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Los Alamos National Laboratory/University of California
Environmental Stewardship (ENV)
Environmental Remediation & Surveillance Program (ERS), MS M992
Los Alamos, New Mexico 87545
(505) 667-0469/FAX (505) 665-4747

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

Date: December 22, 2005
Refer to: ER2005-0947

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



SUBJECT: RESPONSE TO THE NOTICE OF DISAPPROVAL FOR THE VOLUNTARY CORRECTIVE ACTION COMPLETION REPORT FOR SOLID WASTE MANAGEMENT UNIT 16-016(c)-99 AT TECHNICAL AREA 16

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the response to the notice of disapproval (NOD) for the "Voluntary Corrective Action Completion Report for Solid Waste Management Unit (SWMU) 16-016(c)-99 at Technical Area 16." Consolidated Unit 16-016(c)-99 consists of the following sites: SWMU 16-010(a) (Flash Pad 386), SWMU 16-016(c) (former barium nitrate pile), and SWMU 6-006(e) (septic system).

Pending the New Mexico Environment Department's (NMED's) acceptance of this NOD response and its approval of the completion report, the Laboratory requests that NMED issue Certificates of Completion for these SWMUs, pursuant to Section VII.E.6.b of the March 1, 2005, Compliance Order on Consent. The Laboratory requests the Certificates of Completion state the corrective action is complete without controls.

If you have questions, please contact Bill Criswell at (505) 665-5886 (bcriswell@lanl.gov) or Woody Woodworth at (505) 665-5820 (lwoodworth@doeal.gov).

Sincerely,

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

Sincerely,

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



RM/jk

Enclosures: 1) Two hard copies with electronic files – Response to the Notice of Disapproval for the Voluntary Corrective Action Completion Report for Solid Waste Management Unit 16-016(c)-99 at Technical Area 16 (ER2005-0941)

Cy:(w/enc)

R. Mirenda, ENV-ECR, MS M992 (bound copy with CD)
B. Criswell, ENV-ERS, MS M992 (bound copy with CD)
K. VanDerpoel, ENV-SWRC, MS M992 (bound copy with CD)
D. Gregory, DOE LASO, MS A316 (bound copy with CD)
W. Woodworth, DOE LASO, MS A316 (bound copy with CD)
L. King, EPA Region 6 (CD only)
P. Reneau, ENV-ECR, MS M992 (CD only)
ENV-ECR File, MS M992 (unbound copy with CD)
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Cy (w/o enc):

A. Dorries, ENV-ECR, MS M992
D. McInroy, ENV-ERS, MS M992
B. Rich, ADO, MS A104
D. Pepe, NMED-OB
IM-9, MS A150

**Response to the Notice of Disapproval for the Voluntary Corrective Action
Completion Report for Solid Waste Management Unit 16-016(c)-99 at Technical Area 16,
Los Alamos National Laboratory EPA ID No: NM0890010515,
HWB-LANL-03-024**

INTRODUCTION

This submittal is the response by the Los Alamos National Laboratory (LANL or the Laboratory) to the Notice of Disapproval (NOD) issued by the New Mexico Environment Department (NMED) on November 29, 2005, for the "Voluntary Corrective Action Completion Report for Solid Waste Management Unit 16-016(c)-99 at Technical Area 16," dated November 2003 (LA-UR-03-8482). The NMED NOD comments are provided verbatim, with the Laboratory's responses immediately following each comment.

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

SPECIFIC COMMENTS

NMED Comment

1. Section 2.3.1, VCA Investigative and Remediation Activities, page 7:

The statement that barium contamination has not penetrated the bedrock beneath the flash pad is not supported by the data. There are no boreholes in the footprint of flash pad 386. Most of the samples collected from the footprint of flash pad were surface samples (0-1 ft. depth). At two locations, where samples were collected from two different depths, barium was detected at increasing concentrations in samples obtained at greater depths (e.g., at location ID 16-20189, barium in sample from 0-1 ft depth was at 1040 mg/kg and in sample from 2-3 ft depth was at 1400 mg/kg, and for location ID 16-20300, barium was detected at 120mg/kg at 0-1 ft and at 398 mg/kg at 2-3 ft depth). No data is available from greater depth than 3 feet. Revise the text accordingly.

