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EGG-ES-8204

Los Alamos National Laboratory

Sampling and Analysis Data Document

This document contains uninterpreted sampling and analytical data. The data will be interpreted by the DOE Environmental Survey Team and used to modify, as appropriate, the tentative Survey findings contained in the Environmental Survey Preliminary Report. Final Survey findings will be presented in the Environmental Survey Summary Report.

DRAFT

Volume I-A
November 1989

DEPARTMENT OF ENERGY

ENVIRONMENTAL SURVEY

EGG-ES-8204

LOS ALAMOS NATIONAL LABORATORY SAMPLING AND ANALYSIS DATA DOCUMENT (DRAFT)

VOLUME I-A

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4.21 Environmental Problem 21--Leaks/Spills of Dielectric Oil

- Request Number: LA612

- Requester: J. English

- Finding and Basis: Spills and leakage of dielectric oil have resulted in contamination of soils and surface runoff. This contamination may potentially contain PCBs.

  Activities at LANL involving high-voltage equipment require the use of large quantities of dielectric oil. Operations involving the storage and transfer of this oil have resulted in spills and leakage. Several areas were observed during the Environmental Survey where there was spilled oil near tanks and buildings and stained surface runoff ditches apparently contaminated with oil. Dielectric oil contamination is of particular concern because this material potentially contains PCBs.

4.21.1 Sampling and Analysis Objectives

- Statement

  The S&A objective was to determine if spills or leakage of dielectric oil has resulted in contamination of soils or surface runoff with PCBs or other organic compounds at levels above regulatory standards.

- Supporting Information

  A number of instances were observed during the Environmental Survey where dielectric oil storage and transfer activities had resulted in spills and leaks of this material. Sampling at several of these sites was requested to determine if the spilled dielectric oil contained PCBs. This information was needed to prioritize these sites because the presence of PCBs would greatly increase the hazard associated with the sites. Sites were selected for sampling primarily on the basis of the potential hazard (i.e., those sites with a high potential for migration of contaminants). Samples were to be taken at areas where there was visual evidence of spillage (e.g., staining). These locations should provide the highest probability of detecting contamination. Parameters for chemical analysis were selected based on knowledge of the contaminants likely to be present in the oil.

4.21.2 Sampling and Analysis Design

- Sampling Design

Soil samples for LA612 were collected as planned from the stained overflow path from the surface impoundment south of building TA-35-125 (see Table 4.21.1 and Figure 4.21.1). Staining was continuously visible through the sampling area.

A stainless steel hand auger (instead of a stainless steel scoop per S&A plan) was used to collect three grab samples of sediment/soil from three sample points along the stained overflow/drainage path from the surface impoundment. Samples were collected from 0 to 6 in. in depth. One grab was collected within the pond overflow above the lip of the canyon, one downslope "on" the canyon wall, and one at the canyon floor just above confluence with the main stream channel.

- Analytical Design

Samples were analyzed as planned for volatile organic compounds and PCBs (see Table 4.21.1).

4.21.3 Field and Analytical Data

- Field Data

  Field surveys using an HNU photoionization detector did not detect volatile organic compounds, yet odors and staining indicative of petroleum products were evident at all three sampling locations.

- Field Data Evaluation

  None.

- Analytical Data

  Analytical data for volatile organics and pesticide/PCB data are summarized in Tables 4.21.2 and 4.21.3. Volatile organic compounds including acetone and 1,1,1-trichloroethane, ranging from 4 to 95 µg/kg, were detected in two out of the three samples (01, 02) taken from the dielectric oil spill at TA-35-125. Terpene compounds were also tentatively identified in two out of the three samples (02, 03). The following pesticides were detected in two of the samples (01, 03) at concentrations ranging from 2 to 150 µg/kg: delta-BHC, endosulfan I, endosulfan II, gamma-chlordane, and 4,4'-DDT, and its breakdown products 4,4'-DDD and 4,4'-DDE. No PCBs were detected in any of the three samples.

- Analytical Data Evaluation

  LA612: TA-35-125, Leak/Spill Canyon Wall. Sample 01 was taken nearest to the surface impoundment and contained the highest concentrations of target volatile organic compounds with

1,1,1-trichloroethane at 62 μg/kg and acetone at 95 μg/kg. Sample 01 also contained the pesticides delta-BHC, endosulfan II, 4,4'-DDD, 4,4'-DDT, and gamma-chlordane. Sample 02, which was taken at the base of a steep slope down from the storage pond, contained only 4 μg/kg of 1,1,1-trichloroethane, 60 μg/kg of a tentatively identified terpene compound, and no pesticides. Sample 03, taken furthest away from the impoundment and closest to the drainage channel, contained the largest number of volatile organic compounds. This sample contained methylene chloride, acetone, trichloroethene, benzene, toluene, and chlorobenzene, and two terpene compounds ranging in concentrations from 4 to 240 μg/kg; however, the methylene chloride, trichloroethene, benzene, toluene, and chlorobenzene may not be attributable to sample 03 (see Limitations and Qualifications, Section 4.21.4). Terpenes may be a natural degradation product of native coniferous trees. The pesticides detected in sample 03 were endosulfan I, endosulfan II, 4,4'-DDT and its breakdown products 4,4'-DDD and 4,4'-DDE.

- Radiological Data

  Gamma screens detected ^{137}Cs (1200 pCi/kgW) in one sample and natural activities in all three samples.

- Radiological Data Evaluation

Three soil samples were collected along the runoff path from surface impoundment near TA-35-125. Gamma screens were carried out. These results are given in Table 4.21.4.

In addition to the natural activities that were observed in all three samples, ^{137}Cs was found in sample LA61203 at the level of 1200 pCi/kgW.

A radiological survey was not requested. Although there were no radiological analyses requested for this environmental problem, all samples were gamma screened for shipping purposes.

4.21.4 Limitations and Qualifications

- Data Quality Level

The sampling design, sample collection,and documentation are Quality Level I, and the analytical data are Quality Level II.

- Field Data

None.

- Analytical Data

LA612: TA-35-125, Leak/Spill Canyon Wall. The internal standards areas were either low or out of control for these three samples, due to a possible matrix effect, which may introduce the possibility for false negatives and cause the detected compound quantitative values to be biased high. In sample 01, the recovery for toluene (123%) was above control limits, but has minimal affect on the data since no compounds similar to toluene were detected in this sample. Reanalyzed results were used for sample 02 due to poor internal standard areas, surrogate recoveries, and matrix spike recoveries on the initial analyses. 1,1,1-trichloroethane in sample 02 is biased low by approximately 34% due to a high response factor in the continuing calibration; however, this may offset the possible high bias due to low internal standard areas. The concentrations of trichoroethene, benzene, toluene, and chlorobenzene detected in sample 03 are most likely carryover from the matrix spiked sample analyzed immediately before sample 03. The 48 µg/kg of methylene chloride in sample 03 is biased low by approximately 27% due to a high relative response factor in the continuing calibration. It is possible that methylene chloride reported for this sample is the product of laboratory contamination.

The matrix spike for 4,4'-DDT was out of the control limit by 5% with a recovery of 139%. Reported values for 4,4'-DDT may, therefore, be overestimated by as much as 40%. The pesticide analysis for sample 01 was diluted 1:10, which elevated the CRQLs by approximately a factor of 22. Since, low concentrations of TCL compounds (i.e., µg/L) were detected in sample 01 there is minimal impact on the data usability. Although the surrogate recovery for dibutyl chlorendate was within the control limits for sample 02, its recovery of only 30% indicates the chance for false negatives.

- Radiological Data

The results of QC checks indicate that the performance of the gamma-ray spectrometers was adequate to ensure acceptable accuracy and reproducibility of the results obtained using them. In addition, the background seen by each instrument/detector was sufficiently low and constant to ensure accurate compensation for background effects.

Sampling Locations at Overflow Path of Surface Impoundment South of Bldg. TA-35-125

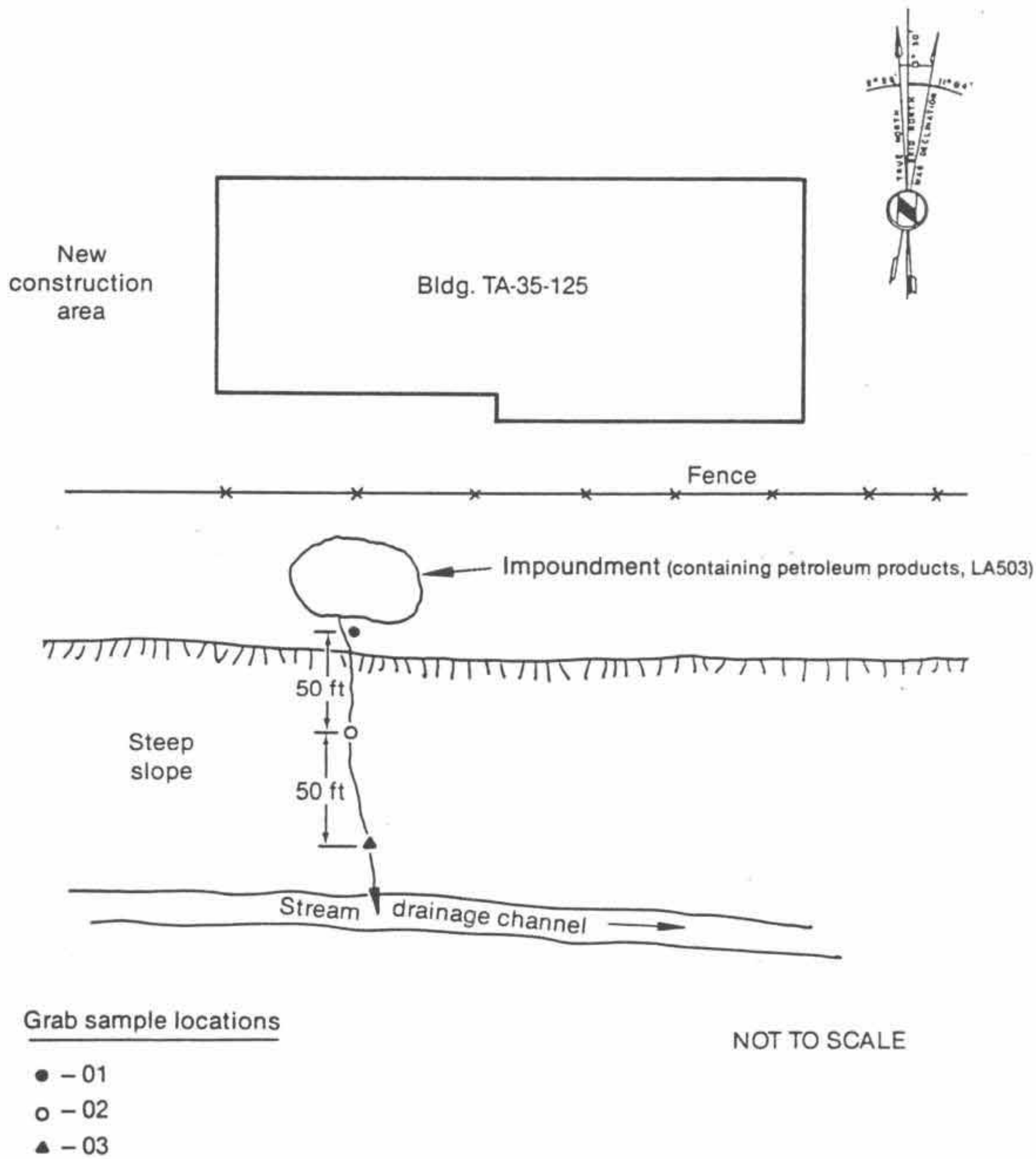


Figure 4.21.1

TABLE 4.21.1 LOS ALAMOS NATIONAL LABORATORY - COMPLETION TABLE - ENVIRONMENTAL PROBLEM 21

(Column Header Legend: P = Planned C = Collected A = Analyzed)
(Status Column Legend: Del = Deleted Dev = Deviation)

REQUEST NUMBER	SN	STAT	DATE COLLECTED mm/dd/yy	AREA	LOCATION	TYPE LOCATION	MEDIA	TYPE	NUMBER SAMPLES		VOLATILE			PCB		
									P	C	P	C	A	P	C	A
LA612			05/18/88	TA-35-125	LEAK/SPILL	CANYON WALL	SOIL	GRAB	3	3	3	3	3	3	3	3
Totals for Problem Number 21									3	3	3	3	3	3	3	3

TABLE 4.21.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 21

AREA	TA-35-125	TA-35-125	TA-35-125
LOCATION	LEAK/SPILL	LEAK/SPILL	LEAK/SPILL
TYPE OF LOCATION	CANYON WALL	CANYON WALL	CANYON WALL
SAMPLE NUMBER	LA61201XX	LA61202XXRE	LA61203XX
MEDIA	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA31401XA	LA31401XA	LA31401XA
FIELD MEASUREMENTS			
Depth (ft)	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS			
Methylene Chloride	---	---	48 B
Acetone	95	---	31
1,1,1-Trichloroethane	62	4 J	---
Trichloroethene	---	---	4 J
Benzene	---	---	5 J
Toluene	---	---	10
Chlorobenzene	---	---	4 J
TENTATIVELY IDENTIFIED COMPOUNDS			
Terpene	---	60 J	140 J
Terpene	---	---	240 J
Total (Allowed) Hold Time	6(14)d	21(14)d*	8(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV
Dilution Factor	1.000	1.000	1.000

TABLE 4.21.3 LOS ALAMOS NATIONAL LABORATORY - PESTICIDE/PCB DATA - ENVIRONMENTAL PROBLEM 21

AREA	TA-35-125	TA-35-125	TA-35-125
LOCATION	LEAK/SPILL	LEAK/SPILL	LEAK/SPILL
TYPE OF LOCATION	CANYON WALL	CANYON WALL	CANYON WALL
SAMPLE NUMBER	LA61201XV	LA61202XV	LA61203XV
MEDIA	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA60501XV	LA60501XV	LA60501XV
FIELD MEASUREMENTS			
Depth (ft)	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS			
delta-BHC	150 J	---	---
Endosulfan I	---	---	30
4,4'-DDE	---	---	2 J
Endosulfan II	34 J	---	6.30 J
4,4'-DDD	57 J	---	3.60 J
4,4'-DDT	12 J	---	18 J
gamma-chlordane	55 J	---	---
Total (Allowed) Hold Time	7(14)d	7(14)d	7(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV
Dilution Factor	0.1	1.0	1.0

TABLE 4.21.4 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 21

AREA	TA-35-125	TA-35-125	TA-35-125
LOCATION	LEAK/SPILL	LEAK/SPILL	LEAK/SPILL
TYPE OF LOCATION	CANYON WALL	CANYON WALL	CANYON WALL
SAMPLE NUMBER	LA61201W[d]	LA61202W[d]	LA61203W[d]
MEDIA	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW
Alpha Emitters			
Thorium - 232[a]	<9000 ±1300	<12500 ±2500	<14900 ±2200
Uranium - 238[a]	<10000 ±1500	<18200 ±3800	<12100 ±2300
Gamma Emitters			
Potassium - 40	22300 ±2700	24500 ±5600	17800 ±2600
Cesium - 137	----	----	1200 ±230

a. Total unbroken chain activity in equilibrium.
d. This column contains the results of the radiological screening run.

4.22 Environmental Problem 22--Inactive Landfills

- Request Numbers: LA800, LA803 through LA808, LA810, LA847, LA848, LA853, and LA855

- Requester: J. Clay/K. Sichelstiel

Inactive landfills at LANL are unlined, creating the potential for subsurface soil contamination and migration of volatile contaminants in the vadose zone. Some of those landfills appear to be inadequately covered, allowing potentially hazardous or radioactive contaminants to be exposed on the surface.

Visual inspection of 30 inactive landfills at LANL and review of the LANL Phase I Report developed under CEARP were used to assess the inactive landfills. Through that assessment, the Survey Team selected 10 landfills to be addressed by the S&A effort. The criteria used to select these disposal sites are as follows:

(a) Information was insufficient to verify that the site exists; therefore, S&A was an effective means to establish whether the area was a disposal site (LA800, LA803, LA804, LA855).

(b) Landfills with inadequate cover located on the edge of mesas with a higher probability of contaminant transport via runoff (LA805, LA806, LA807, LA847, LA848).

(c) Landfills known or suspected to have received chemical waste with no monitoring to determine if the vadose zone was being affected (LA808, LA853).

(d) Landfills not marked or fenced in open access area suspected to contain radioactively contaminated waste (LA810).

4.22.1 Sampling and Analysis Objectives

- Statement

The S&A objectives were the following:

(a) Better define the location and dimensions of landfill areas through use of nonintrusive geophysical techniques (LA800 and LA804).

(b) Determine the presence and concentration of contaminants in the vadose zone soil gas as an indicator of contaminant migration and to confirm burial of chemical waste in cases where specific waste constituents have not been identified (LA808, LA848, LA853, and LA855).

(c) Determine the presence and concentration (above the minimum detection limits) of hazardous substances in surface soils or drainage channels of landfills with inadequate cover (LA803, LA805, LA806, and LA847).

(d) Determine if past leachate outbreaks or runoff have resulted in subsurface soil contamination by hazardous/radioactive substances above background levels (using the CLP minimum detection limits for hazardous substances) at inactive landfills (LA807 and LA810).

- Supporting Information

See Finding and Basis.

4.22.2 Sampling and Analysis Design

- Sampling Design

A variety of sampling design approaches and sampling techniques was used depending on present knowledge regarding location, dimensions, disposal use history, and types of materials disposed for each particular location.

LA800 and LA855: TA-21, "Cold" Dump. The location of the cold dump was based on a few old memos and historical photographs. The area suspected of being the disposal site remains sparsely vegetated, with volcanic tuff exposed over much of the area. Former building sites, piles of asphalt debris, and other construction material are located in the northern third of the area surveyed (the survey area was expanded to encompass this debris). However, there were no surface features that indicated a landfill operation.

The cold dump is believed to be a disposal site for nonradioactive hazardous waste chemicals and/or materials. No records are available that specify waste types and quantities potentially placed in this site.

Nonradioactive chemicals used at TA-21 include, but are not limited to, lithium chloride, potassium chloride, zinc chloride, anhydrous hydrogen chloride, calcium salts, cadmium, lead oxide, mercury, oils, solvents, fluorine, ethylene glycol, phosphoric acid, ammonium citrate, and nitrates.

A geophysical survey (LA800) was performed as planned to assist in defining subsurface anomalies and to delineate fill material, as opposed to shallow bedrock. The geophysical survey was accomplished using electromagnetics and magnetics. Data were collected along east/west lines spaced 20 ft apart (see Figure 4.22.1). Measurement stations were established at 10 ft intervals along these lines. Survey coordinates were taken from the fence corner located in the southeast corner of the area. More detailed information is contained in Appendix A of the "LANL Sampling and Analysis Plan" (DOE, 1988b).

As planned, the geophysical survey (LA800) was followed by biased subsurface soil gas sampling within the area (LA855). Eight sites were sampled adjacent to "suspect" areas identified by geophysical anomolies (see Figure 4.22.1). One sample was collected from each site, with the exception of samples 06 and 09 which were both collected from the same location. Probe depth was designed to be 4 ft; however, near surface bedrock prevented this depth from being reached at locations 1, 2, and 6. No intrusive sampling for subsurface soils was performed due to a lack of available information regarding waste types and quantities disposed in this area, and the potential health and safety hazard.

<u>LA803 and LA853: TA-06, Disposal Pits</u>. CEARP files indicated the previous use of relatively small disposal pits within TA-6 [specifically three that received weapons components contaminated with ^{137}Cs (and possibly other wastes) in the early 1950s that may be a potential source of subsurface soil contamination]. High explosives, radioactive materials including depleted uranium, flammable materials, and heavy metals may be present in the pits. Three areas in TA-6 observed during the survey were suspected of being those disposal pits.

The three areas were shallow depressions within approximately 100 ft of Two Mile Mesa Road. These depressions had evidence of settlement of up to 3 ft and were approximately 20 ft in diameter. All three were in-line, paralleling the road, and west of the concrete saucer firing site.

Following radiation and organic vapor surveys, a single near-surface (12-to 15-in. deep) soil sample from the low point of each depression was collected as planned (LA803). A precleaned stainless steel scoop was used to excavate a small hole, approximately 1-ft diameter and 1-ft deep. The sample was then collected from the bottom of the hole. In addition, three subsurface soil gas samples were collected as planned equidistant from around the perimeter of each depression at a depth of 4 ft (LA853). This design assumed a lateral migration of any organic vapors from the depressions into the adjacent soil or tuff (see Figure 4.22.2).

<u>LA804: TA-39, Waste Disposal Pits</u>. One or two inactive disposal pits are thought to exist north of Building 69 in TA-39. The exact location and boundaries of the trench or trenches, however, are unknown. An old LANL map of the site, dating from the 1960s, showed the approximate outline of two disposal trenches. The suspected trench area was at the time bounded on the east by a stand of trees, which appear to predate LANL use of the site, and bounded on the west by the water pipeline that parallels the road and is marked by placarded sign posts. Discussions with LANL personnel at Site TA-39 corroborated the probable existence of two adjacent trenches, and provided the additional information that the water pipeline excavation did not uncover any part of the disposal trenches. The purpose of the geophysical surveys was to define the trench boundaries within this area.

As planned, magnetics and electromagnetics (Em) were used to perform the geophysical survey on five 10-ft grids to confirm the presence and dimension of the previously used disposal pit(s).

Because the disposal trench could contain mixed and possibly hazardous waste, non-intrusive geophysical methods were employed. Geophysical methods were selected that would respond to the trench boundaries, as well as to material that might be buried in the trench. Magnetic methods were used to detect ferromagnetic material buried in the trench; induction electromagnetic techniques will detect changes in conductivity at the trench boundaries, as well as metal or other conductive material buried within the trench. Resistivity and IP methods were used to determine soil/trench-fill contrasts expected at the boundary of the trench. In addition, self potential measurements may show evidence of electrochemical processes caused by the reaction of waste material with fill material. The disposal pits reportedly received waste and other debris from the TA-39 operations contaminated with high explosives. The pits, or a portion of the pits, are thought to be beneath the asphalt parking area or in the vicinity of the volleyball/basketball recreational area (see Figure 4.22.3).

The results of the sampling and analysis requested for the active pit in TA-39 (see Environmental Problem 14, Request Numbers LA501 and LA507) should be applied to these inactive pits because all of these disposal areas apparently received the same type of waste. Therefore no samples from this inactive pit were required. Both active and inactive pits are situated next to a dry or intermittent stream bed.

<u>LA805 and LA847: TA-33, Suspected Landfill</u>. A suspected landfill on the edge of the mesa top in TA-33 may be a source of radioactive and metal contamination to surface soils in the adjacent drainage pathway.

Metal fragments and debris were observed along the rim of the mesa on the southernmost mesa top in TA-33 (Tower Area), near building TA-33-26. This portion of TA-33 was used as a firing site, including tests on mechanisms required for the assembly of weapons. The types of waste generated from these activities typically include debris and soil that are contaminated with radioactive isotopes (usually uranium), beryllium, various other metals (such as lead), and sometimes high explosives. General practices at the LANL firing sites have included occasional clearing of fragments, etc., in the working area and regrading as needed. TA-33 is located far from the formally designated LANL landfills; consequently, the debris was left at the site rather than transported to a formal landfill.

Surface soil samples were collected as planned from the TA-33 landfill face (LA805) and sediment was collected from a stream channel downgradient of the landfill (LA847) (see Figure 4.22.4 and Figure 4.22.5).

Samples were field screened using a photoionization detector to determine if the sample should be shipped to the laboratory for volatile organic analysis. No organic vapors were detected and the soil conditions were dry; therefore, no samples were collected for volatile organic analysis (samples for other analyses were still collected). A micro-R meter or equivalent was used to bias sample collection for radionuclide analysis.

Composite samples from the face of the landfill were collected due to the large area (approximately 80-ft long) and the need to determine presence of a wide variety of possible contaminants. Soil samples for volatile organic analysis were grabs. For sediment, grab samples from the stream channel were preferred because of the relatively small, well defined area and interest in concentrations of contaminants that may be migrating.

Three composite surface soil samples, each consisting of four subsamples, were collected equidistant along the face of the landfill (LA805). Three grab samples of sediment were collected from the downgradient stream/drainage channel at three points equidistant from each other and adjacent to the landfill (LA847). Based on visual observation of any moisture or staining of the soil column, sample depth was between 0 and 6 in. (see Figure 4.22.5).

<u>LA806: TA-46, Suspected Landfill</u>. Based on historical photographs and CEARP records, the canyon rim at TA-46 has apparently received debris for a number of years. Concrete fragments and asphalt can be seen on the surface, suggesting that construction waste had been placed at this location. If so, there is a potential for asbestos to be exposed on the land surface. No records further describe wastes placed in this area. TA-46 activities have involved various solvents, degreasers, acids, oils potentially contaminated with PCBs, metals, and radionuclides. It was not known whether any of these substances were placed in the filled area.

Spatial composite samples were used due to the large area involved (250 x 100 ft) and the primary interest in presence of a variety of contaminants. Volatile organic field screening techniques were utilized.

Three composite surface soil samples, each consisting of four subsamples, were collected using a 3-in. diameter stainless steel auger from the filled area. Another composite surface soil/sediment was collected from the landfill (see Figure 4.22.6). Sample depth was between 0 and 6 in., based on visual observation of soil moisture and staining. Per the sample requester, no samples were collected for volatile organic analysis because dry or unstained surface or near-surface soil was observed.

<u>LA807: TA-00L, Airport Landfill</u>. The inactive landfill at the county airport received waste from LANL, some of which was radioactively contaminated and some that was nonradioactive but potentially hazardous and a potential source of contamination to surface and/or subsurface soils and the vadose zone.

This site has been covered with fill and is situated at the eastern end and northeastern side of the present Los Alamos County

Municipal Airport landing strip. It was owned and operated by LANL until 1966 and received primarily municipal and "noncontaminated" wastes from the surrounding town residences and LANL. However, reports indicate that some uranium and possible high explosives had been disposed at the site. As much as 125 lb of uranium was accidentally picked up by the refuse crew and disposed at the landfill. In 1953, 25 lb of this uranium was recovered; the remainder was covered with soil and left in the landfill. Because this site received laboratory wastes, and because during early years of operation, "noncontaminated" may have referred only to "nonradioactive" and/or "non-high explosive," other hazardous wastes may be disposed at this landfill. Construction debris, flammable liquids, animal carcasses, and spent oils from the motor pool were also disposed at this landfill site.

Los Alamos County took over ownership and operations in 1966; since then, the practice of intentional burning has stopped. At present, the site is covered with relatively permeable soils (i.e., no capping material). Some construction-type debris protrudes from the side bank that parallels the Pueblo Canyon side. As recently as the summer of 1985, the Los Alamos Site Characterization Program (LASCP), reported the site received "noncontaminated" debris from TA-5 during the decontamination and decommissioning activities. That debris was reportedly only the concrete structures removed from the firing site.

In the past, leachate has been observed flowing out of the landfill bank onto the mesa top and subsequently into the canyon side. That area is the safe area beyond the landing strip and has limited access.

Subsurface soil samples were collected from near the previous landfill/burn area/dump adjacent to the airport. The landfill is located between the canyon rim and the present airport runway. Samples were collected from a strip of land approximately 30 ft wide x 900 ft long that runs parallel to the canyon rim. A fence is located along the length of it. It is assumed that any surface contamination runoff or subsurface migration of leachate is in the direction of the canyon. Due to the large area and primary interest in determining presence of contaminants, composite sampling was utilized.

As planned, fifteen hand augured holes were placed 60 ft apart along the centerline of the 30 x 900-ft strip of land adjacent to the canyon rim using a 3-in. diameter stainless steel auger (see Figure 4.22.7). Soil samples from the 6-to 12-in. depth interval and the 3-ft depth of three consecutive boreholes were each composited to form a composite sample for the two depth intervals. This resulted in the collection of five composite samples from the 6- to 12-in. depth and five composite samples from the 3-ft depth.

LA808 and LA848: TA-0, MDA-C. MDA-C was open from 1948 to 1974 and used for disposal of both radioactive and hazardous chemical wastes, including ^{234}U, ^{235}U, ^{236}U, and ^{238}U; ^{239}Pu; ^{241}Am; tritium; ^{22}Na; ^{60}Co; ^{90}Sr; ^{90}Y; ^{26}Ra; various chemicals; pyrophoric metals; hydrides; powders; sealed vessels containing sodium-potassium alloy; compressed gases; sludge from the treatment plants at TA-35, DP West, and TA-45; and nickel carbonyl. A portion of the landfill was recovered and regraded in 1984.

Currently, there is no monitoring of the vadose zone similar to the ongoing monitoring at the active RCRA landfills. Consequently, the potential for waste migration has not been fully addressed. Future plans call for studying the site from a radiological perspective, but no studies involving chemical waste have been planned.

Soil gas samples were collected, as planned, from 4 ft below the ground surface at points just outside the MDA-C perimeter fence (LA808). Soil gas sampling was partially biased to the area near the previous chemical pit on the north side of MDA-C fenceline, adjacent to the previous chemical pit (6 samples). Twelve additional soil gas samples were collected around the remaining MDA-C perimeter fenceline (see Figure 4.22.7).

Three grab samples of sediment (cores 0 to 12 in.) were collected as planned in the drainage channel at the northeast boundary of MDA-C. This drainage channel, which receives runoff from part of the landfill area, was sampled to provide absolute (versus average concentrations obtained by composite sampling) contaminant concentrations in the sediment within this potential migration pathway (see Figure 4.22.7). Exact location and spacing were determined in the field based on topography and visible sediment accumulation.

<u>LA810: TA-20, Area 1 Covered Pit</u>. Radioactively contaminated metal scrap and debris may still be buried in an old covered pit or landfill and may be a source of subsurface soil contamination.

Area 1 is located at the eastern end of TA-20 in Sandia Canyon. This burial pit was apparently used only once in 1945 for the disposal of radioactively contaminated metal scrap and other debris possibly contaminated with beryllium, high explosives, and uranium.

The exact location of Area 1 is not known; however, it is believed to be located in an area across from the existing LANL guards' firing range, a parking area, and an underground water supply tank. It is not clear whether the wastes were removed from Area 1 during previous actions.

Previous sampling programs were performed under the Los Alamos Site Characterization Program (LASCP) and the CEARP program. Sampling and analysis of surface soils and a phoswich survey were performed on a grid pattern that reportedly covered the presumed burial location. Soils, collected in 1985 under LASCP, were analyzed for depleted uranium, beryllium, and high explosives. The results of that effort were unavailable at the time of the survey, pending LANL review. Under the CEARP program, a magnetometer study was performed in the general vicinity of the pit. Preliminary review by the CEARP contractor indicated that no anomalous conditions were encountered, although it appears that the most likely burial location was not surveyed. The suspect location appears as a slight depression at the lower end of a shallow drainage swale (see Figure 4.22.9). If this is the location of the buried waste, then the potential exists for migration of contaminants.

It was assumed that there are no significant levels of high explosives and pyrophoric material and no gas cylinders buried at this location, and that direct augering into the depression could be performed with a high degree of certainty with regard to personnel safety and radiological protection.

Test augering was done to a depth of 10 ft. No change within the soil was visually detected.

Four composite samples were used to obtain a greater degree of certainty with regard to presence of contaminants than is possible with grab samples. However, two grab samples were collected for volatile organic analysis, based on field PID measurements. All samples were collected at a depth of 3 ft.

- Analytical Design

LA800 and LA804. Geophysical surveys were performed for these request numbers and have no laboratory analyses associated with them.

LA808, LA853, and LA855. Sampling and analysis for these request numbers utilized subsurface soil gas sampling and subsequent analysis for volatile organic compounds (see Table 4.22.1).

LA803, LA805, LA806, LA807, LA810, LA847, and LA848. These request numbers include soil/sediment grab and composite samples analyzed for a wide variety of contaminants, depending on the disposal site use history and known or suspected wastes disposed (see Table 4.22.1).

Most samples were analyzed for volatile organics and metals to ICP detection limits. Other parameters analyzed for on a request by request basis include PCBs, mercury, environmental asbestos, high explosives, hydrocarbons, gamma-emitting radionuclides, plutonium, uranium isotopes, thorium, ^{90}Sr, and ^{226}Ra (see Table 4.22.1).

4.22.3 Field and Analytical Data

- Field Data (including geophysical surveys)

Field spot tests for high explosives, where conducted, were negative. Field surveys for radiation were performed where requested. No radioactivity in excess of natural background radiation (approximately 26-36μR/h) was detected. Field organic vapor surveys for volatile organic compounds revealed concentrations of organic vapors from non-detectable to 105 ppm.

There was no geophysical evidence at site TA-21 (LA800) indicating the presence of trenches or buried waste at the suspected "cold" dump location. The geophysical anomalies at this site correspond to surface clutter, debris piles, or to observed cultural sources. Physical evidence that this site has been scraped or excavated leads to speculation that the dump, if it existed, has since been removed.

At site TA-39 (LA804), the lateral extent of the suspected disposal area was roughly delineated by the magnetic, electromagnetic, and electrical geophysical survey methods. The trench boundaries are not clearly and consistently shown by any of the survey methods, but induced polarization, self potential, and resistivity methods seemed to clearly show one boundary of the trench along one line. Magnetic and electromagnetic methods tend to show the extent of the trench(es) without explicitly showing the boundaries. Through consideration of all of the data collected, and with other historical information, a boundary for the disposal trench(es) was interpreted. This interpretation has an inherent uncertainty which could be reduced through further surveys.

- Field Data Evaluation (including geophysical surveys)

No high explosives or radioactive contamination was detected in the sediments below the landfill at TA-33-26 (LA847). The following lists the results of organic vapor surveys using an HNU photoionization detector field instrument.

Sample Location	Organic Vapors (ppm)
LA80301	Not detected
LA80302	Not detected
LA80303	Equipment malfunction
LA80304	Equipment malfunction
LA80305	Not detected
LA80306	2.4
LA80307	100
LA80308	Not detected
LA80309	4
LA80310	11

Sample Location	Organic Vapors (ppm)
LA803	Not detected
LA805	Not detected
LA806	Not detected
LA808	Survey not performed
LA810	
LA801	60
LA802	105
LA803	50
LA804	50
LA848	Survey not performed
LA853	1-7
LA855	1-7

LA800: TA-21, "Cold" Dump. Contour maps of total magnetic field intensity (after removal of a 52,000 nT datum), and vertical magnetic gradient were plotted. Electromagnetic, conductivity and in-phase response, were measured using a Geonics EM-31. The linear magnetic and electromagnetic, anomalies at the south side of the survey area were caused by the fence along this boundary. A large magnetic anomaly at the southern boundary was caused by a parked car.

A few local anomalies occur. The magnetic and electromagnetic anomaly on line 60 at stations -60 to -70 is associated with a small concrete slab. The anomaly is too localized to indicate a waste disposal site. Buried metal associated with an old cistern or septic tank is a more credible explanation of the anomaly. The magnetic and electromagnetic anomalies found along lines 100 and 120 between stations -150 to -20 are due to terrain and cultural debris. The ground slopes more steeply to the north, and the area is interpreted to have been used as a "garbage" dump. The absence of an electromagnetic anomaly, in conjunction with the magnetic anomaly, supports this interpretation. Further evidence for this interpretation was observed in the field. Old rusty C-ration cans lay on the surface in the area, and there is no indication of trenching. It is believed that this was an open dump where garbage was thrown over the side of the hill.

It appears that the original area of interest has been scraped. No significant geophysical anomalies are present in the scraped area other than those described above. If a "cold" dump was in the area investigated, it has been removed.

<u>LA804: TA-39, Waste Disposal Pits</u>. Contours of magnetic total field intensity, and of vertical magnetic gradient were plotted. Obviously, there are many large ferromagnetic objects buried within the area of interest, as indicated by variability of the magnetic data. Metallic objects and/or conductors were also indicated by the EM-31 conductivity and in-phase measurements.

The IP-resistivity profile along line 130 clearly indicates the east boundary of the trench area between stations -100 and -105 and appears to indicate the west boundary. However, the west boundary of the trench area is obscured by "noise" generated by the water line, which intersects line 130 at station -160. The IP response between stations -150 and -175 is likely due to the proximity of the water line. The west boundary of the waste trench is postulated to be between stations -140 and -145. The IP data might also indicate the boundaries of one of the trenches, or possibly a stratified fill. The results of the electromagnetic (Genie) survey that was conducted show a ratio of the received response from a high frequency "search" signal to that of a lower frequency reference signal. The "crossover" from a region of positive amplitude ratios, to a region of negative values is indicative of a conductive zone or body. An extremely conductive zone or body in the near-surface can cause the signal field intensity to approach zero. When the ratio of received signals approaches zero, a negative response plateau is reached. The flat response on the western portion of the survey area is indicative of the presence of an exceptionally good conductor, presumably the water line.

As it is difficult to pick trench boundaries from magnetic and electromagnetic contour presentations, a careful examination of the magnetic and electromagnetic profiles helps reveal the anomalous areas in greater detail. Interpreted picks of the trench boundary were made from these profiles correlated with the resistivity, induced-polarization, and self potential plots. Admittedly, several of the picks were artistic and without firm scientific method. The picks were made with knowledge of the location of the trenches, taken from the map of the area that showed two trash disposal trenches and with knowledge of the location of the water line. Nevertheless, a reasonably consistent interpretation can be made. The picks were plotted on a map and a best-estimate of the trench outline was made for each technique. All of the results were in reasonable agreement along the southern half of the trench, but electric/electromagnetic data tend to deviate from the magnetic data over the northern portion of the trench. Magnetic data showed the trench boundaries roughly 10 ft east of the electromagnetic data. The "artistically" chosen boundary for the trench was an "eyeball" compromise to all of the data.

- Analytical Data

  Analytical data for the samples collected from the seven inactive landfill sites encompassed by this environmental problem are summarized in Tables 4.22.2 through 4.22.7. Results of the radiological measurements as given in Table 4.23.8.

Note that gamma analysis identified natural activities (^{40}K, ^{232}Th chain, and ^{238}U chain) in all soil samples collected for this problem.

A geophysical (LA800) and soil gas (LA855) survey were performed at the TA-21-259 inactive "cold" dump. No analytical chemical data resulted from the geophysical survey. There were no volatile organic compounds detected in the nine soil gas samples.

Three soil samples (LA803) and ten soil gas samples (LA853) were collected from the inactive landfill at TA-06. All three of the soil samples contained 1,2-dichloroethene (6 to 10 µg/kg), barium (170 to 340 mg/kg), cadmium (4 to 7 mg/kg), chromium (12 to 20 mg/kg), and zinc (39 to 52 mg/kg). One of the samples (LA80301) contained 1.2 mg/kg of beryllium and one other sample (LA80302) contained 12.3 mg/kg of copper. There were no pesticides, PCBs, or high explosives detected in the three soil samples. No volatile organic compounds were detected that were attributable to the ten soil gas samples collected at this location. Radiological constituents detected include ^{235}U (0 to 99 pCi/kgW), total uranium (6000 to 8000 µg/kgD), ^{238}Pu, $^{239+240}Pu$, and ^{90}Sr, at the lower limits of detection.

Three soil samples (LA805) and three sediment samples (LA847) were collected from the TA-33-26 inactive landfill site. There were no high explosives detected in any of the samples. All three of the soil samples contained barium (52 to 540 mg/kg), chromium (4 to 6 mg/kg), and zinc (22 to 120 mg/kg). Two of the three samples (LA80501 and 02) contained copper at 7900 and 2800 mg/kg and sample LA80501 also contained 9.8 mg/kg of silver. All three of the sediment samples contained barium '27 to 140 mg/kg) and zinc (15 to 61 mg/kg). Two of the sampies (LA84701 and 02) *contained cadmium (approximately 3 mg/kg), chromium (approximately 4 to 7 mg/kg), and copper (1600 to 2800 mg/kg). Sample LA84701 also contained 11.3 mg/kg of nickel. The three soil samples (LA805) contained ^{235}U (481 to 5280 pCi/kgW), notable amounts of ^{238}U in excess of equilibrium chain values (13,900 to 155,000 pCi/kgW), and ^{137}Cs (104 to 370 pCi/kgW). Total uranium values for the three soil samples ranged from 55,000 to 300,000 µg/kgD. Plutonium-238 and $^{239+240}Pu$ concentrations were at the lower limits of detection. The three sediment samples (LA847) contained ^{235}U at concentrations ranging from 481 to 1270 pCi/kgW), ^{238}U in excess of equilibrium chain values (13,900 to 39,000 pCi/kgW), and ^{137}Cs (158 to 241 pCi/kgW). Plutonium-238 and $^{239+240}Pu$ concentrations in all three sediment samples were at the lower limits of detection.*

Four soil samples (LA806) were collected at the inactive landfill at TA-46. Seven semivolatile organic target compounds, primarily polyaromatic hydrocarbons, were detected at concentrations ranging from 21 to 1900 µg/kg. There were also six polyaromatic hydrocarbon TIC semivolatile organic compounds detected in sample 01 and one compound was detected in samples 02 and 04. There were five pesticide compounds detected at concentrations ranging from 1 to 100 µg/kg and one PCB detected in two of the samples at 160 and 960 µg/kg. Chrysotile asbestos fibers were detected in three of the four samples at approximately one percent each. Barium (50 to 83 mg/kg), beryllium (1 to 2 mg/kg), and zinc (19 to 38 mg/kg) were detected in all of the samples. Silver was detected in sample 01 at approximately 6 mg/kg, and cadmium (approximately 3 mg/kg) was detected in sample 02. Chromium was detected in samples 03 and 02 at approximately 5 mg/kg. Uranium-235 was detected at 40 to 98 pCi/kgW, total uranium at 2000 to 3000 µg/kgD, ^{238}Pu, $^{239+240}Pu$, and ^{90}Sr at the lower limits of detection. Cesium-137 was detected at 62 to 155 pCi/kgW.

Ten soil samples (LA807) were collected at the inactive landfill at TA-00L. A wide variety of compounds were detected in various samples indicating an inhomogeneity of contaminant distribution at this location. Only four samples were collected for volatile organic analysis. Tetrachloroethene was detected in sample 07 at 30 µg/kg and toluene was detected in samples 07 and 10 at 3 and 1 µg/kg, respectively. There also were approximately ten non-target volatile organic compounds that were detected in concentrations ranging from 4 to 1900 µg/kg. Twelve pesticide compounds were detected at concentrations ranging from 1 to 2000 µg/kg and two PCBs were detected at concentrations ranging from 450 to 8300 µg/kg. Barium (69 to 170 mg/kg), chromium (5 to 35 mg/kg), and zinc (34 to 390 mg/kg) were detected in all ten of the samples. Other metals detected in some of the samples include beryllium (2 mg/kg), cadmium (3 to 9 mg/kg), copper (7 to 120 mg/kg), and nickel (12 to 110 mg/kg). Uranium-235 was detected (39 to 124 pCi/kgW) in all samples, while total uranium ranged from 3000 to 6000 µg/kgD. Cesium-137 concentrations ranged from 0 to 269 pCi/kgW.

Eighteen soil gas samples (LA808) and three soil samples (LA848) were collected from the inactive landfill MDA-C at TA-0. Trichloroethene was detected in four of the eighteen soil gas samples (0.2 to 0.3 mg/m^3). Carbon disulfide was detected in one of the soil gas samples (LA80809) at 0.4 mg/m^3 and one other sample (LA80802) contained 2-butanone at 4 mg/m^3. Toluene (4 µg/kg) was the only volatile organic target compound detected in one of the soil samples (LA84802). There were eight semivolatile target compounds (8 to 190 µg/kg) and six TICs (270 to 790 µg/kg), all primarily polyaromatic hydrocarbons, detected in two of the three soil samples. Four pesticides were detected in the soil samples at concentrations ranging from approximately 1 to 36 µg/kg. Barium (28 to

110 mg/kg) and zinc (22 to 47 mg/kg) were detected in all three soil samples. Chromium was detected in two of the three samples (7 to 19 mg/kg) and nickel was detected in one of the samples at 58 mg/kg. Radiological constituents detected in all three soil samples included ^{226}Ra (800 to 900 pCi/kgD), ^{235}U (64 to 100 pCi/kgW), total uranium (4000 to 6000 µg/kgD), ^{238}Pu (8 to 420 pCi/kgW), $^{239+240}$Pu (328 to 7840 pCi/kgW), and cesium (160 to 395 pCi/kgW). Americium-241 was detected in sample 02 at 790 pCi/kgW.

Two soil samples (LA810) were collected from the Area 1 covered pit at TA-20 for volatile organic analysis. Acetone (24 to 35 µg/kg), 2-butanone (110 to 140 µg/kg), and styrene (1 µg/kg), were detected in both of the samples. Barium (26 to 55 mg/kg), chromium (4 to 25 mg/kg), and zinc (26 to 71 mg/kg) were detected in all four samples. Sample 01 also contained cadmium at 4.2 mg/kg and copper at 619 mg/kg. There were no high explosives detected in these samples. Uranium-235 was detected in all four samples (63 to 123 pCi/kgW). Total uranium was 4000 µg/kg///d for all samples. Cesium-137 levels ranged from 37 to 79 pCi/kgW.

- *Radiological Data*

  The Radiological Data has been included with the Analytical Data sections for the reader's convenience.

- Analytical Data Evaluation

LA800 and LA855: Only geophysical requests were required; therefore, there is no analytical data.

LA803 and LA853: TA-06, Disposal Pits. None of the ten soil gas samples contained detectable concentrations of volatile organic compounds that could be attributed to the samples. Barium, cadmium, chromium, zinc, and 1,2-dichloroethene were detected at comparable concentrations in all three samples. Beryllium was detected in sample LA80301 at 1.2 mg/kg and copper was detected in sample LA80302 at 12.3 mg/kg. There were no pesticides, PCBs, or high explosives detected in any of the three soil samples.

LA805 and LA847: TA-33, Suspected Landfill. There were no high explosives detected in any of the samples. Sample LA80501 contained silver at 9.8 mg/kg. Sediment samples LA84701 and 02 contained copper at 1570 and 2830 mg/kg, respectively. Cadmium was detected in the same two samples at 2.8 and 3.3 mg/kg, respectively. Nickel was detected in sample LA84701 at 11.3 mg/kg.

LA806: TA-46, Suspected Landfill. The most contaminants and the highest concentrations were detected in composite samples 01 and 04, which were collected along the streambed. Primarily polyaromatic hydrocarbon semivolatile organic compounds were detected in all four samples. Pesticides (beta-BHC, endosulfan I and II, gamma chlordane, and 4,4'-DDT) were detected in samples 01, 02, and 04 at concentrations less than 100 μg/kg. The PCB, aroclor-1260, was detected in samples 02 and 03 at 160 and 960 μg/kg, respectively. Chrysotile asbestos fibers were detected in all samples from the fill Areas (01, 02, and 03) at approximately 1% by weight. Comparable concentrations of barium, beryllium, and zinc were detected in all four samples. Chromium was found in comparable concentrations in samples 02 and 03, collected from the center and southern fill areas, respectively. Silver (sample 01) and cadmium (sample 02) were found at concentrations less than their respective CRDLs.

LA807: TA-00L, Airport Landfill. There were only four volatile organic samples collected (06, 07, 09, and 10) at the west end of the landfill. There were no volatile organic compounds detected in sample 06. However, there were approximately a half dozen isomers of aromatic solvents detected in the other three samples. These compounds may be indicative of petroleum distillates, such as diesel fuel or light oils. Because the samples were not analyzed for semivolatile organic compounds, it is not possible to confirm the presence of petroleum distillates. There were no high explosives detected in any of the samples.

The majority of the pesticide/PCB contaminants were detected in samples 01 through 03, with ppm concentrations of endosulfan I and 4,4'-DDT detected in sample 02 (3-ft depth). Aroclor-1254, was detected at ppm concentrations in samples 05 and 06. Samples 07 through 10 contained a number of pesticides, all at concentrations less than 210 µg/kg. 4,4'-DDT, and/or the breakdown products 4,4'-DDD and 4,4'-DDE, were detected in all of the samples collected at the shallow depth. The highest concentrations were at the east end of the landfill and the lowest concentrations were at the center of the landfill (samples 05 and 08). All of the samples collected at the 3-ft depth contained DDT and/or its breakdown products, with the exception of sample 06.

Barium, chromium, and zinc were detected in all of the samples. Barium concentrations appear to be of comparable magnitude at both sampling depths for all location. Chromium concentrations found in the samples from the middle composites (05 and 06) are two to three times higher than those observed in the rest of the samples. Zinc was detected in samples 01 and 02, from the easternmost sampling location, at levels three to four times greater than those found in the samples from the other locations. Copper concentrations found in samples 01 and 02, and in 05 and 06, were of comparable magnitude with respect to depth, and were higher than copper concentrations determined in the rest of the samples. Cadmium was found at comparable concentrations in all shallow depth samples and in four of the five deeper samples. The middle composite (05 and 06) and sample 04 also contained nickel at concentrations between 12 and 110 mg/kg.

LA808 and LA848: TA-0, MDA-C. 2-Butanone was detected in one of the soil gas samples collected adjacent to the chemical pit (02). No other volatile organic compounds were detected in the six soil gas samples collected near the chemical pit. Twelve addition soil gas samples were collected around the perimeter of the landfill area. Carbon disulfide (sample 09) and trichloroethene (samples 09, 12, 15, and 17) were the only volatile organic compounds detected in these samples. Carbon disulfide may be a naturally occurring by-product of biological degradation processes.

There were also three sediment samples (LA848) collected from a drainage channel between the collection points for soil gas samples LA80808 and LA80809. No volatile organic compounds were detected in sample LA84801, collected nearest the landfill perimeter. Two solvents, acetone and toluene, were detected in sample LA84802. The terpene TICs detected in samples 02 and 03 may be naturally occurring (vegetation by-products). The highest number of semivolatile organic compounds were detected in samples 02 and 03 (none were found in sample 01). Sample 02 contained six semivolatile target compounds and three TICs, and sample 03 contained five target compounds and three TICs. The majority of semivolatile organic compounds found in samples 02 and 03 are polyaromatic hydrocarbons, which may be indicative of petroleum distillate contamination. 4,4′-DDT was detected in all three sediment samples, at concentrations ranging between 4 and 16 μg/kg. 4,4′-DDD, a breakdown product of 4,4′-DDT, was also found in samples 02 and 03. Endosulfan I and gamma-chlordane were detected in sample 02. The detection of gamma-chlordane, a weathering by-product of technical chlordane, may indicate the past presence of technical chlordane. Barium and zinc were detected in all three sediment samples. Concentrations of these elements in samples 02 and 03 are of comparable magnitude, and two to three times higher than those found in sample 01, which was collected nearest the landfill perimeter. Chromium was detected in samples 02 and 03, with the concentration in sample 03 being over twice that found in sample 02. Sample LA84803 also contained nickel (58 mg/kg).

LA810: TA-20, Area 1 Covered Pit. Acetone, 2-butanone, and styrene were detected in the two soil samples at comparable concentrations. Terpene isomers also were detected in both samples; the terpenes may be indicators of petroleum distillates or natural by-products from the large pine tree in the vicinity. There were no high explosives detected at this location.

Barium, chromium, and zinc were detected in all four samples from this location. Barium concentrations were of comparable magnitude in all samples. Chromium and zinc concentrations found in sample 01, collected from the west side of the depression, nearest the area of previous study, were higher than those found in the other three samples by five and three, respectively. Copper (619 mg/kg) and cadmium (4.2 mg/kg) were also found in sample 01.

LA855: TA-21, "Cold" Dump. There were no volatile organic compounds detected that were attributable to any of the nine soil gas samples collected at this location.

- Radiological Data Evaluation

The gamma analyses indicated the presence of the natural activities (^{40}K, ^{232}Th chain, and ^{238}U chain) in all thirty samples. Uranium-235 was observed in 29 of the 30 samples, and except for the six samples from requests 805 and 847, the observed activities ranged from 39 to 124 pCi/kgW. For the remaining six samples, the ^{235}U activities were higher, namely 481 to 1370 pCi/kgW for those from the drainage from the TA-33 suspected landfill (LA847) and from 2530 to 5280 pCi/kgW for the samples from the suspected TA-33 landfill face. Cesium-137 was also generally present, being observed in 25 of the 30 samples at levels of 30 to 539 pCi/kgW. The larger activity levels were scattered among several sites, namely those above 300 pCi/kgW were 593 pCi/kgW from LA80303 from Area TA-6, 395 pCi/kgW from Area MDA-C in TA-50 (LA84802), and 371 pCi/kgW from LA80501 taken from Area TA-33.

Amounts of ^{238}U in excess of the natural equilibrium for this chain were observed in the TA-33 Area where the higher ^{235}U activities were found. These values were 13,900 to 39,000 pCi/kgW in the TA-33-26 landfill drainage Area (LA847) and 75,000 to 155,000 pCi/kgW in the TA-33 suspected landfill (LA805). Two samples from MDA-C in TA-50 (LA848) contained ^{241}Am at 310 and 790 pCi/kgW. The only other observed gamma activities were ^{109}Cd (<2000 pCi/kgW) in LA80604, ^{7}Be (270 pCi/kgW) in LA80709, and ^{60}Co (27 pCi/kgW) in LA84701.

The results of the other radiological measurements correlated well with those from the gamma analyses. Alpha spectra were measured for 16 samples (for all requests except LA807 and LA810). For 12 of these samples, the result for ^{238}Pu were lower limits of detection, from <5 to <39 pCi/kgD, and two other values were 29 and 34 pCi/kgD in LA80303 and LA84701, respectively. The two highest ^{238}Pu activities observed were 190 and 420 pCi/kgD in two samples (LA84802 and LA84803) from MDA-C in TA-50; these two samples also had observable amounts of ^{241}Am. A similar pattern was observed for $^{239+240}$Pu. Seven samples gave limits (<9 to <51 pCi/kgD), six others had values of 8 to 182 pCi/kgD, and the three samples from MDA-C in TA-50 had larger activities of 328, 5280, and 7840 pCi/kgD. The samples with two largest values also exhibited measurable concentrations of ^{241}Am.

The alpha spectral analyses also give ^{230}Th activities of 1000 to 4900 pCi/kgD in LA805, LA806, LA810, and LA847. In addition, ^{226}Ra activity was observed at levels of 800 to 900 pCi/kgD in LA848.

Strontium-90 measurements on LA803, LA806, and LA848 only provided lower limits of detection (e.g., ^{90}Sr was not detected in these samples).

The results of the total uranium concentration measurements correlated well with the ^{238}U results from the gamma analyses. Except for the samples from the TA-33 Area (LA805 and LA847), the concentrations ranged from 2000 to 8000 μg/kgD. For those from the TA-33 Area, the concentrations were 55,000 to 150,000 μg/kgD in the drainage (LA847) and 172,000 to 380,000 μg/kgD in the suspected landfill face (LA805).

4.22.4 Limitations and Qualifications

- Data Quality Level

The sampling design, sample collection, and documentation are Quality Level I. The analytical data are generally Quality Level I or II, with the following Quality Level III exception: mercury data for LA803 and LA853 (excessive holding time).

- Field data

Data collected for field measurements for LA847 were collected according to DOE Environmental Survey protocols.

There were no deviations from the S&A plan in the collection of the samples for LA847.

- Analytical Data

The data user should be aware that the Q flag used for the volatile organic soil gas data (LA808, LA853, and LA855) indicates that the compound value listed was quantitated using the initial calibration response factor instead of the daily continuing response factor, since the daily response factor differed from the initial by more than 50%. Note that most of the soil gas samples except for trip blank LA91801 contained 1,1,1-trichloroethane

(1,1,1-TCA) at comparable concentrations. The associated method blanks did not contain 1,1,1-TCA, but one of the associated trip blanks did, and so did the calibration gas field standard, LA90501. Trichlorofluoromethane was also detected at low ppb levels in the majority of the soil gas sample canisters. These contaminants seem to be associated with the canisters and therefore were not reported in the results tables. It is possible that these compounds were used by the manufacturer as a metal cleaner in the canister manufacturing process.

LA803 and LA853: TA-06, Disposal Pits. The total holding time for pesticide/PCB samples was exceeded by 26 days. No target pesticide or PCB compounds were detected in any of these samples. There is a possibility of false negatives due to degradation prior to sample extraction. No munitions were detected but the holding time for these samples was also exceeded by 5 days. Therefore, there is also a possibility for false negatives associated with the high explosives data.

Total holding times for mercury analyses were exceeded for these samples by 26 to 35 days. Due to the potential volatility of the analyte, low quantitative bias is possible, and reported mercury values may not be representative of the samples as collected. Matrix spike recoveries associated with these samples were high for barium (148%), beryllium (176%), cadmium (141%), and chromium (160%). True concentrations for these elements may be only 68%, 57%, 69%, and 62% of reported concentrations, respectively. Given the general consistency of the high spike recoveries, an error in internal standard addition to the spiked sample would also explain the apparent high recoveries. However, without supporting data for this assumption, no further conclusions may be drawn.

LA805 and LA847: TA-33, Suspected Landfill. No high explosives were detected and there is no adverse impact to the data quality.

The samples associated with request LA805 were analyzed for ICP metals in a common analytical batch (SDG). Reported zinc concentrations may have high bias due to 3.7 mg/kg zinc detected in the associated preparation blank. The reported silver value for sample LA80501 may have high bias due to 3.6 mg/kg silver detected in the associated QC blanks. The matrix spike recoveries for barium (72.4%) and silver (43.4%) are less than the lower 75% control limit, indicating low recoveries of these analytes from the sample matrices. True barium concentrations may be as much as 140% of the reported values due to low bias. Reported silver values may have low bias, and true silver concentrations could be as much of 230% of the reported concentrations. Duplicate RPDs for barium (107%), chromium (105%), copper (195%), and zinc (60%) are outside the 20% control limit. Sample inhomogeneity may be responsible for the high RPDs. True concentrations for these elements may vary by the same percentages as the RPDs from the reported values.

