed adverse effect level (NOAEL). The NOAEL/uncertainty factor approach incorporates a factor of 10 to reflect the possible interindividual variability in the human population; it is generally considered a conservative estimate.

Another uncertainty related to toxicity assessment is the assumption of additivity, which may result in an overestimate or underestimate of risk. For noncarcinogens, the effects of a mixture of chemicals generally are unknown and possible interactions could be synergistic or antagonistic. Additionally, the RfDs for different chemicals are not based on the same severity, effect, or target organ. Therefore, the potential for occurrence of noncarcinogenic effects may be overestimated for chemicals that are addressed additively but that act by different mechanisms and on different target organs.

The use of surrogates for some chemicals that do not have EPA-approved or provisional toxicity values also contributes to uncertainty in risk assessment. In this assessment, surrogates were used to establish toxicity values for the following based on structural similarity (NMED 2003, 81172):

- Benzo(g,h,i)perylene
- 2-methylnaphthalene

Neither of these COPCs contributed substantially to the hazard indices of the scenarios assessed at SWMU 33-013.

D-1.3 Interpretation

Based on an industrial scenario, the HI (0.002) is less than NMED's target level of 1.0, the cancer risk (3×10^{-6}) is less than the NMED target level of 1×10^{-5}, and the radiological dose (0.005 mrem/yr) is less than DOE's target dose of 15 mrem/yr. For a construction worker, the HI (0.03) is less than NMED's

target level of 1.0, the cancer risk (1×10^{-6}) is less than the NMED target level of 1×10^{-5}, and the radiological dose (1.3 mrem/yr) is less than DOE's target dose of 15 mrem/yr. The total dose for a Laboratory worker across the SWMU is equivalent to a total risk of 1×10^{-4} based on a comparison with EPA preliminary remediation goals for radionuclides (available online at epa-prgs.ornl.gov/radionuclides/prg_search.shtml). The screening assessments indicate that there is no potential unacceptable risk/dose to human health at SWMU 33-013.

D-2.0 ECOLOGICAL SCREENING ASSESSMENT

The scoping evaluation establishes the breadth and focus of the ecological screening assessment. The ecological scoping checklist, Attachment D-1 to this appendix, was used to determine whether ecological receptors might be affected, identify the types of receptors that might be present, and develop the ecological site conceptual model for SWMU 33-013.

The site is located in an industrially developed area; the site surface consists primarily of base coarse. The surface was historically disturbed by the construction, operation and subsequent D&D of the tritium facility (Building 33-86). The surface was disturbed again during this ACA. The area surrounding SWMU 33-013 is flat and consists primarily of gravel surfacing to the west and south and sparse flora or fauna to the east and north. The small amount of open area within the developed area contains native and nonnative grasses, forbs, a few trees, and shrubs, but these open areas provide limited and fragmented habitat with regular disturbance from site operations at TA-33. The potential pathways to ecological receptors are by root uptake, food-web transport, and soil ingestion.

D-2.1 Assessment Endpoints

An assessment endpoint is an explicit expression of the environmental value to be protected. These endpoints are ecologically relevant and help sustain the natural structure, function, and biodiversity of an ecosystem or its components (EPA 1998, 62809). In a screening-level assessment, assessment endpoints are any adverse effects on ecological receptors, where receptors are populations and communities (EPA 1997, 59370).

The ecological screening assessment is designed to protect populations and communities of biota rather than individual organisms, except for listed or candidate threatened and endangered (T&E) species or treaty-protected species (EPA 1999, 70086). The protection of individuals within these designated protected species may also be protected at the population level; the populations of these species tend to be small, and the loss of an individual adversely affects the species.

In accordance with this guidance, the Laboratory developed generic assessment endpoints (LANL 1999, 64137) to ensure that values at all levels of ecological organization are considered in the ecological screening process. These general assessment endpoints may be measured using impacts on reproduction, growth, and survival to represent categories of effects that may adversely impact populations. In addition, specific receptor species were chosen to represent each functional group. The receptor species were chosen because of their presence at the site, their sensitivity to the COPCs, and their potential for exposure to those COPCs. These categories of effects and the chosen receptor species were used to select the types of effects seen in toxicity studies considered in the development of the toxicity reference values (TRVs). Toxicity studies used in the development of TRVs included only studies in which the adverse effect evaluated affected reproduction, survival, and/or growth.

The selection of receptors and assessment endpoints is designed to be protective of both the representative species used as screening receptors and the other species within their feeding guilds and

the overall food web for the terrestrial and aquatic ecosystems. Focusing the assessment endpoints on these general characteristics of species that affect populations (rather than the biochemical and behavioral changes that may affect only the studied species) also ensures the applicability to the ecosystem of concern.

D-2.2 Screening Evaluation

Analytical results from 0 ft to 4.5 ft are used in this evaluation (the deepest depths from which samples were collected) using the 95% UCL or maximum detected concentrations as the representative concentration. The numerical screening evaluation compared media-specific ecological screening levels (ESLs) for each receptor with the representative concentration. The ESLs are derived for each of the receptors where information is available. The ESLs are based on similar species and derived from experimentally determined as having NOAELs, lowest observed adverse effect levels, or doses lethal to 50% of the population. The derivation of ESLs is based on the approach presented in "Screening Level Ecological Risk Assessment Methods, Revision 2" (LANL 2004, 87630). Relevant information necessary to calculate ESLs, including concentration equations, dose equations, bioconcentration factors, transfer factors, and toxicity reference values, are presented in the ECORISK Database, Version 2.2 (LANL 2005, 90032). The ESLs were developed to reflect an adverse effect on an average, nongravid, adult individual of a particular species (EPA 1993, 59384), are designed to be protective of specific organisms, and may only be used to infer a potential for risk to receptors. The ESLs used in this screening evaluation (Table D-2.2-1) were obtained from the ECORISK Database, Version 2.2 (LANL 2005, 90032).

The receptors, which represent several trophic levels (LANL 2004, 87630), include

- a plant,
- a soil-dwelling invertebrate (represented by the earthworm),
- the American robin (avian insectivore, avian omnivore, and avian herbivore),
- the American kestrel (avian insectivore and carnivore),
- the deer mouse (mammalian omnivore),
- the Montane shrew (mammalian insectivore),
- the desert cottontail (mammalian herbivore), and
- the red fox (mammalian carnivore).

The COPCs evaluated against the ESLs included two inorganic chemicals, 18 organic chemicals, and four radionuclides. The minimum ESL for each COPC was compared with the respective representative concentration; the HQ was calculated by dividing the representative concentration by the ESL (Table D-2.2-2). An HQ greater than 0.3 was used to identify chemicals of potential ecological concern (COPECs) and determine which chemicals are evaluated further (LANL 2004, 87630). Based on this comparison, nine COPCs (two inorganic chemicals and seven organic chemicals) were retained as COPECs (Table D-2.2-2). Nitrate and perchlorate, which do not have ESLs for terrestrial receptors, are also retained as COPECs and discussed in the uncertainty section.

The COPECs were evaluated further in Table D-2.2-3. The HQs for each COPEC/receptor combination as well as the HIs for each receptor were calculated. The HI is the sum of HQs for chemicals with common toxicological endpoints for a given receptor. For the purposes of ecological screening, it is assumed that nonradionuclides have common toxicological effects. The HI analysis provides a clearer picture of potential adverse impacts by determining how many receptors may be affected and provides