LANL Response

1. The Laboratory concurs that there are insufficient data within the footprint of Flash Pad 386 to support the statement noted in the comment. Therefore, the 4th paragraph of p. 7 is revised as follows:

Soils within Flash Pad 386 were excavated and staged with soils from adjacent areas of the material disposal area (MDA) P excavation. Field screening for barium was used to identify the extent of excavation. Surface soils and some bedrock materials were removed from within the flash pad area. Discontinuous areas downgradient of the flash pad were removed. ~~Barium contamination has not penetrated the bedrock beneath the flash pad.~~ Some residual bedrock contamination was identified in the drainage along the western margin of MDA P, but it was below the barium operational preliminary remediation goal of 2000 mg/kg. The remaining areas of exposed soil within the Flash

Pad 386 fence were screened for barium contamination. After excavation, a layer of soil and gravel was placed in the excavation within the current fence. Gravel was placed on the north side of the current fence as an erosion-control measure.

NMED Comment

2. Section 2.3.1, VCA Investigative and Remediation Activities, page 7:

The text states that confirmation sample locations and the matrix type of each sample is depicted in Figure 2.3-1, but Figure 2.3-1 does not provide this information. Revise the figure to indicate location of confirmation samples and indicate the matrix type for each sample taken.

LANL Response

2. The revised Figure 2.3-1 is included in this response.

NMED Comment

3. Table 2.3-2, Frequency of Detected Inorganic Chemicals above the Background Value-Biological Zone, page 12

The background soil value listed for aluminum and vanadium is 29,900 mg/kg and 36.6 mg/kg, respectively. This appears to be a typographical error, since the soil background value should be 29,200 mg/kg for aluminum and 39.6 mg/kg for vanadium, as noted in Table 6.0-1 of the document Inorganic and Radionuclide Background Data for Soil, Canyon Sediments, and Bandelier Tuff, LANL 1998. Revise the tables accordingly.

LANL Response

3. The revised Table 2.3-2 is included in this response. Highlighting indicates changed values for this table and all subsequent tables.

NMED Comment

4. Section 2.4.2.3, Evaluation of Organic Samples, page 16:

Several organic chemicals were eliminated as chemicals of potential concern (COPCs) based upon low detection frequencies. The Environmental Protection Agency (EPA) guidance (Risk Assessment Guidance for Superfund [RAGS], 1989) cited in the Report allows for the elimination of chemicals from a risk assessment if it is detected infrequently (e.g., less than 5% per 20 samples with prior approval from the administrative authority), not detected in other sampled media, and/or if there is no reason to believe the chemical may be present. However, RAGS clearly states that, "chemicals expected to be present should not be eliminated" from the risk assessment. The report provides evidence that these constituents have been historically present at the site, and a review of waste data collected in 1999 and 2000 indicate the presence of these constituents in waste removed from the site. Thus, there is sufficient justification to warrant the inclusion of these constituents in the risk assessment. For the biological zone, the risk assessment should include benzoic acid, 1,4-dichlorobenzene, 1,3-dinitrobenzene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-methylnaphthalene, 3-nitrotoluene, 4-nitrotoluene, and tetryl. For the exposed tuff zone, the risk assessment should include di-n-butylphthalate, 1,3-dinitrobenzene, 2,4-dinitrotoluene, 2,6-dinitrotoluene,

2-methylnaphthalene, 4-nitrotoluene, and tetryl. Revise the risk assessment to include all organic constituents that have been historically present on-site, regardless of the detection frequency.

LANL Response

4. The voluntary corrective action (VCA) completion report for solid waste management unit (SWMU) 16-016(c)-99 was submitted to NMED in November 2003. Subsequently, the risk assessments in the "Material Disposal Area P Site Closure Certification Report, Revision 1" (LA-UR-05-6536), which include SWMU 16-016(c)-99 because of the consolidated nature of the cleanup activities, were revised in response to NMED comments. The risk assessments provided in the MDA P closure certification report now include the chemicals of potential concern (COPCs) listed in the above comment. Specifically, Section 2.4.3, p. 61, paragraphs 3 and 4; Appendix A; and Tables 3.2.3-2 and 3.2.3-4 were modified to include all detected organic chemical data for the MDA P Site.