Samples associated with request LA847 were also analyzed for ICP metals in a common SDG. Cadmium was detected at 1.7 mg/kg in the QC blanks, and therefore, reported values may be biased high by a similar amount. Two matrix spikes were performed with this SDG. The spike recovery for copper was outside the 75-125% control limits for the first spike (-1680%), but was in control for the second matrix spike. Because of the conflicting matrix spike recoveries, the impact of the out-of-control-spike recovery on copper data quality is difficult to determine. For the spike recovery, which was out of control, the sample result for copper was higher by an order of magnitude than the spiked sample result, which suggests possible sample inhomogeneity, external contamination, or an unidentified interference. The duplicate RPD for chromium (43.1%) is outside the 20% control limit. The imprecision associated with chromium quantitation is therefore higher than normal, and true chromium concentrations may be between ±43% of the reported value.

<u>LA806: TA-46, Suspected Landfill</u>. The quality of the volatile organic, pesticide/PCB, and asbestos data indicates no adverse impact to the data usability. However, minimal QC information was provided with the asbestos samples to assess the data quality. No data for control samples was provided. However, because no asbestos was detected in these samples, there is no apparent adverse impact on data quality.

The ICP metals samples for this request were analyzed in a common SDG with the samples from request LA847. Therefore, the same limitations and qualifications listed for that request also apply to samples from LA806. Additionally, beryllium was detected in the associated QC blanks at levels up to 1.2 mg/kg (greater than the CRDL, and therefore out-of-control). Reported beryllium concentrations for these samples may be biased high by a comparable amount.

<u>LA807: TA-00L, Airport Landfill</u>. There is no adverse impact to the usability of the volatile organic, pesticide/PCB, or high explosive data indicated by QC data.

Cadmium (1.5 mg/kg), zinc (3.7 mg/kg), nickel (3.8 mg/kg), and beryllium (0.4 mg/kg) were detected in QC blanks associated with ICP metals determination for these samples. Reported concentrations of these compounds therefore may be biased high by comparable amounts. The matrix spike recovery for barium (72.4%) is less than the lower 75% control limit, indicating low recovery of this analyte from the sample matrix. Reported barium values may have 40% low bias, and true barium concentrations may be as much as 140% of reported values. Duplicate RPDs for barium (107%), chromium (105%), copper (195%), and zinc (60%) are outside the 20% control limits. Sample inhomogeneity may be responsible for the high RPDs. True concentrations may vary by the same percentages as the RPDs from the reported values.

LA808 and LA848: TA-0, MDA-C. Analysis of samples for volatile organic analysis (LA848) missed the total holding time by 3 days. There is a possibility for false negatives and also for low bias to the quantitative values. No other adverse impact to the usability of these data is indicated by QC results.

No adverse impact to reported data quality is indicated by QC samples for the semivolatile organic data, volatile organic soil gas data, pesticide/PCB data, or metals data.

LA810: TA-20, Area 1 Covered Pit. The data user should be aware that detected volatile organic compounds similar in chemical nature to benzene, toluene, and chlorobenzene (e.g., styrene) may be overestimated by as much as 50%, as indicated by matrix spike recoveries. Acetone, detected in sample 01 and 02 and not in the associated method blank, may be biased high by as much as 60% because it is a common lab contaminant. 2-Butanone, also reported in the results table because it was not found in the associated method blank, may be biased high by approximately 20%. No munitions were detected and there is no adverse impact to data quality.

Sample 01 was analyzed for ICP metals in a separate SDG from the other samples for this request. Matrix spike recovery for barium (72.4%) associated with this sample is less than the lower 75% control limit, indicating low recovery from the sample matrix. The reported barium value may have low bias, and true barium concentration may be as much as 160% of the reported value. Duplicate RPDs for barium (107%), chromium (105%), and zinc (60%) are outside the 20% control limit. Sample inhomogeneity may be responsible for the high RPDs. True concentrations may vary by the same percentages as the RPDs from the reported values.

Samples 02, 03, and 04 were analyzed for ICP metals in a common SDG. Calibration blank results were consistently less than the negative CRDL for chromium. Results of standards run at two times the CRDL (approximately 4 mg/kg for chromium) indicate that the analytical accuracy for this element at the low end of the calibration range is only 50% of true value (i.e., true values may be 200% of reported values for reported sample concentrations less than approximately 20 mg/kg.

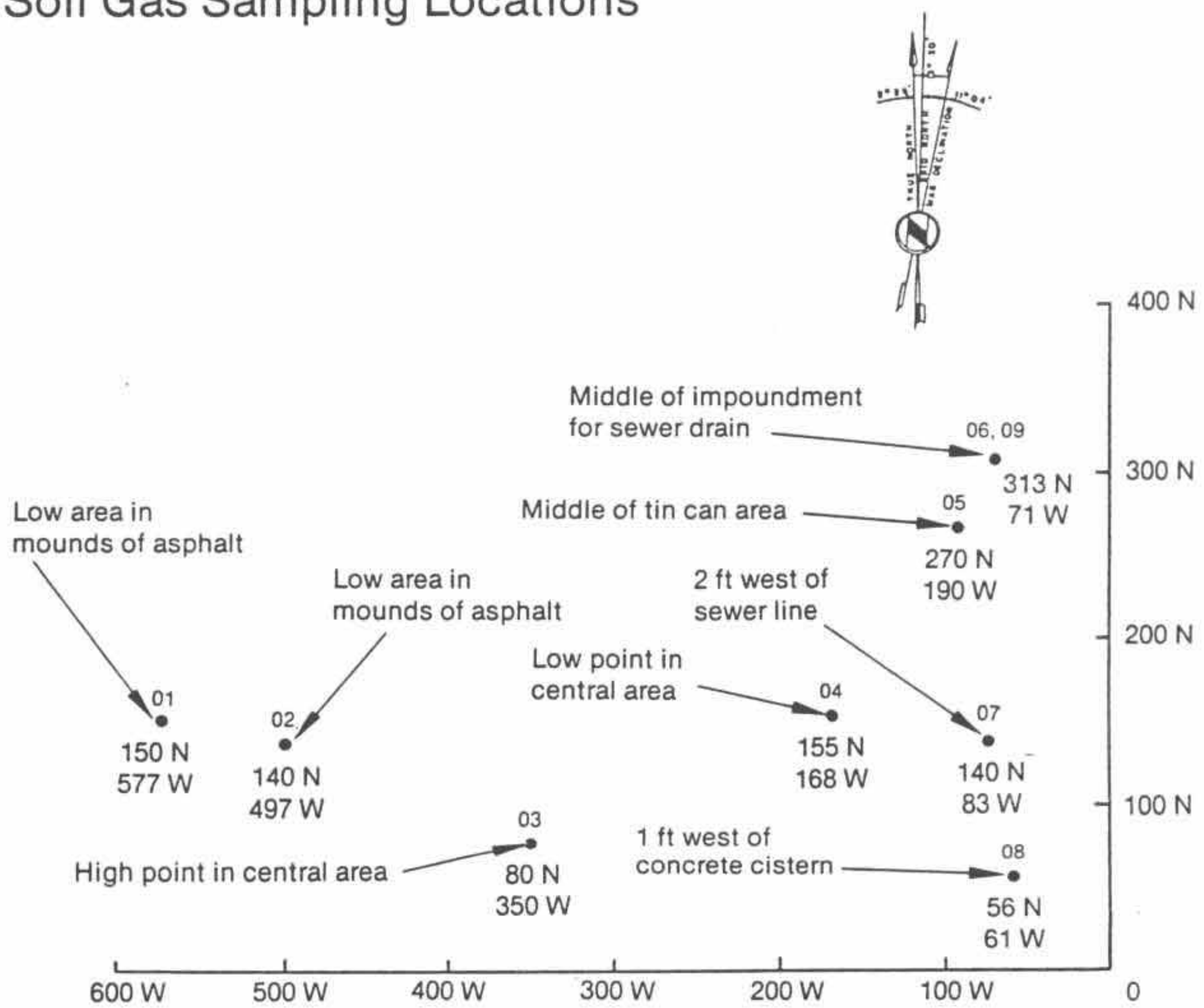
LA855: TA-21, "Cold" Dump. There is no adverse impact to the usability of the soil gas data obtained for this request number indicated by associated QC results.

- Radiological Data

The results of QC checks indicate that the performance of the instruments and the analytical methods were adequate to ensure accuracy and reproducibility of the results obtained using them. In addition, the background seen by each instrument/detector was sufficiently low and constant to ensure accurate compensation for background effects.

The uncertainties cited in the tables for the total uranium results appear to be ten percent of the reported concentrations. Unfortunately, the uncertainties were reported with the same number of significant figures as the concentrations. Therefore, when using the total uranium results, the reader should round the uncertainties to one less significant figure.

TA-21 Cold Dump Site for Geophysical Survey and Soil Gas Sampling Locations

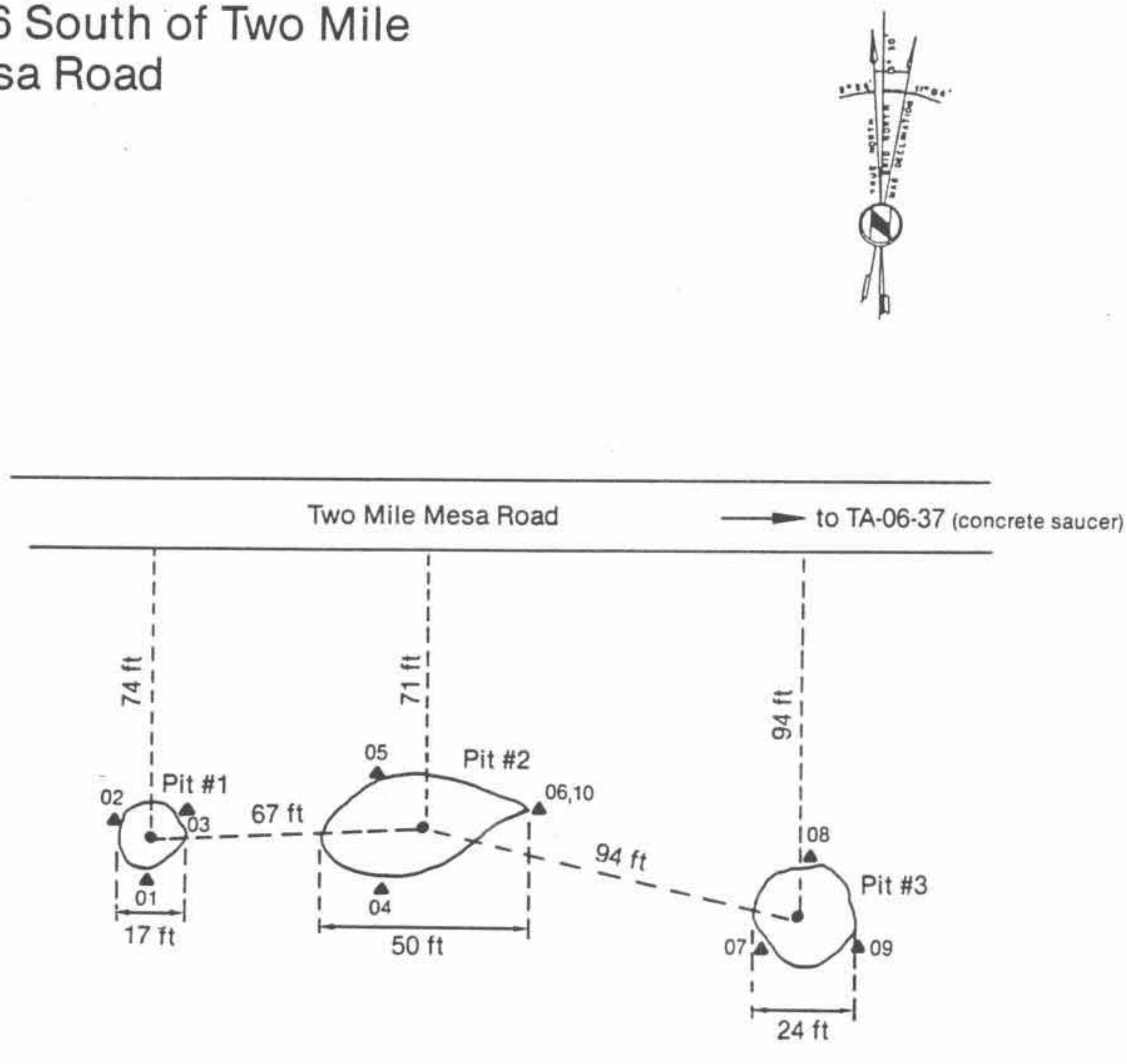


SCALE: 1 in. = 100 ft

• – Sampling locations (LA855)

Figure 4.22.1

Sampling Locations at TA-6 South of Two Mile Mesa Road

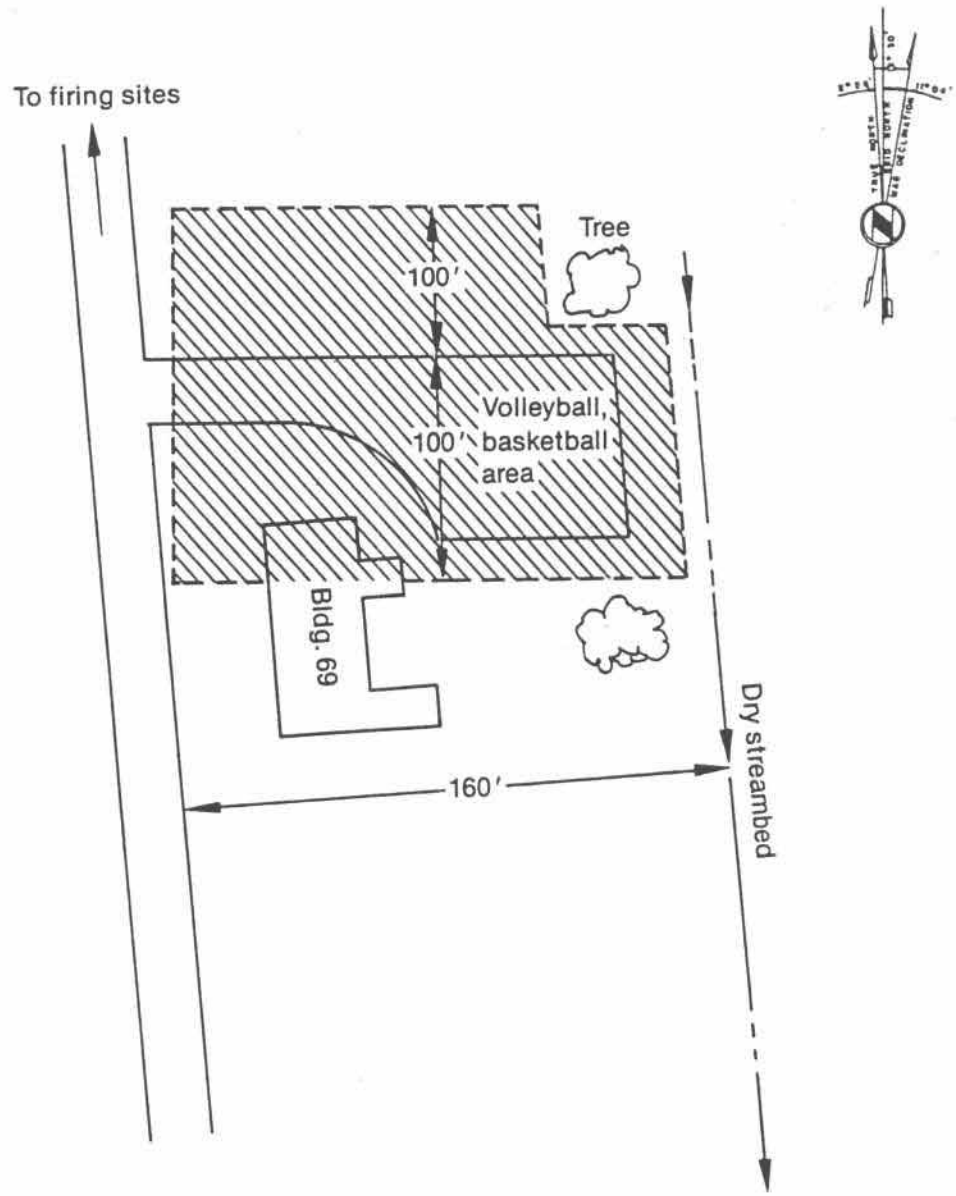


SCALE: 1 in. = 40 ft

● — LA803 (01-03) center of pits
▲ — LA853 (01-10) perimeter of pits

Figure 4.22.2

Area for Geophysical Survey at TA-39



* Not to scale

Figure 4.22.3

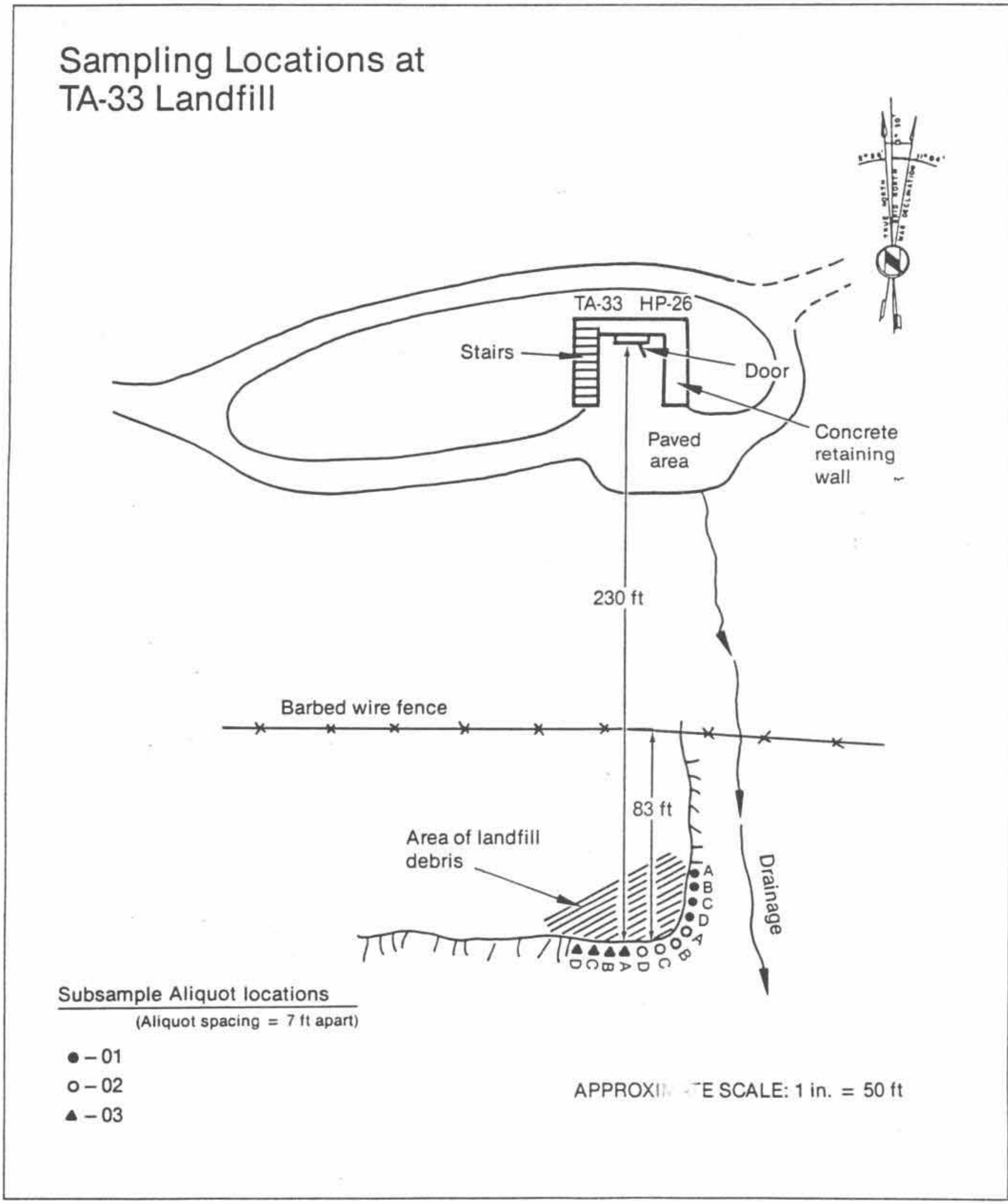

Sampling Locations at
TA-33 Landfill
TA-33 HP-26
Stairs
Door
Concrete
retaining
wall
Paved
area
230 ft
Barbed wire fence
83 ft
Area of landfill
debris
Drainage
A
B
C
D
Subsample Aliquot locations
(Aliquot spacing = 7 ft apart)
● – 01
○ – 02
▲ – 03
APPROXI TE SCALE: 1 in. = 50 ft

Figure 4.22.4

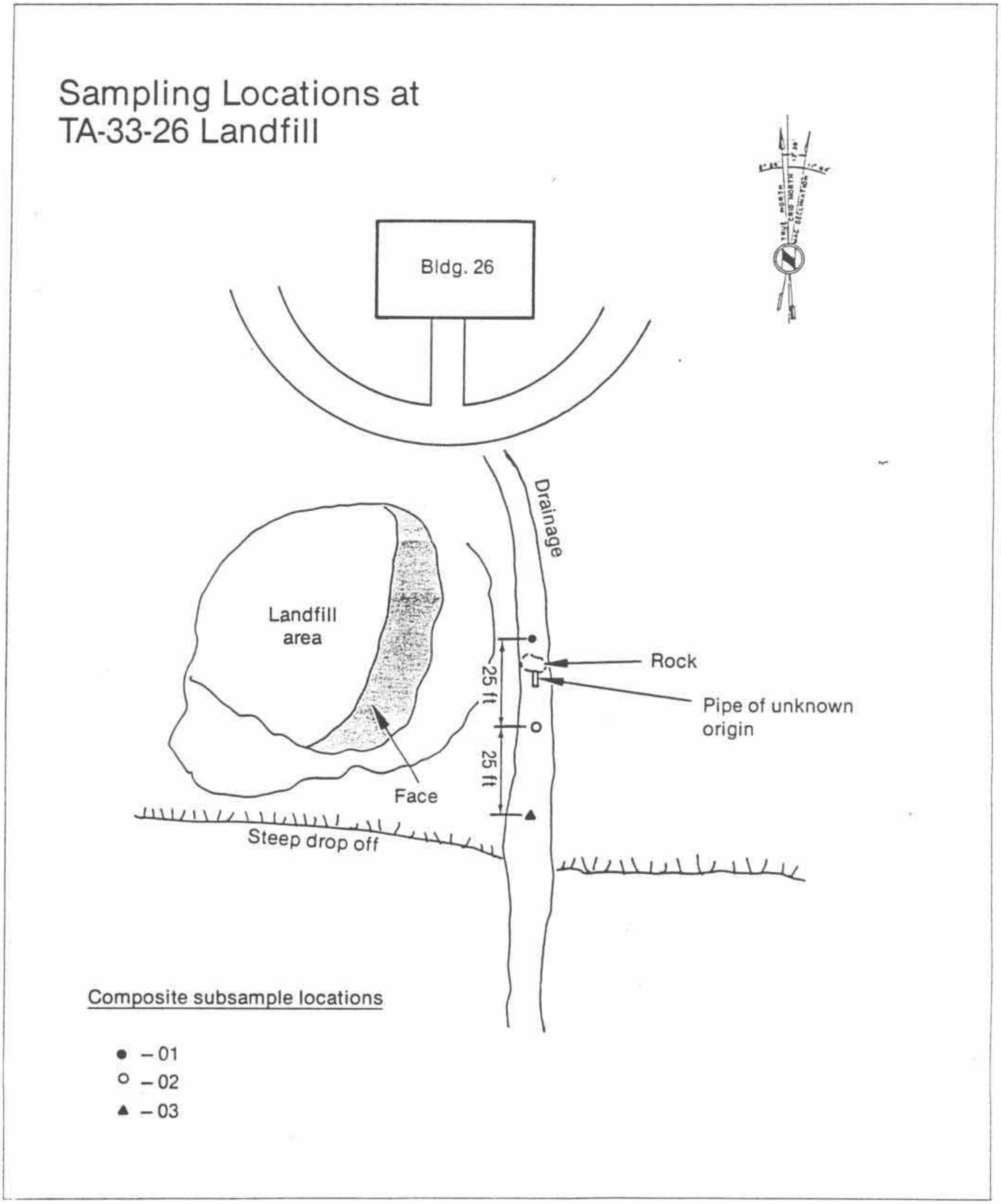

Sampling Locations at
TA-33-26 Landfill
Bldg. 26
Drainage
Landfill
area
Rock
Pipe of unknown
origin
25 ft
25 ft
Face
Steep drop off
Composite subsample locations
• – 01
○ – 02
▲ – 03

Figure 4.22.5

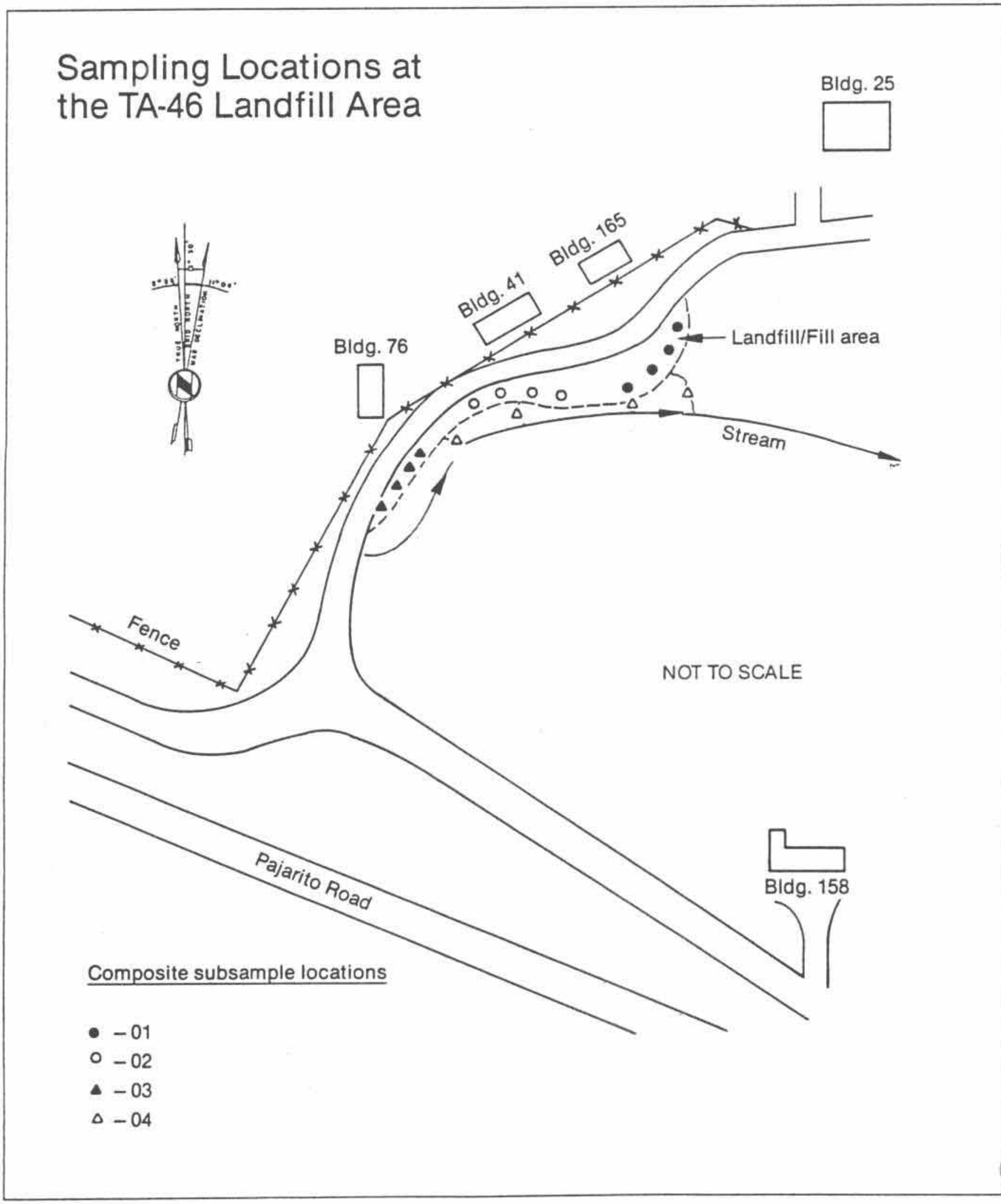
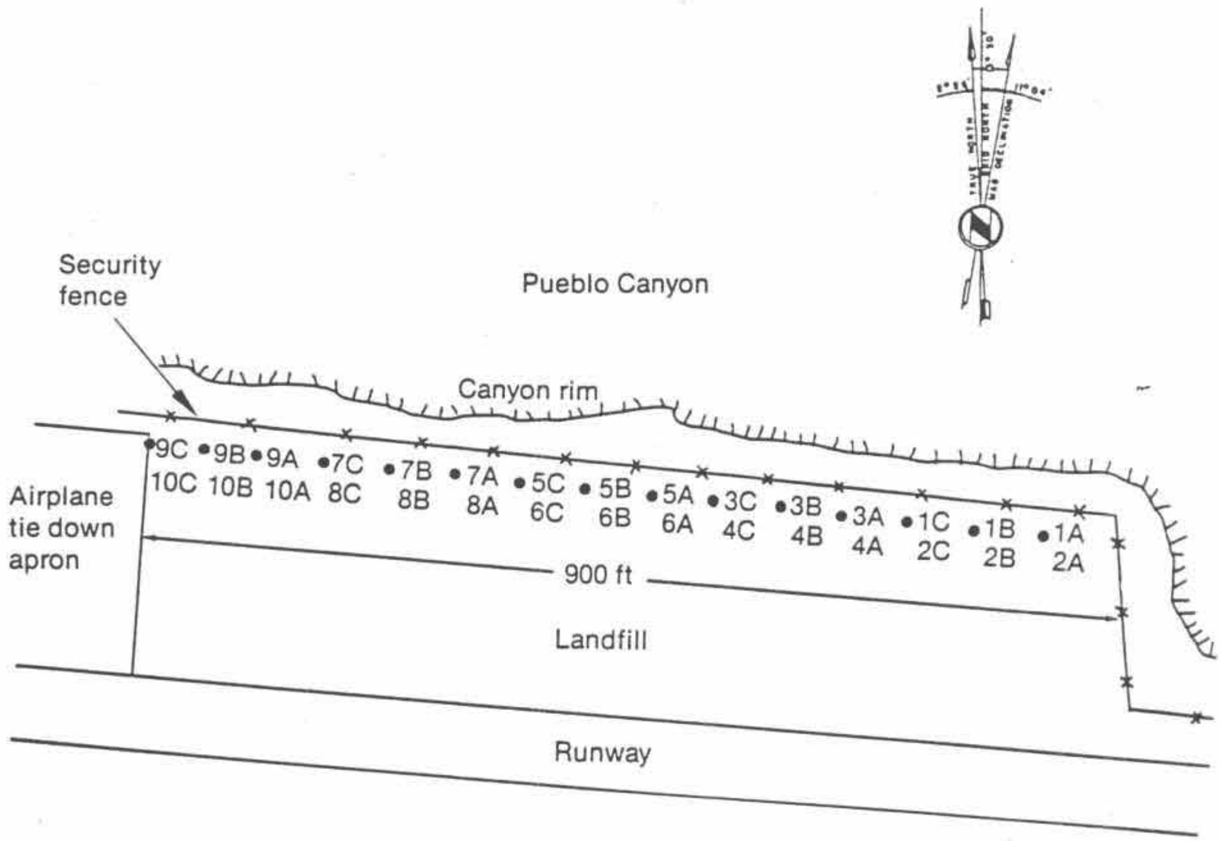

Sampling Locations at
the TA-46 Landfill Area
Bldg. 25
Bldg. 165
Bldg. 41
Bldg. 76
Landfill/Fill area
Stream
Fence
NOT TO SCALE
Pajarito Road
Bldg. 158
Composite subsample locations
● – 01
○ – 02
▲ – 03
△ – 04

Figure 4.22.6

Sampling Locations at Airport Landfill in TA-00L



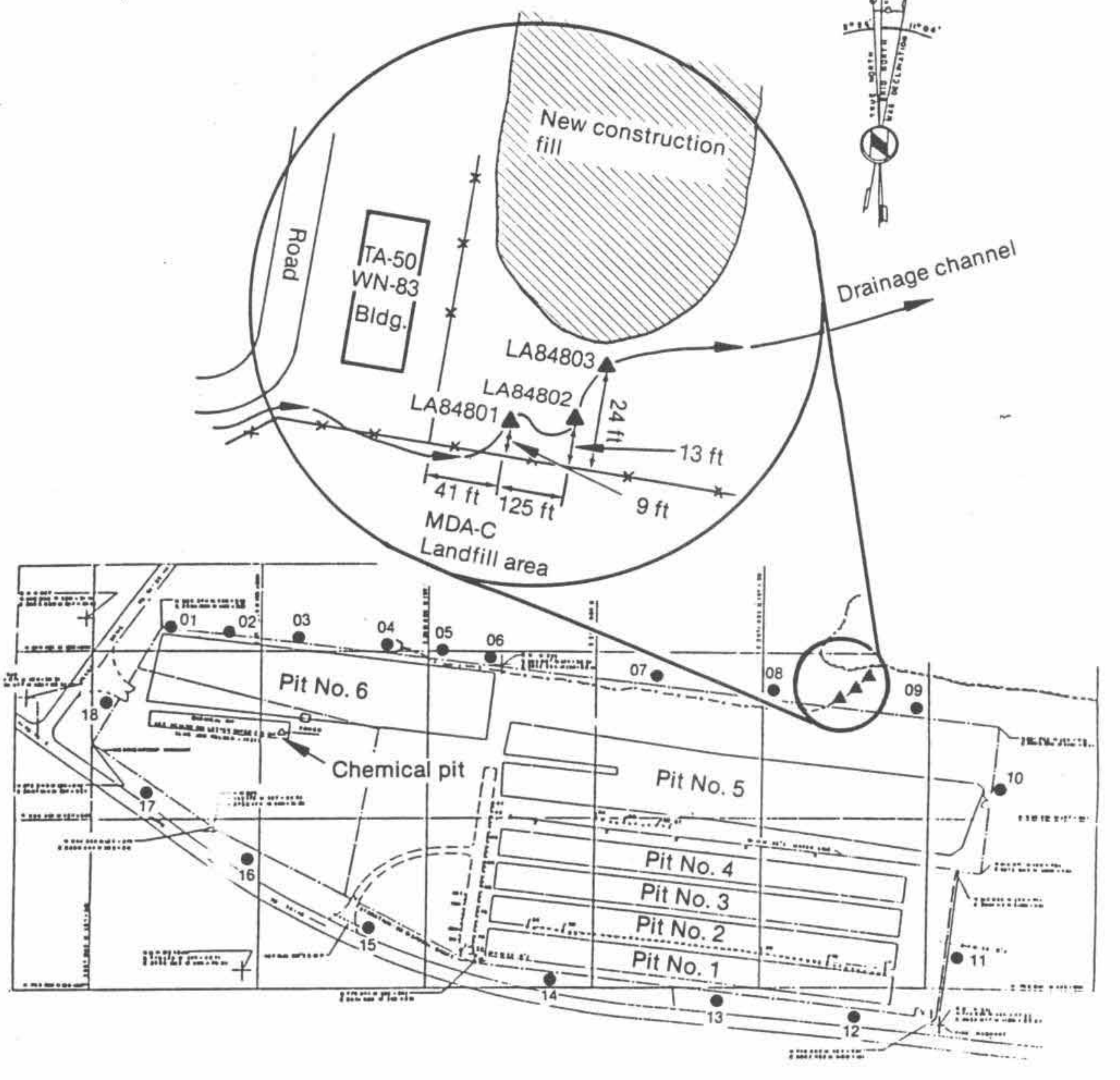
NOT TO SCALE:
Subsample spacing = 60 ft

EXPLANATION

• – Subsample location
(odd numbers are from 0.5 to 1.0 ft in depth,
even numbers are from 1.0 ft to 3.0 ft in depth)
A,B,or C refers to each subsample

Figure 4.22.7

Sampling Locations at TA-0, MDA-C Landfill Area



●— Soil gas sample locations (Req. No. LA808)

▲— Sediment sample locations (Req. No. LA848)

Figure 4.22.8

Sampling Locations at TA-20 Suspected Landfill

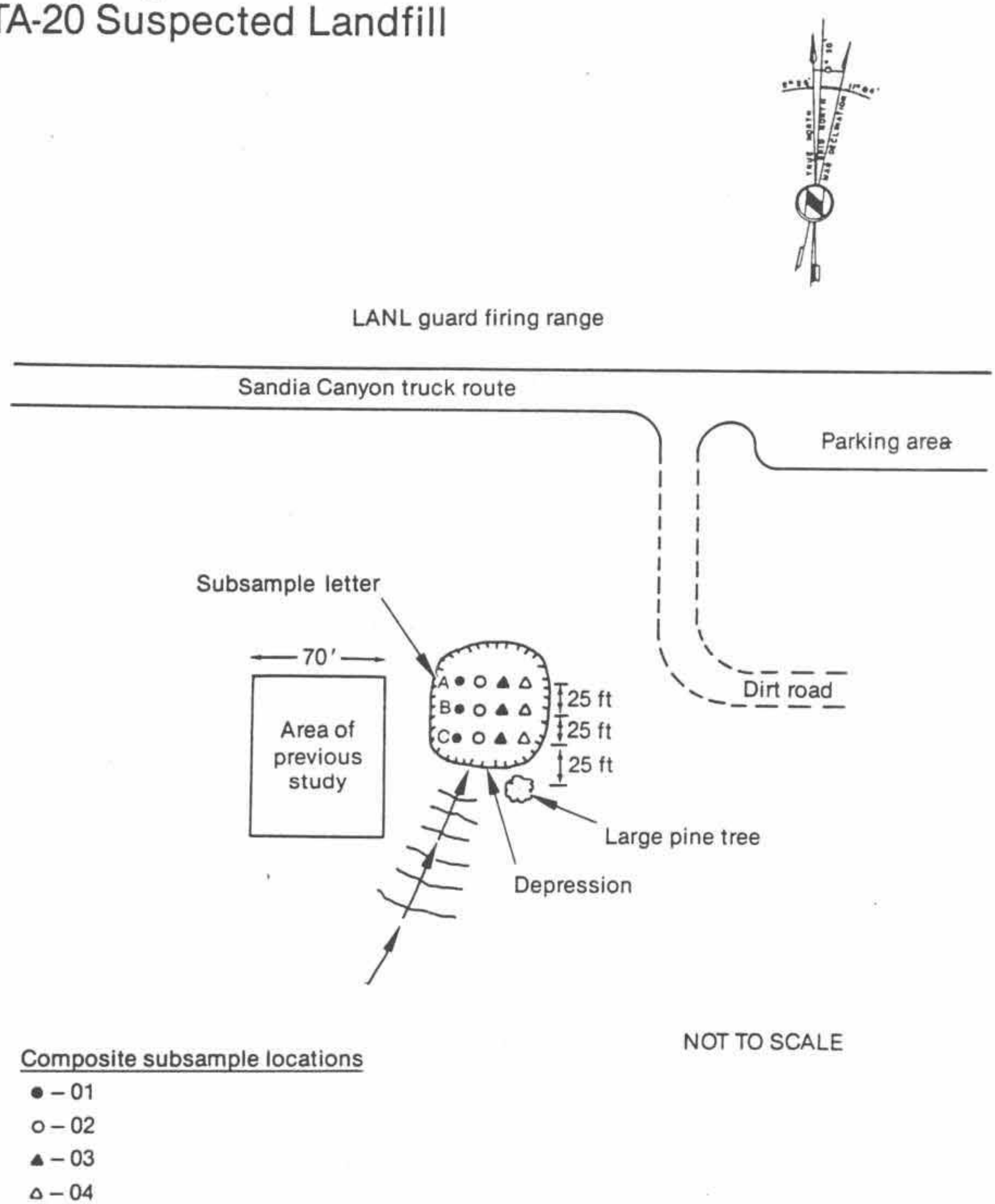


Figure 4.22.9

TABLE 4.22.1 LOS ALAMOS NATIONAL LABORATORY - COMPLETION TABLE - ENVIRONMENTAL PROBLEM 22

(Column Header Legend: P = Planned C = Collected A = Analyzed)
(Status Column Legend: Del = Deleted Dev = Deviation)

REQUEST NUMBER	SN	STAT	DATE COLLECTED mm/dd/yy	AREA	LOCATION	TYPE LOCATION	MEDIA	TYPE	NUMBER SAMPLES		VOLATILE			SEMI VOLATILE			PEST			PCB			ICP METALS			MERCURY			HIGH EXPL			ASBESTOS ENVR		
									P	C	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A
LA800	01	GEO	04/28/88	TA-21-259	INACTIVE	COLD DUMP	GEOPHYS		1	1																								
LA803		DEV	05/06/88	TA-06	INACTIVE	DISPOSALPIT	SOIL	GRAB	6	3	3	3	3							3	3	3	3	3	3	3	3	3	3	3	3			
LA804	01	GEO	04/29/88	TA-39	INACTIVE	DISPOSALPIT	GEOPHYS		1	1																								
LA805			06/20/88	TA-33-26	INACTIVE	LANDFILL	SOIL	S.COMP	3	3	3	0	0										3	3	3				3	3	3			
LA806			05/17/88	TA-46	INACTIVE	LANDFILL	SOIL	S.COMP	4	4	4	0	0	4	4	4				4	4	4	4	4	4							4	4	4
LA807	01		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	0	0				1	1	1	1	1	1	1	1	1				1	1	1			
LA807	02		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	0	0				1	1	1	1	1	1	1	1	1				1	1	1			
LA807	03		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	0	0				1	1	1	1	1	1	1	1	1				1	1	1			
LA807	04		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	0	0				1	1	1	1	1	1	1	1	1				1	1	1			
LA807	05		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	0	0				1	1	1	1	1	1	1	1	1				1	1	1			
LA807	06		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1			
LA807	07		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1			
LA807	08		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	0	0				1	1	1	1	1	1	1	1	1				1	1	1			
LA807	09		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1			
LA807	10		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1			
LA808	01	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	02	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	03	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	04	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	05	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	06	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	07	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	08	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	09	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	10	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	11	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	12	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	13	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	14	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	15	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	16	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	17	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA808	18	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1	1	1	1																					
LA810		DEV	06/20/88	TA-20	INACTIVE	AREA 1 PIT	SS SOIL	S.COMP	4	4	2	2	2										4	4	4				4	4	4			
LA847		DEV	05/17/88	TA-33-26	INACTIVE	LANDFILL	SED	GRAB	3	3													3	3	3				3	3	3			
LA848			05/20/88	TA-50	INACTIVE	MDA-C	SOIL	GRAB	3	3	3	3	3	3	3	3				3	3	3	3	3	3									
LA853		DEV	05/06/88	TA-06	INACTIVE	DISPOSALPIT	SOILGAS	GRAB	9	10	10	10	10																					
LA855			05/10/88	TA-21-259	INACTIVE	COLD DUMP	SOILGAS	GRAB	8	9	8	9	9																					
Totals for Problem Number 22									70	69	61	49	49	7	7	7	10	10	10	20	20	20	30	30	30	3	3	3	23	23	23	4	4	4

TABLE 4.22.1 LOS ALAMOS NATIONAL LABORATORY - COMPLETION TABLE - ENVIRONMENTAL PROBLEM 22 (Continued)

(Column Header Legend: P = Planned C = Collected A = Analyzed)
(Status Column Legend: Del = Deleted Dev = Deviation)

REQUEST NUMBER	SN	STAT	DATE COLLECTED mm/dd/yy	AREA	LOCATION	TYPE LOCATION	MEDIA	TYPE	NUMBER SAMPLES		GAMMA ANALYSIS			PLUTO-NIUM			RADIUM			STRON-TIUM			THORIUM			TOTAL URANIUM		
									P	C	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A
LA800	01	GEO	04/28/88	TA-21-259	INACTIVE	COLD DUMP	GEOPHYS		1	1																		
LA803		DEV	05/06/88	TA-06	INACTIVE	DISPOSALPIT	SOIL	GRAB	6	3	3	3	3	3	3	3				3	3	3				3	3	3
LA804	01	GEO	04/29/88	TA-39	INACTIVE	DISPOSALPIT	GEOPHYS		1	1																		
LA805			06/20/88	TA-33-26	INACTIVE	LANDFILL	SOIL	S.COMP	3	3	3	3	3	3	3	3							3	3	3	3	3	3
LA806			05/17/88	TA-46	INACTIVE	LANDFILL	SOIL	S.COMP	4	4	4	4	4	4	4	4				4	4	4	4	4	4	4	4	4
LA807	01		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA807	02		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA807	03		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA807	04		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA807	05		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA807	06		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA807	07		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA807	08		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA807	09		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA807	10		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	S.COMP	1	1	1	1	1													1	1	1
LA808	01	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	02	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	03	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	04	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	05	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	06	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	07	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	08	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	09	DEV	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	10	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	11	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	12	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	13	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	14	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	15	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	16	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	17	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA808	18	DEV	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	GRAB	1	1																		
LA810		DEV	06/20/88	TA-20	INACTIVE	AREA 1 PIT	SS SOIL	S.COMP	4	4	4	4	4										4	4	4	4	4	4
LA847		DEV	05/17/88	TA-33-26	INACTIVE	LANDFILL	SED	GRAB	3	3	3	3	3	3	3	3							3	3	3	3	3	3
LA848			05/20/88	TA-50	INACTIVE	MDA-C	SOIL	GRAB	3	3	3	3	3	3	3	3	3	3	3	3	3	3				3	3	3
LA853		DEV	05/06/88	TA-06	INACTIVE	DISPOSALPIT	SOILGAS	GRAB	9	10																		
LA855			05/10/88	TA-21-259	INACTIVE	COLD DUMP	SOILGAS	GRAB	8	9																		
Totals for Problem Number 22									70	69	30	30	30	16	16	16	3	3	3	10	10	10	14	14	14	30	30	30

TABLE 4.22.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 22

AREA	TA-06	TA-06	TA-06	TA-00L	TA-00L	TA-00L	TA-00L
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80301XX	LA80302XX	LA80303XX	LA80706XX	LA80707XX	LA80709XX	LA80710XX
MEDIA	SOIL	SOIL	SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA30901XA	LA80302XX	LA80302XX	LA84001XX	LA84001XX	LA84001XX	LA84001XX
FIELD MEASUREMENTS							
Depth (ft)	1-1.25	1-1.25	1-1.25	2	0.5-1	0.5-1	2-3
TARGET COMPOUNDS							
Acetone	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---
1,2-Dichloroethene_(total)	10	6	6	---	---	---	---
2-Butanone	---	---	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	30	---	---
Toluene	---	---	---	---	3 J	---	1 J
Styrene	---	---	---	---	---	---	---
Tentatively Identified Compounds							
C3 Benzene	---	---	---	---	---	57 J	---
C4 Benzene	---	---	---	---	1900 J	18 J	15 J
C4 Benzene	---	---	---	---	1900 J	20 J	---
C5 Benzene	---	---	---	---	---	150 J	6 J
C6 Benzene and Hydrocarbon	---	---	---	---	---	150 J	---
Decahydronaphthalene	---	---	---	---	1200 J	21 J	---
Poss Terpene C15H24	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	13 J
Poss Terpene	---	---	---	---	---	---	28 J
Poss Terpene	---	---	---	---	---	---	4 J
Poss Terpene	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene Mixture	---	---	---	---	---	---	11 J
Total (Allowed) Hold Time	13(14)d	13(14)d	13(14)d	13(14)d	13(14)d	13(14)d	13(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV		ELEV	ELEV	
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.22.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	MDA-C	MDA-C	MDA-C	MDA-C	MDA-C	MDA-C	MDA-C
SAMPLE NUMBER	LA80801XZ	LA80802XZ	LA80803XZ	LA80804XZ	LA80805XZ	LA80806XZ	LA80807XZ
MEDIA	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS
UNITS	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3
SDG NUMBER	LA90501XZ	LA90501XZ	LA90501XZ	LA90501XZ	LA90501XZ	LA90501XZ	LA90501XZ
FIELD MEASUREMENTS							
Depth (ft)	4	4	4	4	4	4	4
TARGET COMPOUNDS							
Acetone	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---
1,2-Dichloroethene_(total)	---	---	---	---	---	---	---
2-Butanone	---	4 BQ	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---
Styrene	---	---	---	---	---	---	---
Tentatively Identified Compounds							
C3 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C5 Benzene	---	---	---	---	---	---	---
C6 Benzene and Hydrocarbon	---	---	---	---	---	---	---
Decahydronaphthalene	---	---	---	---	---	---	---
Poss Terpene C15H24	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene Mixture	---	---	---	---	---	---	---
Total (Allowed) Hold Time	16(ns)d	16(ns)d	16(ns)d	16(ns)d	16(ns)d	16(ns)d	16(ns)d
ELEVated/DECReased CRQL	DECR	DECR	DECR	DECR	DECR	DECR	DECR
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.22.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	MDA-C	MDA-C	MDA-C	MDA-C	MDA-C	MDA-C	MDA-C
SAMPLE NUMBER	LA80808XZ	LA80809XZ	LA80810XZ	LA80811XZ	LA80812XZ	LA80813XZ	LA80814XZ
MEDIA	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS
UNITS	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3
SDG NUMBER	LA90501XZ	LA90501XZ	LA90501XZ	LA90501XZ	LA90501XZ	LA80813XZ	LA80813XZ
FIELD MEASUREMENTS							
Depth (ft)	4	4	4	4	4	4	4
TARGET COMPOUNDS							
Acetone	---	---	---	---	---	---	---
Carbon Disulfide	---	0.4 J	---	---	---	---	---
1,2-Dichloroethene_(total)	---	---	---	---	---	---	---
2-Butanone	---	---	---	---	---	---	---
Trichloroethene	---	0.3 J	---	---	0.3 J	---	---
Tetrachloroethene	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---
Styrene	---	---	---	---	---	---	---
Tentatively Identified Compounds							
C3 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C5 Benzene	---	---	---	---	---	---	---
C6 Benzene and Hydrocarbon	---	---	---	---	---	---	---
Decahydronaphthalene	---	---	---	---	---	---	---
Poss Terpene C15H24	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene Mixture	---	---	---	---	---	---	---
Total (Allowed) Hold Time	17(ns)d	17(ns)d	16(ns)d	16(ns)d	16(ns)d	16(ns)d	16(ns)d
ELEVated/DECReased CRQL	DECR	DECR	DECR	DECR	DECR	DECR	DECR
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.22.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-0	TA-0	TA-0	TA-0	TA-20	TA-20	TA-50
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	MDA-C	MDA-C	MDA-C	MDA-C	AREA 1 PIT	AREA 1 PIT	MDA-C
SAMPLE NUMBER	LA80815XZ	LA80816XZ	LA80817XZ	LA80818XZ	LA81001XX	LA81002XX	LA84801XX
MEDIA	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SS SOIL	SS SOIL	SOIL
UNITS	mg/m^3	mg/m^3	mg/m^3	mg/m^3	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA80813XZ	LA80813XZ	LA80813XZ	LA80813XZ	LA84001XX	LA84001XX	LA82003XA
FIELD MEASUREMENTS							
Depth (ft)	4	4	4	4	0-3	0-3	0-1
TARGET COMPOUNDS							
Acetone	---	---	---	---	24	35	---
Carbon Disulfide	---	---	---	---	---	---	---
1,2-Dichloroethene_(total)	---	---	---	---	---	---	---
2-Butanone	---	---	---	---	110	140	---
Trichloroethene	0.2 J	---	0.3 J	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---
Styrene	---	---	---	---	1 J	1 J	---
Tentatively Identified Compounds							
C3 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C5 Benzene	---	---	---	---	---	---	---
C6 Benzene and Hydrocarbon	---	---	---	---	---	---	---
Decahydronaphthalene	---	---	---	---	---	---	---
Poss Terpene C15H24	---	---	---	---	140 J	---	---
Poss Terpene	---	---	---	---	---	17 J	---
Poss Terpene	---	---	---	---	---	12 J	---
Poss Terpene	---	---	---	---	---	6 J	---
Poss Terpene	---	---	---	---	---	20 J	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene Mixture	---	---	---	---	---	---	---
Total (Allowed) Hold Time	18(ns)d	18(ns)d	18(ns)d	18(ns)d	11(14)d	11(14)d	17(14)d*
ELEVated/DECReased CRQL	DECR	DECR	DECR	DECR			ELEV
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.22.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-50	TA-50	TA-06	TA-06	TA-06	TA-06	TA-06
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	MDA-C	MDA-C	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT
SAMPLE NUMBER	LA84802XX	LA84803XX	LA85301XZ	LA85302XZ	LA85303XZ	LA85304XZ	LA85305XZ
MEDIA	SOIL	SOIL	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS
UNITS	ug/kg	ug/kg	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3
SDG NUMBER	LA82003XA	LA82003XA	LA80813XZ	LA80813XZ	LA80813XZ	LA80813XZ	LA80813XZ
FIELD MEASUREMENTS							
Depth (ft)	0-1	0-1	4	4	4	4	4
TARGET COMPOUNDS							
Acetone	180 B	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---
1,2-Dichloroethene_(total)	---	---	---	---	---	---	---
2-Butanone	---	---	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---
Toluene	4 J	---	---	---	---	---	---
Styrene	---	---	---	---	---	---	---
Tentatively Identified Compounds							
C3 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C5 Benzene	---	---	---	---	---	---	---
C6 Benzene and Hydrocarbon	---	---	---	---	---	---	---
Decahydronaphthalene	---	---	---	---	---	---	---
Poss Terpene C15H24	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Terpene C10H16	160 J	480 J	---	---	---	---	---
Terpene C10H16	240 J	500 J	---	---	---	---	---
Terpene Mixture	---	---	---	---	---	---	---
Total (Allowed) Hold Time	19(14)d*	13(14)d	17(ns)d	17(ns)d	17(ns)d	17(ns)d	17(ns)d
ELEVated/DECReased CRQL	ELEV	ELEV	DECR	DECR	DECR	DECR	DECR
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.22.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-06	TA-06	TA-06	TA-06	TA-06	TA-21-259	TA-21-259
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	COLD DUMP	COLD DUMP
SAMPLE NUMBER	LA85306XZ	LA85307XZ	LA85308XZ	LA85309XZ	LA85310XZ	LA85501XZ	LA85502XZ
MEDIA	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS
UNITS	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3
SDG NUMBER	LA80813XZ	LA80813XZ	LA80813XZ	LA80813XZ	LA80813XZ	LA85501XZ	LA85501XZ
FIELD MEASUREMENTS							
Depth (ft)	4	4	4	4	4	1.7-4	1.7-4
TARGET COMPOUNDS							
Acetone	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---
1,2-Dichloroethene_(total)	---	---	---	---	---	---	---
2-Butanone	---	---	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---
Styrene	---	---	---	---	---	---	---
Tentatively Identified Compounds							
C3 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C5 Benzene	---	---	---	---	---	---	---
C6 Benzene and Hydrocarbon	---	---	---	---	---	---	---
Decahydronaphthalene	---	---	---	---	---	---	---
Poss Terpene C15H24	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene Mixture	---	---	---	---	---	---	---
Total (Allowed) Hold Time	18(ns)d	18(ns)d	18(ns)d	18(ns)d	18(ns)d	14(ns)d	14(ns)d
ELEVated/DECReased CRQL	DECR	DECR	DECR	DECR	DECR	DECR	DECR
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.22.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-21-259	TA-21-259	TA-21-259	TA-21-259	TA-21-259	TA-21-259	TA-21-259
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	COLD DUMP	COLD DUMP	COLD DUMP	COLD DUMP	COLD DUMP	COLD DUMP	COLD DUMP
SAMPLE NUMBER	LA85503XZ	LA85504XZ	LA85505XZ	LA85506XZ	LA85507XZ	LA85508XZ	LA85509XZ
MEDIA	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS	SOILGAS
UNITS	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3	mg/m^3
SDG NUMBER	LA85501XZ	LA85501XZ	LA85501XZ	LA85501XZ	LA85501XZ	LA85501XZ	LA85501XZ
FIELD MEASUREMENTS							
Depth (ft)	1.7-4	1.7-4	1.7-4	1.7-4	1.7-4	1.7-4	1.7-4
TARGET COMPOUNDS							
Acetone	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---
1,2-Dichloroethene_(total)	---	---	---	---	---	---	---
2-Butanone	---	---	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---
Styrene	---	---	---	---	---	---	---
Tentatively Identified Compounds							
C3 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
C5 Benzene	---	---	---	---	---	---	---
C6 Benzene and Hydrocarbon	---	---	---	---	---	---	---
Decahydronaphthalene	---	---	---	---	---	---	---
Poss Terpene C15H24	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene Mixture	---	---	---	---	---	---	---
Total (Allowed) Hold Time	14(ns)d	14(ns)d	15(ns)d	15(ns)d	15(ns)d	15(ns)d	15(ns)d
ELEVated/DECReased CRQL	DECR	DECR	DECR	DECR	DECR	DECR	DECR
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.22.3 LOS ALAMOS NATIONAL LABORATORY - SEMIVOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 22