NMED Comment

5. **Tables 2.3-7 and 2.3-8, Frequency of Detected Organic Chemicals-Biological and Exposed tuff Zones, pages 17 and 18:**

Remove 'footnote c' from Table 2.3-7 and Table 2.3-8. See Comment #4. Revise these tables accordingly.

LANL Response

5. The revised Tables 2.3-7 and 2.3-8 are included in this response.

NMED Comment

6. **Table 2.3-9, Results of Data Review, page 21:**

Some organic chemicals were inappropriately eliminated from further evaluation based on the rationale that the detection frequency was less than 5%. See Comment # 4. Revise Table 2.3-9 to retain organic chemicals (i.e., benzoic acid, di-n-butylphthalate, 1,4-dichlorobenzene, 1,3-dinitrobenzene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-methylnaphthalene, 3-nitrotoluene, 4-nitrotoluene, and tetryl) that were eliminated on the bases of less than 5% detection frequency for further evaluation.

LANL Response

6. The revised Table 2.3-9 is included in this response.

NMED Comment

7. **Section 2.3.2.4, Summary of COPCs, page 23:**

Revise the text to include the organic chemicals that were dropped from further evaluation based on less than 5% detection frequency. See Comment #4.

LANL Response

7. The VCA completion report for SWMU 16-016(c)-99 was submitted to NMED in November 2003. Subsequently, the risk assessments in the "Material Disposal Area P Site Closure Certification Report, Revision 1" (LA-UR-05-6536), which include SWMU 16-016(c)-99 because of the consolidated nature of the cleanup activities, were revised in response to NMED comments. The risk assessments provided in the MDA P closure certification report now include the COPCs listed in the above comment. Specifically, Section 2.5.3, bottom of p. 73 and top of p. 74, was modified to include all detected organic chemical data for the MDA P Site.

NMED Comment

8. **Section 2.3.3.1, Contaminated Media-Current Conditions, page 24:**

The statement "Neither surface water in the vicinity of the MDA P Site nor groundwater beneath the MDA P Site is impacted by residual contamination in the soil and tuff under current conditions" is misleading. No justification supporting this statement has been provided. Groundwater beneath MDA P has not yet been fully investigated, and the borehole data indicates that contamination has migrated in the subsurface. Surface water investigations in Cañon de Valle have not been completed yet. NMED concurs that the residual contamination at the site after the remediation, in the future, may not significantly contribute to potential contamination of groundwater or surface water. However, the contamination that has migrated offsite over the years and has potentially contributed to contamination of surface water and groundwater has not been addressed yet. NMED acknowledges that since contaminant migration from the site is indistinguishable from contamination from other sources, contamination in Cañon de Valle should be addressed through the upcoming Water Canyon/Cañon de Valle investigation and corrective measures currently underway for SWMU 16-021(c). Groundwater monitoring of Water Canyon/Cañon de Valle shall be conducted in accordance with Section IV.B.3.b.iv of the Consent Order.

LANL Response

8. The Laboratory's position that residual contamination from the MDA P Site is not impacting surface or groundwater under current conditions is explained in Section 3.0 of the "Material Disposal Area P Site Closure Certification Report, Revision 1" (LA-UR-05-6536). The Laboratory acknowledges that any historical releases of contaminants from the MDA P Site potentially impacting surface or groundwater will be addressed through the Water Canyon/Cañon de Valle investigation and corrective measures for SWMU 16-021(c) and through groundwater monitoring in accordance with Section IV.B.3.b.iv of the Consent Order.

NMED Comment

9. **Section 2.3.3.5, Nature and Extent of Contamination, page 29:**

The statement that "All COPC concentrations decreased with depth across the site is incorrect." For example, in borehole 526, barium was detected at 30.9 mg/kg at 2-3 feet and at 413 mg/kg at 53.5-54.5 feet. Revise the report accordingly.

LANL Response

9. As provided in Table C-2 of the VCA completion report, Borehole 526 did report an overall decrease in barium concentration with depth from the surface to 54.5 ft because the 0–1-ft concentration was 1800 mg/kg and the 54.5-ft concentration was 413 mg/kg. However, the Laboratory acknowledges that the statement above may be broad and it will be modified to read, “COPC concentrations generally decreased with depth across the site.”