AREA	TA-46	TA-46	TA-46	TA-46	TA-50	TA-50	TA-50
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	MDA-C	MDA-C	MDA-C
SAMPLE NUMBER	LA80601XV	LA80602XV	LA80603XV	LA80604XV	LA84801XV	LA84802XV	LA84803XVRE
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA60501XV	LA60501XV	LA60501XV	LA60501XV	LA60501XV	LA60501XV	LA60501XV
FIELD MEASUREMENTS							
Depth (ft)	0-6	0-6	0-6	0-6	0-1	0-1	0-1
TARGET COMPOUNDS							
Isophorone	---	---	---	---	---	---	13 J
Benzoic acid	83 J	---	---	100 J	---	---	190 J
Phenanthrene	1900	160 J	210 J	64 J	---	51 J	8 J
Fluoranthene	1900	260 J	320 J	78 J	---	100 J	17 J
Pyrene	1700	190 J	230 J	63 J	---	81 J	14 J
Benzo(a)anthracene	590 J	86 J	---	28 J	---	47 J	---
Chrysene	650 J	100 J	120 J	28 J	---	48 J	---
Benzo(b)fluoranthene	590 J	190 J	80 J	21 J	---	33 J	---
TENTATIVELY IDENTIFIED COMPOUNDS							
1,3-Dioxolane	---	---	---	---	---	---	270 J
9,10-Anthracenedione	280 J	---	---	---	---	---	---
9H-Carbazole	210 J	---	---	---	---	---	---
Cyclopenta-PAH MW=190	350 J	---	---	---	---	---	---
Dimethyl-Heptadien-One	---	---	---	---	---	---	520 J
Hyoxy-Meoxy-Benzaldehyde	---	---	---	110 J	---	---	---
Methyl-PAH MW=192	180 J	---	---	---	---	---	---
Methyl-PAH MW=192	170 J	---	---	---	---	---	---
PAH MW=252	420 J	340 J	---	---	---	---	---
Poss Benzaldehyde	---	---	---	---	---	610 J	---
Poss PAH	---	---	---	---	---	360 J	---
Terpene MW=204	---	---	---	---	---	---	290 J
Terpene MW=204	---	---	---	---	---	790 J	---
Total (Allowed) Hold Time	8(14)d	11(14)d	11(14)d	11(14)d	12(14)d	12(14)d	12(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	0.850	1.000	1.000	1.000	1.000	0.850	1.000

TABLE 4.22.4 LOS ALAMOS NATIONAL LABORATORY - PESTICIDE/PCB DATA - ENVIRONMENTAL PROBLEM 22

AREA	TA-06	TA-06	TA-06	TA-46	TA-46	TA-46
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80301XV	LA80302XV	LA80303XV	LA80601XV	LA80602XV	LA80603XV
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA80301XV	LA80301XV	LA80301XV	LA60501XV	LA60501XV	LA60501XV
FIELD MEASUREMENTS						
Depth (ft)	1-1.25	1-1.25	1-1.25	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS						
alpha-BHC	---	---	---	---	---	---
beta-BHC	---	---	---	53	100	---
delta-BHC	---	---	---	---	---	---
gamma-BHC (Lindane)	---	---	---	---	---	---
Heptachlor epoxide	---	---	---	---	---	---
Endosulfan I	---	---	---	---	1 J	---
Dieldrin	---	---	---	---	---	---
4,4'-DDE	---	---	---	---	---	---
Endosulfan II	---	---	---	9 J	---	---
4,4'-DDD	---	---	---	---	---	---
4,4'-DDT	---	---	---	---	---	---
alpha-chlordane	---	---	---	---	---	---
gamma-chlordane	---	---	---	27 J	---	---
Aroclor-1254	---	---	---	---	---	---
Aroclor-1260	---	---	---	---	160 J	960
Total (Allowed) Hold Time	40(14)d	40(14)d	40(14)d	8(14)d	8(14)d	8(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.0	1.0	1.0	1.0	1.0	1.0

TABLE 4.22.4 LOS ALAMOS NATIONAL LABORATORY - PESTICIDE/PCB DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-46	TA-00L	TA-00L	TA-00L	TA-00L	TA-00L
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80604XV	LA80701XV	LA80702XV	LA80703XV	LA80704XV	LA80705XV
MEDIA	SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA60501XV	LA80701XV	LA80701XV	LA80701XV	LA80701XV	LA80701XV
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0.5-1	1-2	0.5-1	1.5-3	0.5-1
TARGET COMPOUNDS						
alpha-BHC	---	---	---	---	---	---
beta-BHC	22	---	---	---	---	---
delta-BHC	---	---	49	---	---	---
gamma-BHC (Lindane)	---	---	---	---	---	---
Heptachlor epoxide	---	---	---	---	---	---
Endosulfan I	---	19	2000	3.20 J	37	---
Dieldrin	---	110	16 J	8.20 J	---	---
4,4'-DDE	---	1.20 J	250	3.40 J	---	---
Endosulfan II	---	---	---	7.30 J	---	---
4,4'-DDD	---	8.60 J	330	---	---	---
4,4'-DDT	7 J	180	1600	100	9 J	---
alpha-chlordane	---	4.60 J	---	3 J	---	---
gamma-chlordane	---	25 J	23 J	5.30 J	---	---
Aroclor-1254	---	---	---	---	---	5700
Aroclor-1260	---	450	---	---	---	---
Total (Allowed) Hold Time	8(14)d	6(14)d	6(14)d	6(14)d	6(14)d	6(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.0	1.0	1.0	1.0	1.0	1.0

TABLE 4.22.4 LOS ALAMOS NATIONAL LABORATORY - PESTICIDE/PCB DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-00L	TA-00L	TA-00L	TA-00L	TA-00L	TA-50
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL	MDA-C
SAMPLE NUMBER	LA80706XV	LA80707XV	LA80708XV	LA80709XV	LA80710XV	LA84801XV
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA80701XV	LA80701XV	LA80701XV	LA80701XV	LA80701XV	LA60501XV
FIELD MEASUREMENTS						
Depth (ft)	1-3	0.5-1	1	0.5-1	2-3	0-1
TARGET COMPOUNDS						
alpha-BHC	---	210	---	---	---	---
beta-BHC	---	---	---	---	---	---
delta-BHC	---	---	---	---	---	---
gamma-BHC (Lindane)	---	150	---	---	---	---
Heptachlor epoxide	---	---	---	---	2.40 J	---
Endosulfan I	---	---	---	---	---	---
Dieldrin	---	---	---	---	7.80 J	---
4,4'-DDE	---	21 J	---	5.60 J	---	---
Endosulfan II	---	---	---	---	---	---
4,4'-DDD	---	---	---	---	---	---
4,4'-DDT	---	---	2.30 J	92	8.10 J	5.10 J
alpha-chlordane	---	---	---	---	---	---
gamma-chlordane	---	---	---	4.70 J	3.40 J	---
Aroclor-1254	8300	---	---	---	---	---
Aroclor-1260	---	---	---	---	---	---
Total (Allowed) Hold Time	6(14)d	6(14)d	6(14)d	6(14)d	6(14)d	12(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.0	0.2	1.0	1.0	1.0	1.0

TABLE 4.22.4 LOS ALAMOS NATIONAL LABORATORY - PESTICIDE/PCB DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-50	TA-50
LOCATION	INACTIVE	INACTIVE
TYPE OF LOCATION	MDA-C	MDA-C
SAMPLE NUMBER	LA84802XV	LA84803XV
MEDIA	SOIL	SOIL
UNITS	ug/kg	ug/kg
SDG NUMBER	LA60501XV	LA60501XV
FIELD MEASUREMENTS		
Depth (ft)	0-1	0-1
TARGET COMPOUNDS		
alpha-BHC	---	---
beta-BHC	---	---
delta-BHC	---	---
gamma-BHC (Lindane)	---	---
Heptachlor epoxide	---	---
Endosulfan I	36	---
Dieldrin	---	---
4,4'-DDE	---	---
Endosulfan II	---	---
4,4'-DDD	4.50 J	6 J
4,4'-DDT	11 J	16 J
alpha-chlordane	---	---
gamma-chlordane	0.83 J	---
Aroclor-1254	---	---
Aroclor-1260	---	---
Total (Allowed) Hold Time	12(14)d	12(14)d
ELEVated/DECReased CRQL	ELEV	ELEV
Dilution Factor	1.0	1.0

TABLE 4.22.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 22

AREA	TA-06	TA-06	TA-06	TA-33-26	TA-33-26	TA-33-26	TA-46	TA-46
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80301XW	LA80302XW	LA80303XW	LA80501XW	LA80502XW	LA80503XW	LA80601XW	LA80602XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA31101XW	LA31101XW	LA31101XW	LA20204XW	LA20204XW	LA20204XW	LA60502XW	LA60502XW
FIELD MEASUREMENTS								
Depth (ft)	1-1.25	1-1.25	1-1.25	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTES								
Antimony	---	---	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---	---	---
Barium	215	342	174	529	541	52.0	83.2	64.7
Beryllium	1.2	---	---	---	---	---	1.3	1.6
Cadmium	6.8	6.7	3.9 B	---	---	---	---	2.8 B
Chromium	20.2	20.0	12.1	6.1	4.0	3.5	---	4.9
Copper	---	12.3	---	7930	2830	---	c	---
Lead	---	---	---	---	---	---	---	---
Mercury[b]	---	---	---	NR	NR	NR	NR	NR
Nickel	---	---	---	---	---	---	---	---
Selenium	---	---	---	---	---	---	---	---
Silver	---	---	---	9.8	---	---	6.4 B	---
Thallium	---	---	---	---	---	---	---	---
Zinc	51.9	48.9	38.7	114	120	22.3	37.5	26.9
% Solids	83.2	67.7	80.4	93.0	94.4	95.1	91.9	88.9
Total (Allowed) Hold Time[a]	63(182)d	63(182)d	63(182)d	150(182)d	150(182)d	150(182)d	8(182)d	8(182)d
Total (Allowed) Hold Time[b]	63(28)d*	54(28)d*	54(28)d*					

a. ICP.
b. CVAAS.
c. Copper not quantitated due to suspected interference and/or external contamination.

TABLE 4.22.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-46	TA-46	TA-00L	TA-00L	TA-00L	TA-00L	TA-00L	TA-00L
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80603XW	LA80604XW	LA80701XW	LA80702XW	LA80703XW	LA80704XW	LA80705XW	LA80706XW
MEDIA	SOIL	SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA60502XW	LA60502XW	LA20204XW	LA20204XW	LA20204XW	LA20204XW	LA20204XW	LA20204XW
FIELD MEASUREMENTS								
Depth (ft)	0-0.5	0-0.5	0.5-1	1-2	0.5-1	1.5-3	0.5-1	1-3
ANALYTES								
Antimony	---	---	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---	---	---
Barium	74.5	49.5	88.8	124	90.7	103	172	112
Beryllium	1.7	1.4	---	---	---	1.9	---	---
Cadmium	---	---	9.3	3.9 B	3.4 B	4.2 B	4.9	8.2
Chromium	5.4	---	12.7	11.2	5.9	8.8	26.1	34.8
Copper	---	---	58.4	110	10.6	7.3	65.2	124
Lead	---	---	---	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR	NR	NR
Nickel	---	---	---	---	---	11.9	42.5	107
Selenium	---	---	---	---	---	---	---	---
Silver	---	---	---	---	---	---	---	---
Thallium	---	---	---	---	---	---	---	---
Zinc	25.9	19.2	387	251	47.3	40.3	88.3	69.7
% Solids	91.4	92.7	85.5	88.4	88.3	84.0	94.8	92.8
Total (Allowed) Hold Time[a]	8(182)d	8(182)d	153(182)d	153(182)d	153(182)d	153(182)d	153(182)d	150(182)d
Total (Allowed) Hold Time[b]								

a. ICP.
b. CVAAS.
c. Copper not quantitated due to suspected interference and/or external contamination.

TABLE 4.22.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-00L	TA-00L	TA-00L	TA-00L	TA-20	TA-20	TA-20	TA-20
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	AREA 1 PIT	AREA 1 PIT	AREA 1 PIT	AREA 1 PIT
SAMPLE NUMBER	LA80707XW	LA80708XW	LA80709XW	LA80710XW	LA81001XW	LA81002XW	LA81003XW	LA81004XW
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA20204XW	LA20204XW	LA20204XW	LA20204XW	LA20204XW	LA81002XW	LA81002XW	LA81002XW
FIELD MEASUREMENTS								
Depth (ft)	0.5-1	1	0.5-1	2-3	0-3	0-3	0-3	0-3
ANALYTES								
Antimony	---	---	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---	---	---
Barium	100	68.6	71.4	120	25.5 B	41.1 B	50.5	54.5
Beryllium	1.9	---	---	---	---	---	---	---
Cadmium	5.7	3.8 B	3.5 B	---	4.2 B	---	---	---
Chromium	12.0	6.8	4.7	5.9	24.8	3.8	4.8	4.9
Copper	11.0	---	14.6	---	619	---	---	---
Lead	---	---	---	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR	NR	NR
Nickel	---	---	---	---	---	---	---	---
Selenium	---	---	---	---	---	---	---	---
Silver	---	---	---	---	---	---	---	---
Thallium	---	---	---	---	---	---	---	---
Zinc	42.3	34.0	53.4	23.8	70.9	26.4	25.6	27.2
% Solids	81.6	90.3	89.8	92.3	92.2	91.5	93.4	91.9
Total (Allowed) Hold Time[a]	150(182)d	153(182)d	153(182)d	153(182)d	150(182)d	156(182)d	156(182)d	156(182)d
Total (Allowed) Hold Time[b]								

a. ICP.
b. CVAAS.
c. Copper not quantitated due to suspected interference and/or external contamination.

TABLE 4.22.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-33-26	TA-33-26	TA-33-26	TA-50	TA-50	TA-50
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	MDA-C	MDA-C	MDA-C
SAMPLE NUMBER	LA84701XW	LA84702XW	LA84703XW	LA84801XW	LA84802XW	LA84803XW
MEDIA	SED	SED	SED	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA60502XW	LA60502XW	LA60502XW	LA82901XW	LA82901XW	HA029A
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-1	0-1	0-1
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	135	76.2	26.6 B	27.6 B	89.0	106
Beryllium	---	---	---	---	---	---
Cadmium	2.8 B	3.3 B	---	---	---	---
Chromium	7.4	3.6	---	---	7.4	19.2
Copper	1570	2830	---	---	---	---
Lead	---	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	11.3	---	---	---	---	58.0
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	45.0	60.9	15.1	22.2	47.1	46.4
% Solids	98.7	98.2	98.0	83.4	79.0	76.6
Total (Allowed) Hold Time[a]	8(182)d	8(182)d	8(182)d	6(182)d	7(182)d	11(182)d
Total (Allowed) Hold Time[b]						

a. ICP.
b. CVAAS.
c. Copper not quantitated due to suspected interference and/or external contamination.

TABLE 4.22.6 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 22

AREA	TA-06	TA-06	TA-06	TA-33-26	TA-33-26	TA-33-26
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80301XY	LA80302XY	LA80303XY	LA80501XY	LA80502XY	LA80503XY
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL002	LANL002	LANL002	LANL008	LANL008	LANL008
FIELD MEASUREMENTS						
Depth (ft)	1-1.25	1-1.25	1-1.25	0-0.50	0-0.50	0-0.50
ANALYTES						
None detected						
Total (Allowed) Hold Time	19(14)d*	50(14)d*	19(14)d*	4(14)d	4(14)d	4(14)d

TABLE 4.22.6 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-00L	TA-00L	TA-00L	TA-00L	TA-00L	TA-00L
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80701XY	LA80702XY	LA80703XY	LA80704XY	LA80705XY	LA80706XY
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL007	LANL007	LANL007	LANL007	LANL007	LANL007
FIELD MEASUREMENTS						
Depth (ft)	.5-1.00	1.00-2.00	.5-1.00	1.5-3.00	.5-1.00	1.00-3.00
ANALYTES						
None detected						
Total (Allowed) Hold Time	5(14)d	5(14)d	5(14)d	5(14)d	5(14)d	5(14)d

TABLE 4.22.6 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-00L	TA-00L	TA-00L	TA-00L	TA-20	TA-20
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	AREA 1 PIT	AREA 1 PIT
SAMPLE NUMBER	LA80707XY	LA80708XY	LA80709XY	LA80710XY	LA81001XY	LA81002XY
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL007	LANL007	LANL007	LANL007	LANL008	LANL008
FIELD MEASUREMENTS						
Depth (ft)	0.5-1.00	1.00	0.5-1.00	2.00-3.00	0.00-3.00	0.00-3.00
ANALYTES						
None detected						
Total (Allowed) Hold Time	5(14)d	5(14)d	5(14)d	5(14)d	4(14)d	4(14)d

TABLE 4.22.6 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-20	TA-20	TA-33-26	TA-33-26	TA-33-26
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	AREA 1 PIT	AREA 1 PIT	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA81003XY	LA81004XY	LA84701XY	LA84702XY	LA84703XY
MEDIA	SS SOIL	SS SOIL	SED	SED	SED
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL008	LANL008	LANL002	LANL002	LANL002
FIELD MEASUREMENTS					
Depth (ft)	0.00-3.00	0.00-3.00	0-0.50	0-0.50	0-0.50
ANALYTES					
None detected					
Total (Allowed) Hold Time	4(14)d	4(14)d	8(14)d	8(14)d	8(14)d

TABLE 4.22.7 LOS ALAMOS NATIONAL LABORATORY - ASBESTOS DATA - ENVIRONMENTAL PROBLEM 22

AREA	TA-46	TA-46	TA-46	TA-46
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80601XS	LA80602XS	LA80603XS	LA80604XS
MEDIA	SOIL	SOIL	SOIL	SOIL
COMPOSITION	%	%	%	%
SDG NUMBER	LA31501XS	LA31501XS	LA31501XS	LA31501XS
FIELD MEASUREMENTS				
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS				
Amosite	1	1	1	----
Mineral Wool	1	----	----	----
Chrysotile	1	1	1	----
Cellulose	1	1	1	1
Soil Matter	96-100	97-100	97-100	99-100

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22

AREA	TA-06	TA-06	TA-06	TA-06	TA-06
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT	DISPOSALPIT
SAMPLE NUMBER	LA80301D	LA80301W	LA80302D	LA80302W	LA80303D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	na	<12050 ±900	na	<14600 ±1100	na
Uranium - 235	na	92.0 ±27.0	na	99.0 ±19.0	na
Uranium - 238[a]	na	<10710 ±840	na	<10880 ±850	na
Uranium - 238[b]	na	----	na	----	na
Uranium (all isotopes)[c]	8000 ±800	na	6000 ±600	na	8000 ±800
Plutonium - 238	<5.0	na	<7.0	na	29.0 ±24.0
Plutonium - 239,240	10.0 ±6.0	na	<9.0	na	76.0 ±26.0
Americium - 241	na	----	na	----	na
Beta Emitters					
Strontium - 90	<540	na	<580	na	670 ±540
Gamma Emitters					
Beryllium - 7	na	----	na	----	na
Potassium - 40	na	13700 ±1300	na	11760 ±950	na
Cobalt - 60	na	----	na	----	na
Cadmium - 109	na	----	na	----	na
Cesium - 137	na	----	na	----	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-06	TA-33-26	TA-33-26	TA-33-26
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	DISPOSALPIT	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80303W	LA80501D	LA80501W	LA80502D
MEDIA	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters				
Radium - 226	na	na	na	na
Thorium - 230	na	1200 ±400	na	1000 ±200
Thorium - 232[a]	<11040 ±800	na	<9250 ±730	na
Uranium - 235	----	na	4200 ±280	na
Uranium - 238[a]	<10040 ±810	na	<10270 ±860	na
Uranium - 238[b]	----	na	139000 ±12000	na
Uranium (all isotopes)[c]	na	338000 ±33800	na	380000 ±38000
Plutonium - 238	na	<15.0	na	<16.0
Plutonium - 239,240	na	<20.0	na	<21.0
Americium - 241	----	na	----	na
Beta Emitters				
Strontium - 90	na	na	na	na
Gamma Emitters				
Beryllium - 7	----	na	----	na
Potassium - 40	16000 ±1200	na	20800 ±1900	na
Cobalt - 60	----	na	----	na
Cadmium - 109	----	na	----	na
Cesium - 137	539 ±47.0	na	371 ±41.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-33-26	TA-33-26	TA-33-26	TA-46	TA-46
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80502W	LA80503D	LA80503W	LA80601D	LA80601W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	na	1100 ±300	na	1100 ±500	na
Thorium - 232[a]	<10220 ±710	na	<11380 ±810	na	<12200 ±1000
Uranium - 235	5280 ±350	na	2530 ±160	na	40.0 ±19.0
Uranium - 238[a]	<9770 ±760	na	<11830 ±880	na	<12500 ±1100
Uranium - 238[b]	155000 ±14000	na	75900 ±8500	na	----
Uranium (all isotopes)[c]	na	172000 ±17200	na	2000 ±200	na
Plutonium - 238	na	<39.0	na	<18.0	na
Plutonium - 239,240	na	<51.0	na	66.0 ±24.0	na
Americium - 241	----	na	----	na	----
Beta Emitters					
Strontium - 90	na	na	na	<640	na
Gamma Emitters					
Beryllium - 7	----	na	----	na	----
Potassium - 40	21600 ±1700	na	23000 ±2000	na	24000 ±3600
Cobalt - 60	----	na	----	na	----
Cadmium - 109	----	na	----	na	----
Cesium - 137	104 ±17.0	na	227 ±38.0	na	62.0 ±57.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-46	TA-46	TA-46	TA-46	TA-46
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80602D	LA80602W	LA80603D	LA80603W	LA80604D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	1200 ±300	na	3200 ±500	na	1800 ±500
Thorium - 232[a]	na	<11690 ±890	na	<14700 ±1100	na
Uranium - 235	na	54.0 ±14.0	na	98.0 ±20.0	na
Uranium - 238[a]	na	<11560 ±970	na	<13700 ±1100	na
Uranium - 238[b]	na	----	na	----	na
Uranium (all isotopes)[c]	3000 ±300	na	3000 ±300	na	2000 ±200
Plutonium - 238	<13.0	na	<5.0	na	<5.0
Plutonium - 239,240	<17.0	na	39.0 ±8.0	na	8.0 ±5.0
Americium - 241	na	----	na	----	na
Beta Emitters					
Strontium - 90	<620	na	<730	na	<990
Gamma Emitters					
Beryllium - 7	na	----	na	----	na
Potassium - 40	na	23500 ±2600	na	28100 ±2400	na
Cobalt - 60	na	----	na	----	na
Cadmium - 109	na	----	na	----	na
Cesium - 137	na	80.0 ±29.0	na	155 ±29.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-46	TA-00L	TA-00L	TA-00L	TA-00L
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80604W	LA80701D	LA80701W	LA80702D	LA80702W
MEDIA	SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	pCi/kgW	ug/kgD	pCi/kgW	ug/kgD	pCi/kgW
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<10330 ±810	na	<11580 ±860	na	<10820 ±770
Uranium - 235	71.0 ±30.0	na	63.0 ±30.0	na	124 ±27.0
Uranium - 238[a]	<9950 ±780	na	<11580 ±840	na	<11430 ±850
Uranium - 238[b]	----	na	----	na	----
Uranium (all isotopes)[c]	na	4000 ±400	na	6000 ±600	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Americium - 241	----	na	----	na	----
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Beryllium - 7	----	na	----	na	----
Potassium - 40	25700 ±2100	na	19800 ±1900	na	20100 ±1600
Cobalt - 60	----	na	----	na	----
Cadmium - 109	<2000	na	----	na	----
Cesium - 137	152 ±24.0	na	162 ±22.0	na	62.0 ±16.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-00L	TA-00L	TA-00L	TA-00L	TA-00L
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80703D	LA80703W	LA80704D	LA80704W	LA80705D
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/kgD	pCi/kgW	ug/kgD	pCi/kgW	ug/kgD
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	na	<12080 ±870	na	<13500 ±980	na
Uranium - 235	na	99.0 ±48.0	na	84.0 ±38.0	na
Uranium - 238[a]	na	<11710 ±870	na	<12200 ±1100	na
Uranium - 238[b]	na	----	na	----	na
Uranium (all isotopes)[c]	3000 ±300	na	3000 ±300	na	3000 ±300
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Americium - 241	na	----	na	----	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Beryllium - 7	na	----	na	----	na
Potassium - 40	na	21500 ±1900	na	20500 ±3400	na
Cobalt - 60	na	----	na	----	na
Cadmium - 109	na	----	na	----	na
Cesium - 137	na	119 ±27.0	na	----	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-00L	TA-00L	TA-00L	TA-00L	TA-00L
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80705W	LA80706D	LA80706W	LA80707D	LA80707W
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	pCi/kgW	ug/kgD	pCi/kgW	ug/kgD	pCi/kgW
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<9800 ±720	na	<10750 ±770	na	<12190 ±850
Uranium - 235	39.0 ±22.0	na	62.0 ±24.0	na	66.0 ±24.0
Uranium - 238[a]	<10180 ±780	na	<10670 ±840	na	<10380 ±770
Uranium - 238[b]	----	na	----	na	----
Uranium (all isotopes)[c]	na	3000 ±300	na	3000 ±300	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Americium - 241	----	na	----	na	----
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Beryllium - 7	----	na	----	na	----
Potassium - 40	19400 ±1500	na	21600 ±1800	na	17300 ±1900
Cobalt - 60	----	na	----	na	----
Cadmium - 109	----	na	----	na	----
Cesium - 137	199 ±25.0	na	131 ±23.0	na	269 ±21.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are <u>ug</u> (/L, /kgW, or /kgD) instead of <u>pCi</u> (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-00L	TA-00L	TA-00L	TA-00L	TA-00L
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA80708D	LA80708W	LA80709D	LA80709W	LA80710D
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/kgD	pCi/kgW	ug/kgD	pCi/kgW	ug/kgD
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	na	<14000 ±960	na	<10810 ±780	na
Uranium - 235	na	71.0 ±32.0	na	64.0 ±24.0	na
Uranium - 238[a]	na	<14600 ±1100	na	<11370 ±870	na
Uranium - 238[b]	na	----	na	----	na
Uranium (all isotopes)[c]	3000 ±300	na	4000 ±400	na	3000 ±300
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Americium - 241	na	----	na	----	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Beryllium - 7	na	----	na	270 ±100	na
Potassium - 40	na	23900 ±1700	na	22700 ±2100	na
Cobalt - 60	na	----	na	----	na
Cadmium - 109	na	----	na	----	na
Cesium - 137	na	----	na	30.0 ±21.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-00L	TA-20	TA-20	TA-20	TA-20
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	AREA 1 PIT	AREA 1 PIT	AREA 1 PIT	AREA 1 PIT
SAMPLE NUMBER	LA80710W	LA81001D	LA81001W	LA81002D	LA81002W
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	na	2400 ±300	na	3100 ±300	na
Thorium - 232[a]	<8630 ±640	na	<16900 ±1100	na	<16000 ±1100
Uranium - 235	63.0 ±24.0	na	94.0 ±36.0	na	97.0 ±42.0
Uranium - 238[a]	<8820 ±690	na	<17800 ±1200	na	<17000 ±1200
Uranium - 238[b]	----	na	----	na	----
Uranium (all isotopes)[c]	na	4000 ±400	na	4000 ±400	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Americium - 241	----	na	----	na	----
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Beryllium - 7	----	na	----	na	----
Potassium - 40	18100 ±1400	na	24400 ±1800	na	25000 ±2000
Cobalt - 60	----	na	----	na	----
Cadmium - 109	----	na	----	na	----
Cesium - 137	----	na	71.0 ±17.0	na	31.0 ±17.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-20	TA-20	TA-20	TA-20	TA-33-26
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	AREA 1 PIT	AREA 1 PIT	AREA 1 PIT	AREA 1 PIT	LANDFILL
SAMPLE NUMBER	LA81003D	LA81003W	LA81004D	LA81004W	LA84701D
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SED
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	3300 ±500	na	1700 ±300	na	4900 ±500
Thorium - 232[a]	na	<17300 ±1200	na	<16900 ±1100	na
Uranium - 235	na	123 ±27.0	na	116 ±27.0	na
Uranium - 238[a]	na	<17900 ±1200	na	<17300 ±1200	na
Uranium - 238[b]	na	----	na	----	na
Uranium (all isotopes)[c]	4000 ±400	na	4000 ±400	na	150000 ±15000
Plutonium - 238	na	na	na	na	34.0 ±7.0
Plutonium - 239,240	na	na	na	na	182 ±14.0
Americium - 241	na	----	na	----	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Beryllium - 7	na	----	na	----	na
Potassium - 40	na	25200 ±1900	na	24100 ±2200	na
Cobalt - 60	na	----	na	----	na
Cadmium - 109	na	----	na	----	na
Cesium - 137	na	79.0 ±30.0	na	60.0 ±16.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-33-26	TA-33-26	TA-33-26	TA-33-26	TA-33-26
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LANDFILL	LANDFILL	LANDFILL	LANDFILL	LANDFILL
SAMPLE NUMBER	LA84701W	LA84702D	LA84702W	LA84703D	LA84703W
MEDIA	SED	SED	SED	SED	SED
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Radium - 226	na	na	na	na	na
Thorium - 230	na	2500 ±800	na	1200 ±500	na
Thorium - 232[a]	<11720 ±920	na	<9930 ±820	na	<11170 ±850
Uranium - 235	1370 ±130	na	481 ±42.0	na	665 ±56.0
Uranium - 238[a]	<11010 ±910	na	<10130 ±830	na	<11000 ±980
Uranium - 238[b]	39000 ±6400	na	13900 ±6900	na	23100 ±3900
Uranium (all isotopes)[c]	na	55000 ±5500	na	65000 ±6500	na
Plutonium - 238	na	<14.0	na	<9.0	na
Plutonium - 239,240	na	<18.0	na	<11.0	na
Americium - 241	----	na	----	na	----
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Beryllium - 7	----	na	----	na	----
Potassium - 40	28600 ±2200	na	22300 ±3700	na	30300 ±2600
Cobalt - 60	27.0 ±24.0	na	----	na	----
Cadmium - 109	----	na	----	na	----
Cesium - 137	229 ±31.0	na	158 ±44.0	na	241 ±32.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-50	TA-50	TA-50	TA-50	TA-50
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	MDA-C	MDA-C	MDA-C	MDA-C	MDA-C
SAMPLE NUMBER	LA84801D	LA84801W	LA84802D	LA84802W	LA84803D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Radium - 226	800 ±260	na	900 ±280	na	900 ±310
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	na	<13500 ±1100	na	<12890 ±930	na
Uranium - 235	na	64.0 ±18.0	na	79.0 ±21.0	na
Uranium - 238[a]	na	<11600 ±1000	na	<12800 ±1000	na
Uranium - 238[b]	na	----	na	----	na
Uranium (all isotopes)[c]	4000 ±400	na	5000 ±500	na	6000 ±600
Plutonium - 238	<8.0	na	190 ±70.0	na	420 ±110
Plutonium - 239,240	328 ±27.0	na	7840 ±400	na	5280 ±370
Americium - 241	na	----	na	790 ±170	na
Beta Emitters					
Strontium - 90	<700	na	<720	na	<900
Gamma Emitters					
Beryllium - 7	na	----	na	----	na
Potassium - 40	na	26600 ±3200	na	24100 ±2400	na
Cobalt - 60	na	----	na	----	na
Cadmium - 109	na	----	na	----	na
Cesium - 137	na	160 ±61.0	na	395 ±38.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.22.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 22 (Continued)

AREA	TA-50
LOCATION	INACTIVE
TYPE OF LOCATION	MDA-C
SAMPLE NUMBER	LA84803W
MEDIA	SOIL
UNITS	pCi/kgW
Alpha Emitters	
Radium - 226	na
Thorium - 230	na
Thorium - 232[a]	<12700 ±1100
Uranium - 235	100 ±43.0
Uranium - 238[a]	<12200 ±1000
Uranium - 238[b]	----
Uranium (all isotopes)[c]	na
Plutonium - 238	na
Plutonium - 239,240	na
Americium - 241	310 ±130
Beta Emitters	
Strontium - 90	na
Gamma Emitters	
Beryllium - 7	----
Potassium - 40	21200 ±2400
Cobalt - 60	----
Cadmium - 109	----
Cesium - 137	291 ±49.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

4.23 Environmental Problem 23--Open Dumps and Boneyards

- Request Numbers: LA811, LA813, LA815, LA817, LA818, LA850, LA851, LA852, and LA856

- Requester: J. Clay/K. Sichelstiel

- Finding and Basis:

Open dumps and boneyards at LANL are potentially a source of radioactive and/or hazardous chemical contaminants that present a risk due to direct contact or that may migrate to surface soils and cause an environmental contamination problem.

Twenty-four open dumps and boneyards were visited during the survey. Piles of waste and radioactive equipment were observed exposed on the land surface at a number of the sites. Six open dumps and two boneyards were of particular concern based on the types of waste/material seen on the surface, proximity to drainage pathways, and accessibility to the site. Those sites are in the following technical areas:

Open Dumps	Boneyards
TA-0, MDA-M (LA811, LA850)	TA-14 (LA817)
TA-15, MDA-Z (LA813, LA851)	TA-36 (LA818, LA852)
TA-22 (LA815, LA856).	

4.23.1 Sampling and Analysis Objectives

- Statement

The S&A objective was to determine the presence of radioactive or hazardous chemical contaminants in surface soils in and around selected open dumps and boneyards. Evidence of contamination will be based on concentrations found in comparison with background levels (analysis performed using CLP suggested minimum detection limits).

Samples were biased toward stained areas, areas of elevated radiation readings, areas immediately adjacent to wastes or equipment, and low areas (where runoff would likely collect) that would serve as an accumulation point for contaminants.

4.23.2 Sampling and Analysis Design

- Sampling Design

Table 4.23.1 summarizes the sampling and analytical requests and the analyses performed.

LA811 and LA850: TA-0, MDA-M Open Dump. Seven targeted grab samples were collected as planned around the MDA-M open dump (LA811). Target grab sampling of surface soils/sediment was used because of the sites' extreme heterogeneity and the survey's interest in absolute contaminant concentrations in the sediment in drainage channels (migration pathways). A grab sample of soil/sediment was collected as planned from four separate major drainage channels immediately downgradient of the dump. Another sample was collected in the area containing visible amber and clear glass lab bottles. A sample was also collected from the area containing visible metal debris, paint/solvent cans, and trash cans. The final sample was collected from the area containing concrete debris (see Figure 4.23.1). Samples were collected from a depth of between 0 and 6 in. using a 3-in. dia stainless steel auger, based on visual observation of moisture or staining of the soil column. Field screening for organic vapors detected slightly elevated (2 ppm) concentrations at all but one sampling site (LA81104).

Several waste piles contained a material that appeared to be asbestos. Although the S&A Plan specified at least one sample would be collected for asbestos analysis, three grab samples of suspected bulk asbestos were collected from three representative waste piles (LA850).

<u>LA813 and LA851: TA-15, MDA-Z Open Dump</u>. Surface soil samples were collected as planned in and around the TA-15, MDA-Z open dump. Samples collected for chemical analysis (LA851) were composited (except volatile organic analysis grab samples) since detection of contaminant presence was the objective. Four spatial composite samples of surface soil were collected for LA851. Each composite consisted of four subsamples. Three of the composite sets were collected from the top of the dump area and adjacent area containing steel blast mats. The fourth composite sample was collected along the base of the downslope side of the landfill (see Figure 4.23.2).

A survey of the sampling locations for organic vapors produced one reading of 10 ppm at location LA85104. However, this may be a spurious reading because of the moderate rain during sampling. Surface soil samples were collected at a depth between 0 and 6 in., based on visual observation of any moisture or staining of the soil column. A portable radiation meter was used to bias samples collected for radiation analysis (LA813). A previous radiation survey detected up to 20,000 cpm in this area.

Five grab samples of surface soil were collected as planned for metals to ICP detection limits and radiation analyses for request number LA813 (see Figure 4.23.3). A radiological survey was performed before sampling began. Several areas covered with a grey-colored material were found to be contaminated. Three of these locations LA81301 (80 μR/h), LA81302-03 (2 μR/h), and LA81304-05 (1000 μR/h) were flagged and subsequently sampled. Many pieces of uranium oxide (yellow cake) were noticed throughout the area. These pieces of uranium oxide produced radiation measurement up to 114,000 cpm and 900 μR/h. Uranium oxide was visible at four of five locations (LA81302 was the exception). However, large uranium oxide pieces were not intentionally included in the samples. After sampling was completed, a piece of uranium oxide was surveyed with different field instruments. Results of the surveys indicated 8000 cpm alpha radiation and 30 μR/h at contact.

<u>LA815 and LA856: TA-22, Marsh Disposal Area</u>. Near surface soils from within the marshy area at TA-22 were collected as planned (LA815), as were subsurface soil samples at the downgradient perimeter of this area (LA856) (see Figure 4.23.4).

Due to uncertainty with regard to disposal history and potential high explosives, no direct coring was attempted within the marsh/disposal zone. Near surface soil samples were collected within the marsh and subsurface boring samples at the downgradient perimeter. It was assumed that any contaminants within the area would have migrated at least slightly beyond the perimeter in the shallow zone (5 ft or less) that would be detectable in soil core samples. Composite samples were collected because determination of the presence of contaminants was the primary concern. One near surface (1-ft depth) soil composite (consisting of four subsamples) was collected from each of three different regions within the marshy area in TA-22, east of Buildings 91 and 93, and north of Building 34 (LA815). In addition, three soil core composite samples were obtained on the downgradient east perimeter of the swamp (LA856). The core samples each were collected to a 5-ft depth. A 3-in. core section was removed at the surface and at 1-, 2-, 3-, 4-, and 5-ft depths; mixed; and a single composite obtained to reflect the average concentration throughout the core length. Three grab samples for volatile organic analysis were collected for both LA815 and LA856. Each sample was obtained from one of the composite subsamples based on elevated HNU photoionization detector readings, or at random when no organic vapors were detected. Elevated measurements were recorded only at location LA81503. A maximum of 100 ppm was measured at this location.

<u>LA817: TA-14, Boneyard Navy Drums</u>. Composite samples of surface soil were collected in the area where empty steel drums were stored. The drums had been used for a previous experiment.

Although the experiments with these drums were performed at a different location, it is assumed that their present storage (unprotected and outdoors) may be contributing contamination to the surrounding soil.

Three composite surface soil samples, each consisting of four subsamples, were collected using a 3-in. diameter stainless steel auger; sample LA81703 was collected from within an 8 x 30 ft area encompassing approximately 16 drums and adjacent to a large horizontal pressure vessel. A radiological survey was performed prior to sampling to bias samples. The old mat placement sites were determined to be contaminated (27-32 μR/h), and the cable mats were also slightly radioactive. Sample LA81702 was collected from the perimeter of the existing cable mats. Sample LA81701 was collected from within the former drum storage area. Figure 4.23.5 shows the locations and radiation measurements at the sampling locations. The former drum storage area (drums were removed in the interval between the survey and sampling) was not found to have detectable radioactivity. The area is located in the boneyard north of Building Q-34 and 40. Sample depth was 0 to 3 in.

<u>LA818 and LA852: TA-36, Boneyard</u>. Surface soil samples were collected as planned for radiation and chemical analyses at various points within the TA-36 boneyard.

Due to the high degree of heterogeneity and multiple areas of concern within the boneyard, target grab sampling was employed.

Samples for radiation analysis were biased using a radiation meter to select sampling points. Radiation readings up to 14,000 cpm were noted during the Survey Team investigation. The photoionization detector was used to field screen samples for volatile organic analysis for LA852.

Samples were collected from the boneyard in TA-36 on the east side of the road leading to Minie Firing Site. Six targeted grab samples of surface soil were collected for radioactivity analysis (LA818) (see Figure 4.23.6). A radiological survey of the TA-36 Boneyard was completed before sampling began. Four locations were identified as exhibiting above background radioactively: LA81801 (100 μR/h), LA81802 (100 μR/h), LA81804 (31 μR/h), and LA81805 (45 μR/h).

Six additional surface soil grab samples were collected using a 3-in. dia stainless steel auger from visibly stained areas or areas downgradient of debris/waste that could contribute contaminants to the surface soil (LA852) (see Figure 4.23.7). Samples were collected between 0 and 6 in. in depth, depending on visual observation of staining or moisture in the soil column. Only two samples for volatile organic analysis were collected (LA85203 and LA85204) based on field surveys for volatile organics that detected 2 ppm and 15 ppm.

- Analytical Design

A summary of sampling and analytical requests and completion information can be found in Table 4.23.1.

LA811 and LA850: TA-0, MDA-M Open Dump. Samples for LA811 were analyzed as planned for volatile organic compounds, metals to ICP detection limits, environmental asbestos, uranium, plutonium, ^{90}Sr, and gamma-emitting radionuclides. Samples for LA850 were analyzed for bulk asbestos only.

LA813 and LA851: TA-15, MDA-Z Open Dump. Samples for LA813 were analyzed as planned for high explosives, metals to ICP detection limits, gamma-emitting radionuclides, uranium isotopes, and thorium isotopes. Samples for LA851 were analyzed as planned for volatile organic compounds, high explosives, and metals to ICP detection limits. A field volatile organic screening technique was used to determine whether or not samples would be collected for laboratory analysis for volatile organics. Only samples collected from areas where the field test exhibited a positive result were analyzed (samples exhibiting positive readings for volatile organics were discarded and a new sample from that site was obtained for laboratory analysis).

LA815 and LA856: TA-22, Marsh Disposal Area. Samples were analyzed as planned for volatile organic compounds, high explosives, metals to ICP detection limits, and environmental asbestos.

LA817: TA-14, Boneyard Navy Drums. Samples were analyzed as planned for metals to ICP detection limits, uranium, plutonium, ^{90}Sr, and gamma-emitting radionuclides.

LA818 and LA852: TA-36, Boneyard. Samples for LA852 were analyzed as planned for volatile organic compounds, metals to ICP detection limits, and high explosives. Samples for LA818 were analyzed as planned for gamma-emitting radionuclides, uranium isotopes, high explosives, and metals to ICP detection limits.

4.23.3 Field and Analytical Data

- Field Data

The field spot tests for high explosives were negative for all samples. Other field data are included in the sampling design sections to add continuity to the discussions.

- Field Data Evaluation

None.

- Analytical Data

The analytical data for this environmental problem are summarized in Tables 4.23.2 through Tables 4.23.6. The results of the radiological measurements related to this problem are given in Table 4.23.7.

The Radiological Data section has been incorporated in this section to provide the reader with both analytical and radiological data for each location within this Environmental Problem.

<u>LA811 and LA8501: TA-0, MDA-M Open Dump</u>. There were no volatile organic target compounds detected in these samples from the MDA-M open dump (LA811). However, hydrocarbons were tentatively identified (see Analytical Data and QC Tables, Appendix E), which may be indicative of petroleum distillate contamination, such as fuel or oil at this site. There were eleven polyaromatic hydrocarbons semivolatile organic compounds detected in two of the seven samples (LA81106 and LA81107) at concentrations ranging from 42 to 860 µg/kg. Approximately one percent each amosite and chrysotile asbestos fibers were detected in one sample (LA81107). Barium (80 to 530 mg/kg), beryllium (0.4 to 1.2 mg/kg), chromium (7 to 19 mg/kg), copper (5 to 1700 mg/kg), nickel (5 to 58 mg/kg), and zinc (15 to 60 mg/kg) were detected in all seven of the samples. Lead was detected in three of the samples at concentrations ranging from 110 to 270 mg/kg. Silver also was detected in two of the samples at concentrations of 30 and 46 mg/kg. Three additional samples of suspected bulk asbestos were

collected from this location (LA850). One of the three samples contained 10% amosite and 5% chrysotile asbestos fibers (sample LA85002).

Cesium-137 (65 to 5500 pCi/kgW) and natural activities were observed in all ten of the samples collected from locations in the TA-0, MDA-M open dump (LA81101-LA81107 and LA85001-LA85003). Results of one sample (LA81105) indicated the presence of ^{238}Pu (5 pCi/kgD); two samples (LA81103 and LA81107) contained ^{90}Sr (540 and 560 pCi/kgD, respectively); and LA81101, LA81105, and LA81107 contained $^{239+240}$Pu (16, 26, and 1440 pCi/kgD, respectively). All seven of the samples for request LA811 contained measurable amounts of ^{235}U (61 to 107 pCi/kgW) and total uranium (2000 to 4000 μg/kgD).

<u>LA813 and LA851: TA-15, MDA-Z Open Dump</u>. Four composite soil samples (LA851) were collected from the top of the MDA-Z open dump at TA-15 and from the downslope side of the landfill. No high explosives were detected in any of the composite samples from the TA-15, MDA-Z landfill (LA851). 1,1,1-Trichloroethane was detected in all of the LA851 samples at concentrations ranging from 2 to 3 μg/kg. Acetone, toluene, and four aromatic TICs also were detected in one of the four samples at concentrations less than 26 μg/kg. Metals detected in all of the LA851 samples include barium (68 to 130 mg/kg), beryllium (1 to 10 mg/kg), and zinc (20 to 38 mg/kg). Cadmium (approximately 3 mg/kg) and chromium (8 to 11 mg/kg) were detected in two of the four samples. Copper was detected in three of the samples at concentrations ranging from 44 to 130 mg/kg. Nickel and silver were also detected in one of the samples at 14.0 and 15.3 mg/kg, respectively.

All four of the samples obtained for request LA851 contained natural activity and two contained ^{137}Cs (LA85110 at

210 pCi/kgW and LA85104 at 365 pCi/kgW), ^{235}U (LA85102 at 1290 pCi/kgW and LA85103 at 3030 pCi/kgW), and ^{238}U in excess of the natural equilibrium amount (LA85101 at 144,000 pCi/kgW and LA85103 at 297,000 pCi/kgW).

Five additional grab soil samples (LA813) were collected from areas in the MDA-Z open dump based on results of the field radiation survey. No high explosives were detected in any of these samples. Metals detected in all five grab samples include barium (84 to 140 mg/kg), beryllium (4 to 29 mg/kg), chromium (40 to 83 mg/kg), copper (130 to 1160 mg/kg), silver (17 to 52 mg/kg), and zinc (19 to 69 mg/kg). Cadmium (2 to 26 mg/kg), lead (120 to 430 mg/kg), and nickel (12 to 130 mg/kg) were also detected in three of the samples.

All five samples (LA813) contained natural activity, ^{26}Al (98 to 651 pCi/kgW), ^{235}U (32,600 to 184,000 pCi/kgW), ^{230}Th (600 to 13,800 pCi/kgD), total uranium (20,000,000 to 147,000,000 µg/kgD), and ^{238}U (3,690,000 to 24,100,000 pCi/kgW) in excess of the natural equilibrium amount. Three samples contained ^{234}U (871,000 to 1,440,000 pCi/kgW).

<u>LA815 and LA856: TA-22, Marsh Disposal Area</u>. Three surface soil samples (LA815) and five subsurface soils samples (LA856) were collected at the Marsh Disposal Area located at TA-22. There were no high explosives or asbestos fibers detected in any of the samples from this location. 1,1,1-Trichloroethane was detected in two of the three surface soil samples (LA815) at concentrations ranging from 5 to 6 µg/kg. Acetone (32 to 54 µg/kg), toluene (4 to 8 µg/kg), and 1,1,1-trichloroethane (2 to 3 µg/kg) were detected in two of the five subsurface soil samples (LA856). Ethylbenzene (19 µg/kg), and five aromatic TICs (17 to 86 µg/kg) were also detected in one of the subsurface soil samples. Metals detected in

all three of the surface soil samples (LA815) include barium (140 to 180 mg/kg), chromium (9 to 13 mg/kg), and zinc (30 to 40 mg/kg). Copper (43 and 66 mg/kg) was detected in two of the surface soil samples and cadmium (3.3 mg/kg) was detected in one of the samples. Metals detected in all five of the subsurface soil samples (LA856) include barium (110 to 150 mg/kg), copper (46 to 84 mg/kg), and zinc (24 to 34 mg/kg). Beryllium was detected in four of the subsurface samples at approximately 1 mg/kg. Cadmium (3 to 5 mg/kg) and chromium (20 to 70 mg/kg) were detected in three of the subsurface samples, and nickel (20 to 27 mg/kg) was detected in two of the samples.

In addition to the natural activities that were detected in all eight samples collected at the TA-22 Marsh (LA815 and LA856), ^{137}Cs was identified in three samples (LA81503, LA85602, and LA85603 at 410, 93, and 97 pCi/kgW, respectively) and ^{235}U was observed in LA81501 and LA81503, at 95 and 90 pCi/kgW, respectively.

<u>LA817: TA-14, Boneyard Navy Drums</u>. Three composite surface soil samples (LA817) were collected from around the old Navy drums located in the Boneyard at TA-14. Metals detected in all three of the soil samples include barium (130 to 210 mg/kg), cadmium (4 to 6 mg/kg), chromium (6 to 11 mg/kg), copper (10 to 65 mg/kg), and zinc (31 to 48 mg/kg). Beryllium (1 to 2 mg/kg) was also detected in two of the three samples.

All three samples obtained from the TA-14 boneyard contained natural activities: ^{137}Cs (210 to 381 pCi/kgW), ^{235}U (95 to 209 pCi/kgW), and total uranium (6000 to 31,000 µg/kgD). Two samples (LA81701 and LA81703) indicated the presence of $^{239+240}Pu$ (22 and 39 pCi/kgD, respectively). One sample, LA81701, had 16,700 pCi/kgW of ^{238}U in excess of that for equilibrium in this decay chain.

<u>LA818 and LA852: TA-36, Boneyard</u>. Six grab soil samples (LA818) were collected from areas with elevated radiation readings at the Boneyard at TA-36. Six grab samples (LA852) were also collected from areas that were visibly stained. There were no high explosives detected in any of the samples. Metals detected in all six samples for request number LA818 include barium (56 to 100 mg/kg), chromium (4 to 27 mg/kg), and zinc (13 to 52 mg/kg). In addition, sample LA81801 contained beryllium (1.5 mg/kg), copper (11.8 mg/kg), lead (154 mg/kg), and silver (19.7 mg/kg). Barium (57 to 140 mg/kg) and zinc (28 to 48 mg/kg) were detected in all six samples for LA852. Five of the six samples also contained chromium at concentrations ranging from 5 to 9 mg/kg. One of the samples contained beryllium at 1 mg/kg and one other sample contained copper at 23.1 mg/kg.

The twelve samples from the TA-36 boneyard showed a wide variety of activity levels. In the six samples for request LA818, natural activities, ^{137}Cs (133 to 1178 pCi/kgW), ^{235}U (80 to 486,000 pCi/kgW, with only two samples containing concentrations above 200 pCi/kgW - LA81801 with 486,000 pCi/kgW and LA81802 with 8520 pCi/kgW), and total uranium (600 to 8,040,000 µg/kgD, with only two samples containing concentrations above 10,000 µg/kgD - LA81801 with 8,040,000 µg/kgD and LA81802 with 870,000 µg/kgD) were detected in all samples. LA81801 also contained ^{26}Al (127 pCi/kgW) and excess ^{238}U (5,020,000 pCi/kgW), and LA81802 contained excess ^{238}U (621,000 pCi/kgW). The six samples for request 852 indicated only the presence of ^{137}Cs at 360 and 240 pCi/kgW in LA85201 and LA85204, respectively, along with the natural activities.

- Radiological Data

  The Radiological Data has been included with the Analytical Data section for the reader's convenience.

- Analytical Data Evaluation

  LA811 and LA850: TA-0, MDA-M Open Dump. There were no target volatile organic compounds detected in any of the seven grab samples except acetone in sample LA81107 (200 µg/kg). However, there were high concentrations of volatile organic hydrocarbons detected as TICs in the four samples collected from the drainage area in the northeast corner of the dump. There were no semivolatile organic target compounds detected in samples LA81101 through 05. Eleven semivolatile organic target compounds, primarily polyaromatic hydrocarbons, were detected in samples LA81106 and 07. These two samples were collected roughly in the center of the open dump near scrap metal and concrete debris. The presence of polyaromatic hydrocarbons may be indicative of petroleum distillate contamination.

  Barium, beryllium, and nickel were detected at comparable concentrations in each of the four samples collected from the drainage area (LA81101 to 04). Copper concentrations in samples 01, 02, and 04 were of comparable magnitude. However, the amount of copper found in sample 03 exceeded that observed in the other drainage area samples by a factor of twelve. Likewise, the zinc concentration detected in sample 01 exceeded the amounts found in the other samples by a factor of two to three. Lead was also detected in sample 01 at 202 mg/kg.

  Sample 05, collected next to discarded lab bottles, contained barium, beryllium, chromium, copper, and nickel in amounts comparable to those found in the drainage area samples. The amount of zinc detected in sample 05, although approximately twice as high as levels observed in samples 02, 03, and 04, was not as great as the amount detected in sample 01.

Sample 06, collected next to metal scrap, solvent cans, paint cans, and metals trash cans, also contained beryllium, chromium, and nickel in amounts comparable to those observed in the drainage area samples. Copper was detected at a level approximately six times greater than those found in samples 01, 02, and 04, but less than that found in sample 03. Barium, lead, silver, and zinc concentrations detected in this sample exceeded their respective MLDs by factors ranging from 6 to 16.

Sample 07, collected among concrete blocks and debris, contained beryllium and chromium concentrations comparable to those detected in the drainage area samples. Concentrations of barium, copper, lead, nickel, silver, and zinc detected in this sample were higher than those detected in any other sample from the MDA-M dump. Lead and nickel concentrations were approximately 6 times their respective MDLs. Concentrations of barium, copper, silver, and zinc exceeded their MDLs by factors of 40, 275, 20, and 150, respectively.

Approximately one percent amosite and chrysotile asbestos fibers were detected in sample LA81107. No asbestos fibers were detected in the other six samples.

Two of the samples (LA85001 and 03) collected as suspected bulk asbestos were composed of approximately 80 to 85% mineral wool and 15 to 20% cellulose fibers. Ten percent amosite and five percent chrysotile fibers were detected in sample LA85002. This sample was collected east of sample LA81107, which also contained asbestos fibers.

Gamma analyses showed the presence of ^{235}U (61 to 107 pCi/kgW) together with the natural activities. Cesium-137 was observed in six of the seven samples at levels of 65 to 1184 pCi/kgW. LA81101 indicated the presence of ^{134}Cs (64 pCi/kgW) and possibly ^{60}Cs (<40 pCi/kgW). Gamma screens for LA850 showed higher levels of activity with ^{137}Cs at 740 to 5500 pCi/kgW in all three samples along with some natural activity (^{40}K in three samples and the ^{238}U chain in one sample). LA85003 contained ^{235}U at 1440 pCi/kgW and possibly ^{56}Co (<720 pCi/kgW).

The other radiological measurements supported the fact that only low levels of radioactivity were observed at this location. The seven samples for LA811 were analyzed for ^{238}Pu, $^{239+240}Pu$, ^{90}Sr, and total uranium. Sample LA81105 indicated the presence of 5 pCi/kgD of ^{238}Pu, but ^{238}Pu was not detected in the others (lower limits of detection ranged from <6 to <150 pCi/kgD). Similarly, for $^{239+240}Pu$, four samples give limits of <20 to <28 pCi/kgD. The other values were 16 pCi/kgD (sample LA81101), 26 pCi/kgD (sample LA81105), and 1440 pCi/kgD (sample LA81107). The ^{90}Sr analyses yielded limits of <430 to <1000 pCi/kgD for five samples and 540 and 560 pCi/kgD for samples LA81103 and LA81107, respectively. Values of 2000 to 4000 μg/kgD were obtained for the total uranium concentrations in these seven samples.

No radiological measurements other than gamma screens were performed for the samples for LA850.

<u>LA813 and LA851: TA-15, MDA-Z Open Dump</u>. There were no high explosives detected in any of the samples collected at this location.

Metal concentrations exhibit a fair degree of variability between the five grab samples (LA813) biased to areas of elevated radioactivity. The highest concentrations of beryllium, copper, lead, and nickel were detected in sample 02. Cadmium and zinc concentrations were greatest in sample 03, while barium and chromium concentrations were greatest in sample 04. The highest silver concentration was detected in sample 05. The amount of beryllium found in sample 02 was two to eight times greater than levels observed in the other grab samples. Cadmium was detected in sample 03 at a level five to twelve times the amounts observed in samples 01 and 02. Sample 02 contains copper and nickel at concentrations that are at least three times higher than the amounts found in the other grab samples. The silver detected in sample 05 exceeded that found in the other samples by a factor of two to three.

Barium, beryllium, and zinc were detected at comparable concentrations in all three composite soil samples (LA851) collected from the top of MDA-Z dump area and adjacent to the steel blast mats. Sample 01, collected near the blast mats, also contained cadmium, nickel, and silver. Copper was found at the highest concentration in sample 02, at approximately three times the amount found in sample 01, and nearly twice the amount found in sample 03. The composite sample collected along the base of the downslope side of the landfill contained barium, beryllium, cadmium, and zinc in concentrations comparable to those found in the other three composite samples.

All four composite samples from TA-15 (LA851) contained comparable concentrations of 1,1,1-trichloroethane (2 to 3 μg/kg). Sample 04, collected along the base of the downslope side of the dump, also contained acetone (23 μg/kg), toluene (4 μg/kg), an aromatic TIC (12 μg/kg), and three terpene isomers (15 to 26 μg/kg). The terpene isomers could be naturally occurring byproducts from vegetation (pinion pine) in the area.

The samples from the TA-15, MDA-Z open dump contained mea[illegible]le radioactivity. The gamma analyses of the five samples obtained for LA813 showed the presence of ^{26}Al, ^{235}U, ^{238}U in excess of the equilibrium amount, and the natural activities in all samples, ^{234}U in three of the samples, and ^{56}Co in one sample. LA81305 exhibited the highest general activity and LA81302 the lowest. The activity ranges for ^{26}Al were 98 to 651 pCi/kgW; for ^{234}U, from 871,000 to 1,440,000 pCi/kgW (but not identified in samples LA81302 and LA81304); for ^{235}U, from 32,600 to 184,000 pCi/kgW; and for the excess ^{238}U, from 3,690,000 to 24,100,000 pCi/kgW. In sample LA81302, ^{56}Co was observed at 41 pCi/kgW.

The alpha spectral analyses of the samples from LA813 indicated the presence of ^{230}Th (600 to 13,800 pCi/kgD), a daughter of ^{238}U. The total uranium analyses gave high levels, from 20,000,000 to 147,000,000 μg/kgD. No other radiological analyses were performed on LA813.

Gamma screens were the only radiological measurements performed on the four samples collected at this location for LA851. They gave similar results, but with lower activities. Cesium-137 (210 and 365 pCi/kgW) was observed in two samples (LA85101 and LA85104). Samples LA85102 and LA85103 contained ^{235}U at 1290 and 3030 pCi/kgW and excess ^{238}U at 144,000 and 297,000 pCi/kgW, respectively. All four samples contained natural activities.

<u>LA815 and LA856: TA-22, Marsh Disposal Area</u>. There were no high explosives or asbestos fibers detected in any of the samples from this location.

1,1,1-Trichloroethane was detected in surface soil samples LA81501 and 03 at comparable concentrations (5 to 6 μg/kg). Acetone (32 to 54 μg/kg) and toluene (4 to 8 μg/kg) were detected in samples LA85601 and 03 collected from the downgradient eastern perimeter of the marsh. 1,1,1-Trichloroethane was detected at comparable concentrations (2 to 3 μg/kg) in subsurface soil samples LA85603 and 05. Ethylbenzene (19 μg/kg), and five aromatic TICs (17 to 86 μg/kg), were also detected in subsurface soil sample LA85601. The four terpene isomers detected in sample LA85601 may be attributable to byproducts from vegetation in the marsh or from petroleum products.

The three surface soil samples (LA815) contained comparable concentrations of barium, chromium, and zinc. Similar amount of copper were detected in samples 01 and 02. Sample 03, collected near a drum, also contained cadmium at a concentration greater than the IDL but less than the CRDL.

The subsurface soil samples (LA856) collected from the downgradient eastern perimeter of the marsh contained comparable concentrations of barium, copper, and zinc. Nickel was found at comparable levels in samples 01 and 05. Beryllium and cadmium were found in four and three of the samples, respectively, at concentrations less than the CRDLs. Chromium, detected in samples 01, 02, and 05, ranged in concentration from 20 mg/kg in sample 02 to 70 mg/kg in sample 01. Barium, cadmium, copper, and zinc concentrations found in the subsurface soils were comparable in magnitude to those found in the surface soils (LA815). Chromium concentrations in the subsurface soils were higher than those found in the surface soils by a factor of two to five.

Gamma screens detected natural activities in all eight samples. Cesium-137 was identified in LA81503, LA85602, and LA85603 at 410, 93, and 97 pCi/kgW, respectively; and ^{235}U was observed at 95 and 90 pCi/kgW in LA81501 and LA81503, respectively.

<u>LA817: TA-14, Boneyard Navy Drums</u>. Barium, cadmium, chromium, and zinc were found at comparable concentrations in all three composite samples. Beryllium was detected at similar levels in samples 01 and 03. Sample 03, collected near the horizontal pressure vessel, contained copper at a level approximately six times higher than those observed in the other two samples.

Gamma analysis indicated that all three samples contained some ^{137}Cs (210 to 381 pCi/kgW) and ^{235}U (95 to 209 pCi/kgW) in addition to the natural activities. One sample (LA81701) also contained excess ^{238}U (16,700 pCi/kgW).

The other radiological measurements on these three samples supported the gamma analyses results. Two samples (LA81701 and LA81703) indicated the presence of $^{239+240}Pu$ (22 and 39 pCi/kgD, respectively) while sample LA81702 contained <29 pCi/kgD. Neither ^{238}Pu (detection limits ranging from <6 to <29 pCi/kgD) nor ^{90}Sr (detection limits ranging from <700 to <810 pCi/kgD) were detected in any of the samples. The total uranium analyses gave 31,000, 17,000, and 6000 μg/kgD, respectively.

<u>LA818 and LA852: TA-36, Boneyard</u>. There were no high explosives detected in any of the samples.

The six soil samples collected from areas of elevated radiation measurements (LA818) all contained similar concentrations of barium and zinc. Sample 01, collected from an area with a radiation reading of 100 μR/hr, also contained beryllium, chromium, copper, lead, and silver. Concentrations of chromium found in the other five grab samples were approximately three times less than the amount found in sample 01.

The six grab samples, collected from areas that were visibly stained (LA852), contained barium and zinc in comparable concentrations. Similar concentrations of chromium were also detected in samples 02 through 06. Copper was found in sample 02, collected near the steel ploate scrap pile. Sample 05, collected near county landfill waste, contained cadmium at a concentration less than the CRDL. Metals concentrations found in the samples from the stained areas (LA852) were generally comparable in magnitude to those found in the samples from the areas of elevated radiation measurements.

The samples for LA818 were analyzed for gamma activity and total uranium, while those for LA852 underwent gamma screening only. No other radiological measurements were performed on samples from this site.

A wide range of gamma-emitting activities was found in the samples collected for LA818. In addition to the natural activities, ^{137}Cs (133 to 1178 pCi/kgW) and ^{235}U (80 to 486,000 pCi/kgW) were observed in all six samples. Only two of the samples contained ^{235}U at concentrations above 200 pCi/kgW, namely, LA81801 with 486,000 pCi/kgW and LA81802 with 8520 pCi/kgW. Other gamma activities were also observed in these two samples: ^{26}Al at 127 pCi/kgW in sample LA81801 and excess ^{238}U at 5,020,000 pCi/kgW in LA81801 and at 621,000 pCi/kgW in sample LA81802.

The total uranium measurements indicated concentrations of 8,040,000 μg/kgD in sample LA81801, 870,000 μg/kgD in sample LA81802, and 6000 to 10,000 μg/kgD in samples LA81803-LA81806.

The gamma screens for samples from this location (LA852) indicated only the presence of ^{137}Cs at 360 and 240 pCi/kgW in samples LA85201 and LA85204, respectively, along with the natural activities.

- Radiological Data Evaluation

The Radiological Data Evaluation has been included with the Analytical Evaluation section for the reader's convenience.

4.23.4 Limitations and Qualifications

- Data Quality Level

The sampling design, sampling procedures, and documentation, are Quality Level I. Analytical data are generally Quality Level I or II.

- Field Data

None.

- Analytical Data

LA811 and LA850: TA-0, MDA-M Open Dump. Note that the CRQLs for the volatile organic data are elevated by at least a factor of five due to only 1 g of sample used for analysis. These elevated CRQLs may result in false negatives. No target compounds were detected in the samples that were not detected in the blank; however, there were numerous hydrocarbons TICs found. The tentatively identified compounds listed for samples LA81102 and LA81103 may be chromatographic carryover from sample LA81101, which was analyzed previous to these samples. For sample LA81107, the hydrocarbon reported is not a TIC but only baseline noise.

There were insufficient data submitted to verify identification of the semivolatile organic compounds fluoranthene and chrysene detected in sample LA81106. Identification of phenanthrene, dibenz (a,h) anthracene, benzo (g,h,i) perylene, and indeno (1,2,3-cd) pyrene detected in sample LA81107 were also questionable as false positives due to poor mass spectral data.

Analytes detected in the bulk and environmental asbestos samples at or less than 1% composition could not be accurately quantitated. Minimal QC information was provided with these samples to assess the data quality. No data for control samples were provided.

Thallium was determined by GFAAS because the ICP instrument used did not have thallium analysis capability. However, because GFAAS is the more sensitive method, there is no adverse impact on data quality. Copper was detected in the preparation blank associated with all samples except LA81101, at 2.0 mg/kg. Reported copper concentrations for these samples may have comparable high bias.

<u>LA813 and LA851: TA-15, MDA-Z Open Dump</u>. The value for 1,1,1-trichloroethane for this sample may be biased low by 40%, due to high response factor in the continuing calibration. There is no adverse impact to the usability of the high explosive data indicated by the quality control data associated with these samples. RDX was detected at 5.4 $\mu g/g$ (detection limit 2.0 $\mu g/g$) in sample LA81302 on the primary column; however, the data reported indicate that this munition was not detected on the confirmation column. The QC table shows a 'C1' next to the detection limit for RDX to indicate that this munition was detected on the primary column and not confirmed. Because the munition was not confirmed, the data are not reported on the tables.

<u>LA813</u>: Nickel, silver, and chromium were detected in the preparation blank associated with metals analysis at 6.7 mg/kg, 3.7 mg/kg, and 18.8 mg/kg, respectively (iron and manganese were also detected in the preparation blank; stainless steel contamination is suspected). Reported values for these elements may exhibit similar high bias. Reported beryllium concentrations may also have high bias due to 0.9 mg/kg beryllium found in the associated QC blanks. The matrix spike recovery for silver (28.2%) was outside the 75 to 125% control limit. Therefore, reported concentrations for silver may be biased low by as much as 250%, and true silver concentrations may be as much as 350% of the reported values. Internal standard was added incorrectly to the matrix spike sample for beryllium, cadmium, and chromium. Therefore, no actual spike recoveries could be calculated for these elements. However, based on the data, it appears that half

the required amount of internal standard was added, which would have made the spiked sample results high by a factor of two. Based on this assumption, spike recoveries would be 65%, 71%, and 41%, for beryllium cadmium, and chromium, respectively. Therefore, reported values for beryllium, cadmium, and chromium may be biased low by 54%, 41%, and 144%, respectively. True values for these elements may be 154%, 141%, and 244% of reported concentrations, respectively. Duplicate RPDs were greater than the 20% control limit for chromium (57.3%) and zinc (21.5%). These RPDs indicate that the imprecision associated with these measurements is higher than normal. Chromium cross-contamination, as indicated by the preparation blank results, may be a contributing factor to both the low matrix spike recovery (i.e., sample results high due to contamination) and to the high imprecision indicated by the duplicate RPD.

<u>LA851</u>: Samples LA85101 and 02 were analyzed for metals to ICP detection limits in a common analytical batch (SDG). Reported silver concentrations for these samples may be biased high due to 3.3 mg/kg silver found in the associated preparation blank. Matrix spike results, as calculated, indicated a high bias to all element concentrations except copper and zinc. Matrix spike recoveries for barium, beryllium, cadmium, chromium, nickel, and silver ranged between 135% to 177%. Resultant high bias to the reported results may result in true concentrations for these elements be only 56% to 74% of the reported concentrations. Given the general consistency of the high spike recoveries, an error in internal standard addition to the spiked sample would also explain the apparent high recoveries. However, without supporting data for this assumption, no further conclusions may be drawn.

Samples LA85103 and 04 were analyzed for metals to ICP detection limits in a common analytical batch with the samples from request LA813. Therefore, the limitations and qualifications given previously for LA813 also apply to samples LA85103 and 04.

<u>LA815 and LA856: TA-22, Marsh Disposal Area</u>. No limitations or qualifications are associated with the volatile organic data for samples LA81501 and 02, and LA85601 and 02. The response factor value for 1,1,2-trichloroethane on the continuing calibration associated with sample LA81503 is suspiciously low (0.01). It is likely that there may have been a retention time shift that caused poor integration of the 1,1,2-trichloroethane peak, thus causing a response of 0.01. There is minimal adverse impact on the data; although, there is a possibility of false negatives for this compound.

Analysis of samples LA81503, LA85604, and LA85605 exceeded the total holding time by 2 days. There is a possibility for false negatives and reported concentrations for compounds that were detected in these samples may be biased low.

Values for 1,1,1-trichloroethane detected in sample LA81503 and LA85605 may be biased low by 34% due to high response factor in the continuing calibration. If the initial calibration response factor is used to quantitate 1,1,1-trichloroethane, the concentrations would be 7 and 3 $\mu g/kg$, respectively. The reported value for 1,1,1-trichloroethane detected in sample LA85603 may be biased low by 39% due to high response factor of 0.78 in the continuing calibration (39%D). If the initial calibration response factor is used to quantitate 1,1,1-trichloroethane, the value would be 4 $\mu g/kg$.

There were no munitions detected in any of the samples analyzed for high explosives from TA-22, and there are no limitations or qualifications associated with these data.

Minimal QC information provided with the environmental asbestos data to assess the data quality, and no data for control samples was provided.

Samples from request LA815 were analyzed for metals to ICP detection limits in a common analytical batch with sample LA85101 and LA85102. Therefore, the same limitations and qualifications that were previously presented for these two sample also apply to all samples for request LA815. Samples from request LA856 were analyzed in a common analytical batch with samples from LA813. Limitations and qualifications presented for LA813 also apply to LA856.

LA817: TA-14, Boneyard Navy Drums. Cadmium (1.7 mg/kg) and beryllium (1.2 mg/kg) were detected in the QC blanks associated with these samples. Therefore, reported concentrations for these elements may be biased high by comparable amounts. Two matrix spikes were performed in association with these samples. Recovery for copper (1680%) was outside the 75-125% control limits for the first spike, but was in control for the second spike. For the spike recovery, which was out of control, the sample result for copper was higher by an order of magnitude than the spiked sample result, which suggests possible sample inhomogeneity, external contamination, or an unidentified interference. The duplicate RPD for chromium (42.1%) was outside the 20% control limit. The imprecision associated with the chromium quantitation is therefore higher than normal, and the true chromium concentrations may be between $\pm$40% of the reported values.

Sample LA81801 was analyzed for metals to ICP detection limits in a common analytical batch with samples from LA813. Limitations and qualifications presented for LA813 also apply to LA81801.

Samples LA81802 through 06 were analyzed for metals to ICP detection limits in a common analytical batch. Associated QC data do not indicate any adverse impact to data quality for these samples.

Samples from request LA852 were analyzed for metals to ICP detection limits in a common analytical batch. Reported beryllium concentrations may have high bias due to 0.4 mg/kg beryllium detected in the associated QC blanks. QC blank results for chromium were consistently less than the negative CRDL. Results of standards run at twice the CRDL for chromium (approximately 4 mg/kg) indicate that the analytical accuracy for this element at the low end of the calibration range was only 50% of the true value (i.e., true values may be 200% of reported chromium concentrations when reported values are 20 mg/kg or less).

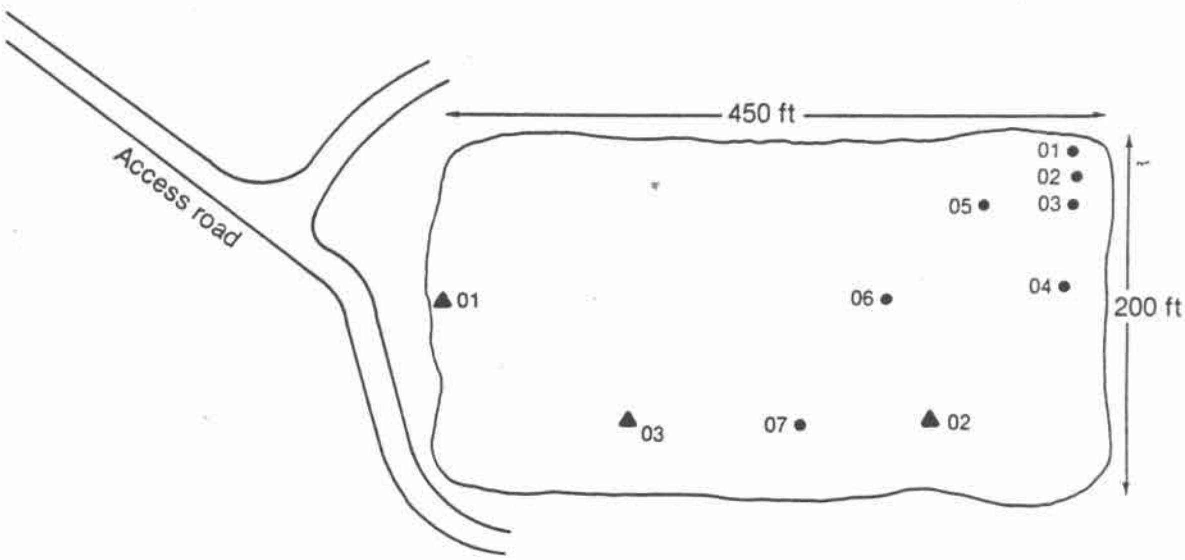
- Radiological Data

The results of QC checks indicate that the performance of the instruments and the analytical methods were adequate to ensure accuracy and reproducibility of the results obtained using them. In addition, the background seen by each instrument/detector was sufficiently low and constant to ensure accurate compensation for background effects.

The uncertainties cited in the tables for the total uranium results appear to be ten percent of the reported concentrations. Unfortunately, the uncertainties were reported with the same number of significant figures as the concentrations. Therefore, when using the total uranium results, the reader should round the uncertainties to one less significant figure.

Sampling Locations at the TA-O MDA-M Dump

NOTE: Sample locations and distances are approximate



SAMPLE SITE DESCRIPTIONS

● – LA811 - Samples 01, 02, 03 & 04 taken in drainage area.
Sample 05 collected next to amber and clear lab bottles.
Sample 06 collected next to metal scrap, solvent can, paint cans and metal trash cans.
Sample 07 collected among concrete blocks and debris.

▲ – LA850 - Samples 01, 02 & 03 were collected from waste containing suspected asbestos.

Figure 4.23.1

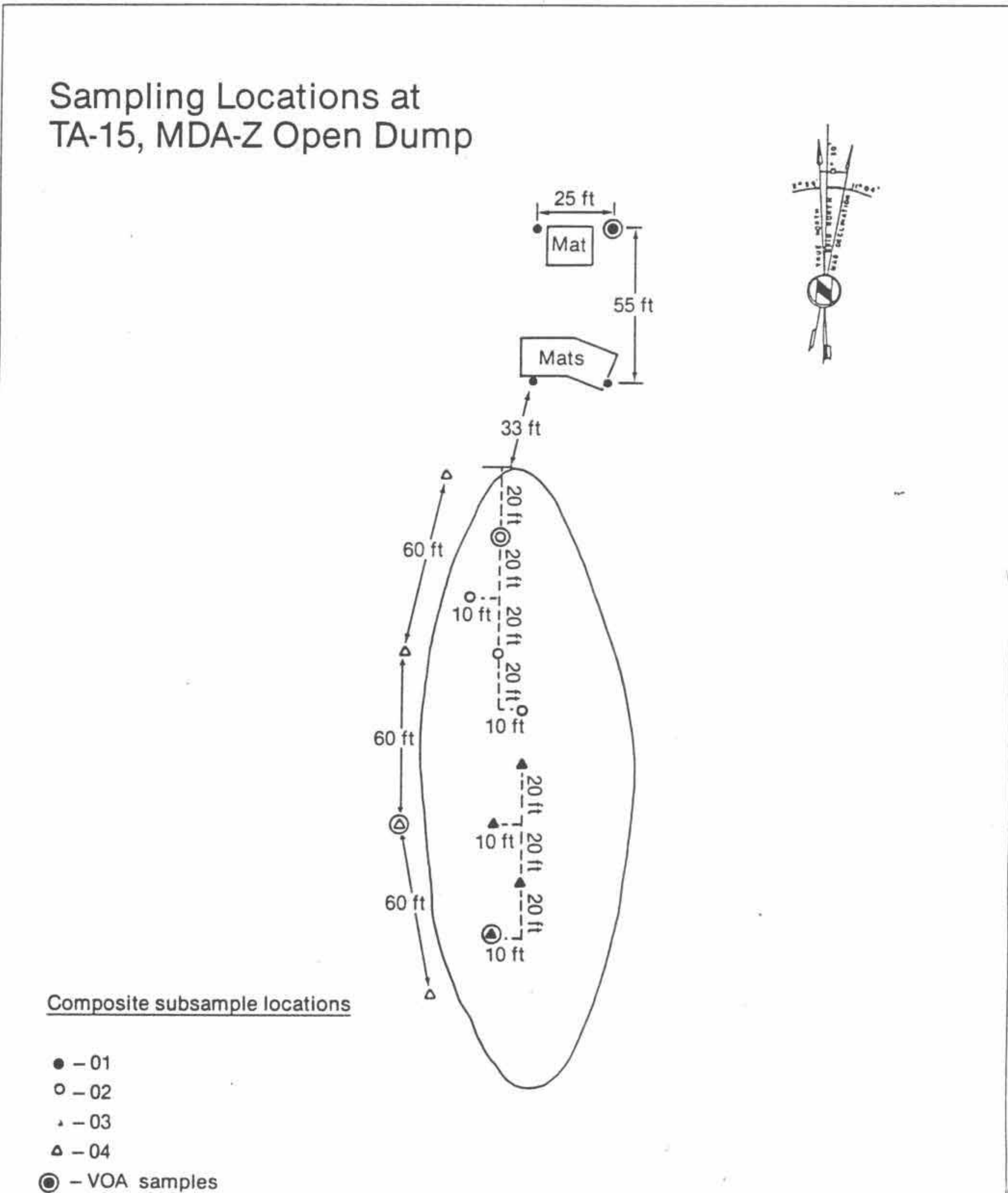

Sampling Locations at
TA-15, MDA-Z Open Dump
25 ft
Mat
55 ft
Mats
33 ft
60 ft
60 ft
60 ft
20 ft
20 ft
10 ft
20 ft
20 ft
10 ft
20 ft
10 ft
20 ft
20 ft
10 ft
Composite subsample locations
• – 01
o – 02
▴ – 03
Δ – 04
◉ – VOA samples

Figure 4.23.2

Sampling Locations at TA-15 MDA-Z Open Dump

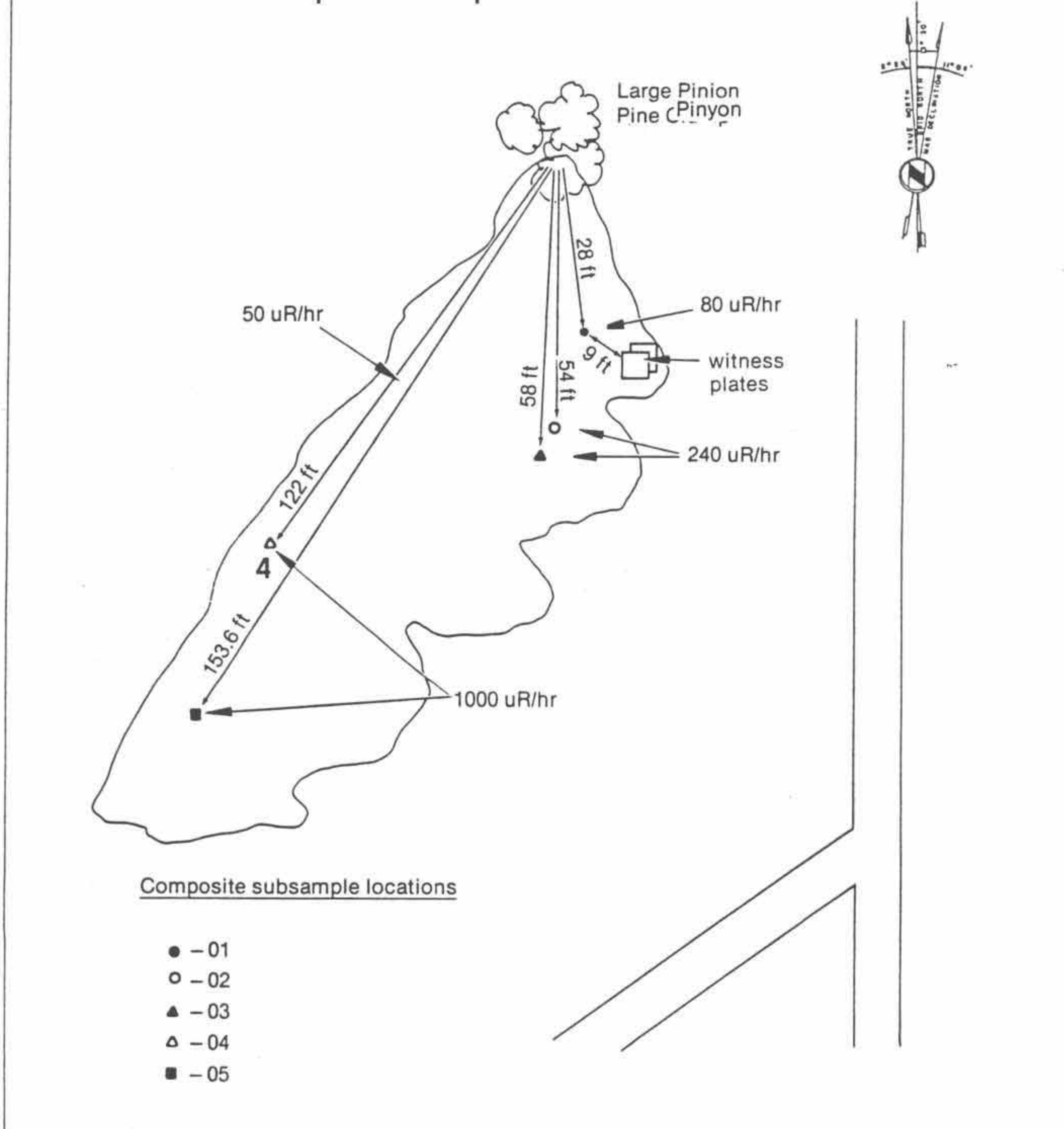


Figure 4.23.3

Sampling Locations at TA-22 Marsh

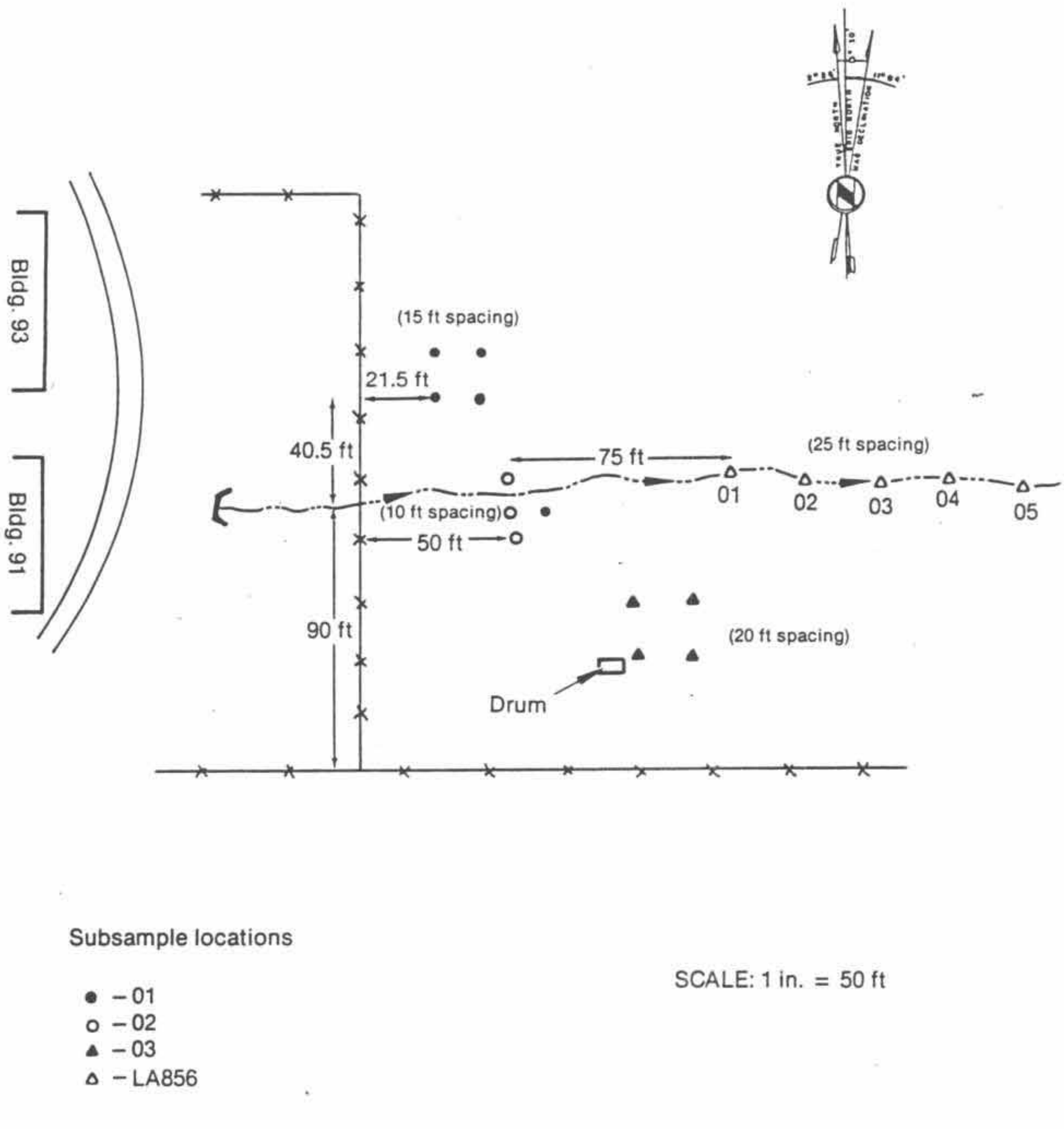
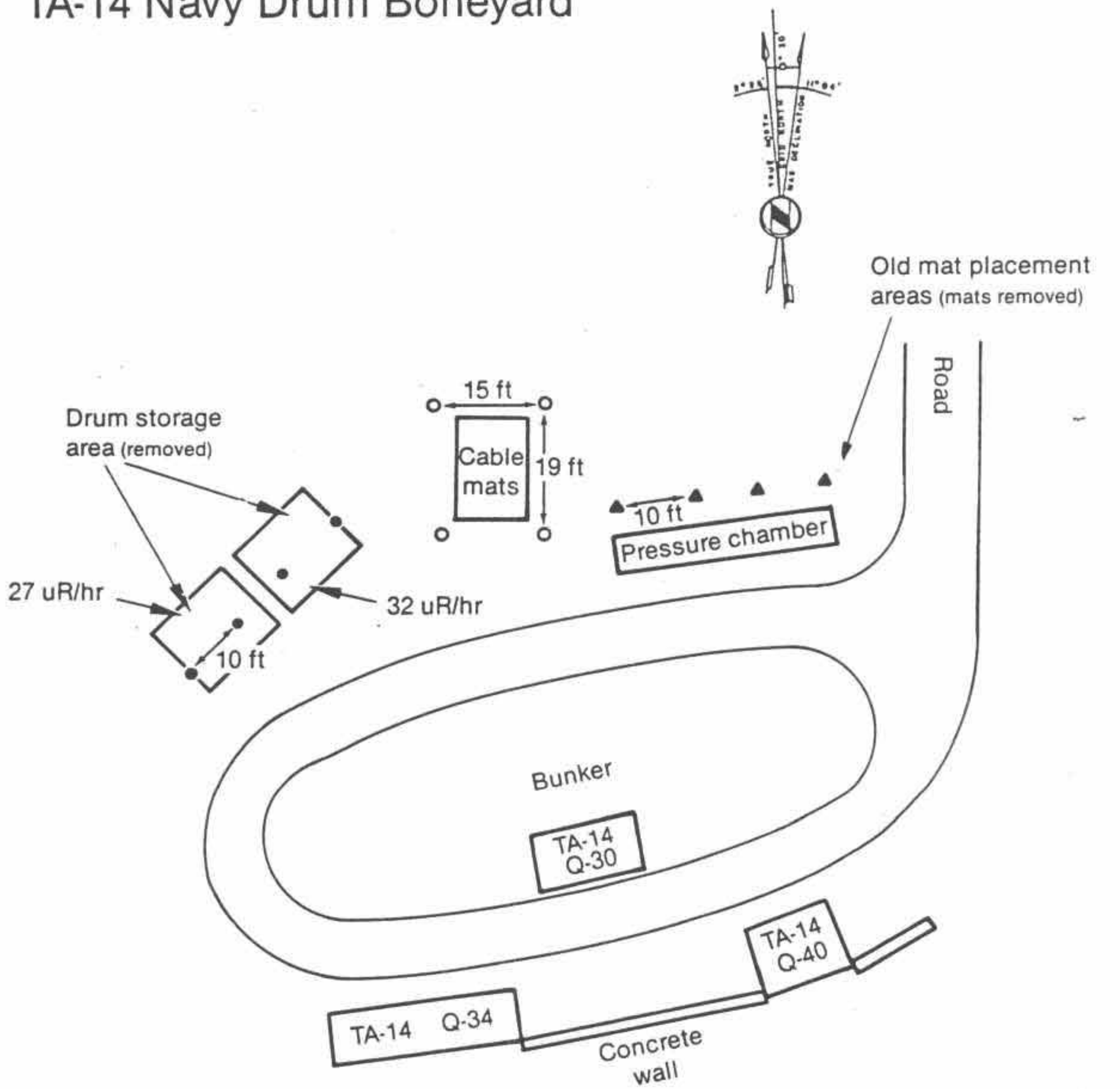


Figure 4.23.4

Sampling Locations at TA-14 Navy Drum Boneyard



Composite subsample locations

● – 01
○ – 02
▲ – 03

Figure 4.23.5

Sampling Locations at TA-36 Boneyard

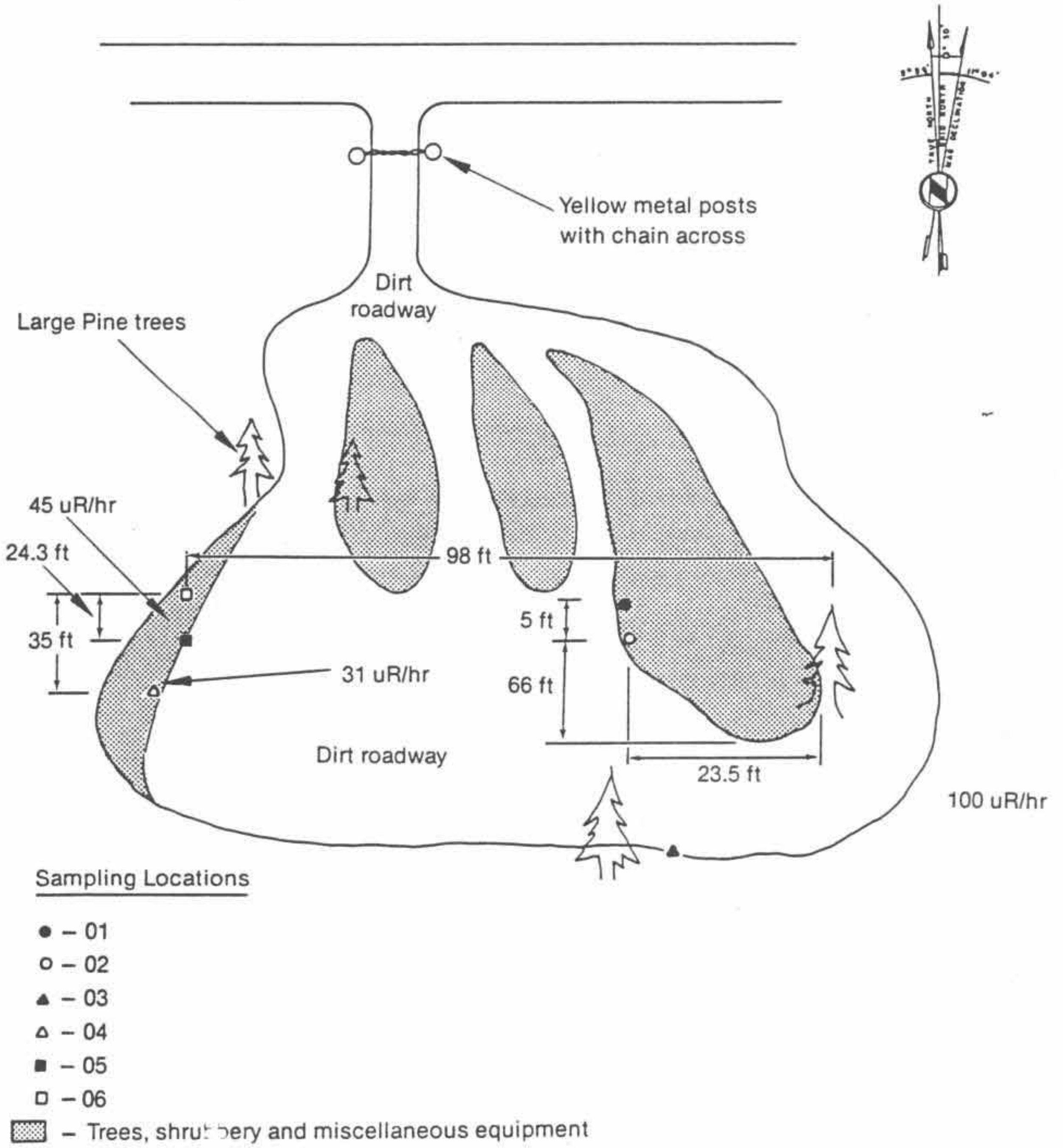


Figure 4.23.6

Sampling Locations at TA-36 Boneyard

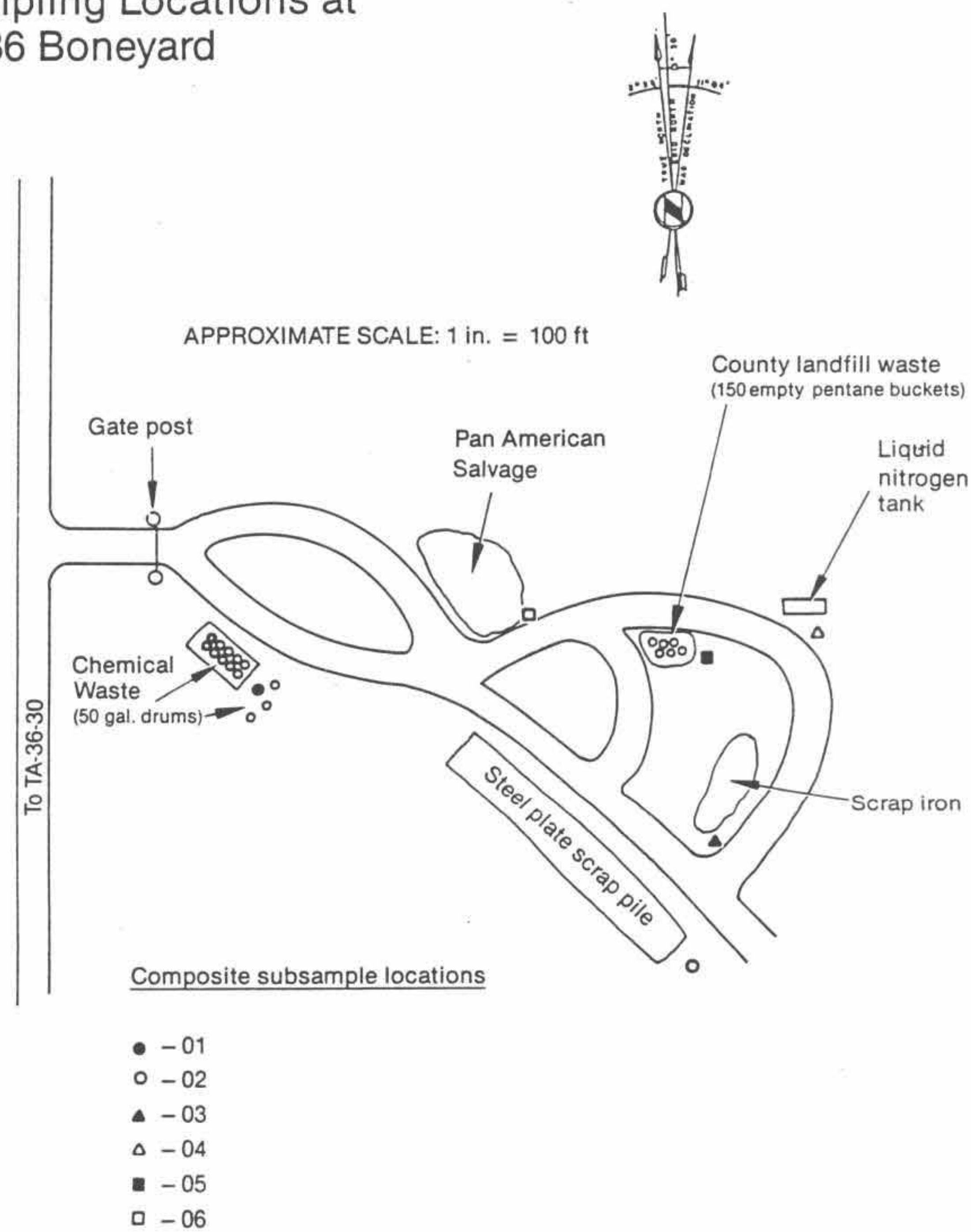


Figure 4.23.7

TABLE 4.23.1 LOS ALAMOS NATIONAL LABORATORY - COMPLETION TABLE - ENVIRONMENTAL PROBLEM 23

(Column Header Legend: P = Planned C = Collected A = Analyzed)
(Status Column Legend: Del = Deleted Dev = Deviation)

REQUEST NUMBER	SN	STAT	DATE COLLECTED mm/dd/yy	AREA	LOCATION	TYPE LOCATION	MEDIA	TYPE	NUMBER SAMPLES	
									P	C
LA811			06/10/88	TA-0	OPEN DUMP	MDA-M	SOIL	GRAB	7	7
LA813			05/24/88	TA-15	OPEN DUMP	MDA-Z	SOIL	GRAB	5	5
LA815			05/23/88	TA-22	MARSHY AREA	DISPOSAL	SOIL	S.COMP	3	3
LA817			05/16/88	TA-14	BONEYARD	OLD DRUMS	SOIL	S.COMP	3	3
LA818			05/25/88	TA-36	BONEYARD	BONEYARD	SOIL	GRAB	6	6
LA850		DEV	06/10/88	TA-0	OPEN DUMP	MDA-M	WASTE	GRAB	1	3
LA851			05/24/88	TA-15	OPEN DUMP	MDA-Z	SOIL	S.COMP	4	4
LA852			06/22/88	TA-36	BONEYARD	BONEYARD	SOIL	GRAB	6	6
LA856			05/24/88	TA-22	MARSHY AREA	DISPOSAL	SS SOIL	S.COMP	5	5
Totals for Problem Number 23									40	42

REQUEST NUMBER	VOLATILE			SEMI VOLATILE			ICP METALS			HIGH EXPL			ASBESTOS BULK			ASBESTOS ENVR			GAMMA ANALYSIS			PLUTO-NIUM			STRON-TIUM			THORIUM			TOTAL URANIUM		
	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A
LA811	7	7	7	7	7	7	7	7	7							7	7	7	7	7	7	7	7	7	7	7	7				7	7	7
LA813							5	5	5	5	5	5							5	5	5							5	5	5	5	5	5
LA815	3	3	3				3	3	3	3	3	3				3	3	3															
LA817							3	3	3										3	3	3	3	3	3	3	3	3				3	3	3
LA818							6	6	6	6	6	6							6	6	6							0	1	1	6	6	6
LA850													3	3	3																		
LA851	4	4	4				4	4	4	4	4	4																					
LA852	6	2	2				6	6	6	6	6	6																					
LA856	5	5	5				5	5	5	5	5	5				5	5	5															
Totals for Problem Number 23	25	21	21	7	7	7	39	39	39	29	29	29	3	3	3	15	15	15	21	21	21	10	10	10	10	10	10	5	6	6	21	21	21

TABLE 4.23.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 23

AREA	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M
SAMPLE NUMBER	LA81101XX	LA81102XX	LA81103XX	LA81104XX	LA81105XX	LA81106XX	LA81107XX
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA20803XX	LA20803XX	LA20803XX	LA20803XX	LA81105XX	LA81105XX	LA81105XX
FIELD MEASUREMENTS							
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS							
Acetone	---	---	---	---	---	---	220
1,1,1-Trichloroethane	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---
TENTATIVELY IDENTIFIED COMPOUNDS							
Aromatic	---	---	---	---	---	---	---
C4 Benzene	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H16O	---	---	---	---	---	---	---
Terpene C10H16O	---	---	---	---	---	---	---
Total (Allowed) Hold Time	10(14)d	10(14)d	10(14)d	10(14)d	11(14)d	11(14)d	13(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.23.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-22	TA-22	TA-22	TA-15	TA-15	TA-15	TA-15
LOCATION	MARSHY AREA	MARSHY AREA	MARSHY AREA	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	DISPOSAL	DISPOSAL	DISPOSAL	MDA-Z	MDA-Z	MDA-Z	MDA-Z
SAMPLE NUMBER	LA81501XX	LA81502XX	LA81503XX	LA85101XX	LA85102XX	LA85103XX	LA85104XX
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA82003XA	LA82003XA	LA81503XX	LA81503XX	LA81503XX	LA81503XX	LA81503XX
FIELD MEASUREMENTS							
Depth (ft)	0-1	0-1	0-1	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS							
Acetone	---	---	---	---	---	---	23 B
1,1,1-Trichloroethane	6 J	---	5 J	3 J	2 J	2 J	2 J
Toluene	---	---	---	---	---	---	4 J
Ethylbenzene	---	---	---	---	---	---	---
TENTATIVELY IDENTIFIED COMPOUNDS							
Aromatic	---	---	---	---	---	---	12 J
C4 Benzene	---	---	---	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	26 J
Terpene C10H16	---	---	---	---	---	---	15 J
Terpene C10H16	---	---	---	---	---	---	25 J
Terpene C10H160	---	---	---	---	---	---	---
Terpene C10H160	---	---	---	---	---	---	---
Total (Allowed) Hold Time	12(14)d	12(14)d	16(14)d*	11(14)d	13(14)d	11(14)d	11(14)d
ELEVated/DECReased CRQL	ELEV	DECR	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.23.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-36	TA-36	TA-22	TA-22	TA-22	TA-22	TA-22
LOCATION	BONEYARD	BONEYARD	MARSHY AREA	MARSHY AREA	MARSHY AREA	MARSHY AREA	MARSHY AREA
TYPE OF LOCATION	BONEYARD	BONEYARD	DISPOSAL	DISPOSAL	DISPOSAL	DISPOSAL	DISPOSAL
SAMPLE NUMBER	LA85203XX	LA85204XX	LA85601XX	LA85602XX	LA85603XX	LA85604XX	LA85605XX
MEDIA	SOIL	SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA82107XX	LA82107XX	LA81503XX	LA81503XX	LA81503XX	LA81503XX	LA81503XX
FIELD MEASUREMENTS							
Depth (ft)	0-0.5	0-0.5	1-5	1-5	1-5	1-5	1-5
TARGET COMPOUNDS							
Acetone	---	---	54 B	---	32 B	---	---
1,1,1-Trichloroethane	---	---	---	---	3 J	---	2 J
Toluene	---	---	4 J	---	8	---	---
Ethylbenzene	---	---	19	---	---	---	---
TENTATIVELY IDENTIFIED COMPOUNDS							
Aromatic	---	---	---	---	---	---	---
C4 Benzene	---	---	42 J	---	---	---	---
Terpene C10H16	---	20 J	17 J	---	---	---	---
Terpene C10H16	---	---	40 J	---	---	---	---
Terpene C10H16	---	---	---	---	---	---	---
Terpene C10H160	---	---	31 J	---	---	---	---
Terpene C10H160	---	---	86 J	---	---	---	---
Total (Allowed) Hold Time	14(14)d	14(14)d	11(14)d	11(14)d	13(14)d	15(14)d*	15(14)d*
ELEVated/DECReased CRQL			ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.23.3 LOS ALAMOS NATIONAL LABORATORY - SEMIVOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 23

AREA	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M
SAMPLE NUMBER	LA81101XV	LA81102XV	LA81103XV	LA81104XV	LA81105XV	LA81106XV	LA81107XV
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA20702XV	LA20702XV	LA20702XV	LA20702XV	LA20702XV	LA20702XV	LA20702XV
FIELD MEASUREMENTS							
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS							
Phenanthrene	---	---	---	---	---	---	42 J
Fluoranthene	---	---	---	---	---	43 J	83 J
Pyrene	---	---	---	---	---	44 J	79 J
Benzo(a)anthracene	---	---	---	---	---	100 J	79 J
Chrysene	---	---	---	---	---	120 J	110 J
Benzo(b)fluoranthene	---	---	---	---	---	420	230 J
Benzo(k)fluoranthene	---	---	---	---	---	410	220 J
Benzo(a)pyrene	---	---	---	---	---	440	130 J
Indeno(1,2,3-cd)pyrene	---	---	---	---	---	860	230 J
Dibenz(a,h)anthracene	---	---	---	---	---	640	92 J
Benzo(g,h,i)perylene	---	---	---	---	---	580	190 J
Total (Allowed) Hold Time	10(14)d	10(14)d	10(14)d	10(14)d	10(14)d	10(14)d	10(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.23.4 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 23

AREA	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M
SAMPLE NUMBER	LA81101XW	LA81102XW	LA81103XW	LA81104XW	LA81105XW	LA81106XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA91601XH	LA20501XW	LA20702XW	LA20702XW	LA20702XW	LA20702XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	79.8	105	139	83.7	100	275
Beryllium	0.42 B	0.66 B	0.86 B	0.50 B	0.48 B	1.2
Cadmium	---	---	---	---	---	---
Chromium	7.3	9.5	9.9	6.8	6.5	13.5
Copper	8.3	7.1	105	5.3	16.0	53.2
Lead[c]	202	---	---	---	---	110
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	6.4 B	6.4 B	9.4	4.9 B	5.7 B	12.0
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	---	29.9
Thallium	---	---	---	---	---	---
Zinc	73.9	21.1	29.5	15.0	58.5	182
% Solids	95.3	96.3	93.0	95.6	95.3	84.5
Total (Allowed) Hold Time[a]	46(182)d	17(182)d	46(182)d	46(182)d	46(182)d	46(182)d
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]	10(182)d	7(182)d	7(182)d	7(182)d	7(182)d	7(182)d

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.23.4 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-0	TA-15	TA-15	TA-15	TA-15	TA-15
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-M	MDA-Z	MDA-Z	MDA-Z	MDA-Z	MDA-Z
SAMPLE NUMBER	LA81107XW	LA81301XW	LA81302XW	LA81303XW	LA81304XW	LA81305XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA20702XW	LA20101XW	LA20101XW	LA20101XW	LA20101XW	LA20101XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.25	0-0.25	0-0.25	0-0.25	0-0.25
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	526	90.4	84.0	84.3	135	86.9
Beryllium	0.64 B	4.0	29.4	11.8	9.2	16.2
Cadmium	---	2.4 B	4.6	26.4	---	---
Chromium	18.7	40.2	51.7	43.8	82.9	70.7
Copper	1660	370	1160	335	197	132
Lead[c]	270	---	430	---	155	116
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	57.5	---	130	15.5	29.5	11.6
Selenium	---	---	---	---	---	---
Silver	45.9	24.2	16.6	18.3	19.5	51.8
Thallium	---	---	---	---	---	---
Zinc	661	31.0	58.7	69.1	42.8	18.8
% Solids	90.2	96.9	97.2	95.5	97.9	95.6
Total (Allowed) Hold Time[a]	46(182)d	100(182)d	100(182)d	100(182)d	100(182)d	100(182)d
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]	7(182)d					

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.23.4 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-22	TA-22	TA-22	TA-14	TA-14	TA-14
LOCATION	MARSHY AREA	MARSHY AREA	MARSHY AREA	BONEYARD	BONEYARD	BONEYARD
TYPE OF LOCATION	DISPOSAL	DISPOSAL	DISPOSAL	OLD DRUMS	OLD DRUMS	OLD DRUMS
SAMPLE NUMBER	LA81501XW	LA81502XW	LA81503XW	LA81701XW	LA81702XW	LA81703XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA31101XW	LA31101XW	LA31101XW	LA60502XW	LA60502XW	LA60502XW
FIELD MEASUREMENTS						
Depth (ft)	0-1	0-1	0-1	0-0.25	0-0.25	0-0.25
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	151	141	176	212	128	128
Beryllium	---	---	---	1.8	---	1.4
Cadmium	---	---	3.3 B	5.6	3.9 B	4.5
Chromium	11.5	9.0	13.0	10.9	6.4	8.2
Copper	66.2	43.2	---	10.7	10.0	65.4
Lead[c]	---	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	---	---	---	---	---	---
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	35.5	30.3	39.8	34.6	31.0	47.9
% Solids	75.3	70.0	81.8	91.2	94.2	94.8
Total (Allowed) Hold Time[a]	46(182)d	46(182)d	46(182)d	9(182)d	9(182)d	9(182)d
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]						

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.23.4 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-36	TA-36	TA-36	TA-36	TA-36	TA-36
LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD
TYPE OF LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD
SAMPLE NUMBER	LA81801XW	LA81802XW	LA81803XW	LA81804XW	LA81805XW	LA81806XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA20101XW	LA20201XW	LA20201XW	LA20201XW	LA20201XW	LA20201XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.25	0-0.25	0-0.25	0-0.25	0-0.25	0-0.25
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	70.7	55.5	100	86.6	68.3	56.6
Beryllium	1.5	---	---	---	---	---
Cadmium	---	---	---	---	---	---
Chromium	27.4	4.2	6.0	5.3	7.1	5.4
Copper	11.8	---	---	---	---	---
Lead[c]	154	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	---	---	---	---	---	---
Selenium	---	---	---	---	---	---
Silver	19.7	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	21.0	13.0	34.2	33.3	23.0	52.0
% Solids	87.3	93.1	83.4	86.2	89.7	92.8
Total (Allowed) Hold Time[a]	99(182)d	176(182)d	176(182)d	176(182)d	176(182)d	176(182)d
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]						

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.23.4 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-15	TA-15	TA-15	TA-15	TA-36	TA-36
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	BONEYARD	BONEYARD
TYPE OF LOCATION	MDA-Z	MDA-Z	MDA-Z	MDA-Z	BONEYARD	BONEYARD
SAMPLE NUMBER	LA85101XW	LA85102XW	LA85103XW	LA85104XW	LA85201XW	LA85202XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA31101XW	LA31101XW	LA20101XW	LA20101XW	LA81002XW	LA81002XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	129	67.5	76.6	111	56.8	73.9
Beryllium	2.0	3.3	10.2	1.2	---	---
Cadmium	2.6 B	---	---	3.2 B	---	---
Chromium	10.8	7.6	---	---	---	5.2
Copper	44.3	126	71.2	---	---	23.1
Lead[c]	---	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	14.0	---	---	---	---	---
Selenium	---	---	---	---	---	---
Silver	15.3	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	37.6	21.2	20.4	25.0	30.2	48.2
% Solids	88.2	93.4	94.4	81.9	96.0	94.7
Total (Allowed) Hold Time[a]	46(182)d	46(182)d	100(182)d	100(182)d	154(182)d	154(182)d
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]						

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.23.4 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-36	TA-36	TA-36	TA-36	TA-22	TA-22
LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	MARSHY AREA	MARSHY AREA
TYPE OF LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	DISPOSAL	DISPOSAL
SAMPLE NUMBER	LA85203XW	LA85204XW	LA85205XW	LA85206XW	LA85601XW	LA85602XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SS SOIL	SS SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA81002XW	LA81002XW	LA81002XW	LA81002XW	LA20101XW	LA20101XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	1-5	1-5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	113	101	139	130	124	151
Beryllium	---	---	1.0 B	---	1.3	1.2 B
Cadmium	---	---	---	---	---	4.8 B
Chromium	9.2	8.4	8.5	7.6	69.9	19.9
Copper	---	---	---	---	50.1	84.2
Lead[c]	---	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	---	---	---	---	27.0	---
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	31.4	34.0	28.9	27.9	27.5	34.4
% Solids	90.7	94.9	93.6	90.2	73.0	67.8
Total (Allowed) Hold Time[a]	154(182)d	154(182)d	154(182)d	154(182)d	100(182)d	100(182)d
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]						

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.23.4 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-22	TA-22	TA-22
LOCATION	MARSHY AREA	MARSHY AREA	MARSHY AREA
TYPE OF LOCATION	DISPOSAL	DISPOSAL	DISPOSAL
SAMPLE NUMBER	LA85603XW	LA85604XW	LA85605XW
MEDIA	SS SOIL	SS SOIL	SS SOIL
UNITS	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA20101XW	LA20101XW	LA20101XW
FIELD MEASUREMENTS			
Depth (ft)	1-5	1-5	1-5
ANALYTES			
Antimony	---	---	---
Arsenic	---	---	---
Barium	132	115	114
Beryllium	1.1 B	0.99 B	---
Cadmium	3.8 B	2.8 B	---
Chromium	---	---	43.0
Copper	78.7	45.7	47.2
Lead[c]	---	---	---
Mercury[b]	NR	NR	NR
Nickel	---	---	20.4
Selenium	---	---	---
Silver	---	---	---
Thallium	---	---	---
Zinc	25.6	25.6	23.8
% Solids	73.6	75.5	72.8
Total (Allowed) Hold Time[a]	100(182)d	100(182)d	100(182)d
Total (Allowed) Hold Time[b]			
Total (Allowed) Hold Time[c]			

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.23.5 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 23

AREA	TA-15	TA-15	TA-15	TA-15	TA-15	TA-22
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	MARSHY AREA
TYPE OF LOCATION	MDA-Z	MDA-Z	MDA-Z	MDA-Z	MDA-Z	DISPOSAL
SAMPLE NUMBER	LA81301XY	LA81302XY	LA81303XY	LA81304XY	LA81305XY	LA81501XY
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL003	LANL003	LANL003	LANL003	LANL003	LANL004
FIELD MEASUREMENTS						
Depth (ft)	0-0.25	0-0.25	0-0.25	0-0.25	0-0.25	0-1.00
ANALYTES						
None detected						
Total (Allowed) Hold Time	8(14)d	8(14)d	8(14)d	8(14)d	8(14)d	9(14)d