NMED Comment

10. Section 2.4.1, Screening Assessments, page 30:

Organic chemicals that were detected in less than 5% of confirmation samples should not have been dropped from consideration for risk assessment. The EPA RAGS guidance clearly states that, “chemicals expected to be present should not be eliminated” from the risk assessment. See Comment #4. Revise the risk assessment to include all organic constituents that have been historically present on-site, regardless of detection frequency.

LANL Response

10. The VCA completion report for SWMU 16-016(c)-99 was submitted to NMED in November 2003. Subsequently, the risk assessments in the “Material Disposal Area P Site Closure Certification Report, Revision 1” (LA-UR-05-6536), which include SWMU 16-016(c)-99 because of the consolidated nature of the cleanup activities, were revised in response to NMED comments. The risk assessments provided in the MDA P closure certification report now include the COPCs mentioned in the above comment. Specifically, Sections 2.5.3.1.1, p. 74, bottom of page, and Section 2.5.3.1.3, p. 83, 2nd paragraph; and Tables 2.5-1 and 2.5-2 were modified to include all detected organic chemical data for the MDA P Site.

NMED Comment

11. Section 2.4.1.1, Human Health, (c) Uncertainty Analysis, page 37:

Organic chemicals that were detected in less than 5% of confirmation samples were inappropriately excluded from the analysis. Revise the analysis to include all organic chemicals that were expected to be present at the site, regardless of the detection frequency.

LANL Response

11. The VCA completion report for SWMU 16-016(c)-99 was submitted to NMED in November 2003. Subsequently, the risk assessments in the “Material Disposal Area P Site Closure Certification Report, Revision 1” (LA-UR-05-6536), which include SWMU 16-016(c)-99 because of the consolidated nature of the cleanup activities, were revised in response to NMED comments. The risk assessments provided in the MDA P closure certification report now include the COPCs mentioned in the above comment. Specifically, Section 2.5.3.1.2, p. 81, 3rd paragraph was modified to include all detected organic chemical data for the MDA P Site.

NMED Comment

12. Section 2.4.1.2 Ecological, (b) Screening Evaluation, page 41:

Version 1.4 of the ECORISK database was used. Provide justification for not using version 1.5, which was released in September 2002. In addition, several COPCs were eliminated from the assessment, as the data provided in ECORISK was less than background and thus, deemed not appropriate for use. Discuss why other sources for ecological toxicity data were not used in these cases.

LANL Response

12. The ecological screening assessment was conducted in the summer of 2002 using version 1.4 of the ECORISK Database that was released in March 2002. Version 1.5 was released at the end of September 2002 after the ecological screening assessment was completed and during the writing of the MDA P closure certification report. It was not feasible to conduct another ecological screening assessment with the newer database version and still meet the schedule for delivery of the document.

The ECORISK Database is a compilation of the available peer-reviewed literature for over a hundred chemicals. Version 1.4 includes 1228 references that are used to establish ecological screening levels (ESLs) for combinations of chemicals and receptors. Gathering, reviewing, and incorporating additional peer-reviewed literature on toxicological studies are continuing processes and are the primary reasons for the annual updates to the ECORISK Database. As applicable studies are incorporated, new or updated toxicity reference values and ESLs are added to the database. The conceptual approach to calculating ESLs in Versions 1.4 and 1.5 is to bias toward producing protective values such that the lowest no observed adverse effect level is used or the minimum lowest observed adverse effect level is used along with the application of uncertainty factors.

The toxicity information used to calculate ESLs is literature based and reflects results of laboratory studies. The values used are often low and sometimes less than naturally occurring or environmentally measured concentrations. As a result, the ESLs for inorganic chemicals can be below the background concentrations and are protectively biased to the point of not being useful. In the case of the MDA P Site, eight metals had ESLs below background (antimony, barium, chromium, cobalt, selenium, silver, vanadium, and zinc). Barium is carried forward as a chemical of potential ecological concern due to ESLs that are greater than the background value (BV) and an exposure concentration above ESLs for several receptors. The other metals came forward from the background comparison because of high maximum concentrations that influenced the statistical distribution tests. A comparison of the 95% upper confidence level (UCL) concentrations to the BVs for the remaining seven metals shows ratios of 0.16 to 1.1. The 95% UCLs for these seven metals are also similar to background concentrations so exposure across the MDA P Site is similar to background. Based upon this information, the concentrations of these seven metals in the biological zone do not result in adverse ecological effects.