TABLE 4.23.5 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-22	TA-22	TA-36	TA-36	TA-36	TA-36
LOCATION	MARSHY AREA	MARSHY AREA	BONEYARD	BONEYARD	BONEYARD	BONEYARD
TYPE OF LOCATION	DISPOSAL	DISPOSAL	BONEYARD	BONEYARD	BONEYARD	BONEYARD
SAMPLE NUMBER	LA81502XY	LA81503XY	LA81801XY	LA81802XY	LA81803XY	LA81804XY
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL004	LANL004	LANL003	LANL003	LANL003	LANL003
FIELD MEASUREMENTS						
Depth (ft)	0-1.00	0-1.00	0-0.25	0-0.25	0-0.25	0-0.25
ANALYTES						
None detected						
Total (Allowed) Hold Time	9(14)d	9(14)d	7(14)d	7(14)d	7(14)d	7(14)d

TABLE 4.23.5 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-36	TA-36	TA-15	TA-15	TA-15	TA-15
LOCATION	BONEYARD	BONEYARD	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	BONEYARD	BONEYARD	MDA-Z	MDA-Z	MDA-Z	MDA-Z
SAMPLE NUMBER	LA81805XY	LA81806XY	LA85101XY	LA85102XY	LA85103XY	LA85104XY
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL003	LANL003	LANL004	LANL004	LANL004	LANL004
FIELD MEASUREMENTS						
Depth (ft)	0-0.25	0-0.25	0-0.50	0-0.50	0-0.50	0-0.50
ANALYTES						
None detected						
Total (Allowed) Hold Time	7(14)d	7(14)d	8(14)d	8(14)d	8(14)d	8(14)d

TABLE 4.23.5 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-36	TA-36	TA-36	TA-36	TA-36	TA-36
LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD
TYPE OF LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD
SAMPLE NUMBER	LA85201XY	LA85202XY	LA85203XY	LA85204XY	LA85205XY	LA85206XY
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL009	LANL009	LANL009	LANL009	LANL009	LANL009
FIELD MEASUREMENTS						
Depth (ft)	0-0.50	0-0.50	0-0.50	0-0.50	0-0.50	0-0.50
ANALYTES						
None detected						
Total (Allowed) Hold Time	6(14)d	6(14)d	6(14)d	6(14)d	6(14)d	6(14)d

TABLE 4.23.5 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-22	TA-22	TA-22	TA-22	TA-22
LOCATION	MARSHY AREA	MARSHY AREA	MARSHY AREA	MARSHY AREA	MARSHY AREA
TYPE OF LOCATION	DISPOSAL	DISPOSAL	DISPOSAL	DISPOSAL	DISPOSAL
SAMPLE NUMBER	LA85601XY	LA85602XY	LA85603XY	LA85604XY	LA85605XY
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL004	LANL004	LANL004	LANL004	LANL004
FIELD MEASUREMENTS					
Depth (ft)	1-5	1-5	1-5	1-5	1-5
ANALYTES					
None detected					
Total (Allowed) Hold Time	8(14)d	8(14)d	8(14)d	8(14)d	8(14)d

TABLE 4.23.6 LOS ALAMOS NATIONAL LABORATORY - ASBESTOS DATA - ENVIRONMENTAL PROBLEM 23

AREA	TA-22	TA-22	TA-22	TA-22	TA-22	TA-22	TA-22
LOCATION	MARSH	MARSH	MARSH	MARSH	MARSH	MARSH	MARSH
TYPE OF LOCATION	DISPOSAL	DISPOSAL	DISPOSAL	DISPOSAL	DISPOSAL	DISPOSAL	DISPOSAL
SAMPLE NUMBER	LA81501XS	LA81502XS	LA81503XS	LA85601XS	LA85602XS	LA85603XS	LA85604XS
MEDIA	SOIL	SOIL	SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
COMPOSITION	%	%	%	%	%	%	%
SDG NUMBER	LA31501XS	LA31501XS	LA31501XS	LA31501XS	LA31501XS	LA31501XS	LA31501XS
FIELD MEASUREMENTS							
Depth (ft)	0-1	0-1	0-1	1-5	1-5	1-5	1-5
TARGET COMPOUNDS							
Amosite	----	----	----	----	----	----	----
Mineral Wool	----	----	----	----	----	----	----
Chrysotile	----	----	----	----	----	----	----
Cotton	----	----	----	----	----	----	----
Cellulose	1	1	1	1	1	1	1
Filler	----	----	----	----	----	----	----
Soil Matter	99-100	99-100	99-100	99-100	99-100	99-100	99-100

TABLE 4.23.6 LOS ALAMOS NATIONAL LABORATORY - ASBESTOS DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-22	TA-0	TA-0	TA-0	TA-0	TA-0	TA-0
LOCATION	MARSH	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	DISPOSAL	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M
SAMPLE NUMBER	LA85605XS	LA81101XS	LA81102XS	LA81103XS	LA81104XS	LA81105XS	LA81106XS
MEDIA	SS SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
COMPOSITION	%	%	%	%	%	%	%
SDG NUMBER	LA31501XS	LA31501XS	LA31501XS	LA31501XS	LA31501XS	LA31501XS	LA31501XS
FIELD MEASUREMENTS							
Depth (ft)	1-5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS							
Amosite	----	----	----	----	----	----	----
Mineral Wool	----	----	----	----	----	----	----
Chrysotile	----	----	----	----	----	----	----
Cotton	----	----	----	----	----	----	----
Cellulose	1	1	1	1	1	1	1
Filler	----	----	----	----	----	----	----
Soil Matter	99-100	99-100	99-100	99-100	99-100	99-100	99-100

TABLE 4.23.6 LOS ALAMOS NATIONAL LABORATORY - ASBESTOS DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-0	TA-0	TA-0	TA-0
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-M	MDA-M	MDA-M	MDA-M
SAMPLE NUMBER	LA81107XS	LA85001XS	LA85002XS	LA85003XS
MEDIA	SOIL	WASTE	WASTE	WASTE
COMPOSITION	%	%	%	%
SDG NUMBER	LA31501XS	LA85001XS	LA85001XS	LA85001XS
FIELD MEASUREMENTS				
Depth (ft)	0-0.5	0-0.1	0-0.1	0-0.1
TARGET COMPOUNDS				
Amosite	1	----	10	----
Mineral Wool	----	85	30	80
Chrysotile	1	----	5	----
Cotton	----	----	10	----
Cellulose	1	15	30	20
Filler	----	----	15	----
Soil Matter	97-100	----	----	----

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23

AREA	TA-0	TA-0	TA-0	TA-0	TA-0
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M
SAMPLE NUMBER	LA81101D	LA81101W	LA81102D	LA81102W	LA81103D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	na	<13360 ±910	na	<11190 ±840	na
Uranium - 234	na	----	na	----	na
Uranium - 235	na	80.0 ±50.0	na	88.0 ±50.0	na
Uranium - 238[a]	na	<12670 ±980	na	<13700 ±1000	na
Uranium - 238[b]	na	----	na	----	na
Uranium (all isotopes)[c]	3000 ±300	na	3000 ±300	na	2000 ±200
Plutonium - 238	<6.0	na	<39.0	na	<27.0
Plutonium - 239,240	16.0 ±8.0	na	<32.0	na	<22.0
Beta Emitters					
Strontium - 90	<430	na	<1000	na	540 ±430
Gamma Emitters					
Aluminum - 26	na	----	na	----	na
Potassium - 40	na	17700 ±1300	na	18600 ±1600	na
Cobalt - 56	na	----	na	----	na
Cobalt - 60	na	<40.0	na	----	na
Cesium - 134	na	64.0 ±13.0	na	----	na
Cesium - 137	na	65.0 ±20.0	na	609 ±65.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-0	TA-0	TA-0	TA-0	TA-0
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-M	MDA-M	MDA-M	MDA-M	MDA-M
SAMPLE NUMBER	LA81103W	LA81104D	LA81104W	LA81105D	LA81105W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<13500 ±1100	na	<11500 ±860	na	<10760 ±850
Uranium - 234	----	na	----	na	----
Uranium - 235	61.0 ±62.0	na	73.0 ±40.0	na	107 ±33.0
Uranium - 238[a]	<12600 ±1200	na	<14400 ±1000	na	<12400 ±1100
Uranium - 238[b]	----	na	----	na	----
Uranium (all isotopes)[c]	na	3000 ±300	na	2000 ±200	na
Plutonium - 238	na	<24.0	na	5.0 ±5.0	na
Plutonium - 239,240	na	<20.0	na	26.0 ±7.0	na
Beta Emitters					
Strontium - 90	na	<620	na	<620	na
Gamma Emitters					
Aluminum - 26	----	na	----	na	----
Potassium - 40	17000 ±2100	na	19300 ±1600	na	19000 ±1900
Cobalt - 56	----	na	----	na	----
Cobalt - 60	----	na	----	na	----
Cesium - 134	----	na	----	na	----
Cesium - 137	164 ±45.0	na	----	na	545 ±68.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-0	TA-0	TA-0	TA-0	TA-15
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-M	MDA-M	MDA-M	MDA-M	MDA-Z
SAMPLE NUMBER	LA81106D	LA81106W	LA81107D	LA81107W	LA81301D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Thorium - 230	na	na	na	na	5600 ±2100
Thorium - 232[a]	na	<10870 ±810	na	<9330 ±750	na
Uranium - 234	na	----	na	----	na
Uranium - 235	na	101 ±38.0	na	86.0 ±28.0	na
Uranium - 238[a]	na	<9420 ±800	na	<10980 ±950	na
Uranium - 238[b]	na	----	na	----	na
Uranium (all isotopes)[c]	4000 ±400	na	4000 ±400	na	95400000 ±9540000
Plutonium - 238	<21.0	na	<150	na	na
Plutonium - 239,240	<28.0	na	1440 ±300	na	na
Beta Emitters					
Strontium - 90	<680	na	560 ±460	na	na
Gamma Emitters					
Aluminum - 26	na	----	na	----	na
Potassium - 40	na	14600 ±1300	na	16600 ±1700	na
Cobalt - 56	na	----	na	----	na
Cobalt - 60	na	----	na	----	na
Cesium - 134	na	----	na	----	na
Cesium - 137	na	1184 ±86.0	na	632 ±54.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-15	TA-15	TA-15	TA-15	TA-15
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-Z	MDA-Z	MDA-Z	MDA-Z	MDA-Z
SAMPLE NUMBER	LA81301W	LA81302D	LA81302W	LA81303D	LA81303W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Thorium - 230	na	600 ±400	na	1100 ±300	na
Thorium - 232[a]	<5100 ±1100	na	<5410 ±630	na	<7180 ±800
Uranium - 234	1070000 ±720000	na	na	na	871000 ±490000
Uranium - 235	105000 ±6600	na	32600 ±2000	na	73700 ±4500
Uranium - 238[a]	<9700 ±1600	na	<7700 ±1100	na	<8200 ±1700
Uranium - 238[b]	12700000 ±1000000	na	3690000 ±270000	na	8550000 ±620000
Uranium (all isotopes)[c]	na	20000000 ±2000000	na	37400000 ±3740000	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Aluminum - 26	344 ±40.0	na	98.0 ±21.0	na	196 ±35.0
Potassium - 40	13200 ±1400	na	14000 ±1100	na	16400 ±1600
Cobalt - 56	----	na	41.0 ±33.0	na	----
Cobalt - 60	----	na	----	na	----
Cesium - 134	----	na	----	na	----
Cesium - 137	----	na	----	na	----

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-15	TA-15	TA-15	TA-15	TA-22
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	MARSHY AREA
TYPE OF LOCATION	MDA-Z	MDA-Z	MDA-Z	MDA-Z	DISPOSAL
SAMPLE NUMBER	LA81304D	LA81304W	LA81305D	LA81305W	LA81501W[d]
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgW
Alpha Emitters					
Thorium - 230	2000 ±600	na	13800 ±3500	na	na
Thorium - 232[a]	na	<6060 ±700	na	----	<8500 ±900
Uranium - 234	na	----	na	1440000 ±480000	----
Uranium - 235	na	48400 ±3000	na	184000 ±11000	95.0 ±50.0
Uranium - 238[a]	na	<8000 ±1100	na	<8000 ±3600	<6100 ±1300
Uranium - 238[b]	na	5670000 ±410000	na	24100000 ±1800000	----
Uranium (all isotopes)[c]	31100000 ±3110000	na	147000000 ±14700000	na	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Aluminum - 26	na	149 ±148	na	651 ±60.0	----
Potassium - 40	na	13100 ±1300	na	13700 ±1100	13200 ±2200
Cobalt - 56	na	----	na	----	----
Cobalt - 60	na	----	na	----	----
Cesium - 134	na	----	na	----	----
Cesium - 137	na	----	na	----	----

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-22	TA-22	TA-14	TA-14	TA-14
LOCATION	MARSHY AREA	MARSHY AREA	BONEYARD	BONEYARD	BONEYARD
TYPE OF LOCATION	DISPOSAL	DISPOSAL	OLD DRUMS	OLD DRUMS	OLD DRUMS
SAMPLE NUMBER	LA81502W[d]	LA81503W[d]	LA81701D	LA81701W	LA81702D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<7100 ±900	<12400 ±1900	na	<16400 ±1200	na
Uranium - 234	----	----	na	----	na
Uranium - 235	----	90.0 ±96.0	na	209 ±48.0	na
Uranium - 238[a]	<9100 ±1100	<10500 ±1700	na	<14400 ±1200	na
Uranium - 238[b]	----	----	na	16700 ±5100	na
Uranium (all isotopes)[c]	na	na	31000 ±3100	na	17000 ±1700
Plutonium - 238	na	na	<6.0	na	<29.0
Plutonium - 239,240	na	na	22.0 ±8.0	na	<24.0
Beta Emitters					
Strontium - 90	na	na	<710	na	<700
Gamma Emitters					
Aluminum - 26	----	----	na	----	na
Potassium - 40	11600 ±1600	14900 ±2200	na	19700 ±2500	na
Cobalt - 56	----	----	na	----	na
Cobalt - 60	----	----	na	----	na
Cesium - 134	----	----	na	----	na
Cesium - 137	----	410 ±100	na	308 ±65.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-14	TA-14	TA-14	TA-36	TA-36
LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD
TYPE OF LOCATION	OLD DRUMS	OLD DRUMS	OLD DRUMS	BONEYARD	BONEYARD
SAMPLE NUMBER	LA81702W	LA81703D	LA81703W	LA81801D	LA81801W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Thorium - 230	na	na	na	1300 ±400	na
Thorium - 232[a]	<14700 ±1000	na	<15000 ±1100	na	<9600 ±1100
Uranium - 234	----	na	----	na	----
Uranium - 235	143 ±37.0	na	95.0 ±32.0	na	486000 ±30000
Uranium - 238[a]	<13700 ±1000	na	<12460 ±910	na	<9400 ±1400
Uranium - 238[b]	----	na	----	na	5020000 ±350000
Uranium (all isotopes)[c]	na	6000 ±600	na	8040000 ±804000	na
Plutonium - 238	na	<21.0	na	na	na
Plutonium - 239,240	na	39.0 ±20.0	na	na	na
Beta Emitters					
Strontium - 90	na	<810	na	na	na
Gamma Emitters					
Aluminum - 26	----	na	----	na	127 ±29.0
Potassium - 40	21600 ±2200	na	20900 ±2100	na	23600 ±2100
Cobalt - 56	----	na	----	na	----
Cobalt - 60	----	na	----	na	----
Cesium - 134	----	na	----	na	----
Cesium - 137	381 ±41.0	na	210 ±29.0	na	199 ±55.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-36	TA-36	TA-36	TA-36	TA-36
LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD
TYPE OF LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD
SAMPLE NUMBER	LA81802D	LA81802W	LA81803D	LA81803W	LA81804D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kgD	pCi/kgW	ug/kgD	pCi/kgW	ug/kgD
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	na	<8530 ±720	na	<10100 ±760	na
Uranium - 234	na	----	na	----	na
Uranium - 235	na	5420 ±350	na	89.0 ±20.0	na
Uranium - 238[a]	na	<9250 ±920	na	<10420 ±880	na
Uranium - 238[b]	na	621000 ±48000	na	----	na
Uranium (all isotopes)[c]	870000 ±87000	na	7000 ±700	na	6000 ±600
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Aluminum - 26	na	----	na	----	na
Potassium - 40	na	26500 ±2300	na	22400 ±2200	na
Cobalt - 56	na	----	na	----	na
Cobalt - 60	na	----	na	----	na
Cesium - 134	na	----	na	----	na
Cesium - 137	na	133 ±55.0	na	908 ±73.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-36	TA-36	TA-36	TA-36	TA-36
LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD
TYPE OF LOCATION	BONEYARD	BONEYARD	BONEYARD	BONEYARD	BONEYARD
SAMPLE NUMBER	LA81804W	LA81805D	LA81805W	LA81806D	LA81806W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	ug/kgD	pCi/kgW	ug/kgD	pCi/kgW
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<9350 ±780	na	<12410 ±930	na	<11120 ±830
Uranium - 234	----	na	----	na	----
Uranium - 235	90.0 ±42.0	na	102 ±29.0	na	80.0 ±17.0
Uranium - 238[a]	<9040 ±790	na	<12500 ±1000	na	<11510 ±850
Uranium - 238[b]	----	na	----	na	----
Uranium (all isotopes)[c]	na	6000 ±600	na	10000 ±1000	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Aluminum - 26	----	na	----	na	----
Potassium - 40	21700 ±1600	na	24900 ±2500	na	27100 ±2100
Cobalt - 56	----	na	----	na	----
Cobalt - 60	----	na	----	na	----
Cesium - 134	----	na	----	na	----
Cesium - 137	1178 ±90.0	na	548 ±76.0	na	619 ±52.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-0	TA-0	TA-0	TA-15	TA-15
LOCATION	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP	OPEN DUMP
TYPE OF LOCATION	MDA-M	MDA-M	MDA-M	MDA-Z	MDA-Z
SAMPLE NUMBER	LA85001W[d]	LA85002W[d]	LA85003W[d]	LA85101W[d]	LA85102W[d]
MEDIA	WASTE	WASTE	WASTE	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	----	----	----	<13700 ±2500	<5700 ±1200
Uranium - 234	----	----	----	----	----
Uranium - 235	----	----	1440 ±530	----	1290 ±160
Uranium - 238[a]	<13600 ±6300	----	----	<12500 ±3300	<6700 ±1500
Uranium - 238[b]	----	----	----	----	144000 ±26000
Uranium (all isotopes)[c]	na	na	na	na	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Aluminum - 26	----	----	----	----	----
Potassium - 40	15600 ±6900	7100 ±3000	16300 ±7700	17600 ±4900	13000 ±2000
Cobalt - 56	----	----	<720	----	----
Cobalt - 60	----	----	----	----	----
Cesium - 134	----	----	----	----	----
Cesium - 137	740 ±260	4600 ±700	5500 ±1200	210 ±160	----

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-15	TA-15	TA-36	TA-36	TA-36
LOCATION	OPEN DUMP	OPEN DUMP	BONEYARD	BONEYARD	BONEYARD
TYPE OF LOCATION	MDA-Z	MDA-Z	BONEYARD	BONEYARD	BONEYARD
SAMPLE NUMBER	LA85103W[d]	LA85104W[d]	LA85201W[d]	LA85202W[d]	LA85203W[d]
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	----	<12600 ±1600	<12200 ±2500	<13100 ±2500	<13000 ±2300
Uranium - 234	----	----	----	----	----
Uranium - 235	3030 ±350	----	----	----	----
Uranium - 238[a]	<8800 ±2800	<10400 ±1900	<10200 ±3100	<12800 ±2900	<11200 ±3300
Uranium - 238[b]	297000 ±57000	----	----	----	----
Uranium (all isotopes)[c]	na	na	na	na	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Aluminum - 26	----	----	----	----	----
Potassium - 40	18200 ±4700	19000 ±4000	27000 ±6200	24100 ±5000	18600 ±4900
Cobalt - 56	----	----	----	----	----
Cobalt - 60	----	----	----	----	----
Cesium - 134	----	----	----	----	----
Cesium - 137	----	365 ±140	360 ±240	----	----

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-36	TA-36	TA-36	TA-22	TA-22
LOCATION	BONEYARD	BONEYARD	BONEYARD	MARSHY AREA	MARSHY AREA
TYPE OF LOCATION	BONEYARD	BONEYARD	BONEYARD	DISPOSAL	DISPOSAL
SAMPLE NUMBER	LA85204W[d]	LA85205W[d]	LA85206W[d]	LA85601W[d]	LA85602W[d]
MEDIA	SOIL	SOIL	SOIL	SS SOIL	SS SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<12900 ±2700	<14400 ±2400	<11600 ±2300	<7100 ±2000	<6900 ±900
Uranium - 234	----	----	----	----	----
Uranium - 235	----	----	----	----	----
Uranium - 238[a]	<12900 ±3100	<12800 ±2700	----	<9000 ±2300	<7500 ±1100
Uranium - 238[b]	----	----	----	----	----
Uranium (all isotopes)[c]	na	na	na	na	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Aluminum - 26	----	----	----	----	----
Potassium - 40	15500 ±4500	16300 ±5900	21000 ±5200	11300 ±4100	11700 ±1600
Cobalt - 56	----	----	----	----	----
Cobalt - 60	----	----	----	----	----
Cesium - 134	----	----	----	----	----
Cesium - 137	240 ±140	----	----	----	93.0 ±34.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.23.7 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 23 (Continued)

AREA	TA-22	TA-22	TA-22
LOCATION	MARSHY AREA	MARSHY AREA	MARSHY AREA
TYPE OF LOCATION	DISPOSAL	DISPOSAL	DISPOSAL
SAMPLE NUMBER	LA85603W[d]	LA85604W[d]	LA85605W[d]
MEDIA	SS SOIL	SS SOIL	SS SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW
Alpha Emitters			
Thorium - 230	na	na	na
Thorium - 232[a]	<7500 ±900	<6700 ±1500	<6900 ±900
Uranium - 234	----	----	----
Uranium - 235	----	----	----
Uranium - 238[a]	<7600 ±1300	<9100 ±2100	<7100 ±1100
Uranium - 238[b]	----	----	----
Uranium (all isotopes)[c]	na	na	na
Plutonium - 238	na	na	na
Plutonium - 239,240	na	na	na
Beta Emitters			
Strontium - 90	na	na	na
Gamma Emitters			
Aluminum - 26	----	----	----
Potassium - 40	13100 ±2100	14200 ±3500	12800 ±1600
Cobalt - 56	----	----	----
Cobalt - 60	----	----	----
Cesium - 134	----	----	----
Cesium - 137	97.0 ±36.0	----	----

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

4.24 Environmental Problem 24--Inactive Liquid Waste Disposal Sites

- Request Numbers: LA819, LA820, LA821, LA823, LA824, LA825, LA828, LA829

  Deleted: LA826, LA830

- Requester: J. Clay/K. Sichelstiel

- Finding and Basis

Former liquid waste disposal practices at LANL may have contaminated surface and subsurface soils with radioactive and/or hazardous constituents.

Past practices at LANL for liquid waste disposal allowed waste water to be directly discharged to sumps, septic tanks, outfalls, or ponds. Records indicate that few or no treatment techniques were used before discharging the waste. Consequently, the potential exists for surface and/or subsurface soils to contain residual levels of contaminants above background concentrations.

Of the 90 inactive liquid waste sites visited during the survey, seven were selected for sampling. The sites fall into the following categories:

1. Received high explosives contaminated waste water and probably solvents (LA819, LA820, LA821, and LA823; also see LA815, Environmental Problem 23).

2. Received plating shop waste (LA824).

3. Potentially received laboratory and shop waste (i.e., solvents, degreasers, acids, metals) and possibly radioactively contaminated waste (LA825 and LA826).

4. Received runoff from areas with visual signs of numerous spills and activities in the technical area, which once used large quantities of PCB contaminated oil (LA828).

5. Received radioactively contaminated waste and possibly chemical waste; the area was cleaned up based on radiation but not chemicals. The area is open to public and may be affecting perched groundwater (LA829 and LA830).

4.24.1 Sampling and Analysis Objectives

- Statement

The sampling and analysis objectives were as follows:

(a) Determine the presence of radioactive and/or hazardous contaminants in surface soils, subsurface soils, pond water, and sediment that are above background levels (using CLP suggested minimum analytical detection limits for hazardous contaminants, LA819-LA821, LA824, LA828-LA830).

(b) Determine the presence and concentration of radioactive and/or hazardous chemical contaminants in inactive sumps or septic tanks (using CLP suggested minimum analytical detection limits). This information will be used to evaluate whether small concentrated quantities of waste may still exist in subsurface containers that are susceptible to leakage (LA823, LA825, LA826).

- Supporting Information

See Finding and Basis.

4.24.2 Sampling and Analysis Design

- Sampling Design

Table 4.24.1 summarizes the sampling and analytical requests and the analyses performed.

LA819 and LA820: TA-16, Inactive Liquid Waste Disposal Pond. Water and sediment grab samples were collected from a small pond located east-northeast of Buildings 89, 90, and 91 in TA-16 (see Figure 4.24.1).

The pond is approximately 150 ft in diameter and contains a minimal amount of water. Conflicting information exists on whether or not the pond sediment has been previously sampled by LANL. One source indicated 12 to 15 samples of the first foot of sediment were collected and analyzed, and showed "trace" amounts of high explosives. Due to lack of specific data, five grab samples of sediment (LA819) and three grab samples of water (LA820) were collected. One sediment sample was located at the mouth of each of two drainage pipe ditches (LA81901 and 04), and three sediment samples were collected from locations traversing the pond (LA81902, 03, 05). The three water samples were collected by a pond sampler and stainless steel beaker on three different days at the influent end of the pond. However, discharge to the pond did not occur during the sampling period. Any influent to the pond during the sampling period would have been surface runoff.

Volatile organic vapors were not detected by photoionization detector field surveys at LA819 or LA820. Radiological surveys did not detect radioactivity above background.

LA821: TA-16, Backfilled Ponds. Three subsurface soil grab samples were collected as planned from each of four backfilled waste ponds located in TA-16, resulting in a total of 12 samples (see Figure 4.24.2).

Site photographs of the closing of these ponds and aerial photos indicate they were used only for liquid disposal. It was assumed that borings, which would penetrate the cover material and enter the bottom of the old pond, could be safely installed directly over the old pond locations. It was also assumed that any accumulated sediment/waste on the pond bottom was not removed during closeout operations. Initial exploratory corings were performed at the location of the past northern most pond to look for stratification as evidence of the floor of the old pond. No stratification was noted and bedrock was encountered at approximately 5 ft. The depth to bedrock decreased as the sampling neared the ponds to the southeast.

The four ponds that were sampled are located west-southwest of Buildings 89 to 91 in TA-16. Aerial photos, closeout operations photos, and utility drawings from the site magnetometer study were used to assist in defining the pond sampling locations. Grab samples were collected from the bottom 12 to 15 in. of each boring hole. The three samples from each pond were collected at the center of each pond and at points on a diagonal line approximately 20 ft from the center using a stainless steel auger (see Figure 4.24.2).

Organic vapor measurements were made continually during the boring and sample collection operations. A maximum of 3 ppm was detected during sample collection.

<u>LA823: TA-08-59, Septic Tank</u>. Two samples of sludge were collected as planned from the abandoned septic tank in TA-8 (see Figure 4.24.3).

Access to the septic tank was via an approximately 20-in. square opening. It was approximately 7 ft from the opening to the bottom of tank. The tank contained an estimated 3 ft of sediment topped by approximately 9 in. of liquid material. Due to single point access and assumed homogeneity, two grab samples of sludge, one from each half of the tank, were collected and deemed representative for the purposes of the survey. Organic vapors were measured at 3 ppm in the tank and a radiological survey measured 15 mR/h.

<u>LA824: TA-16-093, Abandoned Plating Shop Outfall</u>. Three soil/sediment samples were collected as planned from the outfall of a former plating shop in TA-16.

The outfall could not be located with certainty during the survey field investigations due to rerouting of a storm drain. Utility drawings from the site were used to accurately define the outfall location during the sampling phase. It was assumed that any existing soils/sediments in the outfall area would have accumulated any contaminants previously discharged from the plating shop. Figure 4.23.4 shows the location of sampling points.

Limited drawings showed the outfall was north of TA-16-93 and most likely followed an existing drainage pathway. Three grab samples were collected, beginning 10 ft below any visible outfall pipe and subsequently spaced 10 ft apart downstream. Samples of surface soil/sediment were collected at a depth of 0 to 6 in. Volatile organic samples were not collected and organic vapor surveys were not performed because of the dry unstained surface soil and in accordance with instructions of the sample requesters.

<u>LA825 and LA826: TA-46-070, Sumps</u>. Sludge only was sampled from an abandoned Sump 70 in TA-46 (LA825) (see Figure 4.24.5). Liquid was not present in the sump; therefore, the water samples originally planned (LA826) were deleted.

Sump 70 received liquid from Building 58, and its overflow went into Sump 69. Therefore, both sumps received the same material, and only Sump 70 was sampled. These sumps are covered and no longer in service. Due to the small, confined area (3-ft dia), only two grab samples of sludge on the sump bottom were collected. The sludge layer was 8 in. deep. Depth to the present sump bottom was approximately 8 ft. Organic vapor field measurements did not detect any organic vapors.

LA828: TA-35-34, West Basin. Soil/sediment samples (LA828) were collected as planned from the west storm water collection basin behind TA-35-34 and Building 236. See Figure 4.24.6 for sampling sites.

Two basins are located behind Buildings 236 and 34. However, the east basin had broken away into the canyon and no longer functions as a collection basin. The west basin was intact (60 x 10 x 8 ft deep) and a discharge pipe was observed; however, no water was in the basin. Due to the small area and lack of information on variability or characterization, the soil/sediment was grab sampled (0 to 6-in. depth) at each end and the middle of the basin. Sediment/soil samples were collected from within the basin, based on visual observation of any moisture or staining of the soil column. Dry, unstained soil was not sampled for volatile organic analysis in accordance with the sample requester's instructions.

LA829 and LA830: TA-10, Bayo Canyon Site. The eastern portion of the Bayo Canyon site contained radiochemistry laboratory buildings and ancillary structures that handled radioactive and chemical wastes. These were used in support of the adjacent firing sites, apparently much like present activities at TA-35 (TENSITE). Liquid wastes from these R&D support operations were formerly discharged to the soils, subsurface soils, and an ephemeral stream, thus potentially contaminating these areas. Discharge was via blowou of holding tanks, sanitary sewer pit overflow, a leach field, and some liquid disposal into an open pit.

Previous studies by LANL indicate the presence of radioactive contamination within the subsurface soils of the vadose zone (L-76 and L-85; 1979 and 1982, respectively). Strontium-90 was the primary contaminant. Previous subsurface investigations in 1961, 1973, and 1974 may not have fully addressed the following potential contaminant migration aspects:

a. The depth of contamination at this point is not critical under survey sampling and analytical programs because the former liquid disposal area has been demarcated for no excavation until the year 2142.

b. This demarcated area is on now public property belonging to Los Alamos County. Although the area has restricted use agreements, migration out of its bounds has not been clearly addressed.

c. Migration pathways have not been fully addressed (it is known that net infiltration on a yearly basis is negative, due to high evapotranspiration rates at Los Alamos). However, seasonal infiltration having positive values on a daily, weekly, or monthly basis creates the potential for contaminant migration. Also, the ponderosa pine population in this area is relatively sparse, thus limiting transpiration. Migration would be vertical (downwards), and presumably the wetting front would flow irregularly due to the intermittent nature of positive infiltration. Under certain geologic conditions, the wetting front may reach a perched water table where lateral migration of contaminants is possible.

d. Perched water table conditions may exist at this site. Previous subsurface drilling went down to 25 to 90 ft at four locations in 1961, to 8 to 40 ft at three locations in 1973, and to 35 ft at another 10 locations in 1974.

The 1974 tests detected significant levels of beta activity above background levels at depths from 15 to 35 ft at the W-6 location, which is presumed to be in a streambed or in close proximity (maps depicting the locations are unclear).

The demarcated restricted zone is transected by an ephemeral stream; visible signs of flow were apparent during the survey, although water was not present at that time. Intermittent surface water infiltration "recharging" the known contaminant area is another means of contaminant migration.

e. No data are available on the presence of other chemical contaminants within the soils. Other chemicals such as nitric, hydrochloric, hydrofluoric, and sulfuric acids; metals; and reportedly smaller volumes of organic solvents were formerly disposed at the site.

One of three test borings was completed downgradient of the TA-10 former Liquid Waste Disposal Pit (see Figure 4.24.7). Only one boring was completed and the planned monitoring wells were not installed because there was no evidence of a perched water zone in the alluvium. The permeable strata displayed no evidence of water.

Borings were made down to the first encountered impervious boundary. The screen/sandpack portion of the well was within the lower reaches of the alluvial materials and upper reaches of tuff bedrock. The boring depth was 62 ft. Samples were not collected from the ephemeral stream, since water in that stream would reflect primarily surface water runoff from storm events. Since this is county property, appropriate notification/permits were obtained.

A composite sample was collected from the borehole. The sample was to be biased using a radiological survey and organic vapor survey, and collecting the corresponding radioactive or organic samples from the regions demonstrating the highest detectable readings. However, no radiation or organic vapors were detected and a single composite sample for inorganic, semivolatile, and radionuclide analysis was made from soil collected at the five port locations (0 to 39 ft) on the core barrel. A single randomly-selected grab sample for volatile organic analysis was collected from the 29- to 34-ft interval.

- Analytical Design

<u>LA819 and LA820: TA-16, Inactive Liquid Waste Disposal Pond</u>. Sediment (LA819) and water (LA820) samples were analyzed as planned for volatile organic compounds, high explosives, and metals to ICP detection limits.

<u>LA821: TA-16, Backfilled Ponds</u>. Subsurface soil samples were analyzed for volatile organic compounds, metals to ICP detection limits, and high explosives.

<u>LA823: TA-8-59, Septic Tank</u>. Sludge samples were analyzed as planned for volatile organic compounds, metals to ICP detection limits, high explosives, uranium, plutonium, ^{90}Sr, and gamma-emitting radionuclides.

<u>LA824: TA-16-093, Abandoned Plating Shop Outfall</u>. Soil samples were analyzed as planned for high explosives, metals to ICP detection limits, and total cyanide.

<u>LA825: TA-46-070, Sumps</u>. Sludge samples were analyzed as planned for volatile and semivolatile organic compounds, PCBs, metals to ICP detection limits, mercury, gamma-emitting radionuclides, thorium, uranium, plutonium, and ^{90}Sr.

LA828: TA-35-34, West Basin. Soil samples were analyzed as planned for volatile and semivolatile organic compounds, PCBs, and metals to ICP detection limits.

LA829 and LA830: TA-10, Bayo Canyon Site. The soil sample was analyzed for volatile and semivolatile organic compounds, metals to ICP detection limits, gross alpha and beta activity, gamma-emitting radionuclides, and ^{90}Sr.

4.24.3 Field and Analytical Data

- Field Data

Field measurements are located on the analytical data tables. For the reader's convenience, most field data has been reported with the sampling design descriptions that appear on the previous pages. High explosive spot tests were negative for all samples.

- Field Data Evaluation

LA819 and LA820: TA-16, Inactive Liquid Waste Disposal Pond. Field data from the pond in TA-16 (LA820) indicate that the water in the pond had a pH ranging from 7.8 to 8.1, had very low concentrations of dissolved solids (specific conductance of 105-150 μS), and that the temperature was 21 to 26°C. Discharges to the pond did not occur during any of the sampling periods, and LANL operators indicated that the pond bottom may have been sealed with clay and discharges discontinued. See LA819 for data on sediments below the clay liner. Organic vapor measurements were negative, and radiation measurements were at background levels.

LA821: TA-16, Backfilled Ponds.

None.

LA823: TA-8-59, Septic Tank.

None.

LA824: TA-16-093, Abandoned Plating Shop Outfall. The very dry condition of the sediment precluded organic vapor measurements.

LA825: TA-46-070, Sumps.

None.

LA828: TA-35-34, West Basin.

None.

LA829: TA-10, Bayo Canyon Site. No field data were collected for these samples.

- Analytical Data

Analytical data are summarized in Tables 4.24.2 to 4.24.7.

LA819 and LA820: TA-16, Inactive Liquid Waste Disposal Pond. Metals detected in all five soil samples include barium (430 to 2300 mg/kg), chromium (9 to 25 mg/kg), copper (7 to 18 mg/kg), and zinc (31 to 99 mg/kg). Beryllium and cadmium were detected in four of the five samples at approximately 1 mg/kg, and 3 to 5 mg/kg, respectively. Nickel was found in only one of the soil samples, at 133 mg/kg. All three water samples contained barium in concentrations ranging from 5300 to 6400 µg/L. Two of the three water samples contained zinc (66 and 84 µg/L).

Chromium (16 µg/L) and silver (34 µg/L) were also found in one water sample. Acetone and 2-butanone were detected in some of the soil samples, at concentrations ranging from 14 to 150 µg/kg. Styrene was detected in one of the soil samples at 2 µg/kg and a possible terpene also was identified tentatively in one other sample at approximately 28 µg/kg. 2-Hexanone was the only volatile organic compound that potentially may have been present in one of the water samples (13 µg/kg).

<u>LA821: TA-16, Backfilled Ponds</u>. Metals found in all of the samples include barium (160 to 230 mg/kg), chromium (11 to 31 mg/kg), and zinc (30 to 52 mg/kg). Beryllium (1 to 2 mg/kg) and copper (7 to 12 mg/kg) were found in ten and nine of the samples, respectively. Cadmium (approximately 3 mg/kg) and nickel (14 to 19 mg/kg) were each detected in six samples. One of the samples contained lead at 19 mg/kg. Volatile organic compounds, including ketones, a chlorinated hydrocarbon, and three aromatic compounds were detected in a seven of the samples at concentrations ranging from 2 to 310 µg/kg.

<u>LA823: TA-8-59, Septic Tank</u>. Two grab sludge samples were collected from the septic tank at TA-08-59. Metals found in both samples include barium (260 and 280 mg/kg), beryllium (approximately 2 mg/kg), cadmium (approximately 6 mg/kg), chromium (21 and 28 mg/kg), copper (approximately 20 mg/kg), and zinc (70 and 74 mg/kg). Nickel (11 mg/kg) and silver (5.7 mg/kg) were also detected in one of the two samples. Fifteen volatile organic target compounds, primarily industrial solvents, were detected in the samples at concentrations ranging from 3 to 6200 µg/kg. Three tentatively identified volatile organic compounds were also detected at concentrations ranging from 13 to 42 µg/kg.

<u>LA824: TA-16-093, Abandoned Plating Shop Outfall</u>. Metals detected in all of the soil samples include barium (420 to 1600 mg/kg), beryllium (approximately 2 mg/kg), cadmium (approximately 5 mg/kg), chromium (approximately 9 mg/kg), copper (10 to 15 mg/kg), and zinc (130 to 230 mg/kg). Lead was also detected in one of the samples, at 330 mg/kg. Cyanide was found in two of the three samples at approximately 0.4 mg/kg.

<u>LA825: TA-046-070 Sumps</u>. Metals found in both sludge samples include mercury (28 to 57 mg/kg), cadmium (15 to 37 mg/kg), chromium (43 and 55 mg/kg), copper (approximately 2500 mg/kg), lead (1700 and 1900 mg/kg), silver (120 to 200 mg/kg), and zinc (760 to 1200 mg/kg). The PCB aroclor-1254 was detected in both samples at concentrations of 9200 and 37,000 µg/kg. Tetrachloroethene and toluene were detected in one sample, at concentrations of 36 and 180 µg/kg, respectively. Fluoranthene was detected in both samples at 9600 and 49,000 µg/kg. There were also eight semivolatile organic TICs detected, primarily naphthalene derivatives and phenols, at concentrations ranging from 1600 to 49,000 µg/kg.

<u>LA828: TA-35-34, West Basin</u>. Metals found in all three soil samples include barium (52 to 100 mg/kg), chromium (4 to 5 mg/kg), copper (8 to 19 mg/kg), and zinc (62 to 200 mg/kg). The PCB aroclor-1260 was detected in all samples at concentrations ranging from 560 to 1700 µg/kg. Three semivolatile organic target compounds were detected in one of the samples at concentrations ranging from 36 to 1000 µg/kg. One of the other samples contained ten semivolatile organic compounds, primarily polyaromatic hydrocarbons, at concentrations ranging from 72 to 2700 µg/kg. The remaining sample did not contain any

semivolatile organic compounds. There were no volatile organic compounds detected in any of the samples.

<u>LA829 and LA830: TA-10, Bayo Canyon Site</u>. One composite surface soil sample (LA829) was collected from the Bayo Canyon site at TA-10. Metals detected include barium (43 mg/kg), chromium (9.6 mg/kg), and zinc (28 mg/kg). Benzoic acid was detected at 100 µg/kg, and methylene chloride may have been present at 32 µg/kg.

There were no high explosives detected in any of the samples.

- Radiological Data

  The results of the radiological measurements are given in Table 4.24.8.

  Very little activity besides the expected natural activities was seen in the 28 soil and sediment samples. Cesium-137 (40 to 1220 pCi/kgW) was detected in 15 samples, ^{235}U (48 to 970 pCi/kgW) in seven samples, total uranium (10,000 to 26,000 µg/kgD) in four samples, $^{239+240}Pu$ (19 to 536 pCi/kgD) in two samples, and ^{238}Pu (15 pCi/kgD) in one sample. No gross alpha, gross beta, or gamma activity was detected in the three water samples (LA820).

- Analytical Data Evaluation

<u>LA819 and LA820: TA-16, Inactive Liquid Waste Disposal Pond</u>. Five grab samples of sediment (LA819) and three temporarily spaced grab samples of water (LA820) were collected from the inactive liquid waste disposal pond at TA-16.

Chromium, copper, and zinc were detected in all sediment samples (LA819) in concentrations of comparable magnitude. Barium was also found in all of the sediment samples, but concentrations showed more variability. The highest amount of barium was detected in sample 02, collected approximately 30 ft from the southern boundary of the pond. The least amount of barium, found in sample 01, collected near the southern drainage pipe, is approximately five times less than that detected in sample 02. Cadmium and beryllium, each detected in four of the five samples, were found in concentrations of comparable magnitude.

Acetone was detected in sediment samples LA81901, 02, and 05, with the highest concentration (40 μg/kg) being found in sample 02. All sediment samples except 04 contained 2-butanone in concentrations ranging from 14 to 150 μg/kg. The highest 2-butanone concentration was found in sample 01, collected near the southern drainage pipe. Styrene was detected in sample 02 at 2 μg/kg, and a possible terpene was tentatively identified in sample 01 at approximately 28 μg/kg. Terpenes can be naturally released by-products from vegetation.

All of the grab water samples (LA820) contained barium in comparable concentrations. Zinc was detected in the first (01) and third (03) grab samples, again at concentrations of comparable magnitude. The third grab sample (03) also contained chromium and silver.

2-Hexanone, detected in the third water sample (LA82003) at 13 μg/L, was the only volatile organic compound detected in any of the water samples. However, its presence in the actual sample was open to question (see Limitations and Qualifications, Section 4.24.4).

Gamma screens indicated that four samples contained ^{137}Cs at levels of 280 to 790 pCi/kgW and all samples contained the natural activities. For the water samples, no activities were found in the gamma, gross alpha, and gross beta screens.

<u>LA821: TA-16, Backfilled Ponds</u>. Three grab subsurface soil samples were collected from each of four backfilled waste disposal ponds at TA-16.

Barium, chromium, and zinc were detected in all samples from all four disposal ponds. Concentrations of these elements are comparable in magnitude, both among samples from the same pond, and between ponds. Beryllium was detected in all samples from ponds 1, 2, and 4 (LA82101-06, and 10-12), and in one sample from pond 3 (sample 07). The concentrations of beryllium found are comparable between all samples. Comparable amounts of copper were detected in all samples from ponds 01 and 02 (samples 01 - 06), two samples from pond 3 (samples 08 and 09), and one sample from pond 4 (sample 12). Nickel was found in similar concentrations in all samples from ponds 1 and 2 but was not found in samples from ponds 3 and 4. Cadmium was detected in all samples from ponds 3 and 4 (samples 07 - 12) but was not found in the samples from ponds 1 and 2. Lead was detected only in sample 05, collected from pond 2.

No volatile organic compounds were detected in the samples from pond 3 (samples 07 -09). Acetone, in concentrations ranging from 81 to 310 μg/kg, may have been present (see the Limitations and Qualifications section) in all samples from pond 1 and two samples from pond 2 (samples 01-05). 4-Methyl-2-pentanone (13 μg/kg) was detected in sample 01 from pond 1, and 2-butanone (106 μg/kg) was detected in sample 06 from pond 2. Volatile organic compounds were detected in only sample 12 from pond 4, and include solvents trichloroethene, benzene, toluene, and chlorobenzene, in concentrations ranging from 2 to 5 μg/kg.

Gamma screens or analyses detected ^{137}Cs at about the detection limit (250 pCi/kgW) in one sample (LA82112), ^{235}U in two samples (65 and 72 pCi/kgW in LA82101 and LA82102, respectively), and the natural activities in all nine samples.

<u>LA823: TA-08-59, Septic Tank</u>. Two grab sludge samples were collected from the septic tank at TA-8-59.

Barium, beryllium, cadmium, chromium, copper, and zinc were detected in both samples from the TA-08-59 septic tank. Concentrations of these elements are of comparable magnitude between the west-side (sample 01) and east-side (sample 02) samples. Concentrations of nickel and silver less than their respective CRDLs also were found in the east-side sample (02).

Fifteen target volatile organic solvents (chlorinated hydrocarbons, ketones, and aromatic compounds) were detected in both samples at concentrations ranging from 3 to 6200 µg/kg. Three tentatively identified volatile organic compounds (2-butanol, 1,1-difluoroethane, and a possible terpene) were also detected at concentrations ranging from 13 to 42 µg/kg.

The gamma analysis of sample LA82302 indicated ^{137}Cs (222 pCi/kgW), ^{235}U (48 pCi/kgW), and the natural activities. The less sensitive gamma screen for sample LA82301 indicated ^{137}Cs (277 pCi/kgW) and the natural activities. From alpha spectral analysis, the results for ^{238}Pu are <30 and <6 pCi/kgD and for $^{239+240}Pu$ are <25 and 19 pCi/kgD, respectively; ^{90}Sr analyses gave limits of <590 and <580 pCi/kgD, respectively. The total uranium concentrations were measured to be 15,000 and 10,000 µg/kgD.

<u>LA824: TA-16-093, Abandoned Plating Shop Outfall</u>. Three grab soil samples were collected from the abandoned plating shop outfall area at TA-16-093.

Beryllium, cadmium, chromium, and copper were detected in all three samples collected from the outfall area. Concentrations of these elements are of comparable magnitude between samples. Concentrations of barium and zinc found in the three samples exhibit trends: the lowest amounts are found in sample 01, collected nearest the outfall, and the highest concentrations are found in sample 03, collected farthest from the outfall. The amount of barium found in sample 03 is three to four times greater than that found in sample 01, and the concentrations of zinc in sample 03 exceed that detected in sample 01 by nearly a factor of two. Lead was found in sample 02, collected approximately 10 ft from the outfall, at 332 mg/kg. The presence of cyanide (approximately 0.4 mg/kg) is indicated in samples 01 and 03. Equivalent concentrations of cyanide in sample 02 may have been undetected (see the Limitations and Qualifications section).

Gamma screens showed the presence of ^{137}Cs at 380 to 1220 pCi/kgW and the natural activities in all three samples.

<u>LA825: TA-46-070, Sumps</u>. Two grab sludge samples were collected from abandoned Sump 70 at TA-46-070.

Cadmium, chromium, copper, lead, mercury, silver, and zinc were detected in both samples from the abandoned sump (TA-46-70). Elemental concentrations are of comparable magnitude between the samples. Concentrations of cadmium, chromium, lead, and silver all exceed their respective MDLs by factors between 4 and 20. Concentrations of copper, mercury, and zinc exceed their respective MDLs by factors of at least 130, 70, and 50, respectively.

The PCB aroclor-1254 was detected in both samples 01 and 02 at concentrations of 9200 and 37,000 μg/kg, respectively. Tetrachloroethene and toluene were detected at concentrations of 36 and 180 μg/kg respectively in sample 02. Fluoranthene was detected in both samples, at 9600 in sample 01 and 49,000 μg/kg in sample 02. Nine semivolatile organic TICs, primarily naphthalene derivatives and phenols , were detected in each sample (15 compounds total) at concentrations ranging from 1600 to 49,000 μg/kg.

For the two sludge samples, gamma analyses identified ^{137}Cs at 40 and 58 pCi/kgW, ^{235}U at 840 and 970 pCi/kgW, and some of the natural activities (the ^{232}Th chain was not observed). From the alpha spectral analysis, the results are 15 and <17 pCi/kgD for ^{238}Pu, 536 and <22 pCi/kgD for $^{239+240}$Pu, and 1100 and 2100 pCi/kgD for ^{230}Th from the ^{238}U chain for samples LA82501 and LA82502, respectively. The total uranium analyses gave 11,000 and 26,000 μg/kgD, respectively, for the two samples. These are the same relative values as the ^{230}Th activities. The ^{90}Sr analyses gave limits of <2400 and <2900 pCi/kgD.

LA828: TA-35-34, West Basin. Three grab soil samples were collected from the west storm water collection basin at TA-35-34.

Barium, chromium, copper, and zinc were found in all three samples collected from the west storm water collection basin. Concentrations of these metals appear to be highest in sample 01, collected furthest from the discharge pipe, and lowest in sample 02, collected from the middle of the collection basin.

No volatile organic compounds were detected in any of the samples from this location. PCB aroclor-1260 was detected in all three samples at concentrations ranging from 560 μg/kg(sample 02) to 1700 μg/kg (sample 03). There appears to be a trend in semivolatile organic compound concentrations, with no semivolatile organics being detected in sample 01 collected furthest from the discharge pipe, and the highest number and concentrations of semivolatile organic compounds found in sample 03, collected nearest the discharge pipe. Pyrene, fluoranthene, and 2,2'-oxybisethane were detected in sample 02, collected from the middle of the collection basin, at concentrations ranging from

36 to 1000 μg/kg. Sample 03 contained ten semivolatile organic compounds, primarily polyaromatic hydrocarbons, and included a trinitrotoluene (TNT) isomer, at concentrations ranging from 72 to 2700 μg/kg.

Gamma screens indicated the presence of ^{137}Cs at 256 to 510 pCi/kgW and the natural activities in all three samples.

LA829: TA-10, Bayo Canyon Site. One composite boring sample (subsurface soil) was collected from the Bayo Canyon site at TA-10.

Metals detected in the soil sample include barium (43.3 mg/kg), chromium (8.6 mg/kg), and zinc (28.3 mg/kg). Benzoic acid was detected at 100 μg/kg, and methylene chloride may also have been present at 32 μg/kg (see the Limitations and Qualifications section).

Gamma analysis gave ^{235}U at 85 pCi/kgW, possibly ^{109}Cd at <2000 pCi/kgW, and the natural activities. For ^{90}Sr a limit of <650 pCi/kgD was obtained.

- Radiological Data Evaluation

The Radiological Date Evaluation has been included with the Analytical Data Evaluation section for the reader's convenience.

4.24.4 Limitations and Qualifications

- Data Quality Level

The sampling design, sample collection,and documentation are Quality Level I. The analytical data are generally Quality Level I or II, with the following Quality Level III exceptions: volatile organic data for LA82109, 10, and 11; cyanide data for

LA824, and mercury data for LA825. All of these Quality Level III exceptions were due to excessive holding times.

- Field Data

Field data were collected utilizing DOE Environmental Survey Protocols. The following deviations from the S&A Plan occurred during field collection/measurement of samples.

LA819 and LA820: TA-16, Inactive Liquid Waste Disposal Pond. The deviation from the S&A Plan for this sample request was the use of a pond sampler with a precleaned stainless steel beaker to collect the samples and transfer them from the pond to the sample bottles instead of direct immersion. This deviation should have no significant impact on the analytical data. This was done to prevent stirring and entrapment of bottom material, which would have occurred if the samplers had waded out to the sampling spot and utilized direct immersion.

LA824: TA-16-093, Abandoned Plating Shop Outfall. Use of a precleaned stainless steel scoop instead of a Teflon scoop was the only deviation from the work plan for these three sediment samples. This deviation will have no adverse affect on the analytical data.

LA825: TA-46-070, Sumps. An organic vapor survey was not performed on these samples in the field, as requested in the S&A Plan, due to battery failure. This deviation has no adverse impact on the analytical data.

- Analytical Data

LA819 and LA820: TA-16, Inactive Liquid Waste Disposal Pond. Sample LA81905 had internal standard areas for 1,4-difluorobenzene and chlorbenzene-d_5 that were less than 50% of the area for these compounds in the daily calibration standard. Therefore, the quantitative values for the aromatic volatile compounds are probably overestimated by a factor of at least two.

All sediment samples (LA819) were analyzed in a common SDG for determination of metals to ICP Detection limits. Beryllium was detected in associated QC blanks at 0.4 mg/kg; therefore, reported beryllium concentrations may be biased high by a comparable amount. QC blank results during analysis were consistently less than the negative CRDL for chromium and nickel. Results of standards run at twice the CRDL (approximately 4 mg/kg for chromium and 16 mg/kg for nickel) indicate that the analytical accuracy for these elements at the low end of the calibration range is only 50% of the true value (i.e., true values may be as much as 200% of reported concentrations). Nickel recovery from the LCS is less than the lower control limit (lower control limit = 49.2 mg/kg, found = 47.7 mg/kg, recovery = 78%). The low recovery may be due to calibration inaccuracy evidenced by the negative QC blank results for nickel.

The three water samples (LA820) were analyzed for metals to ICP detection limits in three separate SDGs. Total holding times were exceeded by five days for samples 01 and 02. However, due to the stable, nonvolatile nature of the analytes,no adverse impact on data quality is expected because of the holding time violations. There is no additional adverse impact to data quality for samples LA82001 LA82002 indicated by the associated QC data. The silver concentration reported for sample LA82003 may be totally or partially due to laboratory contamination, because 12 μg/L silver was detected in the associated preparation blank, and up to 18 μg/L silver was observed in the associated QC blanks. Silver was also over-recovered from the ICV standard, at 114% (upper control limit is 110%), which also indicates high bias for the reported value.

LA821: TA-16, Backfilled Ponds. The samples LA82101-06 were analyzed by one laboratory, and samples LA82107-12 were analyzed by a different laboratory. The data set for LA82101-06 are not comparable to other organic CLP data due to variances in the analytical procedures and reporting formats used. Therefore, caution should be exercised by the data user when comparing these data.

Note that the CRQLs for the volatile organic data for LA82101-06 are elevated due to only 1 g of sample used for analysis (5 g of soil is specified). Therefore, there is an increased probability of false negatives associated with these data. Acetone detected in samples LA82101, 03, and 05 is most likely a false positive. Coelution with a freon peak (which was noted on the raw data but not reported) may have produced a spectral interference. There are random retention time shifts throughout these data, which may have led to additional false positives and false negatives. Some of the internal standards and surrogate spike compounds had to be manually integrated, and many of the peaks (especially 1,2-dichloroethane-d_4) are split. In general the chromatography is very poor, making the identification of target and non-target compounds difficult.

The total holding times for volatile organic samples LA82109, 10, and 11 were exceeded by 13 days; therefore, the quantitative values may be biased low or there may be false negatives.

Samples LA82101 through LA82106 were analyzed in a common SDG for metals to ICP detection limits. Thallium analyses for these samples were performed via GFAAS because the ICP instrument used did not have an analytical wavelength for thallium. However, because GFAAS is the more sensitive of the two analytical techniques, the resultant data quality is actually better than that achievable with ICP analysis. Copper was detected in the associated preparation blank at 1.7 mg/kg. Therefore, reported values for copper may have comparable high bias. Serial dilution results for zinc were greater than the 10% difference control limit, at 15%. Although this high percent difference could indicate the presence of an interferant, it also could indicate errors introduced by dilution or non-linearity in the calibration curve. The analytical imprecision associated with the reported zinc concentrations may be as much 15%.

Samples LA82107 through LA82112 also were analyzed in a common SDG for metals to ICP detection limits. Thallium was quantitated by ICP for these samples. Beryllium was detected in associated QC blanks at 0.4 mg/kg, so reported beryllium concentrations may have comparable high bias. QC blank results for chromium were consistently less than the negative CRDL. Results of standards run at twice the CRDL (approximately 4 mg/kg for chromium) indicate that the analytical accuracy for these elements at the low end of the calibration range is only 50% of true value (i.e., true values may be 200% of reported concentrations).

<u>LA823: TA-8-59, Septic Tank</u>. The total holding times for volatile organics sample 01 and 02 were exceeded by one day. Therefore, there is a slight possibility for false negatives, and the quantitative values may be biased low for these two samples. The concentrations of chloroethane (450 μg/kg), 1,1-dichloroethene (510 μg/kg), and 1,2-dichloroethene (6200 μg/kg) detected in sample 01 exceed the calibration range of the instrument and may therefore be underestimated. The following compounds detected in sample 02 also had concentrations that exceeded the calibration range of the instrument and may therefore be underestimated: 1,1-dichloroethane (1100 μg/kg), 2-butanone (440 μg/kg), 1,2-dichloroethene (total) (5800 μg/kg), and 1,1,1-trichloroethane (1200 μg/kg). The concentration of acetone is biased low by a factor of 1.4 due to the high response factor in continuing calibration. If the response factor from the initial calibration is used to calculate the concentration for acetone, more representative values would be 246 μg/kg (sample 01) and 350 μg/kg (sample 02).