NMED Comment

13. Section 2.4.1.2 Ecological, (b) Screening Evaluation, page 41:

The text states that chemicals with seven or fewer detections in soil above the soil background value are rendered inaccessible to receptors. Because 100% of the site was not sampled, and the lower detection frequency above background does not render the chemicals inaccessible (it lowers the potential for exposure, but not eliminate it), this statement is erroneous. Revise the text to remove the discussion on these chemicals being inaccessible to receptors due to low frequency of detection

above background. In addition, there is reasonable evidence to conclude that these chemicals are present at the site due to site activities. The exclusion of these chemicals as COPCs based upon the low frequency of detections is not valid (unless appropriate statistical analyses demonstrates otherwise) and requires prior approval from NMED. Explain why only barium was retained as COPC, when residual concentrations of barium, cobalt, and copper were found to be above the range of background concentration. Revise the risk assessment to address risk associated with exposure to these constituents.

LANL Response

13. The text referred to in the comment was provided to place the screening results in the context of ecologically meaningful estimates of potential risk. The text reads, "All of the inorganic COPCs, except for barium, have seven or fewer detections in soil above the soil BV, indicating that the residual concentrations of inorganic chemicals in the biological zone are in tuff and are inaccessible to receptors." The text does not state that chemicals with seven or fewer detections in the soil above the soil background value are rendered inaccessible to receptors, as stated in the comment. The statement of inaccessibility in tuff is supported by the agreement among NMED, EPA Region 6, and LANL that the exposed tuff zone does not require a quantitative ecological risk assessment, including generation and review of hazard quotients, because there are no complete pathways in the exposed tuff zone. Because the majority of all detections greater than background in the biological zone are in the tuff (few detections greater than background are in soils), the residual concentrations of inorganic chemicals in the biological zone are largely inaccessible to ecological receptors, lowering but not eliminating exposure, as indicated by the comment. Inorganic chemicals were not removed from the ecological assessment based on low frequency of detection in soil, but they were eliminated because ESLs are below background values. The exposure point concentrations (95% UCLs) are within the range of background as stated in the text following the above-quoted sentence. These criteria were used to determine that barium was the only inorganic COPC requiring additional investigation. Therefore, no revision to the text is necessary.

In addition, Section 2.5.3.3.2, p. 90, paragraphs 1, 2, and 3; and Tables 2.5-7 and 2.5-8 were modified to include all detected organic chemical data for the MDA P Site.

NMED Comment

14. Section 2.4.2.2 Groundwater Assessment, page 57:

The statement that residual constituent concentrations at MDA P Site are confined primarily to the upper 5 ft of the soil and tuff is not supported by the data. Barium, RDX and HMX were detected in boreholes 554, 557 and 526 at depth indicating that contamination has moved in the subsurface. Barium was detected at 413 mg/kg in borehole 526 at approximately 55 ft bgs, the last depth sampled. RDX and HMX were also detected at this depth. Barium was detected at 715 mg/kg at approximately 19 ft bgs and at 406 mg/kg at approximately 37 ft bgs; RDX was detected at 3.9 mg/kg at approximately 19 ft bgs in borehole 557. Revise the text accordingly.

LANL Response

14. The Laboratory concurs that concentrations of barium, RDX, and HMX have been detected at depth, including some migration of contamination into the shallow subsurface at MDA P. However, concentrations of contaminants typically decrease markedly from the surface with depth.

Text in Section 2.4.2.2, p. 57 will be modified to read as follows:

The residual hazardous constituent concentrations at the MDA P Site are generally within the upper 5 ft of the soil and tuff, and substantial inventories of contaminants have not accumulated in the subsurface.