The total holding time for high explosives samples 01 and 02 were exceeded by 8 days; therefore, there may be a possibility of false negatives due to biodegradation.

Nickel (6.7 mg/kg), silver (3.7 mg/kg), chromium (18.8 mg/kg) and beryllium (0.9 mg/kg) were detected in blanks associated with these samples for determination of metals to ICP detection limits. Reported values for these elements therefore may have comparable high bias. Concentrations of iron, and manganese also found in the blanks suggest that stainless steel is the source of the laboratory contamination. Matrix spike recovery is outside the 75% to 125% control limits for silver (29%). This indicates that silver may have been lost from the sample during preparation, and that the reported value may have comparable low bias. Internal standard was added incorrectly to the matrix spike for beryllium, cadmium, chromium, copper, and nickel. Therefore, no actual spike recoveries could be calculated for these elements. However, based on the data, it appears that half the required amount of internal standard was added, which would have made the spiked sample results high by a factor of two. Based on this assumption, the only spike recoveries for these elements out of control would be for beryllium (65%), cadmium (71%), and chromium (41%). Reported values for beryllium, cadmium, and chromium may be biased low by 54%, 41%, and 144%, respectively, and true concentrations may be 150%, 140%, and 240% of reported values, respectively. Duplicate RPDs for chromium and zinc are greater than the 20% control limit, at 57% and 21%, respectively. The imprecision associated with the chromium quantitation may be a contributing factor to the low matrix spike recovery for this element, and may be caused by the laboratory contamination evidenced by the blank results.

<u>LA824: TA-16-093, Abandoned Plating Shop Outfall</u>. Reported values for beryllium and cadmium may have high bias due to 1.2 mg/kg and 1.7 mg/kg, respectively, detected in associated blanks. Two matrix spikes were performed with this SDG. Copper recovery

(-1680%) was outside the 75% to 125% control limits for the first spike, but was in control on the second matrix spike. For the spike recovery, which was out of control, the sample result for copper was higher by an order of magnitude than the spiked sample result, which suggests possible sample inhomogeneity, external contamination, or an unidentified interference. The duplicate RPD for chromium (43.1%) is outside the 20% control limit. The imprecision associated with chromium quantitation is therefore higher than normal, and true chromium concentrations may be between $\pm$43% of the reported values.

Quantitation of cyanide in these samples is highly questionable due to several factors. Total and analytical holding times were exceeded for all samples by four and seven days, respectively. Due to the reactive, unstable nature of cyanide compounds, the reported results may not be representative of the samples as collected. Because of possible reaction and/or degradation, the reported results are likely to have low bias. Due to a refrigerator malfunction, sample storage condition requirements (4°C) were not maintained for the distilled samples as recommended for sample preservation. This storage condition violation may also influence the representativeness of the reported data. The matrix spike was only 29% recovered, which implies either incomplete recovery of analyte from the sample matrices, or loss of analyte when required storage conditions were violated. Reported results may be biased low by up to 250%, and true values could range as high as 350% of the reported values. Given that cyanide was detected in two of the three samples despite all of the problems that tend to cause low recovery, it is likely that true cyanide concentrations in all samples were higher than the reported values.

<u>LA825: TA-46-070, Sumps</u>. Recovery of the volatile organic surrogate, toluene-d_8 (127%) is outside of the QC limits of 117% for sample 01. The surrogate problem may be due to a matrix effect which was confirmed by reanalysis of the sample, which

indicated even higher recoveries for toluene-d_5 and bromofluorobenzene. Quantitation of the aromatic compounds may be overestimated by as much as approximately 25%. The internal standard area for chlorobenzene-d_5 was less than 50% of its daily continuing calibration standard. Reanalysis of the sample resulting in two internal standard areas, chlorobenzene-d_5 and difluorobenzene, being outside the QC limits. These low internal standard areas also may point towards a matrix effect. There were no volatile organic compounds detected in the original analysis, however, the sample was reanalyzed and tetrachloroethene was detected. Tetrachloroethene was also detected in sample 02. It is likely that tetrachloroethene may be in sample 01, especially since the CRQLs in the original analysis were 4 times higher than the reanalysis (original analysis 1.3 g of sample used, reanalysis 5.0 g of sample used). Due to analytical problems mentioned previously with the surrogates, internal standard areas, and holding times (151 days for reanalysis), the original analysis data were used in the results table.

Volatile organic analysis of sample 02 encountered similar matrix effect problems to those encountered for sample 01. Both toluene-d_8 and bromofluorobenzene surrogate recoveries exceeded the upper QC limits. The poor surrogate recoveries are likely to be due to a matrix effect since the matrix spike, matrix spike duplicate, and the reanalysis of the sample resulted in similar recoveries. The reported values for tetrachloroethene and toluene may be overestimated by as much as two times the true values due to the low internal standard areas. The internal standards, difluorobenzene and chlorobenzene-d_5, had areas less than 50% of the daily continuing calibration standards. The reanalysis of this sample had areas of all three internal standards outside the QC limits, indicating that a matrix effect is a probably cause of low internal standard area counts. Due to the analytical problems mentioned previously and the 151 day holding time on the reanalysis, the original analysis data was used for the results table.

The CRQLs for semivolatile organic analysis sample 01 were elevated approximately 788 times the base CRQLs listed in the protocol due to half the required amount of soil being extracted, 74% moisture, 1:50 dilution, and GPC cleanup. Although no target compounds were detected, there is a high probability of false negatives due to elevated detection limits. Sample 01 was extracted using 15 g rather than the usual 30 g because of the high moisture content in the sample. Sodium sulfate, used in the extraction procedure for removal of water from the solid, was suspected of containing many of the phthalate esters observed in the semivolatile organics analysis results for soil samples. Because of this suspected phthalate contamination from the sodium sulfate, the use of sodium sulfate was minimized in the extraction procedure. Thus, a reduced weight of samples with a high moisture content was extracted so that less total mass of sodium sulfate was required to remove the water. The effect of extracting one half as much sample would be a doubling of the CRQL values before percent moisture and dilutions are considered. Sample 02 also had CRQLs elevated approximately 155 times the base CRQLs listed in the protocol due to a 1:20 dilution, GPC cleanup, and a 74% moisture. Only one TCL compound attributable to the sample was detected, but there is a possibility of false negatives due to elevated detection limits.

Total holding times for mercury analysis were exceeded by eight days. Due to the volatile nature of this analyte, low bias to the reported concentrations is likely. Two matrix spikes were performed for analysis of metals to ICP detection limits. Lead and silver were under-recovered from one of the spikes (63% and 56%, respectively), but recoveries for both elements were in control for the second spike. These recoveries indicate that analyte recovery from the sample matrices was not uniform. Reported silver and lead concentrations may have as much as 79% and 58% low bias, respectively, and true concentrations may be as much as 180% and 160% of reported values, respectively. The duplicate RPD for zinc exceeded the 20% control limit, at 25%.

RPDs for aluminum, iron, and manganese were also out of control, and because they are common soil constituents, suggest that the cause of the high RPDs may be sample inhomogeneity. Reported silver concentrations may have high analytical bias due to laboratory contamination, as evidenced by 17 mg/kg silver found in the preparation blank.

LA828: TA-35-34, West Basin. The RPD for zinc exceeded the 20% control limit, at 25%. RPDs for aluminum, iron, and manganese, which are common soil constituents, are also out of control, and suggest the the cause of the high imprecision may be sample inhomogeneity.

LA829: TA-10, Bayo Canyon Site. There is no adverse impact to data quality suggested by analytical QC data associated with this sample.

- Radiological Data

The results of QC checks indicate that the performance of the instruments and the analytical methods were adequate to ensure accuracy and reproducibility of the results obtained using them. In addition, the background seen by each instrument/detector was sufficiently low and constant to ensure accurate compensation for background effects.

The uncertainties cited in the tables for the total uranium results appear to be ten percent of the reported concentrations. Unfortunately, the uncertainties were reported with the same number of significant figures as the concentrations. Therefore, when using the total uranium results, the reader should round the uncertainties to one less significant figure.

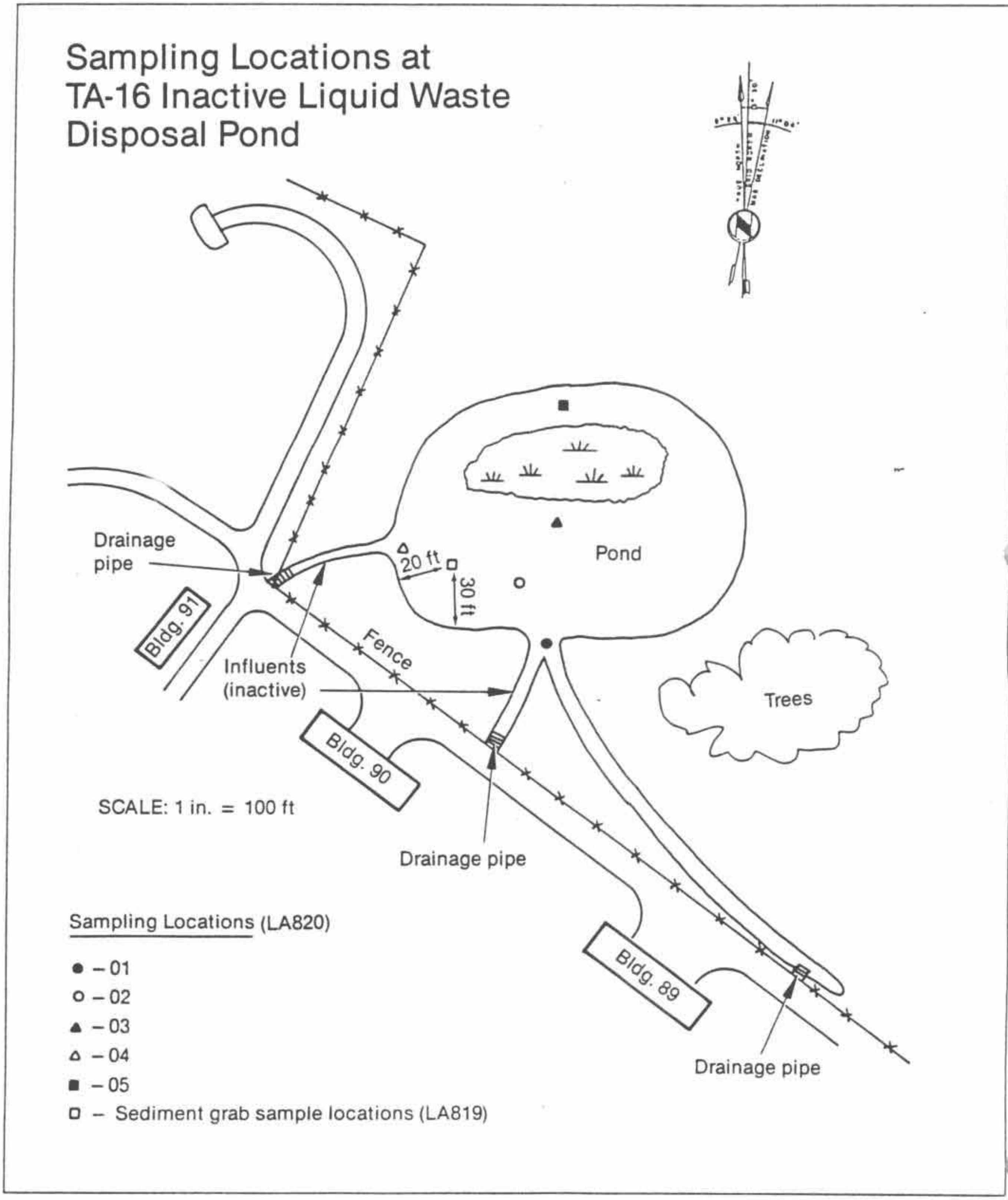
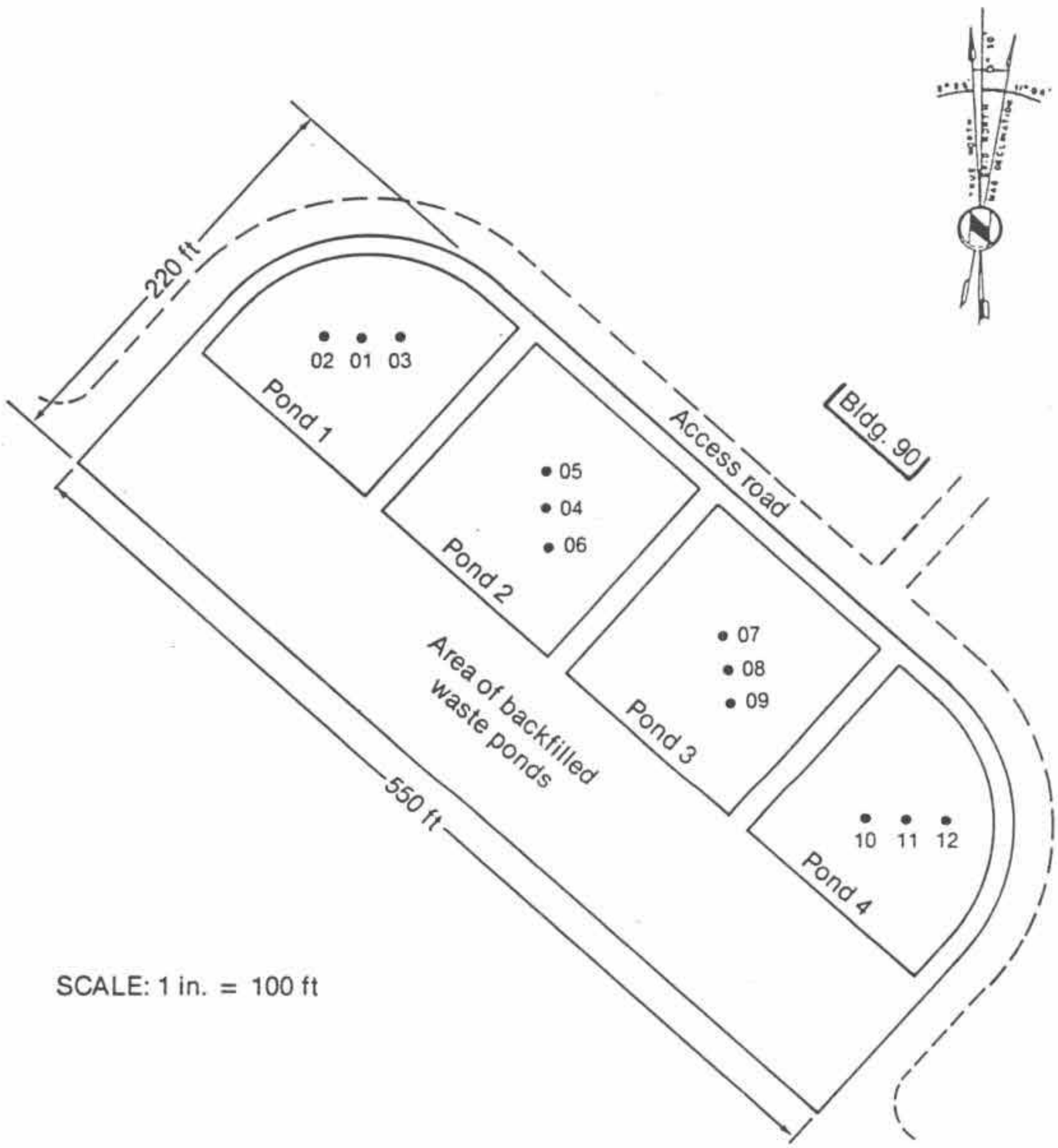

Sampling Locations at
TA-16 Inactive Liquid Waste
Disposal Pond
Drainage pipe
Bldg. 91
Influents (inactive)
Fence
20 ft
30 ft
Pond
Trees
Bldg. 90
SCALE: 1 in. = 100 ft
Drainage pipe
Bldg. 89
Drainage pipe
Sampling Locations (LA820)
● – 01
○ – 02
▲ – 03
△ – 04
■ – 05
□ – Sediment grab sample locations (LA819)

Figure 4.24.1

Sampling Locations at TA-16 Inactive Liquid Waste Disposal Pond



SCALE: 1 in. = 100 ft

• – Grab sample locations

Figure 4.24.2

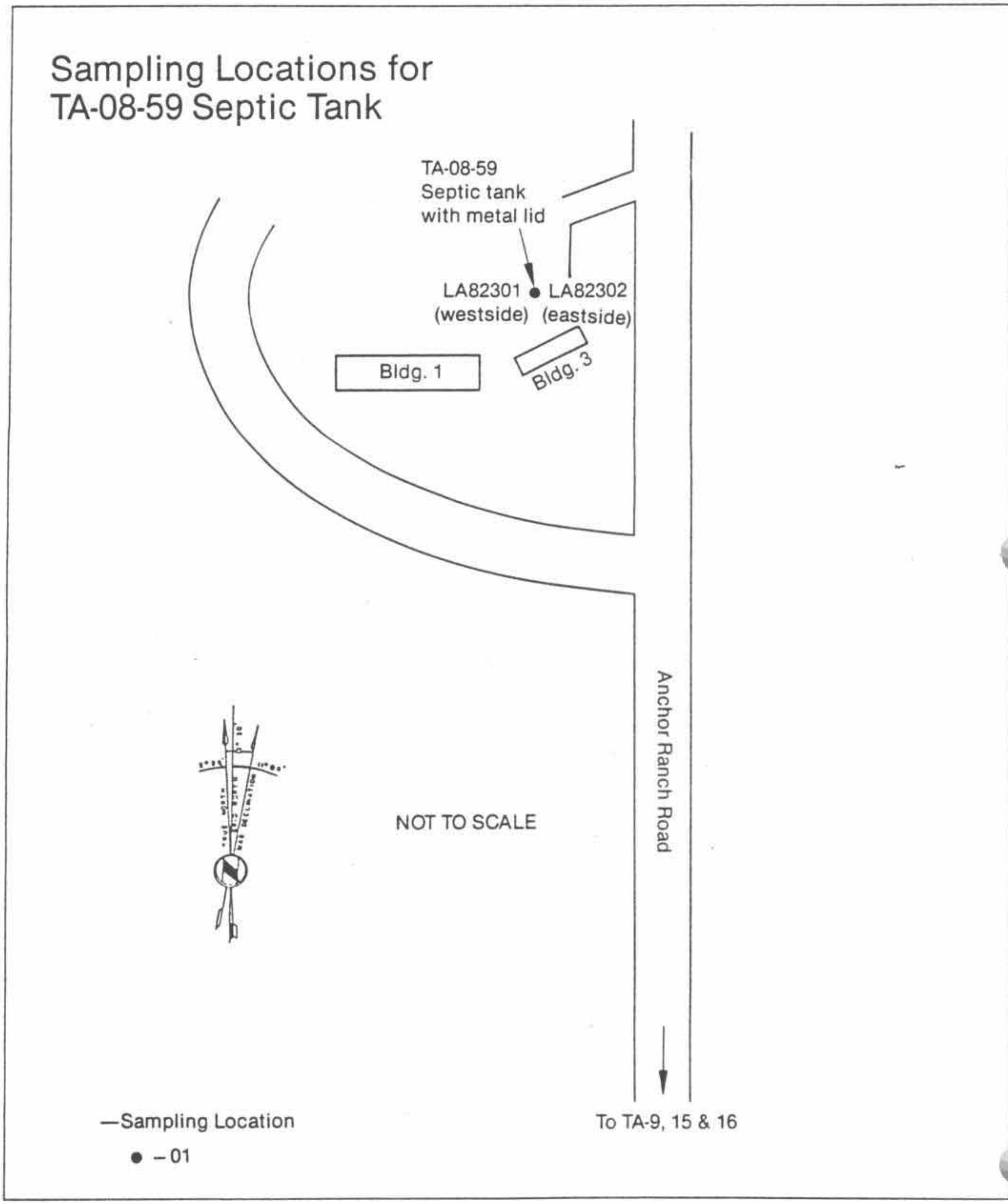

Sampling Locations for
TA-08-59 Septic Tank
TA-08-59
Septic tank
with metal lid
LA82301
(westside)
LA82302
(eastside)
Bldg. 1
Bldg. 3
NOT TO SCALE
Anchor Ranch Road
To TA-9, 15 & 16
—Sampling Location
● –01

Figure 4.24.3

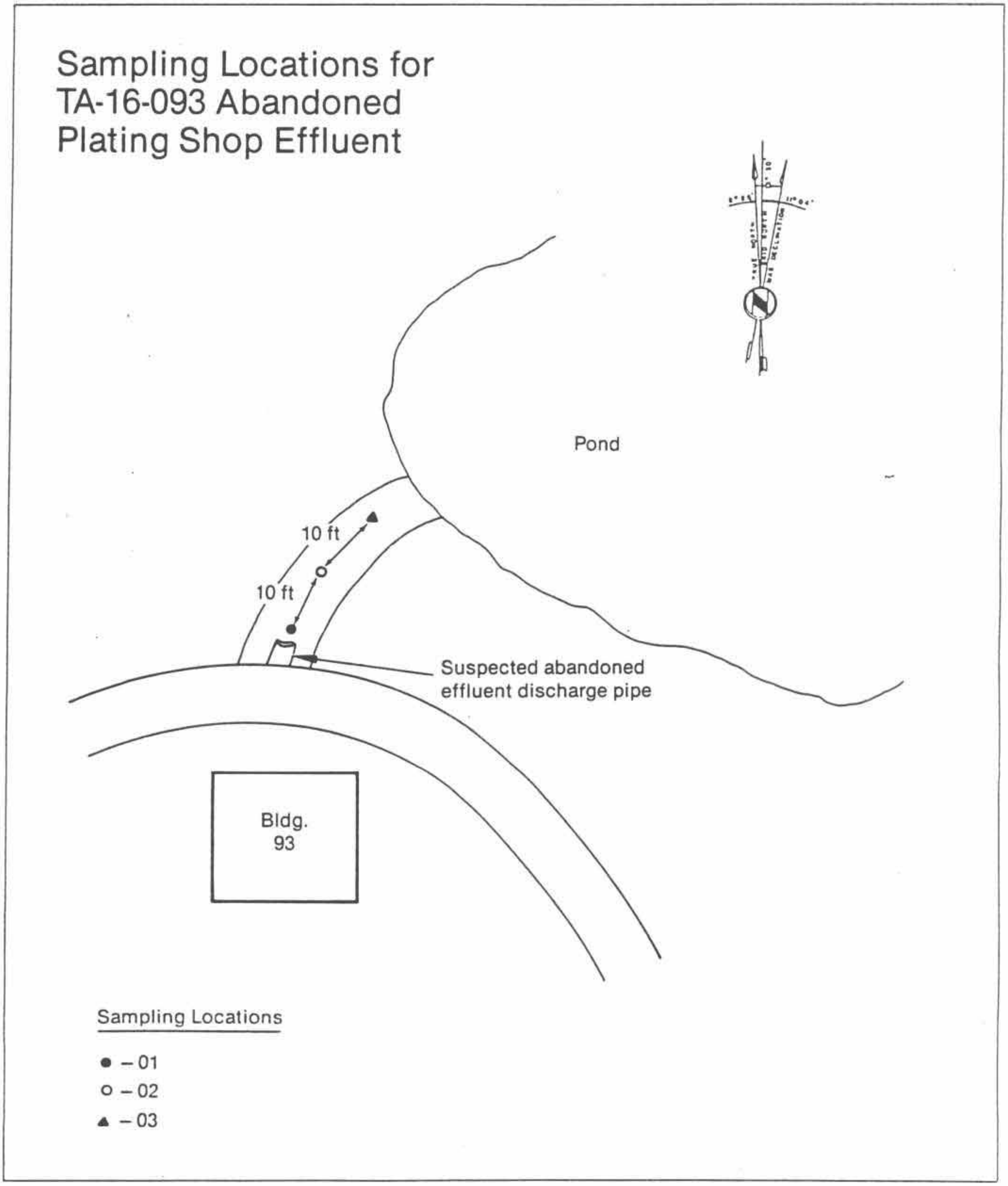

Sampling Locations for
TA-16-093 Abandoned
Plating Shop Effluent
Pond
10 ft
10 ft
Suspected abandoned
effluent discharge pipe
Bldg.
93
Sampling Locations
● – 01
○ – 02
▲ – 03

Figure 4.24.4

Sampling Locations at TA-46-70 Abandoned Sump

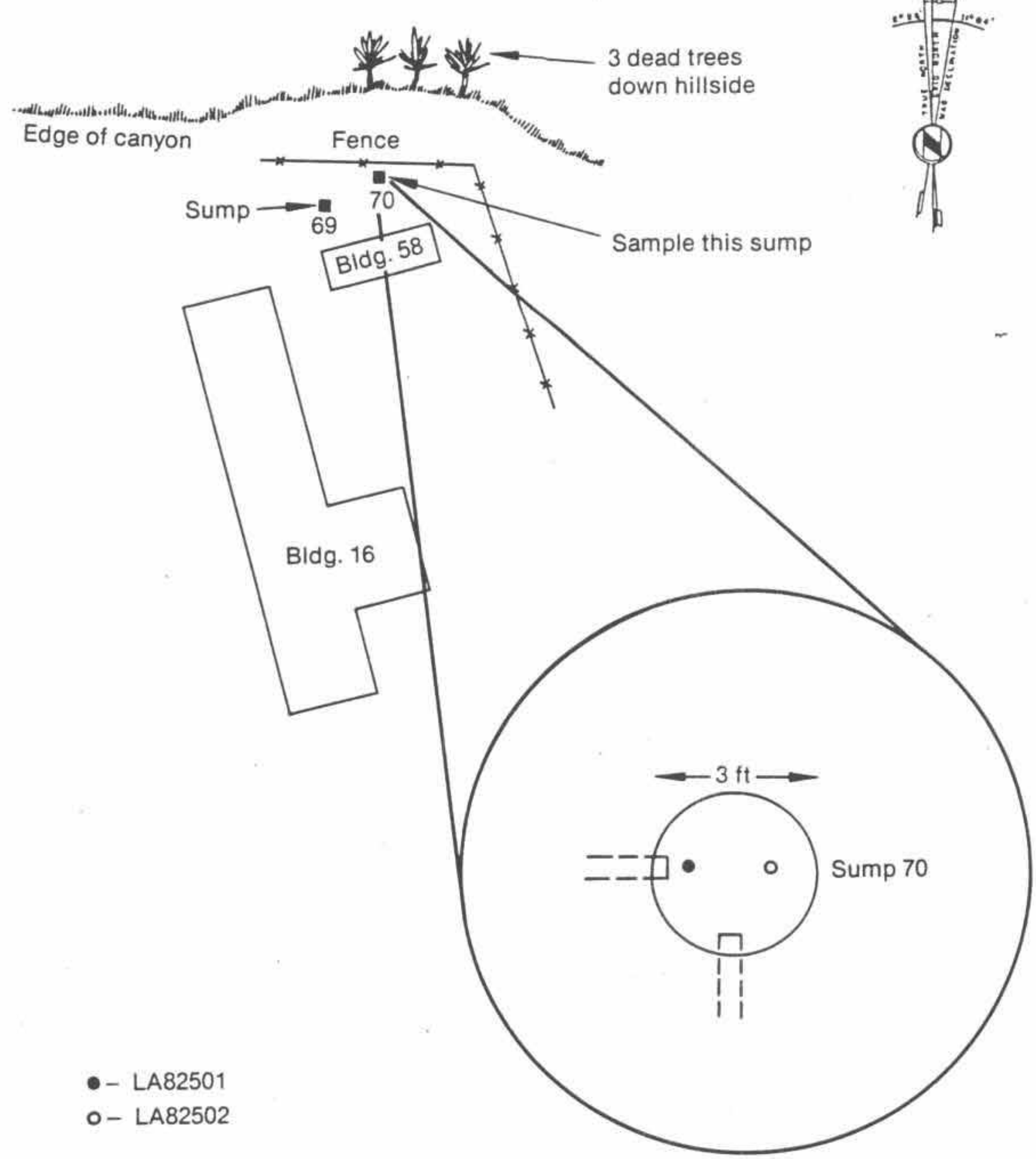


Figure 4.24.5

Sampling Location at TA-35-34 Collection Basin

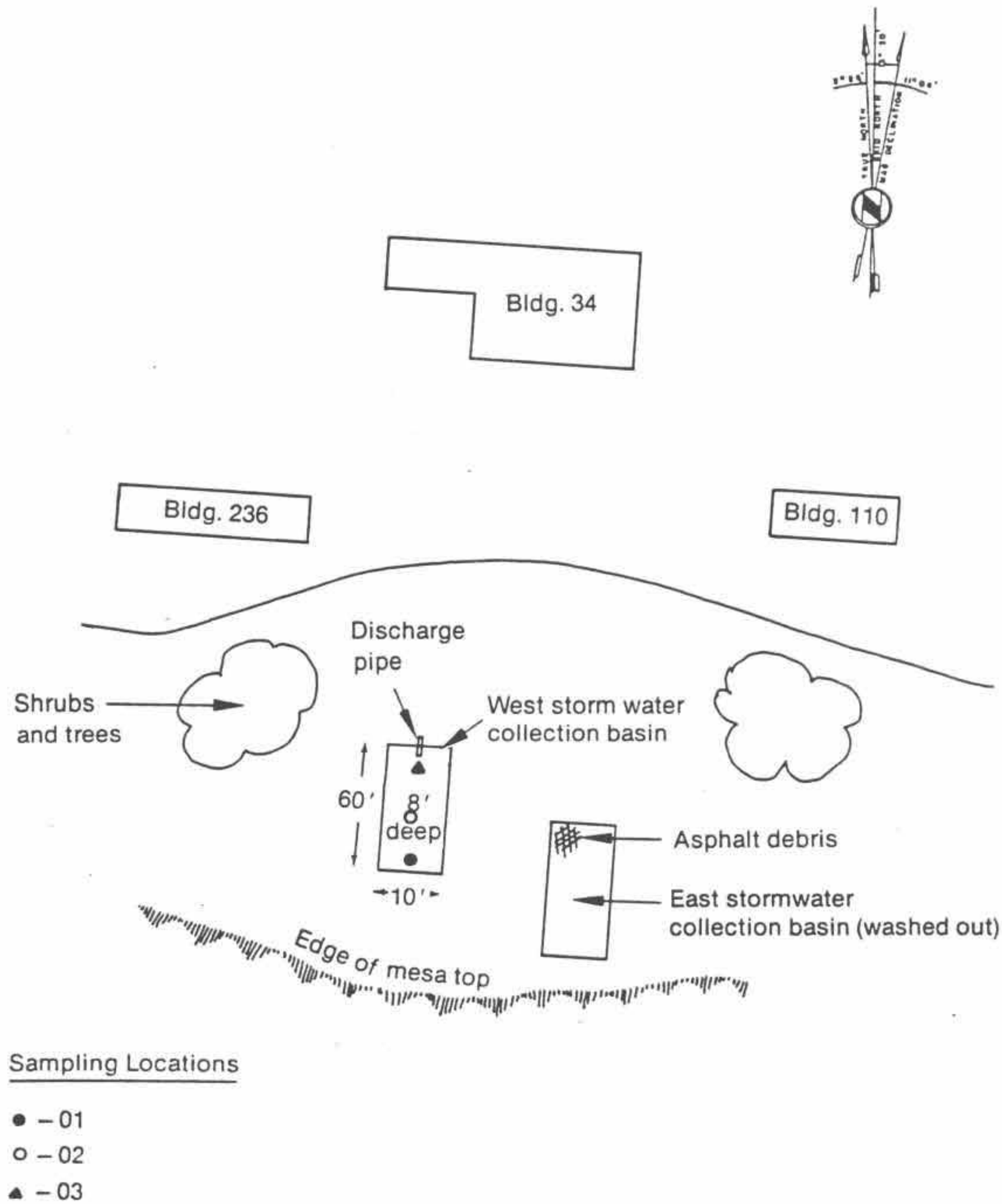
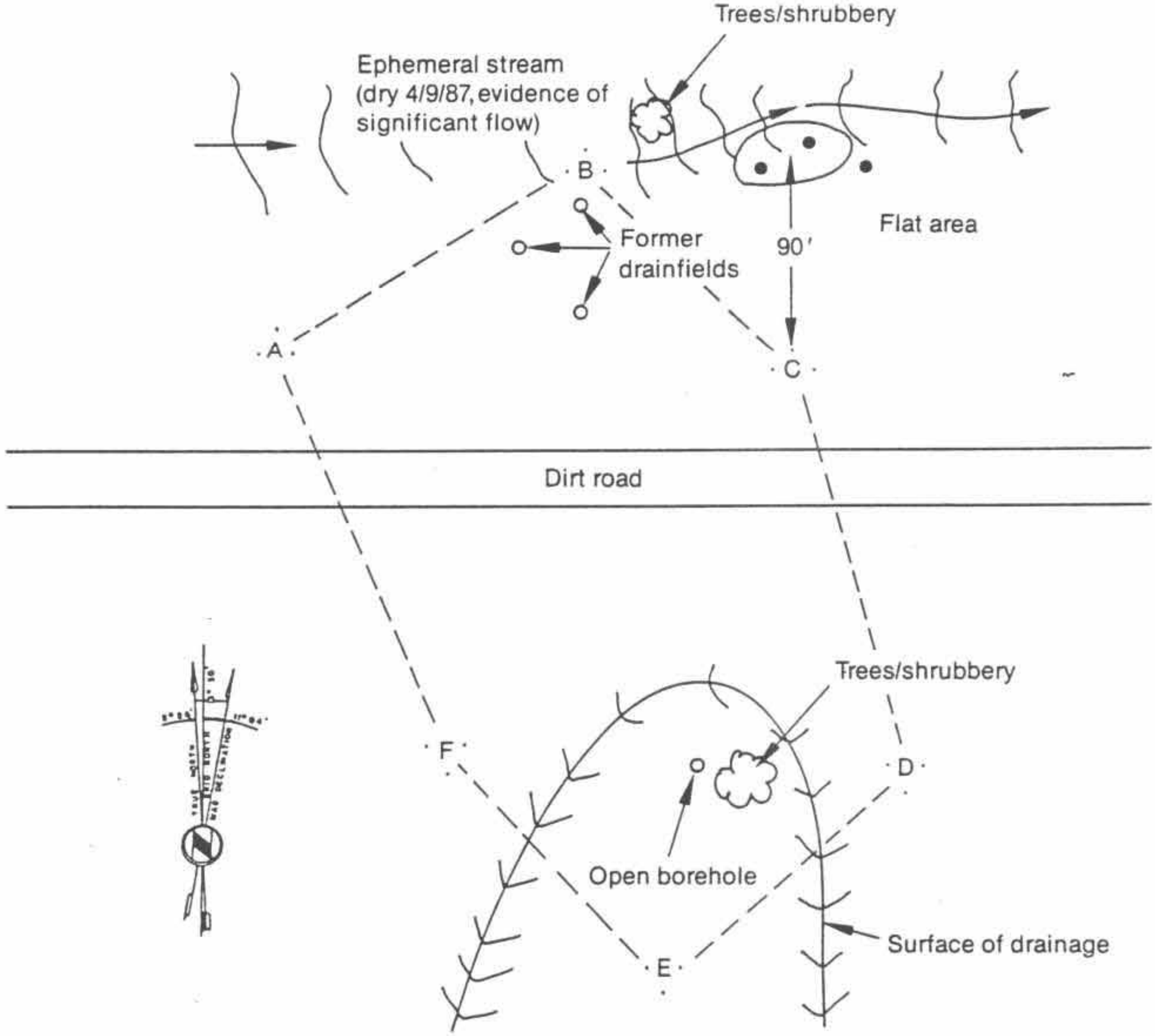


Figure 4.24.6

Borehole/Monitor Well Locations at TA-10



Area bounded by points A-F are not to be excavated or disturbed until year 2142

● —Approximate location of borings/monitor wells, distance between adjacent wells to be approx. 40′ to 60′

Figure 4.24.7

LANL S&A Data Document - November 1989 - DRAFT: NOT TO BE CITED

TABLE 4.24.1 LOS ALAMOS NATIONAL LABORATORY - COMPLETION TABLE - ENVIRONMENTAL PROBLEM 24

(Column Header Legend: P = Planned C = Collected A = Analyzed)
(Status Column Legend: Del = Deleted Dev = Deviation)

REQUEST NUMBER	SN	STAT	DATE COLLECTED mm/dd/yy	AREA	LOCATION	TYPE LOCATION	MEDIA	TYPE	NUMBER SAMPLES		VOLATILE			SEMI VOLATILE			PCB			ICP METALS			MERCURY			HIGH EXPL			CYANIDE			GAMMA ANALYSIS			PLUTO-NIUM			STRON-TIUM			THORIUM			TOTAL URANIUM		
									P	C	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A
LA819			06/21/88	TA-16	INACTIVE	LWD POND	SED	GRAB	5	5	5	5	5							5	5	5				5	5	5																		
LA820	01		05/12/88	TA-16	INACTIVE	LWD POND	WATER	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA820	02		05/13/88	TA-16	INACTIVE	LWD POND	WATER	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA820	03		05/18/88	TA-16	INACTIVE	LWD POND	WATER	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	01	DEV	06/01/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1				0	1	1												
LA821	02	DEV	06/01/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1				0	1	1												
LA821	03	DEV	06/02/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	04	DEV	06/02/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	05	DEV	06/02/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	06	DEV	06/02/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	07	DEV	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	08	DEV	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	09	DEV	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	10	DEV	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	11	DEV	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA821	12	DEV	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	GRAB	1	1	1	1	1							1	1	1				1	1	1																		
LA823	01		05/03/88	TA-08-59	INACTIVE	SEPTIC TANK	SLUDGE	GRAB	1	1	1	1	1							1	1	1				1	1	1				1	1	*	1	1	1	1	1	1				1	1	1
LA823	02		05/03/88	TA-08-59	INACTIVE	SEPTIC TANK	SLUDGE	GRAB	1	1	1	1	1							1	1	1				1	1	1				1	1	1	1	1	1	1	1	1				1	1	1
LA824			05/16/88	TA-16-093	INACTIVE	OUTFALL	SED	GRAB	3	3										3	3	3				3	3	3	3	3	3															
LA825	01		05/09/88	TA-46-070	INACTIVE	SUMPS	SLUDGE	GRAB	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA825	02		05/09/88	TA-46-070	INACTIVE	SUMPS	SLUDGE	GRAB	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA826	01	DEL	05/09/88	TA-46-070	INACTIVE	SUMPS	WATER	GRAB	1																																					
LA826	02	DEL		TA-46-070	INACTIVE	SUMPS	WATER	GRAB	1																																					
LA828			05/05/88	TA-35-34	RUNOFFBASIN	WEST BASIN	SED	GRAB	3	3	3	3	3	3	3	3	3	3	3	3	3	3																								
LA829	01		05/17/88	TA-10	BAYO CANYON	BORINGS	SS SOIL	GRAB	1	1	1	1	1	1	1	1				1	1	1										1	1	1				1	1	1						
LA829	02	DEL		TA-10	BAYO CANYON	BORINGS	SS SOIL	GRAB	1																																					
LA829	03	DEL		TA-10	BAYO CANYON	BORINGS	SS SOIL	GRAB	1																																					
LA830	01	DEL		TA-10	BAYO CANYON	NEW WELLS	WATER	GRAB	1																																					
LA830	02	DEL		TA-10	BAYO CANYON	NEW WELLS	WATER	GRAB	1																																					
LA830	03	DEL		TA-10	BAYO CANYON	NEW WELLS	WATER	GRAB	1																													1	0	0						
Totals for Problem Number 24									38	31	28	28	28	6	6	6	5	5	5	31	31	31	2	2	2	25	25	25	3	3	3	5	7	6	4	4	4	6	5	5	2	2	2	4	4	4

* Gamma screening was done.

TABLE 4.24.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA81901XX	LA81902XX	LA81903XX	LA81904XX	LA81905XX	LA82001XA	LA82002XA
MEDIA	SED	SED	SED	SED	SED	WATER	WATER
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L
SDG NUMBER	LA84001XX	LA84001XX	LA84001XX	LA84001XX	LA84001XX	LA31401XA	LA31401XA
FIELD MEASUREMENTS							
pH						8.0	7.8
Conductivity (uS)						105	
Temperature (C)						21.5	26.5
Depth (ft)	0-1	0-1	0-1	0-1	0-1	0-0.33	0-0.33
TARGET COMPOUNDS							
Vinyl Chloride	---	---	---	---	---	---	---
Chloroethane	---	---	---	---	---	---	---
Methylene Chloride	---	---	---	---	---	---	---
Acetone	27	40	---	---	17	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---
1,2-Dichloroethene_(total)	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---
2-Butanone	150	100	77	---	14	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---
1,1,2-Trichlorethane	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---
4-Methyl-2-Pentanone	---	---	---	---	---	---	---
2-Hexanone	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---
Chlorobenzene	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---
Styrene	---	2 J	---	---	---	---	---

TABLE 4.24.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA81901XX	LA81902XX	LA81903XX	LA81904XX	LA81905XX	LA82001XA	LA82002XA
MEDIA	SED	SED	SED	SED	SED	WATER	WATER
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L
SDG NUMBER	LA84001XX	LA84001XX	LA84001XX	LA84001XX	LA84001XX	LA31401XA	LA31401XA
TENTATIVELY IDENTIFIED COMPOUNDS							
2-Butanol	---	---	---	---	---	---	---
Dibromoethene	---	---	---	---	---	---	---
1,1-Difluoroethane	---	---	---	---	---	---	---
Dimethyldisulfide	---	---	---	---	---	---	---
Poss Terpene	28 J	---	---	---	---	---	---
Total (Allowed) Hold Time	10(14)d	10(14)d	10(14)d	10(14)d	10(14)d	15(30)d	14(30)d
ELEVated/DECReased CRQL		ELEV		ELEV	ELEV		
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.24.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA82003XA	LA82101XX	LA82102XX	LA82103XX	LA82104XX	LA82105XX	LA82106XX
MEDIA	WATER	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA82003XA	LA50006XX	LA50006XX	LA50001XX	LA50001XX	LA50006XX	LA50006XX
FIELD MEASUREMENTS							
pH	8.1						
Conductivity (uS)	118						
Temperature (C)	20.6						
Depth (ft)	0-0.33	3-4.5	3-4.5	2.5-4.5	2.5-4.5	2.5-4.5	2.5-4.5
TARGET COMPOUNDS							
Vinyl Chloride	---	---	---	---	---	---	---
Chloroethane	---	---	---	---	---	---	---
Methylene Chloride	---	---	---	---	---	---	---
Acetone	---	81 B	190 B	310 B	220 B	160 B	---
1,1-Dichloroethene	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---
1,2-Dichloroethene_(total)	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---
2-Butanone	---	---	---	---	---	---	106
1,1,1-Trichloroethane	---	---	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---
1,1,2-Trichlorethane	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---
4-Methyl-2-Pentanone	---	13 J	---	---	---	---	---
2-Hexanone	13 B	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---
Chlorobenzene	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---
Styrene	---	---	---	---	---	---	---

TABLE 4.24.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA82003XA	LA82101XX	LA82102XX	LA82103XX	LA82104XX	LA82105XX	LA82106XX
MEDIA	WATER	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/L	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA82003XA	LA50006XX	LA50006XX	LA50001XX	LA50001XX	LA50006XX	LA50006XX
TENTATIVELY IDENTIFIED COMPOUNDS							
2-Butanol	---	---	---	---	---	---	---
Dibromoethene	---	---	---	---	---	---	---
1,1-Difluoroethane	---	---	---	---	---	---	---
Dimethyldisulfide	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	---
Total (Allowed) Hold Time	13(30)d	15(14)d*	15(14)d*	12(14)d	13(14)d	14(14)d	14(14)d
ELEVated/DECReased CRQL		ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.24.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16	TA-08-59
LOCATION	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	INACTIVE
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	SEPTIC TANK
SAMPLE NUMBER	LA82107XX	LA82108XX	LA82109XX	LA82110XX	LA82111XX	LA82112XX	LA82301XX
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SLUDGE
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA82107XX	LA82107XX	LA82107XX	LA82107XX	LA82107XX	LA82107XX	LA30901XA
FIELD MEASUREMENTS							
Depth (ft)	0-5	0-5	0-5	0-5	0-5	0-5	3.8-6.8
TARGET COMPOUNDS							
Vinyl Chloride	---	---	---	---	---	---	24
Chloroethane	---	---	---	---	---	---	450 E
Methylene Chloride	---	---	---	---	---	---	190
Acetone	---	---	---	---	---	---	180
1,1-Dichloroethene	---	---	---	---	---	---	140
1,1-Dichloroethane	---	---	---	---	---	---	510 E
1,2-Dichloroethene_(total)	---	---	---	---	---	---	6200 E
Chloroform	---	---	---	---	---	---	59
1,2-Dichloroethane	---	---	---	---	---	---	110
2-Butanone	---	---	---	---	---	---	120
1,1,1-Trichloroethane	---	---	---	---	---	---	160
Trichloroethene	---	---	---	---	---	2 J	33
1,1,2-Trichlorethane	---	---	---	---	---	---	9
Benzene	---	---	---	---	---	4 J	---
4-Methyl-2-Pentanone	---	---	---	---	---	---	---
2-Hexanone	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	5 J	47
Chlorobenzene	---	---	---	---	---	4 J	---
Ethylbenzene	---	---	---	---	---	---	3 J
Styrene	---	---	---	---	---	---	---

TABLE 4.24.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16	TA-08-59
LOCATION	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	INACTIVE
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	SEPTIC TANK
SAMPLE NUMBER	LA82107XX	LA82108XX	LA82109XX	LA82110XX	LA82111XX	LA82112XX	LA82301XX
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SLUDGE
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA82107XX	LA82107XX	LA82107XX	LA82107XX	LA82107XX	LA82107XX	LA30901XA
TENTATIVELY IDENTIFIED COMPOUNDS							
2-Butanol	---	---	---	---	---	---	---
Dibromoethene	---	---	---	---	---	---	---
1,1-Difluoroethane	---	---	---	---	---	---	---
Dimethyldisulfide	---	---	---	---	---	---	---
Poss Terpene	---	---	---	---	---	---	37 J
Total (Allowed) Hold Time	9(14)d	9(14)d	27(14)d*	27(14)d*	27(14)d*	14(14)d	15(14)d*
ELEVated/DECReased CRQL		ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.24.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-08-59	TA-46-070	TA-46-070	TA-35-34	TA-35-34	TA-35-34	TA-10
LOCATION	INACTIVE	INACTIVE	INACTIVE	RUNOFFBASIN	RUNOFFBASIN	RUNOFFBASIN	BAYO CANYON
TYPE OF LOCATION	SEPTIC TANK	SUMPS	SUMPS	WEST BASIN	WEST BASIN	WEST BASIN	BORINGS
SAMPLE NUMBER	LA82302XX	LA82501XX	LA82502XX	LA82801XX	LA82802XX	LA82803XX	LA82901XX
MEDIA	SLUDGE	SLUDGE	SLUDGE	SED	SED	SED	SS SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA30901XA	LA80302XX	LA80302XX	LA80302XX	LA80302XX	LA80302XX	LA31401XA
FIELD MEASUREMENTS							
Depth (ft)	3.8-6.8	0-0.67	0-0.67	0-0.5	0-0.5	0-0.5	0-39
TARGET COMPOUNDS							
Vinyl Chloride	26	---	---	---	---	---	---
Chloroethane	300	---	---	---	---	---	---
Methylene Chloride	160	---	---	---	---	---	32 B
Acetone	260	---	---	---	---	---	---
1,1-Dichloroethene	210	---	---	---	---	---	---
1,1-Dichloroethane	1100 E	---	---	---	---	---	---
1,2-Dichloroethene_(total)	5800 E	---	---	---	---	---	---
Chloroform	320	---	---	---	---	---	---
1,2-Dichloroethane	130	---	---	---	---	---	---
2-Butanone	440 E	---	---	---	---	---	---
1,1,1-Trichloroethane	1200 E	---	---	---	---	---	---
Trichloroethene	55	---	---	---	---	---	---
1,1,2-Trichlorethane	32	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---
4-Methyl-2-Pentanone	---	---	---	---	---	---	---
2-Hexanone	---	---	---	---	---	---	---
Tetrachloroethene	---	---	36 J	---	---	---	---
Toluene	72	---	180	---	---	---	---
Chlorobenzene	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---
Styrene	---	---	---	---	---	---	---

TABLE 4.24.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-08-59	TA-46-070	TA-46-070	TA-35-34	TA-35-34	TA-35-34	TA-10
LOCATION	INACTIVE	INACTIVE	INACTIVE	RUNOFFBASIN	RUNOFFBASIN	RUNOFFBASIN	BAYO CANYON
TYPE OF LOCATION	SEPTIC TANK	SUMPS	SUMPS	WEST BASIN	WEST BASIN	WEST BASIN	BORINGS
SAMPLE NUMBER	LA82302XX	LA82501XX	LA82502XX	LA82801XX	LA82802XX	LA82803XX	LA82901XX
MEDIA	SLUDGE	SLUDGE	SLUDGE	SED	SED	SED	SS SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA30901XA	LA80302XX	LA80302XX	LA80302XX	LA80302XX	LA80302XX	LA31401XA
TENTATIVELY IDENTIFIED COMPOUNDS							
2-Butanol	42 J	---	---	---	---	---	---
Dibromoethene	---	---	---	---	---	---	---
1,1-Difluoroethane	13 J	---	---	---	---	---	---
Dimethyldisulfide	---	---	---	---	---	---	---
Poss Terpene	29 J	---	---	---	---	---	---
Total (Allowed) Hold Time	15(14)d*	11(14)d	11(14)d	14(14)d	14(14)d	14(14)d	9(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV	
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.24.3 LOS ALAMOS NATIONAL LABORATORY - SEMIVOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24

AREA	TA-46-070	TA-46-070	TA-35-34	TA-35-34	TA-35-34	TA-10
LOCATION	INACTIVE	INACTIVE	RUNOFFBASIN	RUNOFFBASIN	RUNOFFBASIN	BAYO CANYON
TYPE OF LOCATION	SUMPS	SUMPS	WEST BASIN	WEST BASIN	WEST BASIN	BORINGS
SAMPLE NUMBER	LA82501XV	LA82502XV	LA82801XV	LA82802XV	LA82803XV	LA82901XV
MEDIA	SLUDGE	SLUDGE	SED	SED	SED	SS SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA30801XV	LA30801XV	LA30801XV	LA30801XV	LA30801XV	LA60501XV
FIELD MEASUREMENTS						
Depth (ft)	0-0.67	0-0.67	0-0.5	0-0.5	0-0.5	0-39
TARGET COMPOUNDS						
Benzoic acid	---	---	---	---	840 JB	100 J
Phenanthrene	---	---	---	---	72 J	---
Fluoranthene	49000 J	9600 J	---	42 J	120 J	---
Pyrene	---	---	---	36 J	140 J	---
Chrysene	---	---	---	---	99 J	---
TENTATIVELY IDENTIFIED COMPOUNDS						
Benzaldehyde	---	---	---	---	1300 J	---
C13 Naphthalene	7900 J	---	---	---	---	---
C13 Naphthalene	31000 J	---	---	---	---	---
C13 Naphthalene	25000 J	---	---	---	---	---
C13 Naphthalene	30000 J	---	---	---	---	---
C13 Naphthalene or Azulene	---	7800 J	---	---	---	---
C13 Naphthalene or Azulene	---	6200 J	---	---	---	---
C13 Naphthalene or Azulene	---	9200 J	---	---	---	---
C14 Naphthalene	22000 J	---	---	---	---	---
C14 Naphthalene or Azulene	43000 J	1600 J	---	---	---	---
C14 Naphthalene or Azulene	13000 J	3500 J	---	---	---	---
C14 Phenol	17000 J	4000 J	---	---	---	---
C15 Phenol	---	4800 J	---	---	---	---
C20 Phosphoric Acid Ester	---	32000 J	---	---	---	---
Junipenene	---	---	---	---	790 J	---

TABLE 4.24.3 LOS ALAMOS NATIONAL LABORATORY - SEMIVOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-46-070	TA-46-070	TA-35-34	TA-35-34	TA-35-34	TA-10
LOCATION	INACTIVE	INACTIVE	RUNOFFBASIN	RUNOFFBASIN	RUNOFFBASIN	BAYO CANYON
TYPE OF LOCATION	SUMPS	SUMPS	WEST BASIN	WEST BASIN	WEST BASIN	BORINGS
SAMPLE NUMBER	LA82501XV	LA82502XV	LA82801XV	LA82802XV	LA82803XV	LA82901XV
MEDIA	SLUDGE	SLUDGE	SED	SED	SED	SS SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA30801XV	LA30801XV	LA30801XV	LA30801XV	LA30801XV	LA60501XV
TENTATIVELY IDENTIFIED COMPOUNDS						
Phenanthrenecarboxylic Acid	---	---	---	---	2700 J	---
Poss 2,2'-Oxybis-Ethane	---	---	---	1000J	---	---
Poss Pentadecadiyroic Acid	---	11000 J	---	---	---	---
Prob Stigmast-En-Ol Isomer	---	---	---	---	1600 J	---
Prob Phenan. Crboxylic Acid	---	---	---	---	1700 J	---
Prob Phosphene Acid Ester C20	86000 J	---	---	---	---	---
Trinitrotoluene Isomer	---	---	---	---	420 J	---
Total (Allowed) Hold Time	8(14)d	8(14)d	12(14)d	12(14)d	12(14)d	11(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	0.020	0.050	0.100	1.000	1.000	1.000

TABLE 4.24.4 LOS ALAMOS NATIONAL LABORATORY - PESTICIDE/PCB DATA - ENVIRONMENTAL PROBLEM 24

AREA	TA-46-070	TA-46-070	TA-35-34	TA-35-34	TA-35-34
LOCATION	INACTIVE	INACTIVE	RUNOFFBASIN	RUNOFFBASIN	RUNOFFBASIN
TYPE OF LOCATION	SUMPS	SUMPS	WEST BASIN	WEST BASIN	WEST BASIN
SAMPLE NUMBER	LA82501XV	LA82502XV	LA82801XV	LA82802XV	LA82803XV
MEDIA	SLUDGE	SLUDGE	SED	SED	SED
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA30801XV	LA30801XV	LA30801XV	LA30801XV	LA30801XV
FIELD MEASUREMENTS					
Depth (ft)	0-0.67	0-0.67	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS					
Aroclor-1254	37000	9200	---	---	---
Aroclor-1260	---	---	750	560	1700
Total (Allowed) Hold Time	8(14)d	8(14)d	12(14)d	12(14)d	12(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	0.2	0.2	1.0	1.0	1.0

TABLE 4.24.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 24

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA81901XW	LA81902XW	LA81903XW	LA81904XW	LA81905XW	LA82001XH
MEDIA	SED	SED	SED	SED	SED	WATER
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	UG/L
SDG NUMBER	LA81002XW	LA81002XW	LA81002XW	LA81002XW	LA81002XW	LA82001XH
FIELD MEASUREMENTS						
pH						8.0
Conductivity (uS)						105
Temperature (C)						21.5
Depth (ft)	0-1	0-1	0-1	0-1	0-1	0-0.33
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	434	2310	1730	1910	1080	5330
Beryllium	1.1 B	1.4	1.4	---	0.96 B	---
Cadmium	5.0	5.1	4.5 B	2.8 B	---	---
Chromium	23.2	25.4	17.3	9.3	10.3	---
Copper	8.0	12.8	9.4	18.4	6.8	---
Lead[c]	---	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	---	13.3	---	---	---	---
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	99.3	65.9	57.4	99.0	31.1	65.6
% Solids	80.0	83.8	77.4	85.0	85.6	
Total (Allowed) Hold Time[a]	155(182)d	155(182)d	155(182)d	155(182)d	155(182)d	187(182)d*
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]						

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.24.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	INACTIVE	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA82002XH	LA82003XH	LA82101XW	LA82102XW	LA82103XW	LA82104XW
MEDIA	WATER	WATER	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	UG/L	UG/L	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA30901XH	LA82001XH	LA50001XW	LA50001XW	LA50001XW	LA50001XW
FIELD MEASUREMENTS						
pH	7.8	8.1				
Conductivity (uS)	150	118				
Temperature (C)	26.5	20.6				
Depth (ft)	0-0.33	0-0.33	3-4.5	3-4.5	2.5-4.5	2.5-4.5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	6420	5470	221	200	210	216
Beryllium	---	---	1.5	1.5	1.4	1.5
Cadmium	---	---	---	---	---	---
Chromium	---	15.6	22.3	25.3	28.6	22.7
Copper	---	---	10.8	10.2	9.7	11.1
Lead[c]	---	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	---	---	15.5	15.2	15.2	17.0
Selenium	---	---	---	---	---	---
Silver	---	33.7	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	---	84.1	43.0	44.6	38.7	40.8
% Solids			89.4	88.7	87.5	88.2
Total (Allowed) Hold Time[a]	12(182)d	187(182)d*	26(182)d	26(182)d	25(182)d	25(182)d
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]			14(182)d	14(182)d	13(182)d	13(182)d

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.24.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA82105XW	LA82106XW	LA82107XW	LA82108XW	LA82109XW	LA82110XW
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA50001XW	LA50001XW	LA81002XW	LA81002XW	LA81002XW	LA81002XW
FIELD MEASUREMENTS						
Depth (ft)	2.5-4.5	2.5-4.5	0-5	0-5	0-5	0-5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	200	207	193	175	160	226
Beryllium	1.9 B	1.5	1.2	---	---	1.1 B
Cadmium	---	---	3.4 B	2.8 B	3.0 B	3.4 B
Chromium	30.9	26.5	15.8	11.0	11.4	13.0
Copper	11.8	10.6	---	7.4	7.1	---
Lead[c]	19.1 B	---	---	---	---	---
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	18.6	14.5	---	---	---	---
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	51.8	41.4	34.8	30.2	34.9	36.4
% Solids	86.7	85.5	85.9	91.5	85.8	87.2
Total (Allowed) Hold Time[a]	26(182)d	26(182)d	175(182)d	175(182)d	175(182)d	175(182)d
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]	14(182)d	14(182)d				