**Table 2.3-2
Frequency of Detected Inorganic Chemicals above the Background Value—Biological Zone**

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range* (mg/kg)	BV (mg/kg)	Frequency of Detects above BV	Frequency of Nondetects above BV
Aluminum	Soil	71	71	2,630 to 19,900	29,200	0/71	0/71
Aluminum	Tuff	73	73	766 to 32,700	7,340	6/73	0/73
Antimony	Soil	71	17	[0.09] to 2.90	0.83	1/71	23/71
Antimony	Tuff	73	3	[0.14] to 1.20	0.5	1/73	41/73
Arsenic	Soil	71	66	[0.12] to 4.80	8.17	0/71	0/71
Arsenic	Tuff	73	61	[0.12] to 3.80	2.79	4/73	0/73
Barium	Soil	71	71	18.7 to 6,630	295	28/71	0/71
Barium	Tuff	73	73	9.30 to 2,920	46	45/73	0/73
Beryllium	Soil	71	71	0.27 to 1.80	1.83	0/71	0/71
Beryllium	Tuff	73	73	0.23 to 1.90	1.21	7/73	0/73
Cadmium	Soil	71	24	[0.01] to 1.40	0.4	1/71	4/71
Cadmium	Tuff	73	33	[0.02] to 0.80	1.63	0/73	0/73
Chromium	Soil	71	70	1.6 to 39.4	19.3	1/71	0/71
Chromium	Tuff	73	69	0.51 to 15.6	7.14	8/73	0/73
Cobalt	Soil	71	71	0.690 to 44.7	8.64	4/71	0/71
Cobalt	Tuff	73	70	0.41 to 41.3	3.14	9/73	0/73
Copper	Soil	71	71	0.68 to 36.8	14.7	6/71	0/71
Copper	Tuff	73	73	0.004 to 32.4	4.66	19/73	0/73
Iron	Soil	71	71	4,580 to 19,900	21,500	0/71	0/71
Iron	Tuff	73	73	6.47 to 22,500	14,500	4/73	0/73
Lead	Soil	71	71	3.80 to 61.5	22.3	5/71	0/71
Lead	Tuff	73	73	1.25 to 24.20	11.2	8/73	0/73
Manganese	Soil	71	71	30.90 to 1,290	671	1/71	0/71
Manganese	Tuff	73	73	44.7 to 456	482	0/73	0/73
Mercury	Soil	71	36	[0.2] to 0.07	0.1	0/71	0/71
Mercury	Tuff	73	14	[0.0028] to 0.0610	0.1	0/73	0/73
Nickel	Soil	71	69	[1.3] to 10.5	15.4	0/71	0/71
Nickel	Tuff	73	62	0.79 to 12.6	6.58	8/73	0/73
Selenium	Soil	71	33	[0.10] to 0.480	1.52	0/71	0/71
Selenium	Tuff	73	48	0.13 to 0.74	0.3	21/73	2/73
Silver	Soil	71	16	[0.019] to 15.8	1	7/71	3/71
Silver	Tuff	73	15	[0.035] to 4.60	1	2/73	1/73
Thallium	Soil	71	30	[0.0130] to [1.2]	0.73	0/71	3/71
Thallium	Tuff	73	25	[0.012] to 1.2	1.1	1/73	1/73
Vanadium	Soil	71	70	[0.380] to 29.3	39.6	0/71	0/71
Vanadium	Tuff	73	70	[0.380] to 26.4	17	2/73	0/73
Zinc	Soil	71	67	[9.4] to 912	48.8	7/71	0/71
Zinc	Tuff	73	73	0.027 to 150	63.5	2/73	0/73

*[] = Not detected.

**Table 2.3-7
Frequency of Detected Organic Chemicals—Biological Zone**

Analyte	Number of Analyses	Number of Detects	Concentration Range ^a (mg/kg)	Frequency of Detection (%)	EQL ^b (mg/kg)
Acetone	5	1	0.014 to [0.026]	20.0	0.03
Amino-2,6-dinitrotoluene[4-]	145	18	0.063 to 0.980	11.8	0.77
Amino-4,6-dinitrotoluene[2-]	145	20	0.044 to 1.10	13.2	0.36
Aroclor-1260	3	1	[0.039] to 0.061	33.3	0.04
Benzoic acid	139	3	0.1 to [2.3]	2.2	2.30
Bis(2-ethylhexyl)phthalate	139	8	0.110 to [0.470]	5.8	0.47
DDT[4,4'-]	3	1	[0.002] to 0.0079	33.3	0.002
Dichlorobenzene[1,4-]	144	1	0.001 to [0.470]	0.7	0.47
Dinitrobenzene[1,3-]	145	3	0.046 to [1.40]	2.1	1.40
Dinitrotoluene[2,4-]	282 ^c	1	[0.08] to [1.40]	0.4	1.40
Dinitrotoluene[2,6-]	282 ^c	2	[0.08] to [1.40]	0.7	1.40
HMX	145	57	[0.08] to 16.0	38.9	0.36
Methylnaphthalene[2-]	139	1	0.040 to [0.470]	0.7	0.47
Nitrotoluene[3-]	145	1	[0.080] to [1.40]	0.7	1.40
Nitrotoluene[4-]	145	1	[0.080] to [1.40]	0.7	1.40
RDX	145	76	0.069 to 37.00	52.8	0.36
Tetryl	144	1	[0.080] to [1.40]	0.7	1.40
Toluene	5	1	0.001 to [0.007]	20.0	0.01
Trinitrotoluene[2,4,6-]	145	12	0.034 to 1.20	8.3	0.77