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.24.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-08-59	TA-08-59	TA-16-093	TA-16-093
LOCATION	BACKFILLED	BACKFILLED	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LWD POND	LWD POND	SEPTIC TANK	SEPTIC TANK	OUTFALL	OUTFALL
SAMPLE NUMBER	LA82111XW	LA82112XW	LA82301XW	LA82302XW	LA82401XW	LA82402XW
MEDIA	SS SOIL	SS SOIL	SLUDGE	SLUDGE	SED	SED
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA81002XW	LA81002XW	LA20101XW	LA20101XW	LA60502XW	LA60502XW
FIELD MEASUREMENTS						
Depth (ft)	0-5	0-5	3.8-6.8	3.8-6.8	0-0.5	0-0.5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	192	170	285	261	420	1120
Beryllium	1.1	1.0 B	2.2	1.8	1.8	1.7
Cadmium	3.2 B	3.0 B	6.2 B	6.1 B	5.1	5.3
Chromium	14.0	12.5	28.1	20.9	9.2	9.2
Copper	---	7.1	20.8	19.5	10.2	11.1
Lead[c]	---	---	---	---	---	332
Mercury[b]	NR	NR	NR	NR	NR	NR
Nickel	---	---	---	11.3 B	---	---
Selenium	---	---	---	---	---	---
Silver	---	---	---	5.7 B	---	---
Thallium	---	---	---	---	---	---
Zinc	37.1	39.5	73.8	70.1	130	206
% Solids	85.5	85.7	52.6	53.7	95.6	90.0
Total (Allowed) Hold Time[a]	175(182)d	175(182)d	121(182)d	121(182)d	9(182)d	9(182)d
Total (Allowed) Hold Time[b]						
Total (Allowed) Hold Time[c]						

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.24.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16-093	TA-46-070	TA-46-070	TA-35-34	TA-35-34	TA-35-34
LOCATION	INACTIVE	INACTIVE	INACTIVE	RUNOFFBASIN	RUNOFFBASIN	RUNOFFBASIN
TYPE OF LOCATION	OUTFALL	SUMPS	SUMPS	WEST BASIN	WEST BASIN	WEST BASIN
SAMPLE NUMBER	LA82403XW	LA82501XW	LA82502XW	LA82801XW	LA82802XW	LA82803XW
MEDIA	SED	SLUDGE	SLUDGE	SED	SED	SED
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA60502XW	LA30201XW	LA30201XW	LA30201XW	LA30201XW	LA30201XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.67	0-0.67	0-0.5	0-0.5	0-0.5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	1590	---	---	102	51.7	81.9
Beryllium	1.8	---	---	---	---	---
Cadmium	5.6	15.0	36.6	---	---	---
Chromium	8.6	54.5	42.8	5.3	3.9	4.9
Copper	14.5	2520	2450	18.5	8.1	11.9
Lead[c]	---	1730	1930	---	---	---
Mercury[b]	NR	27.7	56.7	NR	NR	NR
Nickel	---	---	---	---	---	---
Selenium	---	---	---	---	---	---
Silver	---	120	198	---	---	---
Thallium	---	---	---	---	---	---
Zinc	234	760	1150	195	61.9	124
% Solids	93.8	28.1	28.4	76.8	80.7	77.1
Total (Allowed) Hold Time[a]	9(182)d	16(182)d	16(182)d	20(182)d	20(182)d	20(182)d
Total (Allowed) Hold Time[b]		37(28)d*	37(28)d*			
Total (Allowed) Hold Time[c]						

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.24.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-10
LOCATION	BAYO CANYON
TYPE OF LOCATION	BORINGS
SAMPLE NUMBER	LA82901XW
MEDIA	SS SOIL
UNITS	mg/kg
SDG NUMBER	LA82901XW
FIELD MEASUREMENTS	
Depth (ft)	0-39
ANALYTES	
Antimony	---
Arsenic	---
Barium	43.3 B
Beryllium	---
Cadmium	---
Chromium	8.6
Copper	---
Lead[c]	---
Mercury[b]	NR
Nickel	---
Selenium	---
Silver	---
Thallium	---
Zinc	28.3
% Solids	90.7
Total (Allowed) Hold Time[a]	9(182)d
Total (Allowed) Hold Time[b]	
Total (Allowed) Hold Time[c]	

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.24.6 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 24

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA81901XY	LA81902XY	LA81903XY	LA81904XY	LA81905XY	LA82001XM
MEDIA	SED	SED	SED	SED	SED	WATER
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/mL
SDG NUMBER	LANL008	LANL008	LANL008	LANL008	LANL008	LANL001
FIELD MEASUREMENTS						
Temperature (C)						21.5
Conductivity (uS)						105
pH						7.98
Depth (ft)	0-1.00	0-1.00	0-1.00	0-1.00	0-1.00	0-0.33
ANALYTES						
None detected						
Total (Allowed) Hold Time	3(14)d	3(14)d	3(14)d	3(14)d	3(14)d	12(14)d

TABLE 4.24.6 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	INACTIVE	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA82002XM	LA82003XM	LA82101XY	LA82102XY	LA82103XY	LA82104XY
MEDIA	WATER	WATER	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/mL	ug/mL	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL001	LANL001	LANL011	LANL011	LANL011	LANL011
FIELD MEASUREMENTS						
Temperature (C)	26.5	20.6				
Conductivity (uS)	0.15	118				
pH	7.82	8.05				
Depth (ft)	0-0.33	0-0.33	3-4.5	3-4.5	2.5-4.5	2.5-4.5
ANALYTES						
None detected						
Total (Allowed) Hold Time	12(14)d	12(14)d	2(14)d	2(14)d	2(14)d	12(14)d

TABLE 4.24.6 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA82105XY	LA82106XY	LA82107XY	LA82108XY	LA82109XY	LA82110XY
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL011	LANL011	LANL008	LANL008	LANL008	LANL009
FIELD MEASUREMENTS						
Temperature (C)						
Conductivity (uS)						
pH						
Depth (ft)	2.5-4.5	2.5-4.5	0-5	0-5	0-5	0-5
ANALYTES						
None detected						
Total (Allowed) Hold Time	12(14)d	12(14)d	23(14)d*	23(14)d*	23(14)d*	27(14)d*

TABLE 4.24.6 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-08-59	TA-08-59	TA-16-093	TA-16-093
LOCATION	BACKFILLED	BACKFILLED	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LWD POND	LWD POND	SEPTIC TANK	SEPTIC TANK	OUTFALL	OUTFALL
SAMPLE NUMBER	LA82111XY	LA82112XY	LA82301XY	LA82302XY	LA82401XY	LA82402XY
MEDIA	SS SOIL	SS SOIL	SLUDGE	SLUDGE	SED	SED
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	80
SDG NUMBER	LANL009	LANL009	LANL002	LANL002	LANL002	LANL002
FIELD MEASUREMENTS						
Temperature (C)						
Conductivity (uS)						
pH						
Depth (ft)	0-5	0-5	3.8-6.8	3.8-6.8	0-0.50	0-0.50
ANALYTES						
None detected						
Total (Allowed) Hold Time	27(14)d*	27(14)d*	22(14)d*	22(14)d*	9(14)d	9(14)d

TABLE 4.24.6 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16-093
LOCATION	INACTIVE
TYPE OF LOCATION	OUTFALL
SAMPLE NUMBER	LA82403XY
MEDIA	SED
UNITS	ug/g
SDG NUMBER	LANL002
FIELD MEASUREMENTS	
Temperature (C)	
Conductivity (uS)	
pH	
Depth (ft)	0-0.50
ANALYTES	
None detected	
Total (Allowed) Hold Time	9(14)d

TABLE 4.24.7 LOS ALAMOS NATIONAL LABORATORY - CYANIDE DATA - ENVIRONMENTAL PROBLEM 24

AREA	TA-16-093	TA-16-093	TA-16-093
LOCATION	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	OUTFALL	OUTFALL	OUTFALL
SAMPLE NUMBER	LA82401XW	LA82402XW	LA82403XW
MEDIA	SED	SED	SED
UNITS	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA82401XW	LA82401XW	LA82401XW
FIELD MEASUREMENTS			
Depth (ft)	0-0.5	0-0.5	0-0.5
ANALYTES			
Cyanide	0.39	---	0.40
% Solid	95.6	90.0	93.8
Total (Allowed) Hold Time	21(14)d*	21(14)d*	21(14)d*

TABLE 4.24.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 24

AREA	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA81901W[d]	LA81902W[d]	LA81903W[d]	LA81904W[d]	LA81905W[d]
MEDIA	SED	SED	SED	SED	SED
UNITS	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW
Gross Alpha	na	na	na	na	na
Gross Beta	na	na	na	na	na
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<16200 ±3000	<14400 ±1800	<8700 ±1000	<11100 ±4600	<17900 ±3600
Uranium - 235	----	----	----	----	----
Uranium - 238[a]	<11700 ±3700	<13500 ±2200	<5900 ±1100	<12100 ±3900	<12800 ±3700
Uranium (all isotopes)[c]	na	na	na	na	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Potassium - 40	12000 ±9400	18800 ±2800	11000 ±1500	19000 ±8100	22500 ±6300
Cadmium - 109	----	----	----	----	----
Cesium - 137	680 ±240	320 ±90.0	280 ±60.0	----	790 ±240

a. Total unbroken chain activity in equilibrium.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.24.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA LOCATION TYPE OF LOCATION SAMPLE NUMBER MEDIA UNITS	TA-16 INACTIVE LWD POND LA81907W[d] SED pCi/kgW	TA-16 INACTIVE LWD POND LA81908W[d] SED pCi/kgW	TA-16 INACTIVE LWD POND LA81909W[d] SED pCi/kgW	TA-16 INACTIVE LWD POND LA82001W[d] WATER pCi/L	TA-16 INACTIVE LWD POND LA82002W[d] WATER pCi/L
Gross Alpha	na	na	na	nd[e]	nd[e]
Gross Beta	na	na	na	nd[e]	nd[e]
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<15300 ±2600	<9700 ±2100	<11900 ±2700	----	----
Uranium - 235	----	----	----	----	----
Uranium - 238[a]	<10400 ±3100	<11200 ±3300	<14000 ±2900	----	----
Uranium (all isotopes)[c]	na	na	na	na	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Potassium - 40	10000 ±4200	7600 ±3600	11900 ±5100	----	----
Cadmium - 109	----	----	----	----	----
Cesium - 137	----	----	----	----	----

a. Total unbroken chain activity in equilibrium.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.
e. No gross activity detected.

TABLE 4.24.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	INACTIVE	BACKFILLED	BACKFILLED	BACKFILLED	BACKFILLED
TYPE OF LOCATION	LWD POND	LWD POND	LWD POND	LWD POND	LWD POND
SAMPLE NUMBER	LA82003W[d]	LA82101W	LA82102W	LA82103W[d]	LA82104W[d]
MEDIA	WATER	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	pCi/L	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW
Gross Alpha	nd[e]	na	na	na	na
Gross Beta	nd[e]	na	na	na	na
Alpha Emitters					
Thorium - 230	na	----	----	----	----
Thorium - 232[a]	----	<11560 ±840	<11490 ±830	<13300 ±1400	<13200 ±1600
Uranium - 235	----	65.0 ±23.0	72.0 ±20.0	----	----
Uranium - 238[a]	----	<7890 ±650	<7460 ±670	<9500 ±1700	<8900 ±1700
Uranium (all isotopes)[c]	na	na	na	na	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Potassium - 40	----	17900 ±2000	18000 ±1800	16200 ±2400	17000 ±3000
Cadmium - 109	----	----	----	----	----
Cesium - 137	----	----	----	----	----

a. Total unbroken chain activity in equilibrium.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.
e. No gross activity detected.

TABLE 4.24.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA LOCATION TYPE OF LOCATION SAMPLE NUMBER MEDIA UNITS	TA-16 BACKFILLED LWD POND LA82105W[d] SS SOIL pCi/kgW	TA-16 BACKFILLED LWD POND LA82106W[d] SS SOIL pCi/kgW	TA-16 BACKFILLED LWD POND LA82110W[d] SS SOIL pCi/kgW	TA-16 BACKFILLED LWD POND LA82111W[d] SS SOIL pCi/kgW	TA-16 BACKFILLED LWD POND LA82112W[d] SS SOIL pCi/kgW
Gross Alpha	na	na	na	na	na
Gross Beta	na	na	na	na	na
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<14000 ±1800	<13100 ±2000	<12900 ±2500	<12400 ±3100	<12500 ±3100
Uranium - 235	----	----	----	----	----
Uranium - 238[a]	<8900 ±1500	<9700 ±1700	<10000 ±3300	<11200 ±3300	<11100 ±3100
Uranium (all isotopes)[c]	na	na	na	na	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Potassium - 40	13600 ±2300	16800 ±2600	17800 ±4900	10900 ±4400	18400 ±5100
Cadmium - 109	----	----	----	----	----
Cesium - 137	----	----	----	----	250 ±220

a. Total unbroken chain activity in equilibrium.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.
e. No gross activity detected.

TABLE 4.24.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-08-59	TA-08-59	TA-08-59	TA-08-59	TA-16-093
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	SEPTIC TANK	SEPTIC TANK	SEPTIC TANK	SEPTIC TANK	OUTFALL
SAMPLE NUMBER	LA82301D	LA82301W[d]	LA82302D	LA82302W	LA82401W[d]
MEDIA	SLUDGE	SLUDGE	SLUDGE	SLUDGE	SED
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgW
Gross Alpha	na	na	na	na	na
Gross Beta	na	na	na	na	na
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	na	<8520 ±1200	na	<9220 ±670	<19400 ±4200
Uranium - 235	na	----	na	48.0 ±12.0	----
Uranium - 238[a]	na	<8160 ±1400	na	<8580 ±670	<13400 ±6100
Uranium (all isotopes)[c]	15000 ±1500	na	10000 ±1000	na	na
Plutonium - 238	<30.0	na	<6.0	na	na
Plutonium - 239,240	<25.0	na	19.0 ±8.0	na	na
Beta Emitters					
Strontium - 90	<590	na	<580	na	na
Gamma Emitters					
Potassium - 40	na	11500 ±2300	na	11200 ±1300	17800 ±8700
Cadmium - 109	na	----	na	----	----
Cesium - 137	na	277 ±68.0	na	224 ±24.0	540 ±240

a. Total unbroken chain activity in equilibrium.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.
e. No gross activity detected.

TABLE 4.24.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-16-093	TA-16-093	TA-46-070	TA-46-070	TA-46-070
LOCATION	INACTIVE	INACTIVE	INACTIVE	INACTIVE	INACTIVE
TYPE OF LOCATION	OUTFALL	OUTFALL	SUMPS	SUMPS	SUMPS
SAMPLE NUMBER	LA82402W[d]	LA82403W[d]	LA82501D	LA82501W	LA82502D
MEDIA	SED	SED	SLUDGE	SLUDGE	SLUDGE
UNITS	pCi/kgW	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Gross Alpha	na	na	na	na	na
Gross Beta	na	na	na	na	na
Alpha Emitters					
Thorium - 230	na	na	1100 ±300	na	2100 ±400
Thorium - 232[a]	<13600 ±6700	<17000 ±3200	na	----	na
Uranium - 235	----	----	na	840 ±100	na
Uranium - 238[a]	<6600 ±4200	<16100 ±5300	na	<1100 ±1100	na
Uranium (all isotopes)[c]	na	na	11000 ±1100	na	26000 ±2600
Plutonium - 238	na	na	15.0 ±11.0	na	<17.0
Plutonium - 239,240	na	na	536 ±42.0	na	<22.0
Beta Emitters					
Strontium - 90	na	na	<2400	na	<2900
Gamma Emitters					
Potassium - 40	10200 ±6600	30100 ±7000	na	11320 ±870	na
Cadmium - 109	----	----	na	----	na
Cesium - 137	380 ±200	1220 ±370	na	58.0 ±36.0	na

a. Total unbroken chain activity in equilibrium.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.
e. No gross activity detected.

TABLE 4.24.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-46-070	TA-35-34	TA-35-34	TA-35-34	TA-10
LOCATION	INACTIVE	RUNOFFBASIN	RUNOFFBASIN	RUNOFFBASIN	BAYO CANYON
TYPE OF LOCATION	SUMPS	WEST BASIN	WEST BASIN	WEST BASIN	BORINGS
SAMPLE NUMBER	LA82502W	LA82801W[d]	LA82802W[d]	LA82803W[d]	LA82901D
MEDIA	SLUDGE	SED	SED	SED	SS SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgD
Gross Alpha	na	na	na	na	na
Gross Beta	na	na	na	na	na
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	----	<14900 ±2000	<10000 ±2500	<12200 ±2100	na
Uranium - 235	970 ±130	140 ±120	----	----	na
Uranium - 238[a]	----	<12700 ±2100	<9700 ±3400	<12400 ±2500	na
Uranium (all isotopes)[c]	na	na	na	na	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	<650
Gamma Emitters					
Potassium - 40	1150 ±630	24800 ±4100	20800 ±5500	21600 ±3300	na
Cadmium - 109	----	----	----	----	na
Cesium - 137	40.0 ±42.0	260 ±80.0	510 ±360	256 ±83.0	na

a. Total unbroken chain activity in equilibrium.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.
e. No gross activity detected.

TABLE 4.24.8 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 24 (Continued)

AREA	TA-10
LOCATION	BAYO CANYON
TYPE OF LOCATION	BORINGS
SAMPLE NUMBER	LA82901W
MEDIA	SS SOIL
UNITS	pCi/kgW
Gross Alpha	na
Gross Beta	na
Alpha Emitters	
Thorium - 230	na
Thorium - 232[a]	<11870 ±840
Uranium - 235	85.0 ±22.0
Uranium - 238[a]	<13290 ±930
Uranium (all isotopes)[c]	na
Plutonium - 238	na
Plutonium - 239,240	na
Beta Emitters	
Strontium - 90	na
Gamma Emitters	
Potassium - 40	23000 ±1800
Cadmium - 109	<2000
Cesium - 137	----

a. Total unbroken chain activity in equilibrium.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.
e. No gross activity detected.

4.25 Environmental Problem 25--Spills and Unplanned Liquid Releases

- Request Numbers: LA831, LA832, and LA846

- Requester: J. Clay/K.D. Sichelstiel

- Finding and Basis: Spills and/or unplanned releases of liquids at the LANL facility potentially have contaminated soils with hazardous and/or radioactive constituents. These releases and potentially contaminated soils may have adverse effects on surrounding biota or surface water, creating an environmental problem.

  Evidence of spills and/or unplanned releases of liquid wastes or chemicals at over 30 sites was observed during the survey. Visual observations were used to assess these sites. Remnant wastes, stressed vegetation, and stained surface soils were key indicators of potential environmental problems. Four areas with releases of concern are included in the sampling and analysis requests. The selection of these four were based on the following:

  - Wastes from unplanned releases still present and appear to have impacted biota adversely.

  - Soil staining resulting from releases of oily substances, which potentially contain PCBs and hazardous or radioactive constituents.

  (One request was deleted by the survey team prior to finalization of the S&A Plan).

4.25.1 Sampling and Analysis Objectives

- Statement

The S&A objectives were as follows:

- Determine the presence of hazardous constituents within the waste substance/liquid that has affected the vegetation on DOE property south of the Los Alamos County Roads Department facility.

- Determine the presence (above minimum detection limits) of hazardous constituents and toxic substances in the surface soils.

- Determine the possibility of surface migration of contaminated soils via surface water drainage by sampling along potential pathways on canyon side.

- Supporting Information

  See Finding and Basis.

4.25.2 Sampling and Analysis Design

- Sampling Design

  Surface soils were collected as planned at a depth of between 0 to 6-in., using a stainless steel hand auger, based on visual observation of any staining or moisture in the soil column. Dry, unstained surface soil was not collected for volatile organic analysis.

  Relatively well-defined, small areas were grab sampled for request numbers LA832 and LA846. This design provided absolute contaminant concentrations (versus average) and some information regarding variability. In addition, certain areas have multiple stains from a potentially wide variety of sources, thus further supporting the rationale for targeted grab samples.

Table 4.25.1 summarizes the sampling and analytical requests and the analyses performed.

<u>LA831: TA-35-207, Stained Spill Areas</u>. A spatial composite sampling design was used for the samples collected at TA-35-207 to account for large area(s) that appeared to be contaminated from the same sources (see Figure 4.25.1). Each composite for this location consisted of four subsamples. Samples were collected from stained areas on top of the mesa, on the canyon wall/slope, and visible stains on the canyon floor. Photoionization detector, HNU or OVA, readings were used to bias collection of the three volatile organic analysis grab samples.

<u>LA832: TA-46-031, Stains at Storage Areas</u>. Six separate grab samples were collected from stained areas at TA-46-031 (see Figure 4.25.2).

<u>LA846: TA-32, Stains and Spills at Storage Tank Area</u>. Three grab samples were collected from the drainage channel on DOE property. Grab sample 01 was collected from near the county property line, within the stained drainage channel, and approximately 10 ft from the fenceline. Grab sample 02 was spaced approximately 3 ft downgradient from the first grab sample. Grab sample 03 was collected between the second grab sample and the canyon rim (see Figure 4.25.3 for specific locations).

- Analytical Design

Samples from all locations under this environmental problem were analyzed as planned for volatile and semivolatile organic compounds, metals to ICP detection limits, and PCBs. In addition, a TCLP analysis was requested for the three samples from LA846 if the semivolatile organic and/or metals concentrations exceeded the TCLP threshold limits. The concentration of lead for sample LA846 exceeded the TCLP threshold limit; however, TCLP analysis was not performed (see Analytical Data Evaluation). Samples collected for request number LA832 were also analyzed as planned for mercury, total uranium, plutonium, ^{90}Sr, and gamma-emitting radionuclides.

4.25.3 Field and Analytical Data

- Field Data

Radiation fields up to 17 µR/h (background) were measured at TA-46-031 (LA832) and at TA-32 (LA846). Organic vapors were detected at concentrations up to 6 ppm at TA-35-207, <3 ppm at TA-46-031, and in the 20 to 60 ppm range at all three locations sampled at TA-32.

- Field Data Evaluation

None.

- Analytical Data

Analytical data for this environmental problem are summarized in Table 4.25.2 through Table 4.25.5.

Three spatial composite samples were collected from visible spill and stain areas at TA-35-207 (LA831). Acetone was detected in two of the three samples, at concentrations ranging from 70 to 160 µg/kg. Two volatile organic terpene isomers were also tentatively identified in one of the samples at concentrations of 49 and 1700 µg/kg. Terpenes may be a natural product of native coniferous trees. Five PAH semivolatile organic compounds were detected in one of the samples at concentrations ranging from 14 to 71 µg/kg. 2,4-Dinitrotoluene was detected in another sample at 6100 µg/kg. No PCBs were detected; however, six pesticides were detected in a varied distribution at concentrations ranging from 0.7 to 41 µg/kg. Zinc (26 *to 36 mg/kg) was detected in all three of the samples, barium (34 to 37 mg/kg) was detected in two of the samples, and beryllium (1.7 mg/kg) and cadmium (3.2 mg/kg) were detected in one sample.*

Six grab soil samples were collected from stained areas at TA-46-031 (LA832). Only one chlorinated solvent (1,1,1-trichloroethane) was detected in one of the samples from this location at 12 µg/kg. Eleven semivolatile organic compounds, primarily PAHs, were detected in two of these samples, at concentrations ranging from 230 to 6800 µg/kg. Numerous hydrocarbons, which are indicative of contamination with petroleum distillates, such as an oil or heavy fuel, were also detected in these samples. The only PCB detected was aroclor-1248, found in one sample at 6200 µg/kg. Three metals were detected in all six samples: barium (37 to 70 mg/kg), copper (16 to 180 mg/kg), and zinc (75 to 340 mg/kg). Other metals detected in various samples include beryllium (0.4 to 0.5 mg/kg), chromium (5 to 21 mg/kg), lead (24 to 56 mg/kg), mercury (0.4 to 20 mg/kg), and nickel (8 to 12 mg/kg). One sample contained silver at 3.5 mg/kg.

Three grab soil samples were collected from stained areas at TA-32 (LA846). Acetone and xylene were detected in one of the three samples, at 190 and 94 µg/kg, respectively. Pyrene was detected in all three of the samples, at concentrations ranging from 920 to 2500 µg/kg. Numerous hydrocarbons which are indicative of contamination with petroleum distillates, such as an oil or heavy fuel, were also detected in these samples. There were no pesticides or PCBs detected. Six metals were detected at comparable concentrations in all three samples: barium (54 to 67 mg/kg), beryllium (0.3 mg/kg), chromium (7 to 9 mg/kg), copper (9 to 11 mg/kg), lead (190 to 480 mg/kg), and zinc (69 to 77 mg/kg). Nickel, at 5 to 6 mg/kg was also detected in *two of the three samples. The concentrations of lead detected exceeded the TCLP threshold limit of 100 mg/kg for all three samples; however, TCLP analysis was inadvertently omitted.*

- Analytical Data Evaluation

LA831: TA-35-207, Stained Spill Areas. The sampling design for this location was predicated on the observation that each of the areas sampled appeared to be contaminated from the same source. Zinc was the only metal detected in all three samples at comparable concentrations (26 to 36 mg/kg). Barium, beryllium, and cadmium were detected in some, but not all, of the locations.

Sample 01 contained acetone (160 µg/kg), 2,4-dinitrotoluene (6100 µg/kg), endosulfan II (3.5 µg/kg), alpha and gamma chlordane (41 and 22 µg/kg respectively), barium (37.4 mg/kg), and beryllium (1.7 mg/kg). Alpha and gamma chlordane presence probably indicate weathered technical chlordane.

Sample 02 contained acetone (70 µg/kg), two volatile organic TIC terpene isomers (49 to 1700 µg/kg), three semivolatile organic TIC branched indene isomers (6200 to 41,000 µg/kg), gamma-BHC (0.7 µg/kg), endosulfan I (24 µg/kg), and alpha and gamma chlordane (6.8 and 29 µg/kg, respectively). Terpenes can be naturally occurring compounds associated with native coniferous trees.

Sample 03 contained no volatile organic compounds, five PAH semivolatile organic compounds (14 to 71 µg/kg), 4,4'-DDT (8.6 µg/kg, no breakdown products were detected), barium (34.3 mg/kg), and cadmium (3.2 mg/kg).

LA832: TA-46-031, Stains at Storage Areas. The only volatile organic target compound detected and attributable to the samples from this location is 1,1,1-trichloroethane in sample 02, at 12 µg/kg.

Although there were fourteen PAH target compounds reported in the semivolatile organic data, at concentrations ranging from 39 to 6800 µg/kg, approximately half of these compounds are suspect as false positives (see Limitations and Qualifications, Section 4.25.4). There were very high concentrations of hydrocarbons detected in all of these samples, which interfered with accurate identification and quantitation of the semivolatile compounds. The data user should interpret these data with caution and consider the number and concentration of compounds reported as a minimum.

The PCB aroclor-1248 was detected in sample 04 at 6200 µg/kg.

As stated previously, the only three metals that were detected in all six of the samples were barium, copper, and zinc. There is no clear-cut trend to the distribution of metals in the samples collected from this location. Beryllium was detected in samples 03-06, chromium in 01-05, lead in 01, 02, 04, and 05, mercury and nickel in 02 and 03, and silver only in sample 02.

<u>LA846: TA-32, Stains and Spills at Storage Tank Area</u>. Sample 03 contained acetone and xylene at 190 and 94 µg/kg, respectively. No other volatile organic target compounds were detected in any of the samples.

The only semivolatile organic target compound definitively attributable to these three samples was pyrene, which was detected at concentrations ranging from 920 to 2500 µg/kg. The other five semivolatile compounds reported are suspect as false positives (see Limitations and Qualifications, Section 4.25.4). There were also very high concentrations of hydrocarbon TICs detected in all of these samples, which interfered with accurate identification and quantitation of the semivolatile compounds. The data user should interpret these data with caution and consider the number and concentration of compounds reported as a minimum.

Barium, beryllium, chromium, copper, lead, and zinc were detected in all of the samples at comparable concentrations. Nickel was detected in samples 01 and 03 at 6.1 and 5.4 mg/kg, respectively. Because these concentrations of nickel are greater than the IDL, and less than the CRDL, if nickel had been present in sample 02 at a lower concentration, it would not have been detected.

TCLP analysis was requested for these samples if the semivolatile organic or metals concentrations exceeded the TCLP threshold limits. Lead was the only metal detected that exceeded those limits.

- Radiological Data

The results of the radiological measurements are given in Table 4.25.6.

The less sensitive gamma screens from the TA-35-207 (LA831) area indicate the presence of ^{137}Cs (140 and 254 pCi/kgW) in two samples (LA831001 and LA83103) and the natural activities in all samples.

Gamma analyses performed for the six samples from the TA-46-031 area (LA832) indicate the presence of ^{137}Cs (28 to 363 pCi/kgW) in all six, ^{235}U (63 to 1920 pCi/kgW) in five samples, ^{238}U in excess of the chain equilibrium amount (by 52,700 pCi/kgW) in one sample (LA83202), and the natural activities.

Alpha spectral, ^{90}Sr, and total uranium analyses were performed on the six samples from the TA-46-031 area. Plutonium-238 was identified (60 and 125 pCi/kgD) in two samples (LA83201 and LA83202), and $^{239+240}Pu$ was seen in all six samples (12 to 1310 pCi/kgD). The total uranium analyses indicate 3000 to 89,000 µg/kgD in all six *samples, with the larger values correlated with the larger plutonium activities. The ^{90}Sr analyses gave only limits of <430 to <670 pCi/kgD.*

- Radiological Data Evaluation

The radiological measurements performed on these samples included gamma analyses, gamma screens, alpha spectral analyses, ^{90}Sr analyses, and total uranium analyses.

<u>LA831: TA-35-207, Stained Spill Areas</u>. Gamma screens were performed on the three samples from TA-35, and the presence of ^{137}Cs (254 and 140 pCi/kgD in samples LA83101 and LA83103, respectively) was indicated along with the natural activities in all three samples. No other radiological measurements were made.

<u>LA832: TA-46-031, Stains at Storage Areas</u>. For the six samples from TA-46, a variety of measurements were made. The gamma analyses showed the presence of ^{137}Cs at 28 to 363 pCi/kgW with the highest concentration in LA83202. Similarly, ^{235}U was detected in five samples: between 63 and 112 pCi/kgW in four samples (LA83201, LA83203-LA83205); and 1920 pCi/kgW in sample LA83202. The U^{235} concentration was <124 pCi/kgW in sample LA83206. An excess of ^{238}U above the chain equilibrium value was found at 52,700 pCi/kgW for LA83202.

For these six samples, alpha spectral analysis gave values as follows: ^{238}Pu at 125 and 60 pCi/kgD for LA83201 and LA83202, respectively, and limits of <8 to <13 pCi/kgD for the other four samples; $^{239+240}Pu$ at 650 and 1310 pCi/kgD for samples LA83201 and LA83202, respectively, and 12 to 28 pCi/kgD for the remaining four samples. The total uranium analyses results correlated well with these results, giving 10,000 and 89,000 µg/kgD for samples LA83201 and LA83202, respectively, and 3000 µg/kgD for the remaining four samples. Only lower limits of detection (ranging from <430 to <670 pCi/kgD) were obtained for the ^{90}Sr analyses.

LA846: TA-32, Stains and Spills at Storage Tank Area. For the three samples from the TA-32 area, gamma screens indicated only the presence of the natural activities. No other radiological measurements were made on these samples.

4.25.4 Limitations and Qualifications

- Data Quality Level

Sampling design, sample collection techniques, and documentation are Quality Level I. The organic analytical data obtained for request numbers LA832 and LA846 are Quality Level II. The remainder of the analytical data obtained is Quality Level I.

- Field Data

None.

- Analytical Data

High levels of hydrocarbons (oil) were detected in all samples analyzed for semivolatile organic compounds for request numbers LA832 and LA846. Therefore, these matrix interferences may give false negatives and false positives, as indicated by poor spike recoveries, and subsequently impact the data quality. The 2,4-dinitrophenol response factor for both continuing calibrations was low (does not meet SPCC criteria specified in the protocol), which would cause possible false negatives or bias concentrations high. One TIC was reported as a "hydrocarbon fraction," spans approximately 35 min, and resembles a typical hydrocarbon pattern with an elevated baseline in the center of the chromatogram. This is not standard analytical procedure for reporting TICs or for quantitation and identification of hydrocarbons. Review of the raw data indicates that there are approximately 10-20 TICs in these samples with peak heights greater than the nearest internal standards. This reporting approach represents a minimum amount of data and seriously compromises the usability of this data. The TICs present in these samples introduce interferences that also made identification and quantitation of the target compounds difficult, and therefore subject to inaccuracies (false positives and false negatives). The concentrations and number of contaminants reported for these samples should be considered a minimum because the raw data indicate there are more contaminants than those reported.

There is a high probability for false negatives associated with the pesticide and PCB data for request numbers LA832 and LA846. Due to the high background (as indicated by interfering peaks and retention time shifts) present in the samples and indicated on one of the two method blank samples, the qualitative identification of contaminants was difficult. Only PCB analysis was requested for the samples in this environmental problem. Although the pesticide standards were analyzed, it is uncertain whether or not the raw data were reviewed to see if there were any pesticides present in the samples. As a result of the manner in which the laboratory interpreted the PCB request, aroclor-1254 was used as a matrix spike standard rather than the six pesticide standards specified in the protocol. This compound was spiked into the two samples (one of the samples used contained aroclor-1254 prior to spiking) used for the matrix spike and matrix spike duplicate analyses at a concentration less than the detection limit (approximately 40 μg/kg). These data are footnoted on the QC table to account for this deviation from standard procedure. Because the matrix spike was performed in this manner, there were insufficient data to adequately assess the accuracy and precision of these data. The surrogate spike data (percent recovery and retention time shift information for DBC) are also sporadic and frequently outside QC limits, even for one of the two method blanks analyzed. This indicates that the interference noted for these data may have been introduced during the analytical procedure rather than due to a matrix interference. There were indications that some of the interferences may be "weathered PCBs" for which no standards were available.

Thallium was determined by GFAAS for samples analyzed for request numbers LA832 and LA846 because the ICP instrument used did not have a thallium line. Copper was detected at 2.0 mg/kg in the preparation blank, and therefore reported concentrations for the samples may be biased high by a similar amount.

<u>LA831: TA-35-207, Stained Spill Areas</u>. There is a strong potential for false negatives associated with the volatile organic data for these three samples, as indicated by very low internal standard areas. This problem could be due to either a matrix effect or poor purging of the sample during analysis.

A number of the semivolatile organic surrogate spike recoveries were out of the control limits for sample 01. Some of the recoveries were too high, and some of the recoveries were too low, which frequently indicates an interference or matrix effect. There were no compounds detected chemically similar to those surrogate spike recoveries that were out of the control limits; therefore, there is no impact to the quantitative value obtained for the one compound that was detected. This sample had a high percent moisture content, and a 15 g aliquot was used for sample extraction rather than the 30 g normally used. The sample was extracted using the low level preparation method, with the only exception being the amount of sample extracted. The CRQLs are elevated by a factor of 515 for LA83101 due to extracting one-half as much sample as normal, 23% moisture content, and a 1:100 dilution. Due to the possible matrix effects and elevated detection limits there is a possibility of false negatives. Sample 02 contained apparent chemical interferences (e.g., hydrocarbons), which caused an elevated baseline. Due to the apparent contamination, the sample was not reextracted. However, this sample was reanalyzed with comparable results. These chemical interferences contributed to many of the internal standard areas and surrogate recoveries being out of the control limits. The CRQLs were elevated by a factor of approximately 48, and therefore there is a possibility of false negatives. For sample 03, the QC data was acceptable and there is no impact to the usability of the data.

Beryllium and cadmium were detected in the associated QC blanks at 1.2 mg/kg, and 1.7 mg/kg, respectively. Reported values for these elements may have comparable high bias. Two matrix spikes were performed associated with these samples. For copper, one spike recovery was in control and the other was not (1680%). For the spike recovery, which was out of control, the sample result for copper was higher by an order of magnitude than the spiked sample result, which suggests possible sample inhomogeneity, external contamination, or an unidentified interference.

<u>LA832: TA-46-031, Stains at Storage Areas</u>. The CRQLs for the volatile organic analyses are elevated due to only 1 g of sample being used instead of 5 g as specified in the protocol. As there were virtually no compounds detected in these samples, this procedure may have resulted in false negatives for the volatile organic data.

The duplicate for metals analysis associated with samples 01 and 02 has an RPD for mercury (44.4%) greater than the 20% control limit, indicating higher than normal imprecision. The sample on which the duplicate analysis was performed was only 18.3% solid, and this inhomogeneity is likely a major cause of the higher analytical imprecision.

<u>LA846: TA-32, Stains and Spills at Storage Tank Area</u>. The elevated CRQLs for the volatile organic data (due to only 1 g of sample used for analysis) may likely result in false negatives. Ten hydrocarbons were reported for sample 01, and there were 51 TIC peaks on the chromatogram. For sample 02, some of the TICs

may by carryover from the previous sample (LA84601). Also, one of the TICs may be a substituted napthalene. There were 10 hydrocarbons reported and approximately 45 TIC peaks on the chromatogram. Ten hydrocarbons were reported for sample 03 also and approximately 60 TIC peaks were on the chromatogram.

- Radiological Data

The results of QC checks indicate that the performance of the instruments and the analytical methods were adequate to ensure accuracy and reproducibility of the results obtained using them. In addition, the background seen by each instrument/detector was sufficiently low and constant to ensure accurate compensation for background effects.

The uncertainties cited in the tables for the total uranium results appear to be ten percent of the reported concentrations. Unfortunately, the uncertainties were reported with the same number of significant figures as the concentrations. Therefore, when using the total uranium results, the reader should round the uncertainties to one less significant figure.

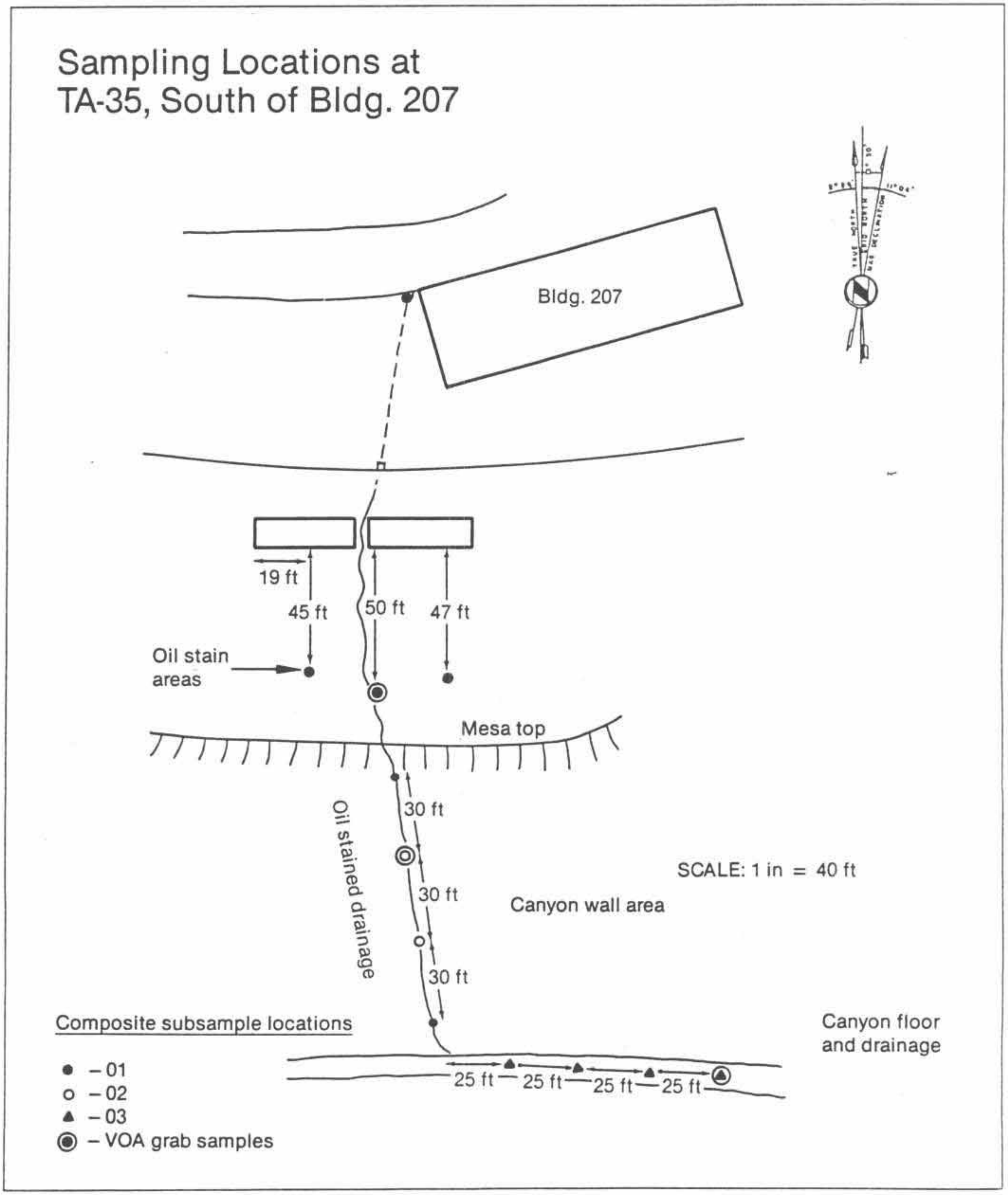

Sampling Locations at
TA-35, South of Bldg. 207
Bldg. 207
19 ft
45 ft
50 ft
47 ft
Oil stain
areas
Mesa top
30 ft
30 ft
30 ft
Oil stained drainage
SCALE: 1 in = 40 ft
Canyon wall area
Canyon floor
and drainage
25 ft
25 ft
25 ft
25 ft
Composite subsample locations
● – 01
○ – 02
▲ – 03
◉ – VOA grab samples

Figure 4.25.1

Sampling Locations at TA-46 North of Bldg. 31

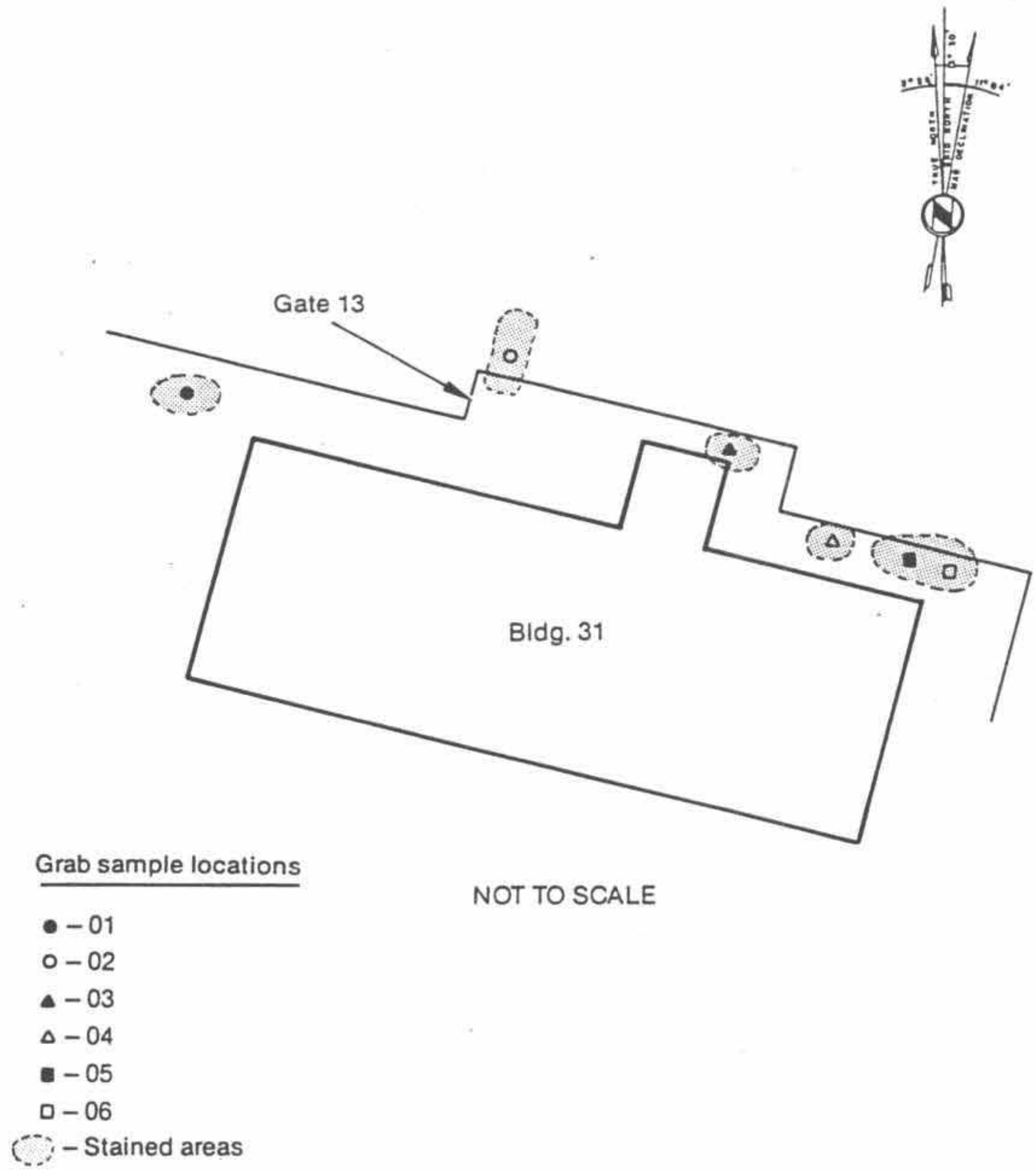


Figure 4.25.2

Sampling Locations at TA-32 Drainage Channel

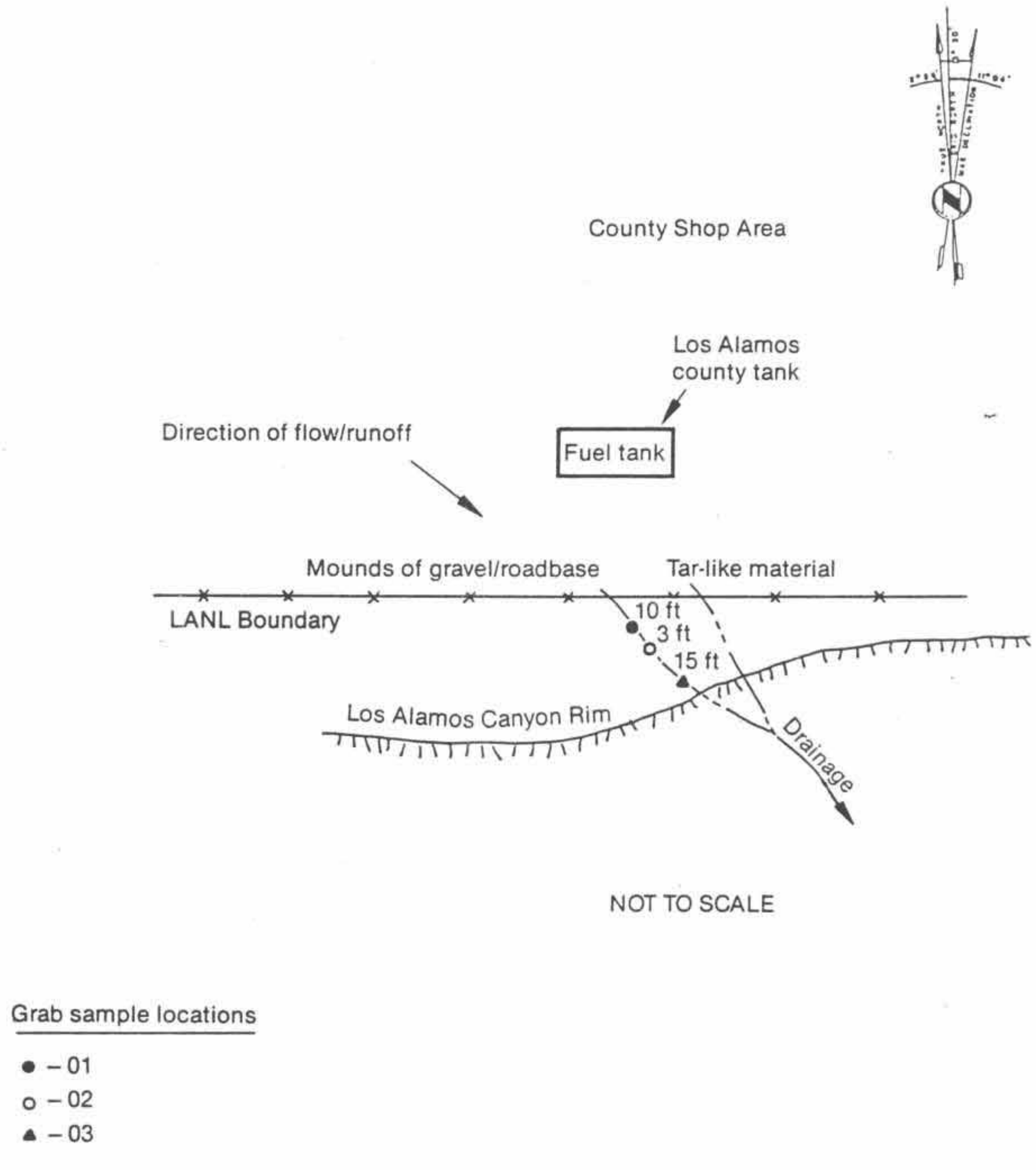


Figure 4.25.3

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TABLE 4.25.1 LOS ALAMOS NATIONAL LABORATORY - COMPLETION TABLE - ENVIRONMENTAL PROBLEM 25

(Column Header Legend: P = Planned C = Collected A = Analyzed)
(Status Column Legend: Del = Deleted Dev = Deviation)

REQUEST NUMBER	SN	STAT	DATE COLLECTED mm/dd/yy	AREA	LOCATION	TYPE LOCATION	MEDIA	TYPE	NUMBER SAMPLES		VOLATILE			SEMI VOLATILE			TCLP SEMIVOL			PCB			ICP METALS			TCLP METALS			MERCURY			GAMMA ANALYSIS			PLUTO-NIUM			STRON-TIUM			TOTAL URANIUM		
									P	C	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A
LA831			05/19/88	TA-35-207	SPILL	STAIN	SOIL	S.COMP	3	3	3	3	3	3	3	3				3	3	3	3	3	3																		
LA832			06/08/88	TA-46-031	STORAGEAREA	STAIN	SOIL	GRAB	6	6	6	6	6	6	6	6				6	6	6	6	6	6				6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
LA846			06/09/88	TA-32	STORAGETANK	SPILL/STAIN	SOIL	GRAB	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3															
Totals for Problem Number 25									12	12	12	12	12	12	12	12	3	3	3	12	12	12	12	12	12	3	3	3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

TABLE 4.25.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 25

AREA	TA-35-207	TA-35-207	TA-35-207	TA-46-031	TA-46-031	TA-46-031	TA-46-031
LOCATION	SPILL	SPILL	SPILL	STORAGEAREA	STORAGEAREA	STORAGEAREA	STORAGEAREA
TYPE OF LOCATION	STAIN	STAIN	STAIN	STAIN	STAIN	STAIN	STAIN
SAMPLE NUMBER	LA83101XX	LA83102XX	LA83103XX	LA83201XX	LA83202XX	LA83203XX	LA83204XX
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA82003XA	LA82003XA	LA82003XA	LA60203XX	LA20801XX	LA20801XX	LA20801XX
FIELD MEASUREMENTS							
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS							
Acetone	160	70	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	12 J	---	---
Xylene (total)	---	---	---	---	---	---	---
TENTATIVELY IDENTIFIED COMPOUNDS							
Terpene C10H16	---	1700 J	---	---	---	---	---
Terpene C10H16	---	49 J	---	---	---	---	---
Total (Allowed) Hold Time	14(14)d	14(14)d	14(14)d	9(14)d	1(14)d	1(14)d	1(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.25.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 25 (Continued)

AREA	TA-46-031	TA-46-031	TA-32	TA-32	TA-32
LOCATION	STORAGEAREA	STORAGEAREA	STORAGETANK	STORAGETANK	STORAGETANK
TYPE OF LOCATION	STAIN	STAIN	SPILL/STAIN	SPILL/STAIN	SPILL/STAIN
SAMPLE NUMBER	LA83205XX	LA83206XX	LA84601XX	LA84602XX	LA84603XX
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA20801XX	LA20801XX	LA20803XX	LA20803XX	LA20803XX
FIELD MEASUREMENTS					
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS					
Acetone	---	---	---	---	190 B
1,1,1-Trichloroethane	---	---	---	---	---
Xylene (total)	---	---	---	---	94
TENTATIVELY IDENTIFIED COMPOUNDS					
Terpene C10H16	---	---	---	---	---
Terpene C10H16	---	---	---	---	---
Total (Allowed) Hold Time	1(14)d	1(14)d	11(14)d	11(14)d	11(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.000	1.000	1.000	1.000	1.000

TABLE 4.25.3 LOS ALAMOS NATIONAL LABORATORY - SEMIVOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 25

AREA	TA-35-207	TA-35-207	TA-35-207	TA-46-031	TA-46-031	TA-46-031	TA-46-031
LOCATION	SPILL	SPILL	SPILL	STORAGEAREA	STORAGEAREA	STORAGEAREA	STORAGEAREA
TYPE OF LOCATION	STAIN	STAIN	STAIN	STAIN	STAIN	STAIN	STAIN
SAMPLE NUMBER	LA83101XV	LA83102XVRE	LA83103XV	LA83201XV	LA83202XV	LA83203XV	LA83204XV
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA60501XV	LA60501XV	LA60501XV	LA83201XV	LA83201XV	LA83201XV	LA83201XV
FIELD MEASUREMENTS							
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS							
2-Methylphenol	---	---	---	---	---	---	---
Nitrobenzene	---	---	---	---	---	---	---
bis(2-Chloroethoxy)methane	---	---	---	---	---	---	---
Acenaphthene	---	---	---	---	---	---	---
Dibenzofuran	---	---	---	---	---	---	---
2,4-Dinitrotoluene	6100 J	---	---	---	---	---	---
N-Nitrosodiphenylamine (1)	---	---	---	---	---	---	---
Phenanthrene	---	---	71 J	230 J	---	---	---
Anthracene	---	---	17 J	---	---	---	---
Fluoranthene	---	---	61 J	270 J	160 J	---	---
Pyrene	---	---	49 J	350 J	360 J	---	400 J
Benzo(a)anthracene	---	---	---	---	---	---	1300 J
Chrysene	---	---	---	---	---	---	1400 J
Benzo(b)fluoranthene	---	---	14 J	---	---	---	6800
Benzo(k)fluoranthene	---	---	---	---	---	---	5400
Benzo(a)pyrene	---	---	---	---	---	---	4900
Indeno(1,2,3-cd)pyrene	---	---	---	---	---	---	5700
Dibenz(a,h)anthracene	---	---	---	---	---	360 J	3700
Benzo(g,h,i)perylene	---	---	---	---	---	---	2700
TENTATIVIELY IDENTIFIED COMPOUNDS							
Poss Branched Indene	---	41000 J	---	---	---	---	---
Poss Branched Indene	---	6200 J	---	---	---	---	---
Poss Branched Indene	---	20000 J	---	---	---	---	---
Total (Allowed) Hold Time	13(14)d	13(14)d	13(14)d	13(14)d	13(14)d	13(14)d	13(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	0.010	0.050	1.000	0.200	0.200	0.200	0.200

TABLE 4.25.3 LOS ALAMOS NATIONAL LABORATORY - SEMIVOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 25 (Continued)

AREA	TA-46-031	TA-46-031	TA-32	TA-32	TA-32
LOCATION	STORAGEAREA	STORAGEAREA	STORAGETANK	STORAGETANK	STORAGETANK
TYPE OF LOCATION	STAIN	STAIN	SPILL/STAIN	SPILL/STAIN	SPILL/STAIN
SAMPLE NUMBER	LA83205XV	LA83206XV	LA84601XV	LA84602XV	LA84603XV
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA83201XV	LA83201XV	LA83201XV	LA83201XV	LA83201XV
FIELD MEASUREMENTS					
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS					
2-Methylphenol	---	---	---	85 J	---
Nitrobenzene	---	---	---	200 J	---
bis(2-Chloroethoxy)methane	39 J	---	---	---	---
Acenaphthene	---	61 J	---	---	---
Dibenzofuran	---	77 J	---	---	---
2,4-Dinitrotoluene	---	---	---	---	---
N-Nitrosodiphenylamine (1)	---	---	---	---	1200 J
Phenanthrene	---	---	---	---	---
Anthracene	---	---	---	---	---
Fluoranthene	---	150 J	---	---	210 J
Pyrene	---	160 J	2500	1400 J	920 J
Benzo(a)anthracene	---	---	---	---	---
Chrysene	---	---	---	350 J	250 J
Benzo(b)fluoranthene	---	---	---	---	---
Benzo(k)fluoranthene	220 J	---	---	---	---
Benzo(a)pyrene	450 J	---	---	---	---
Indeno(1,2,3-cd)pyrene	1600 J	480 J	---	---	---
Dibenz(a,h)anthracene	---	---	---	---	---
Benzo(g,h,i)perylene	---	---	---	---	---
TENTATIVELY IDENTIFIED COMPOUNDS					
Poss Branched Indene	---	---	---	---	---
Poss Branched Indene	---	---	---	---	---
Poss Branched Indene	---	---	---	---	---
Total (Allowed) Hold Time	13(14)d	13(14)d	12(14)d	12(14)d	12(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	0.200	0.200	0.200	0.200	0.200

TABLE 4.25.4 LOS ALAMOS NATIONAL LABORATORY - PESTICIDE/PCB DATA - ENVIRONMENTAL PROBLEM 25

AREA	TA-35-207	TA-35-207	TA-35-207	TA-46-031	TA-46-031	TA-46-031
LOCATION	SPILL	SPILL	SPILL	STORAGEAREA	STORAGEAREA	STORAGEAREA
TYPE OF LOCATION	STAIN	STAIN	STAIN	STAIN	STAIN	STAIN
SAMPLE NUMBER	LA83101XV	LA83102XV	LA83103XV	LA83201XV	LA83202XV	LA83203XV
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA60501XV	LA60501XV	LA60501XV	LA60403XV	LA60403XV	LA60403XV
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS						
gamma-BHC (Lindane)	---	0.70 J	---	---	---	---
Endosulfan I	---	24	---	---	---	---
Endosulfan II	3.50 J	---	---	---	---	---
4,4'-DDT	---	---	8.60 J	---	---	---
alpha-chlordane	41 J	6.80 J	---	---	---	---
gamma-chlordane	22 J	29 J	---	---	---	---
Aroclor-1248	---	---	---	---	---	---
Total (Allowed) Hold Time	13(14)d	13(14)d	13(14)d	13(14)d	13(14)d	13(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor	1.0	1.0	1.0	0.1		

TABLE 4.25.4 LOS ALAMOS NATIONAL LABORATORY - PESTICIDE/PCB DATA - ENVIRONMENTAL PROBLEM 25 (Continued)

AREA	TA-46-031	TA-46-031	TA-46-031	TA-32	TA-32	TA-32
LOCATION	STORAGEAREA	STORAGEAREA	STORAGEAREA	STORAGETANK	STORAGETANK	STORAGETANK
TYPE OF LOCATION	STAIN	STAIN	STAIN	SPILL/STAIN	SPILL/STAIN	SPILL/STAIN
SAMPLE NUMBER	LA83204XV	LA83205XV	LA83206XV	LA84601XV	LA84602XV	LA84603XV
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA60403XV	LA60403XV	LA60403XV	LA60403XV	LA60403XV	LA60403XV
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS						
gamma-BHC (Lindane)	---	---	---	---	---	---
Endosulfan I	---	---	---	---	---	---
Endosulfan II	---	---	---	---	---	---
4,4'-DDT	---	---	---	---	---	---
alpha-chlordane	---	---	---	---	---	---
gamma-chlordane	---	---	---	---	---	---
Aroclor-1248	6200	---	---	---	---	---
Total (Allowed) Hold Time	13(14)d	13(14)d	13(14)d	12(14)d	12(14)d	12(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
Dilution Factor			0.1			

TABLE 4.25.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 25

AREA	TA-35-207	TA-35-207	TA-35-207	TA-46-031	TA-46-031	TA-46-031
LOCATION	SPILL	SPILL	SPILL	STORAGEAREA	STORAGEAREA	STORAGEAREA
TYPE OF LOCATION	STAIN	STAIN	STAIN	STAIN	STAIN	STAIN
SAMPLE NUMBER	LA83101XW	LA83102XW	LA83103XW	LA83201XW	LA83202XW	LA83203XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA60502XW	LA60502XW	LA60502XW	LA20702XW	LA20702XW	LA20501XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	37.4 B	---	34.3 B	37.3 B	61.0	69.8
Beryllium	1.7	---	---	---	---	0.52 B
Cadmium	---	---	3.2 B	---	---	---
Chromium	---	---	---	5.2	20.8	14.0
Copper	---	---	---	179	72.3	23.0
Lead[c]	---	---	---	26.2 B	39.9 B	---
Mercury[b]	NR	NR	NR	---	0.40	20.3
Nickel	---	---	---	---	12.2	8.2 B
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	3.5 B	---
Thallium	---	---	---	---	---	---
Zinc	31.5	35.8	25.8	110	341	66.0
% Solids	76.9	82.7	82.6	94.9	88.3	88.7
Total (Allowed) Hold Time[a]	6(182)d	6(182)d	6(182)d	48(182)d	48(182)d	19(182)d
Total (Allowed) Hold Time[b]				19(28)d	19(28)d	19(28)d
Total (Allowed) Hold Time[c]				9(182)d	9(182)d	7(182)d

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.25.5 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 25 (Continued)

AREA	TA-46-031	TA-46-031	TA-46-031	TA-32	TA-32	TA-32
LOCATION	STORAGEAREA	STORAGEAREA	STORAGEAREA	STORAGETANK	STORAGETANK	STORAGETANK
TYPE OF LOCATION	STAIN	STAIN	STAIN	SPILL/STAIN	SPILL/STAIN	SPILL/STAIN
SAMPLE NUMBER	LA83204XW	LA83205XW	LA83206XW	LA84601XW	LA84602XW	LA84603XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA20501XW	LA20501XW	LA20501XW	LA20702XW	LA20702XW	LA20702XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	46.0	57.0	46.0	59.5	54.4	67.1
Beryllium	0.42 B	0.46 B	0.41 B	0.35 B	0.29 B	0.33 B
Cadmium	---	---	---	---	---	---
Chromium	5.6	5.9	---	7.5	8.7	6.7
Copper	21.6	24.5	16.1	11.2	8.8	9.6
Lead[c]	55.5	24.1 B	---	485	435	186
Mercury[b]	---	---	---	---	---	---
Nickel	---	---	---	6.1 B	---	5.4 B
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	109	129	74.7	76.6	71.7	69.4
% Solids	90.7	87.5	91.8	86.1	89.5	89.2
Total (Allowed) Hold Time[a]	19(182)d	19(182)d	19(182)d	47(182)d	47(182)d	47(182)d
Total (Allowed) Hold Time[b]	19(28)d	19(28)d	19(28)d	18(28)d	18(28)d	18(28)d
Total (Allowed) Hold Time[c]	7(182)d	7(182)d	7(182)d	8(182)d	8(182)d	8(182)d

a. ICP.
b. CVAAS.
c. GFAAS.