^a [] = Not detected.

^b EQL = Estimated quantitation limit.

^c Dinitrotoluenes were analyzed as part of the high explosives suite and in some samples as part of the semivolatile organic compound suite.

**Table 2.3-8
Frequency of Detected Organic Chemicals—Exposed Tuff Zone**

Analyte	Number of Analyses	Number of Detects	Concentration Range ^a (mg/kg)	Frequency of Detection (%)	EQL ^b (mg/kg)
Amino-2,6-dinitrotoluene[4-]	143	20	0.049 to 0.550	14.0	0.330
Amino-4,6-dinitrotoluene[2-]	143	23	[2.5E-07] to 0.882	16.1	0.330
Bis(2-ethylhexyl)phthalate	137	7	0.08 to 0.620	5.1	0.430
Carbon disulfide	5	1	[0.005] to 0.010	20.0	0.006
Di-n-butylphthalate	137	1	0.130 to [0.430]	0.7	0.430
Dinitrobenzene[1,3-]	143	1	0.044 to [0.330]	0.7	0.330
Dinitrotoluene[2,4-]	280 ^c	2	0.036 to [0.430]	0.7	0.430
Dinitrotoluene[2,6-]	280 ^c	1	[0.080] to [0.430]	0.4	0.430
HMX	143	76	[0.080] to 5.740	53.1	0.330
Methylnaphthalene[2-]	137	1	0.058 to [0.430]	0.7	0.430
Nitrotoluene[4-]	143	1	[0.080] to [0.330]	0.7	0.330
RDX	143	107	0.054 to 10.80	74.8	0.320
Tetryl	143	1	[0.08] to [0.330]	0.7	0.330
Toluene	5	2	0.001 to [0.026]	40.0	0.026
Trinitrobenzene[1,3,5-]	143	8	0.047 to 0.360	5.6	0.330
Trinitrotoluene[2,4,6-]	143	10	0.029 to 0.480	7.0	0.330

^a [] = Not detected.

^b EQL = Estimated quantitation limit.

^c Dinitrotoluenes were analyzed as part of the high explosives suite and in some samples as part of the semivolatile organic compound suite.

**Table 2.3-9
Results of Data Review**

Analyte	Biological Zone		Exposed Tuff Zone	Result	Rationale
	Soil	Tuff			
Inorganic Chemicals					
Aluminum	— ^a	X ^b	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests
Antimony	—	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests
Arsenic	—	—	—	Eliminated	Eliminated from both zones because detected concentrations did not exceed established BVs or were not statistically different from background
Barium	X	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests
Beryllium	—	—	X	Retained	Retained for exposed tuff zone because detected concentrations exceeded established BVs and failed statistical tests
Cadmium	—	—	—	Eliminated	Eliminated from both zones because detected concentrations did not exceed established BVs or were not statistically different from background
Chromium	—	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests
Cobalt	X	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests or had samples greater than the maximum BV value by several factors
Copper	X	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests
Iron	—	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests
Lead	X	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests or had samples greater than the maximum BV value by several factors
Manganese	—	—	—	Eliminated	Eliminated from both zones because detected concentrations did not exceed established BVs or were not statistically different from background

Table 2.3-9 (continued)

Analyte	Biological Zone		Exposed Tuff Zone	Result	Rationale
	Soil	Tuff			
Mercury	—	—	X	Retained	Retained for exposed tuff zone because detected concentrations exceeded established BVs and because there is no background data set for comparison
Nickel	—	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests
Perchlorate	ND ^c	ND	X	Retained	Retained for exposed tuff zone because it was detected in seven samples and does not have an associated BV
Selenium	—	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests
Silver	X	—	—	Retained	Retained for biological zone because there is no soil background data set for comparison
Thallium	—	—	—	Eliminated	Eliminated from both zones because detected concentrations did not exceed established BVs or were not statistically different from background
Vanadium	—	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests
Zinc	X	X	X	Retained	Retained for both zones because detected concentrations exceeded established BVs and failed the statistical tests or had samples greater than maximum BV by several factors
Radionuclides					
Cesium-137	—		ND	Eliminated	Eliminated from biological zone because detected concentrations did not exceed established BVs
Uranium-234	—		—	Eliminated	Eliminated from both zones because detected concentrations did not exceed established BVs
Uranium-235	—		—	Eliminated	Eliminated from both zones because detected concentrations did not exceed established BVs
Uranium-238	—		—	Eliminated	Eliminated from both zones because detected concentrations did not exceed established BVs
Organic Chemicals					
Acetone	X		ND	Retained	Retained for biological zone because it was detected in one sample
Amino-2,6-dinitrotoluene[4-]	X		X	Retained	Retained for both zones because it was detected in 18 samples (biological zone) and 20 samples (exposed tuff zone)
Amino-4,6-dinitrotoluene[2-]	X		X	Retained	Retained for both zones because it was detected in 20 samples (biological zone) and 23 samples (exposed tuff zone)

Table 2.3-9 (continued)

Analyte	Biological Zone		Exposed Tuff Zone	Result	Rationale
	Soil	Tuff			
Aroclor-1260	X		ND	Retained	Retained for biological zone because it was detected in one sample
Benzoic Acid	X		ND	Retained	Retained for biological zone because it was detected in three samples
Bis(2-ethylhexyl)phthalate	X		X	Retained	Retained for both zones because it was detected in eight samples (biological zone) and seven samples (exposed tuff zone)
Carbon Disulfide	ND		X	Retained	Retained for exposed tuff zone because it was detected in one sample
Di-n-butylphthalate	ND		X	Retained	Retained for exposed tuff zone because it was detected in one sample
DDT[4,4]	X		ND	Retained	Retained for biological zone because it was detected in one sample
Dichlorobenzene[1,4-]	X		ND	Retained	Retained for biological zone because it was detected in one sample
Dinitrobenzene[1,3-]	X		X	Retained	Retained for both zones because it was detected in three samples (biological zone) and one sample (exposed tuff zone)
Dinitrotoluene[2,4-]	X		X	Retained	Retained for both zones because it was detected in one sample (biological zone) and two samples (exposed tuff zone)
Dinitrotoluene[2,6-]	X		X	Retained	Retained for both zones because it was detected in two samples (biological zone) and one sample (exposed tuff zone)
HMX	X		X	Retained	Retained for both zones because it was detected in 57 samples (biological zone) and 76 samples (exposed tuff zone)
Methylnaphthalene[2-]	X		X	Retained	Retained for both zones because it was detected in one sample per zone
Nitrotoluene[3-]	X		ND	Retained	Retained for biological zone because it was detected in one sample
Nitrotoluene[4-]	X		X	Retained	Retained for both zones because it was detected in one sample per zone
RDX	X		X	Retained	Retained for both zones because it was detected in 76 samples (biological zone) and 107 samples (exposed tuff zone)
Tetryl	X		X	Retained	Retained for both zones because it was detected in one sample per zone
Toluene	X		X	Retained	Retained for both zones because it was detected in one sample (biological zone) and two samples (exposed tuff zone)
Trinitrobenzene[1,3,5-]	ND		X	Retained	Retained for exposed tuff zone because it was detected in eight samples

Table 2.3-9 (continued)

Analyte	Biological Zone		Exposed Tuff Zone	Result	Rationale
	Soil	Tuff			
Trinitrotoluene[2,4,6-]	X		X	Retained	Retained for both zones because it was detected in 12 samples (biological zone) and 10 samples (exposed tuff zone)

^a — = Eliminated as a COPC.

^b X = Retained as a COPC.

^c ND = 100% not detected within a given zone.