TABLE 4.25.6 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 25

AREA	TA-35-207	TA-35-207	TA-35-207	TA-46-031	TA-46-031
LOCATION	SPILL	SPILL	SPILL	STORAGEAREA	STORAGEAREA
TYPE OF LOCATION	STAIN	STAIN	STAIN	STAIN	STAIN
SAMPLE NUMBER	LA83101W[d]	LA83102W[d]	LA83103W[d]	LA83201D	LA83201W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Thorium - 232[a]	<10300 ±1500	<9600 ±1300	<6900 ±900	na	<6370 ±500
Uranium - 235	----	----	----	na	112 ±21.0
Uranium - 238[a]	<9900 ±1500	<11400 ±1700	<6200 ±1100	na	<7170 ±600
Uranium - 238[b]	----	----	----	na	----
Uranium (all isotopes)[c]	na	na	na	10000 ±1000	na
Plutonium - 238	na	na	na	125 ±12.0	na
Plutonium - 239,240	na	na	na	650 ±32.0	na
Beta Emitters					
Strontium - 90	na	na	na	<430	na
Gamma Emitters					
Potassium - 40	23500 ±3000	21200 ±2500	18800 ±3200	na	18400 ±1300
Cesium - 137	254 ±70.0	----	140 ±41.0	na	144 ±20.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.25.6 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 25 (Continued)

AREA	TA-46-031	TA-46-031	TA-46-031	TA-46-031	TA-46-031
LOCATION	STORAGEAREA	STORAGEAREA	STORAGEAREA	STORAGEAREA	STORAGEAREA
TYPE OF LOCATION	STAIN	STAIN	STAIN	STAIN	STAIN
SAMPLE NUMBER	LA83202D	LA83202W	LA83203D	LA83203W	LA83204D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Thorium - 232[a]	na	<6430 ±530	na	<10630 ±760	na
Uranium - 235	na	1920 ±150	na	81.0 ±24.0	na
Uranium - 238[a]	na	<7370 ±640	na	<10810 ±870	na
Uranium - 238[b]	na	52700 ±5900	na	----	na
Uranium (all isotopes)[c]	89000 ±8900	na	3000 ±300	na	3000 ±300
Plutonium - 238	60.0 ±16.0	na	<8.0	na	<8.0
Plutonium - 239,240	1310 ±100	na	12.0 ±7.0	na	14.0 ±7.0
Beta Emitters					
Strontium - 90	<500	na	<500	na	<510
Gamma Emitters					
Potassium - 40	na	15300 ±1200	na	22100 ±1600	na
Cesium - 137	na	363 ±39.0	na	28.0 ±20.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.25.6 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 25 (Continued)

AREA	TA-46-031	TA-46-031	TA-46-031	TA-46-031	TA-46-031
LOCATION	STORAGEAREA	STORAGEAREA	STORAGEAREA	STORAGEAREA	STORAGEAREA
TYPE OF LOCATION	STAIN	STAIN	STAIN	STAIN	STAIN
SAMPLE NUMBER	LA83204W	LA83205D	LA83205W	LA83206D	LA83206W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Thorium - 232[a]	<11570 ±780	na	<10000 ±730	na	<12650 ±940
Uranium - 235	77.0 ±30.0	na	63.0 ±30.0	na	<124
Uranium - 238[a]	<10790 ±790	na	<10590 ±810	na	<12300 ±1100
Uranium - 238[b]	----	na	----	na	----
Uranium (all isotopes)[c]	na	3000 ±300	na	3000 ±300	na
Plutonium - 238	na	<8.0	na	<13.0	na
Plutonium - 239,240	na	14.0 ±8.0	na	28.0 ±8.0	na
Beta Emitters					
Strontium - 90	na	<670	na	<480	na
Gamma Emitters					
Potassium - 40	23800 ±1700	na	20400 ±1800	na	26400 ±3600
Cesium - 137	267 ±34.0	na	278 ±28.0	na	237 ±79.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.25.6 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 25 (Continued)

AREA	TA-32	TA-32	TA-32
LOCATION	STORAGETANK	STORAGETANK	STORAGETANK
TYPE OF LOCATION	SPILL/STAIN	SPILL/STAIN	SPILL/STAIN
SAMPLE NUMBER	LA84601W[d]	LA84602W[d]	LA84603W[d]
MEDIA	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW
Alpha Emitters			
Thorium - 232[a]	<10100 ±1200	<10500 ±2500	<8000 ±2800
Uranium - 235	----	----	----
Uranium - 238[a]	<11200 ±1900	<11500 ±2900	<9600 ±3100
Uranium - 238[b]	----	----	----
Uranium (all isotopes)[c]	na	na	na
Plutonium - 238	na	na	na
Plutonium - 239,240	na	na	na
Beta Emitters			
Strontium - 90	na	na	na
Gamma Emitters			
Potassium - 40	22000 ±2600	20900 ±5300	13900 ±5300
Cesium - 137	----	----	----

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

4

4.26 Environmental Problem 26--Inactive Firing Sites

- Request Numbers: LA834 through LA836, LA857

- Requester: J. Clay/ K.D. Sichelstiel

- Finding and Basis: Inactive firing sites and old high explosive burn areas at LANL may have contaminated surface soils with radionuclides, metals, and high explosives.

  The activities at old firing sites typically scattered debris (including depleted uranium, various metals, and high explosives) over large areas. As a result, surface soils may contain residual levels of those contaminants. The old burn areas used for controlled disposal of high explosives may have contaminated the surface soils with high explosives and substances such as kerosene, which were used to help start the burn.

  Of the approximately 70 inactive firing sites at LANL, five were selected for sampling and analyses. They include sites discovered during the survey that are suspected of having been used as a firing site or as a disposal area for firing site debris (LA834, LA835, and LA857), and firing sites that have been cleaned up by LANL but may have areas still contaminated (LA836).

4.26.1 Sampling and Analysis Objectives

- Statement

  The S&A objective was to determine the presence of contaminants (depleted uranium, metals, high explosives) associated with surface soils at inactive firing sites. Concentrations will be compared with background levels.

Sampling and analysis performed at the active firing sites also will be used for data comparison and to help address all the other inactive firing sites.

- Supporting Information:

  See Finding and Basis

26.2 Sampling and Analytical Design

- Sampling Design

  An electromagnetic geophysical survey (LA857) was initially conducted as planned to check for buried metallic material. The geophysical survey encompassed the entire area. A radiological survey (not originally planned) was performed to provide additional data and aid in biasing sample locations. Six spatial surface soil composites, consisting of four subsamples each, were collected as planned from the mounded and trenched area northeast of TA-8-23 (LA834) (see Figure 4.26.1). Exact determination of sampling points was made in the field based on the geophysical survey, radiological survey, and visual observation of mounds and trenches or any other suspect points (e.g., debris, stains, dead vegetation).

  Five of the six composite soil samples were collected from locations representing geophysical or radiological anomalies. The sixth sample was collected from a drainage channel traversing the area. Sample depth was between 0 to 6-in., based on visual observation of any moisture or staining of the soil column (see Figure 4.26.1).

<u>LA835: TA-15, G-Point Depression</u>. Surface soil samples were collected as planned in the vicinity of a depression at the G-point in TA-15 (see Figure 4.26.2). A portable radiation meter was used to bias the sampling effort area. Three surface soil composites, consisting of four subsamples each, were collected from the TA-15 G-point depression and adjacent areas. Based on visual observation of any moisture or stains of the soil column, sample collection depths did not exceed 6 in.

Three grab samples for volatile organic analysis were collected from the same areas as the composites. The location of grab samples was biased toward subsample locations exhibiting the highest organic vapor measurements with the HNU photoionization detector. Dry, unstained surface or near surface soil was not sampled for volatile organic compounds since it was assumed no volatile organic compounds would be present.

<u>LA836: TA-5, X-Chamber</u>. Nine surface soil grab samples were collected as planned from three locations in an area adjacent to previous remedial action activities at the old X-chamber site north of TA-5 (see Figure 4.26.3). Grab sampling was selected to determine maximum contaminant levels because this area was part of a previous remedial action effort, and a comparison of existing concentrations to established cleanup concentrations may be performed (during the remedial action there was evidence of depleted uranium migration). This sample design also provides variability data.

Three surface soil grab samples were collected from three different areas downgradient of the previous area of remedial action (9 samples total). The first set of grab samples was collected downslope from the previous X-chamber, one approximately 20-ft downslope from the edge of prior remedial action, one 40-ft downslope, and one approximately 150-ft downslope just prior to the lip of the canyon rim. The second set of grab samples were collected at the same distances from the rim of the canyon midway between the past X-chamber and control chamber locations. The third set of samples was obtained from drainage channels downslope from the past location of the control chamber. Two samples were collected from the drainage pathway within 60 ft of the canyon rim, and the third sample was collected at or near the juncture of drainage paths. Samples were collected to a depth of 0 to 3 in.

Table 4.26.1 summarizes the sampling and analytical requests and analyses performed.

- Analytical Design

<u>LA834 and LA857: TA-8, Mounds and Trenches</u>. Samples for request number LA834 were analyzed as planned for high explosives, metals to ICP detection limits, plutonium, ^{90}Sr, gamma-emitting radionuclides, and uranium isotopes. A geophysical survey was performed for LA857; therefore, no samples were collected for this request number.

<u>LA835: TA-15, G-Point Depression</u>. G-Point samples were analyzed as planned for volatile organic compounds, metals to ICP detection limits, high explosives, gross alpha and beta activity, gamma-emitting radionuclides, and uranium isotopes.

<u>LA836: TA-5, X-Chamber</u>. Samples were analyzed as planned for high explosives, metals to ICP detection limits, gross alpha and beta activity, gamma emitting radionuclides, uranium isotopes, and thorium isotopes.

4.26.3 <u>Field and Analytical Data</u>

- Field Data

The field spot tests for high explosives were negative for all samples from all three locations.

Surveys to detect areas of radiation in excess of background levels were performed at the TA-8 mounds and trenches (LA834) and at the TA-15 G-point depression (LA835).

The walkover radiation survey of TA-8 was performed as a systematic survey along north-south grid lines, at 50-ft intervals. Results of the survey are illustrated in Figure 4.26.2. Three locations with radioactivity exceeding background were identified as a result of this survey: LA830401 (38 μR/h), LA83402 (31 μR/h), and LA83405 (200 μR/h). Material that appeared to be uranium oxide was visible at sample locations LA83402 and LA83405. The three remaining sampling locations were chosen based on the results of the geophysical survey.

A geophysical survey (LA857) was performed to identify any buried metallic objects or old disposal pits and to bias samples at the TA-8 mounds (LA834). A grid was established of twelve east-west survey lines laid out at 50-ft intervals. Above ground and buried electrical sources, visible metallic surface clutter, and mixed debris piles were detected with the geophysical survey. The survey showed no anomalous responses correlated with the unexplained mounds and trenches that prompted the investigation. It is concluded that there are no disposal areas other than debris piles, and that there are no ferromagnetic or other metallic objects buried in either the trenches or the associated mounds. The debris piles were designated as sampling points LA83403 and LA83404.

A random radiological survey was conducted at the TA-15 G-point depression (LA835). Results for this location were background corrected (background equaled 26 μR/h). Radioactivity in excess of background was identified at eleven locations illustrated in Figure 4.26.2 at levels ranging from 70 to 400 μR/h. Samples collected at this *location also were surveyed for organic vapors using an HNU photoionization detector; however, volatile organic compounds were not measured at this location.*

- Field Data Evaluation

<u>LA834 and LA857: TA-8, Mounds and Trenches</u>. Two instruments were used to perform the radiological survey, a Ludlam Model 19 "micro R-meter" and a Harshaw "Phoswich" detector. These surveys were used to bias three of the sampling locations (LA83401, 02, and 05). The three remaining sampling locations (LA83403, 04, and 06) were biased based on geophysical anomalies.

Contours of the total magnetic field intensity [after removal of a 52,000 nanotesla (nT) datum] were plotted for the geophysical survey. Several large magnitude anomalies indicated the presence of ferromagnetic material. Contours of the vertical gradient of the magnetic field were plotted. The vertical magnetic gradient provides a more accurate location of buried magnetic material. Contours of the electromagnetic measurements were also plotted. Anomalies on the electromagnetic maps correlate with those on the magnetic maps and confirm the presence of buried metallic ferromagnetic objects; however, all the magnetic and electromagnetic anomalies can be correlated with known objects. The anomaly at the east end of lines -250 and -300 are attributed to hardware and utilities located in this area. The anomalies at approximately (200, -450), (225, -400), and (300, -450) are attributed to piles of debris and a concrete pad, which may be the roof an underground bunker that is immediately east of the debris pile at 300, -450. The large magnetic total field intensity anomalies seen at stations (200, -450) and (225, -400) are probably from a single large object, oriented roughly north-south in the debris pile at (225,-400). The magnetic gradient data shows the target to be centered within the debris pile; this is corroborated by the electromagnetic data. Some linear anomalies in the southern portion of the area are apparent from the electromagnetic and magnetic profiles. These linear anomalies are possibly due to buried utility lines or fence wire.

This survey indicated the absence of anomalous responses along the trenches and associated mounds occupying the western half of the site. The absence of anomalies suggests that no metallic objects are buried there. The site lies on a gentle slope that rises to the west and in the direction of the trenches; it is suspected that the trenches were constructed to divert rainwater around underground bunkers, rather than for the disposal of waste.

LA835: TA-15, G-Point Depression. A radiological survey was conducted at TA-15 based on data obtained during the initial survey site visit. Two instruments were used to perform the radiological survey, a Ludlam Model 19 "micro R-meter" and a Harshaw "Phoswich" detector. Eleven locations and associating sampling sites are shown in Figure 4.26.2. Results for this location were background corrected (background equaled 26 μR/h)and ranged from 70 to 400 mR/hr (see Figure 4.26.2).

LA836: TA-5, X-Chamber. Sampling locations are shown in Figure 4.26.3. Field data for these samples are listed on the analytical data tables.

- Analytical Data

Analytical data are summarized in Tables 4.26.2 through 4.16.4.

No high explosives were detected in any of the samples. Volatile organic analyses were only requested for the three samples from TA-15 G-point (LA835). Methylene chloride was the only volatile organic compound detected (LA83503) that may have been attributable to these samples.

Seven metals were detected in the samples from the TA-8 mounds and trenches (LA834). Three metals were detected in all of the samples at relatively comparable concentrations including barium (51 to 280 mg/kg), beryllium (0.3 to 1.4 mg/kg), and zinc (30 to 48 mg/kg). Other metals detected in various samples include chromium (8 to 19 mg/kg), copper (3 to 34 mg/kg), lead (19 to 21 mg/kg), and nickel (7 to 14 mg/kg).

Eight metals were detected in the samples from the TA-15 G-point area (LA835). Six metals were detected in all of the samples including barium (150 to 590 mg/kg), beryllium (68 to 180 mg/kg), chromium (36 to 110 mg/kg), copper (160 to 1500 mg/kg), nickel (20 to 52 mg/kg), and zinc (72 to 650 mg/kg). Cadmium was detected in two samples at 4.5 and 9.2 mg/kg, and silver was detected in one sample at 16.5 mg/kg.

The same seven metals detected in the TA-8 samples were also found in the samples from the TA-5 X-chamber area. Four metals were detected in all of the samples including barium (46 to 170 mg/kg), beryllium (0.4 to 1.5 mg/kg), copper (6 to 260 mg/kg) and zinc (24 to 55 mg/kg). Other metals detected in various samples include chromium (5 to 17 mg/kg), lead (17 to 210 mg/kg), and nickel (7 to 9 mg/kg).

- Analytical Data Evaluation

<u>LA834 and LA857: TA-8, Mounds and Trenches</u>. There is no analytical data associated with request number LA857, which was a geophysical survey used to bias sampling for LA834.

No high explosives were detected in the samples collected at this location.

Concentrations of all metals are of comparable magnitude among the samples from this area. Barium concentrations show the highest variability, ranging from 50 mg/kg in sample 01 to 280 mg/kg in sample 05. Concentrations of lead observed in samples 04, 05, and 06 are extremely close to quantitation limits. Therefore, potential lead concentrations of comparable magnitude in samples 01-03 may have been reported as false positives.

<u>LA835: TA-15, G-Point Depression</u>. There were no high explosives detected in the samples collected at this location. Methylene chloride was detected in all three of the samples, but was also detected in the associated method blank. Only the concentration of methylene chloride detected in sample 03 (38 μg/kg) exceeded the criteria used for inclusion in the results table. Caution should be exercised when interpreting these data.

Barium, beryllium, chromium, copper, nickel, and zinc were detected in all three of the samples from this location. The highest concentrations of barium, beryllium, chromium, and nickel were found in sample 02, collected from the depression area near visible uranium oxide. Copper and zinc concentrations were highest in sample 03, collected near building 233. Cadmium was detected in samples 01 and 03, at 4.5 and 9.2 mg/kg, respectively. Silver was detected in sample 02 at 16.5 mg/kg.

<u>LA836: TA-5, X-Chamber</u>. There were no high explosives detected in the samples collected at this location.

Barium, beryllium, copper, and zinc were detected in all nine samples from this location. Concentrations of beryllium and zinc were of comparable magnitude in all samples. The highest concentrations of barium were detected in samples 01, 02, and 03 collected downslope from the previous X-chamber. Barium concentrations found in samples 01 and 02 (closest to prior remedial action area) were equivalent (160 and 170 mg/kg, respectively) and were nearly two times higher than the concentration found in sample 03. The highest concentration of copper was also detected in sample 01 (257 mg/kg) and was higher by a factor of ten than copper concentrations found in the rest of the samples.

Lead was detected in four of the nine samples. The concentration of lead was again highest (210 mg/kg) in sample 01, downslope from the previous x-chamber and was greater by a factor 10 than the other detectable values. Comparable amounts of chromium and nickel were detected in five and two of the samples, respectively.

- Radiological Data

Radiological data are summarized in Table 4.26.5.

LA834 and LA857: Mounds and Trenches. There is no analytical data associated with request number LA857, which was a geophysical survey used to bias sampling for LA834.

Gamma analysis detected ^{137}Cs ranging from 350 to 630 pCi/kgW and ^{235}U from 82 to 840 pCi/kgW in all six samples. Sample 05 contained the most ^{235}U and also contained ^{238}U at a concentration of 23,000 pCi/kgW. Plutonium-238 levels in all six samples ranged from <5 to >29 pCi/kgD. The ^{239}Pu and ^{240}Pu concentrations ranged from 27 to 150 pCi/kgD. Strontium-90 was detected at <450 to <810 pCi/kgD. Total uranium levels ranged from 2000 to 49,000 µg/kgD. Natural activities also were observed in all six samples.

LA835: TA-15, G-Point Depression Uranium-235 was detected at a range of 7600 to 22,000 pCi/kgW and ^{238}U above the chain equilibrium value at 68,000 to 19,000,000 pCi/kgW in all three samples. Cesium-137 was detected at 41 to 136 pCi/kgW in two samples. Uranium-234 at 350,000 pCi/kgW *was measured in sample 03. Cobalt-60 was detected in one sample (01) at 35 pCi/kgW. Total uranium values correlated with the excess ^{238}U values and ranged from 1,320,000 to 6,800,000 µg/kgD. Natural activities were also detected in all three samples.*

LA836: TA-5, X-Chamber. Cesium-137 was identified at 370 to 2200 pCi/kgW, ^{235}U at 130 to 2500 pCi/kgW in all nine samples. Excess ^{238}U was detected in three samples ranging from 11,000 to 72,000 pCi/kgW. Cobalt-56 may have been present in four of the nine samples at 28 to <86 pCi/kgW.

Alpha spectral analysis detected ^{230}Th at 1200 to 2200 pCi/kgD and total uranium at 6000 to 120,000 µg/kgD in all nine samples.

- Radiological Data Evaluation

The radiological measurements included gamma analyses, alpha spectral analyses, ^{90}Sr analyses, and total uranium analyses.

LA834: TA-8, Mounds and Trenches. For the samples from the TA-08 mounds and trenches, the gamma analyses indicated the presence of ^{137}Cs (350 to 630 pCi/kgW) and ^{235}U (82 to 840 pCi/kgW) in all six samples. The greatest ^{235}U value was found in sample LA83405. This sample also contained an excess (over the chain equilibrium value) of ^{238}U of 23,000 pCi/kgW. Cobalt-56 (<51 pCi/kgW) and ^{54}Mn (<45 pCi/kgW) were possibly present in one sample each. The natural activities were observed in all six samples.

From the alpha spectral measurements on these samples, the ^{238}Pu concentration was 11 pCi/kgD in sample 01 and <5 to <29 pCi/kgD in the other five samples. The $^{239+240}Pu$ concentration ranged from 27 to 150 pCi/kgD. The ^{90}Sr analyses gave limits of <450 to

<810 pCi/kgD. The total uranium analyses gave concentrations of 2000 to 49,000 μg/kgD, with the highest values being 13,000 μg/kgD in sample 01 and 49,000 μg/kgD in sample 05 (which correlates with the excess ^{238}U value noted above).

<u>LA835: TA-15, G-Point Depression</u>. For the three samples from the TA-15 area, the gamma analyses identified natural activities, ^{235}U (7600 to 22,000 pCi/kgW) and excess ^{238}U, above the chain equilibrium value (680,000 to 19,000,000 pCi/kgW) in all three samples: ^{137}Cs at 41 and 140 pCi/kgW in samples 01 and 02, ^{234}U at 350,000 pCi/kgW in sample 03, and ^{60}Co at 35 pCi/kgW in sample 01.

The only other radiological measurements performed on these samples were the total uranium analyses, which correlated with the excess ^{238}U values and gave values of 1,320,000 to 6,800,000 μg/kgD.

<u>LA836: TA-5, X-Chamber</u>. For the nine samples from the TA-5 X-chamber area, the gamma analyses identified, in addition to the natural activities were ^{137}Cs at 370 to 2200 pCi/kgW in all nine samples, with the highest value in sample 07; ^{235}U at 130 to 2500 pCi/kgW in all nine samples, with the highest value in sample 01; and excess ^{238}U at 11,000, 23,000, and 72,000 pCi/kgW in samples 05, 02, and 01, respectively. Small amounts of ^{56}Co may have been present in samples 01, 02, 04, and 06 at 28 and <46 to <66 pCi/kgW.

From the alpha spectral analyses, activities for ^{230}Th were identified at 1200 to 2200 pCi/kgD in all nine samples. In addition, the total uranium content was found to range from 6000 to 120,000 μg/kgD, with the largest values 116,000 μg/kgD for sample 01 and 44,000 μg/kgD for sample 02 (which correlates with the higher ^{238}U excess values above).

4.26.4 Limitations and Qualifications

- Data Quality Level

Sampling design, sample collection techniques, analytical data, and documentation for this environmental problem are Quality Level I with the exception of high explosives data for LA836, which is Quality Level II.

- Field Data

None.

- Analytical Data

LA834: TA-8, Mounds and Trenches. Thallium was determined by GFAAS for all metals requests for this location because the ICP instrument used did not have a thallium wavelength line. There is no adverse impact to the metals data for this location.

LA835: TA-15, G-Point Depression. The toluene d_8 volatile organic surrogate recovery for sample 03 exceeded the upper control limit by 2% (119 vs. 117). The internal standard area for chlorobenzene was out of the control limits (low 2935023 vs. 3652472). A matrix effect was probably the reason for the low area, and would explain the high recovery for the surrogate. Impact to data quality is minimal; the quantitative value for methylene chloride may be biased low by a factor of 1.27. However, methylene chloride was also detected in the associated method blank, which would bias the concentration high.

Two matrix spikes were associated with the metals samples for this location. One copper spike recovery was within the >5 to 125% control limits and the other was not. For the spike recovery, which was out of control, the sample result for copper was higher by an order of magnitude than the spiked sample result, which suggests possible sample inhomogeneity, external contamination, or ar :nidentified interference. The duplicate RPD for chromium (4ɔ.1%) was outside the ±20% control limit. The imprecision associated with the chromium quantitation therefore was higher than normal, and true chromium concentrations may vary ±43% from the reported values. The reported value for cadmium in samples 01 and 03 may have high bias due to 1.7 mg/kg of cadmium found in the associated blanks. Although 1.2 mg/kg beryllium also was detected in the associated blanks, the reported values were sufficiently greater than the blank values, and no adverse impact on the beryllium data is expected.

<u>LA836: TA-5, X-Chamber</u>. There were no confirmed concentrations of high explosives detected in samples from this location. These samples were reanalyzed due to instrument problems and low matrix spike recoveries. The low matrix spike recoveries were due to a problem with the preparation of the matrix spike standard and should have no effect on the accuracy of the results for the samples. The recoveries for the analytes for the matrix spike ranged from 33 to 43%. The recoveries for the matrix spike duplicate ranged from 44 to 68%, and the RPDs were 30-50%. The % RSD for HMX on the linearity check was 44% and RDX was not detected on the 0.2 ppm (low end of calibration range) calibration standard. This, coupled with the poor accuracy and precision indicated by the matrix spike and matrix spike duplicate samples, and the lack of information provided on what caused the preparation problem with the spike solution, makes it very difficult to assess the quality of this data. Therefore, there is a probability of false negatives.

Thallium was analyzed by GFAAS for all metals requests because the ICP instrument used for analysis did not have a thallium wavelength line. Copper was detected in the preparation blank associated with sample 01 through 06 at 1.7 mg/kg and in the preparation blank associated with samples 07 and 08 at 2.0 mg/kg. Reported copper concentrations for these samples may be biased high by equivalent amounts. The serial dilution result for zinc associated with samples 01 through 06 were greater than the 10% difference control limit of 15.4%. Although this high percent difference could indicate the presence of an interferant, it could also indicate errors introduced by dilution or non-linearity in the calibration curve. Zinc quantitation therefore may be subject to increased analytical uncertainty.

- Radiological Data

The results of QC checks indicate that the performance of the instruments and the analytical methods were adequate to ensure accuracy and reproducibility of the results obtained using them. In addition, the background seen by each instrument/detector was sufficiently low and constant to ensure accurate compensation for background effects.

The uncertainties cited in the tables for the total uranium results appear to be ten percent of the reported concentrations. Unfortunately, the uncertainties were reported with the same number of significant figures as the concentrations. Therefore, when using the total uranium results, the reader should round the uncertainties to one less significant figure.

Area of Geophysical Survey, Radiological Survey and Sampling Locations at TA-08 Inactive Firing Site

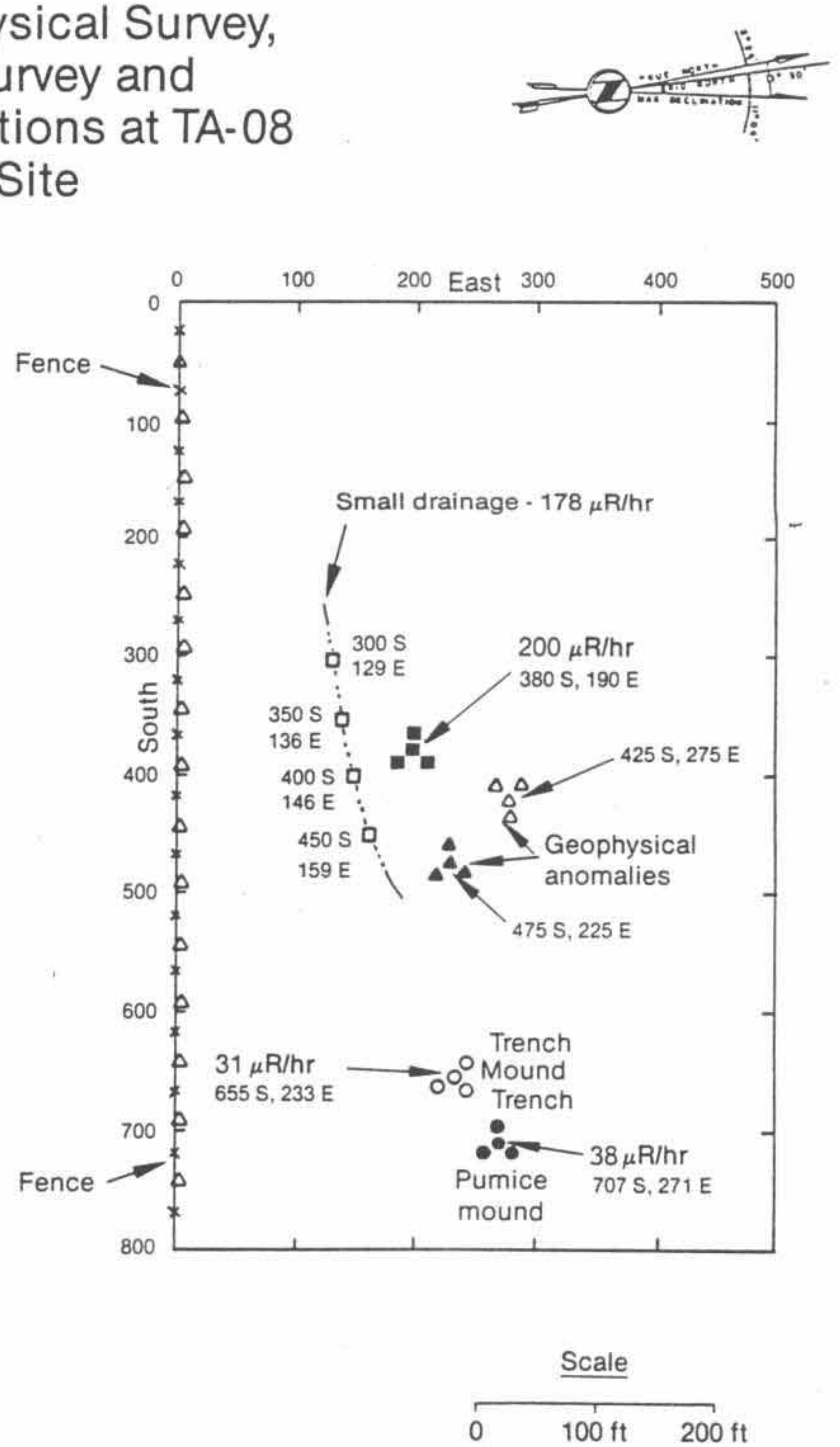


Figure 4.26.1

Radiological Survey and Soil Sampling Locations at TA-15 G-Point Depression

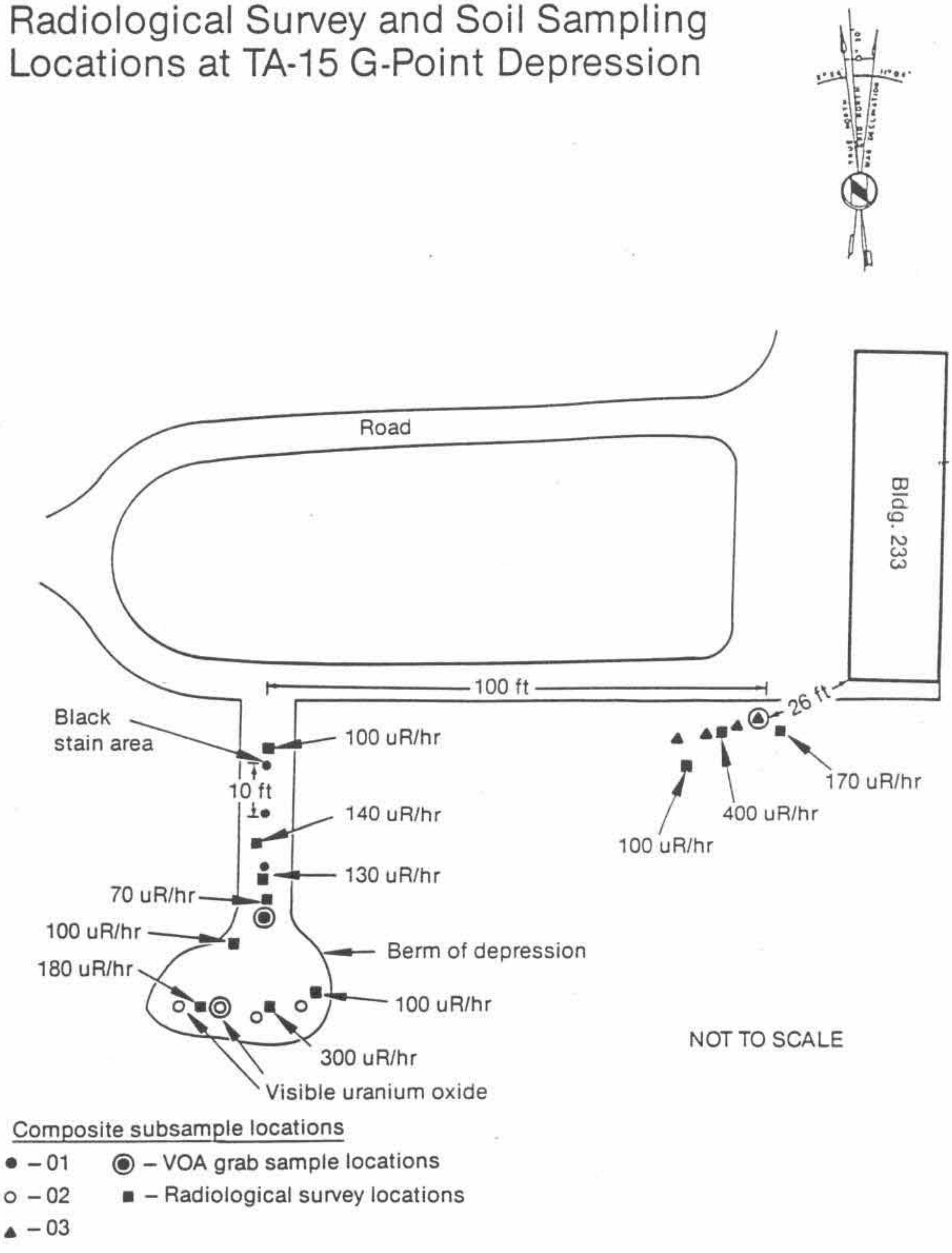


Figure 4.26.2

Sampling Locations at TA-05 X-Chamber at Mortandad Canyon

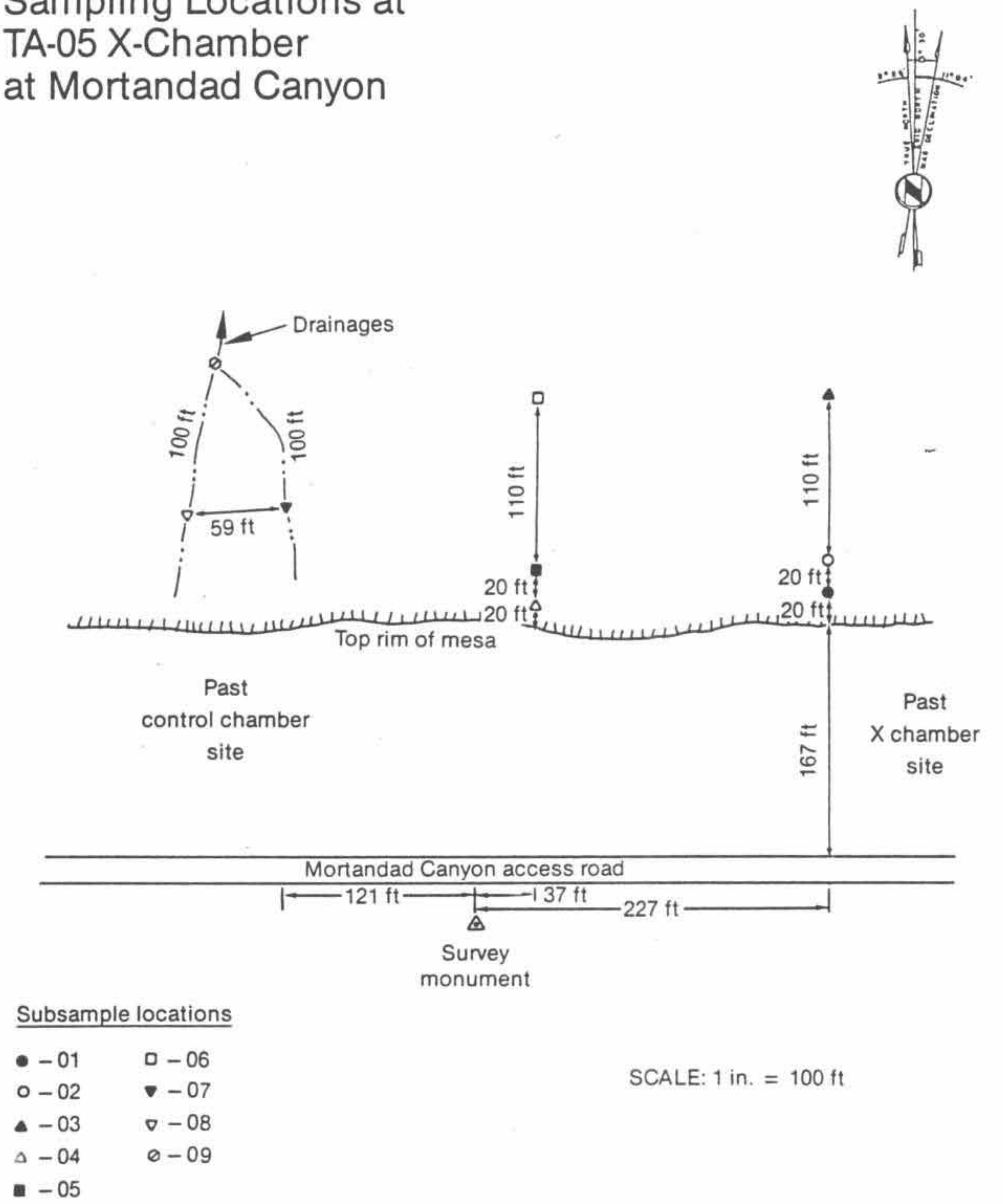


Figure 4.26.3

TABLE 4.26.1 LOS ALAMOS NATIONAL LABORATORY - COMPLETION TABLE - ENVIRONMENTAL PROBLEM 26

(Column Header Legend: P = Planned C = Collected A = Analyzed)
(Status Column Legend: Del = Deleted Dev = Deviation)

REQUEST NUMBER	SN	STAT	DATE COLLECTED mm/dd/yy	AREA	LOCATION	TYPE LOCATION	MEDIA	TYPE	NUMBER SAMPLES		VOLATILE			ICP METALS			HIGH EXPL			GAMMA ANALYSIS			PLUTONIUM			STRONTIUM			THORIUM			TOTAL URANIUM		
									P	C	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A	P	C	A
LA834			06/07/88	TA-08	INACTIVE FS	MOUNDS	SOIL	S.COMP	6	6				6	6	6	6	6	6	6	6	6	6	6	6	6	6	6				6	6	6
LA835			05/17/88	TA-15	INACTIVE FS	G-POINT	SOIL	S.COMP	3	3	3	3	3	3	3	3	3	3	3	3	3	3										3	3	3
LA836			06/06/88	TA-05	D&D'D F.S	X-CHAMBER	SOIL	GRAB	9	9				9	9	9	9	9	9	9	9	9							9	9	9	9	9	9
LA857		GEO	04/27/88	TA-08	INACTIVE FS	MOUNDS	GEOPHYS		1	1																								
Totals for Problem Number 26									19	19	3	3	3	18	18	18	18	18	18	18	18	18	6	6	6	6	6	6	9	9	9	18	18	18

TABLE 4.26.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 26

AREA	TA-15	TA-15	TA-15
LOCATION	INACTIVE FS	INACTIVE FS	INACTIVE FS
TYPE OF LOCATION	G-POINT	G-POINT	G-POINT
SAMPLE NUMBER	LA83501XX	LA83502XX	LA83503XX
MEDIA	SOIL	SOIL	SOIL
UNITS	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA31401XA	LA31401XA	LA31401XA
FIELD MEASUREMENTS			
Depth (ft)	0-0.5	0-0.5	0-0.5
TARGET COMPOUNDS			
Methylene Chloride	---	---	38 B
Total (Allowed) Hold Time	7(14)d	7(14)d	9(14)d
ELEVated/DECReased CRQL	ELEV	ELEV	DECR
Dilution Factor	1.000	1.000	1.000

TABLE 4.26.3 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 26

AREA	TA-08	TA-08	TA-08	TA-08	TA-08	TA-08
LOCATION	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS
TYPE OF LOCATION	MOUNDS	MOUNDS	MOUNDS	MOUNDS	MOUNDS	MOUNDS
SAMPLE NUMBER	LA83401XW	LA83402XW	LA83403XW	LA83404XW	LA83405XW	LA83406XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA50006XW	LA50006XW	LA50006XW	LA91601XH	LA50006XW	LA50006XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	50.5	177	212	259	284	116
Beryllium	0.27 B	0.58 B	0.98 B	0.83 B	1.4	0.78 B
Cadmium	---	---	---	---	---	---
Chromium	---	8.4	13.1	11.9	18.8	9.9
Copper	2.7 B	5.7	11.9	34.3	---	7.5
Lead[b]	---	---	---	20.8 B	21.1 B	19.0 B
Mercury	NR	NR	NR	NR	NR	NR
Nickel	---	6.7 B	9.8	9.5	14.3	6.5 B
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	30.5	29.7	33.6	34.2	48.1	34.5
% Solids	87.5	89.1	92.2	93.4	69.3	87.0
Total (Allowed) Hold Time[a]	8(182)d	8(182)d	8(182)d	49(182)d	8(182)d	8(182)d
Total (Allowed) Hold Time[b]	8(182)d	8(182)d	8(182)d	13(182)d	8(182)d	8(182)d

a. ICP.
b. GFAAS.

TABLE 4.26.3 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-15	TA-15	TA-15	TA-05	TA-05	TA-05
LOCATION	INACTIVE FS	INACTIVE FS	INACTIVE FS	D&D'D F.S	D&D'D F.S	D&D'D F.S
TYPE OF LOCATION	G-POINT	G-POINT	G-POINT	X-CHAMBER	X-CHAMBER	X-CHAMBER
SAMPLE NUMBER	LA83501XW	LA83502XW	LA83503XW	LA83601XW	LA83602XW	LA83603XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA60502XW	LA60502XW	LA60502XW	LA50001XW	LA50001XW	LA50001XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.5	0-0.5	0-0.5	0-0.25	0-0.25	0-0.25
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	345	586	149	161	166	91.4
Beryllium	67.6	180	132	0.61 B	1.5	0.90 B
Cadmium	4.5 B	---	9.2	---	---	---
Chromium	35.9	108	47.1	---	17.0	8.5
Copper	158	616	1470	257	8.0	7.8
Lead[b]	---	---	---	210	19.8 B	---
Mercury	NR	NR	NR	NR	NR	NR
Nickel	19.9	51.5	20.3	---	9.3	6.7 B
Selenium	---	---	---	---	---	---
Silver	---	16.5	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	72.2	146	649	50.1	54.6	41.5
% Solids	87.1	88.0	87.5	91.5	90.9	95.7
Total (Allowed) Hold Time[a]	8(182)d	8(182)d	8(182)d	21(182)d	21(182)d	21(182)d
Total (Allowed) Hold Time[b]				9(182)d	9(182)d	9(182)d

a. ICP.
b. GFAAS.

TABLE 4.26.3 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-05	TA-05	TA-05	TA-05	TA-05	TA-05
LOCATION	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S
TYPE OF LOCATION	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER
SAMPLE NUMBER	LA83604XW	LA83605XW	LA83606XW	LA83607XW	LA83608XW	LA83609XW
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA50001XW	LA50001XW	LA50001XW	LA20702XW	LA20702XW	LA50006XW
FIELD MEASUREMENTS						
Depth (ft)	0-0.25	0-0.25	0-0.25	0-0.25	0-0.25	0-0.25
ANALYTES						
Antimony	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---
Barium	71.1	79.2	45.8	70.5	61.1	48.2
Beryllium	0.71 B	0.39 B	0.48 B	0.59 B	0.58 B	0.37 B
Cadmium	---	---	---	---	---	---
Chromium	5.0	---	---	5.0	5.9	---
Copper	25.5	25.9	7.5	10.9	6.6	6.4
Lead[b]	---	22.6 B	---	17.1 B	---	---
Mercury	NR	NR	NR	NR	NR	NR
Nickel	---	---	---	---	---	---
Selenium	---	---	---	---	---	---
Silver	---	---	---	---	---	---
Thallium	---	---	---	---	---	---
Zinc	23.5	29.1	28.9	35.0	29.0	24.4
% Solids	90.0	92.4	96.1	95.1	93.1	96.5
Total (Allowed) Hold Time[a]	21(182)d	21(182)d	21(182)d	45(182)d	45(182)d	9(182)d
Total (Allowed) Hold Time[c]	9(182)d	9(182)d	9(182)d	11(182)d	11(182)d	9(182)d

a. ICP.
b. GFAAS.

TABLE 4.26.4 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 26

AREA	TA-08	TA-08	TA-08	TA-08	TA-08	TA-08
LOCATION	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS
TYPE OF LOCATION	MOUNDS	MOUNDS	MOUNDS	MOUNDS	MOUNDS	MOUNDS
SAMPLE NUMBER	LA83401XY	LA83402XY	LA83403XY	LA83404XY	LA83405XY	LA83406XY
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL011	LANL011	LANL011	LANL011	LANL011	LANL011
FIELD MEASUREMENTS						
Depth (ft)	0-0.50	0-0.50	0-0.50	0-0.50	0-0.50	0-0.50
ANALYTES						
None detected						
Total (Allowed) Hold Time	6(14)d	6(14)d	6(14)d	6(14)d	6(14)d	6(14)d

TABLE 4.26.4 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-15	TA-15	TA-15	TA-05	TA-05	TA-05
LOCATION	INACTIVE FS	INACTIVE FS	INACTIVE FS	D&D'D F.S	D&D'D F.S	D&D'D F.S
TYPE OF LOCATION	G-POINT	G-POINT	G-POINT	X-CHAMBER	X-CHAMBER	X-CHAMBER
SAMPLE NUMBER	LA83501XY	LA83502XY	LA83503XY	LA83601XY	LA83602XY	LA83603XY
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL002	LANL002	LANL002	LANL005	LANL005	LANL005
FIELD MEASUREMENTS						
Depth (ft)	0-0.50	0-0.50	0-0.50	0-0.25	0-0.25	0-0.25
ANALYTES						
None detected						
Total (Allowed) Hold Time	8(14)d	8(14)d	8(14)d	9(14)d	9(14)d	9(14)d

TABLE 4.26.4 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-05	TA-05	TA-05	TA-05	TA-05	TA-05
LOCATION	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S
TYPE OF LOCATION	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER
SAMPLE NUMBER	LA83604XY	LA83605XY	LA83606XY	LA83607XY	LA83608XY	LA83609XY
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL005	LANL005	LANL005	LANL011	LANL011	LANL011
FIELD MEASUREMENTS						
Depth (ft)	0-0.25	0-0.25	0-0.25	0-0.25	0-0.25	0-0.25
ANALYTES						
None detected						
Total (Allowed) Hold Time	9(14)d	9(14)d	9(14)d	7(14)d	7(14)d	7(14)d

TABLE 4.26.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 26

AREA	TA-08	TA-08	TA-08	TA-08	TA-08
LOCATION	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS
TYPE OF LOCATION	MOUNDS	MOUNDS	MOUNDS	MOUNDS	MOUNDS
SAMPLE NUMBER	LA83401D	LA83401W	LA83402D	LA83402W	LA83403D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	na	<21500 ±1400	----	<16300 ±100	na
Uranium - 234	na	----	na	----	na
Uranium - 235	na	181 ±35.0	na	105 ±29.0	na
Uranium - 238[a]	na	<30900 ±2100	na	<23100 ±1600	na
Uranium - 238[b]	na	----	na	----	na
Uranium (all isotopes)[c]	13000 ±1300	na	4000 ±400	na	3000 ±300
Plutonium - 238	11.0 ±8.0	na	<6.0	na	<6.0
Plutonium - 239,240	89.0 ±14.0	na	31.0 ±8.0	na	31.0 ±8.0
Beta Emitters					
Strontium - 90	<750	na	<760	na	<630
Gamma Emitters					
Potassium - 40	na	17700 ±1800	na	18800 ±1700	na
Manganese - 54	na	----	na	----	na
Cobalt - 56	na	<51.0	na	----	na
Cobalt - 60	na	----	na	----	na
Cesium - 137	na	628 ±56.0	na	351 ±45.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).

TABLE 4.26.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-08	TA-08	TA-08	TA-08	TA-08
LOCATION	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS
TYPE OF LOCATION	MOUNDS	MOUNDS	MOUNDS	MOUNDS	MOUNDS
SAMPLE NUMBER	LA83403W	LA83404D	LA83404W	LA83404W[d]	LA83405D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgW	pCi/kgD
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<12070 ±850	na	<11310 ±810	<11800 ±1600	na
Uranium - 234	----	na	----	----	na
Uranium - 235	82.0 ±48.0	na	83.0 ±26.0	----	na
Uranium - 238[a]	<11960 ±890	na	<12600 ±930	<11700 ±1700	na
Uranium - 238[b]	----	na	----	----	na
Uranium (all isotopes)[c]	na	4000 ±400	na	na	49000 ±4900
Plutonium - 238	na	<5.0	na	na	<27.0
Plutonium - 239,240	na	27.0 ±6.0	na	na	33.0 ±24.0
Beta Emitters					
Strontium - 90	na	<810	na	na	<800
Gamma Emitters					
Potassium - 40	16800 ±1500	na	17800 ±1700	20800 ±2700	na
Manganese - 54	<45.0	na	----	----	na
Cobalt - 56	----	na	----	<120	na
Cobalt - 60	----	na	----	----	na
Cesium - 137	450 ±40.0	na	534 ±45.0	----	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.26.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-08	TA-08	TA-08	TA-15	TA-15
LOCATION	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS
TYPE OF LOCATION	MOUNDS	MOUNDS	MOUNDS	G-POINT	G-POINT
SAMPLE NUMBER	LA83405W	LA83406D	LA83406W	LA83501D	LA83501W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	ug/kgD	pCi/kgW
Alpha Emitters					
Thorium - 230	na	na	na	na	na
Thorium - 232[a]	<13280 ±970	na	<11120 ±850	na	<14400 ±1000
Uranium - 234	----	na	----	na	----
Uranium - 235	842 ±71.0	na	90.0 ±27.0	na	7560 ±500
Uranium - 238[a]	<13150 ±980	na	<10110 ±850	na	<14400 ±1200
Uranium - 238[b]	23100 ±3900	na	----	na	675000 ±49000
Uranium (all isotopes)[c]	na	2000 ±200	na	1320000 ±132000	na
Plutonium - 238	na	<29.0	na	na	na
Plutonium - 239,240	na	147 ±38.0	na	na	na
Beta Emitters					
Strontium - 90	na	<450	na	na	na
Gamma Emitters					
Potassium - 40	16800 ±1200	na	20200 ±1700	na	20800 ±1600
Manganese - 54	----	na	----	na	----
Cobalt - 56	----	na	----	na	----
Cobalt - 60	----	na	----	na	35.0 ±20.0
Cesium - 137	384 ±36.0	na	459 ±42.0	na	41.0 ±25.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.26.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-15	TA-15	TA-15	TA-15	TA-05
LOCATION	INACTIVE FS	INACTIVE FS	INACTIVE FS	INACTIVE FS	D&D'D F.S
TYPE OF LOCATION	G-POINT	G-POINT	G-POINT	G-POINT	X-CHAMBER
SAMPLE NUMBER	LA83502D	LA83502W	LA83503D	LA83503W	LA83601D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	ug/kgD	pCi/kgW	ug/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Thorium - 230	na	na	na	na	1400 ±300
Thorium - 232[a]	na	<9640 ±860	na	<14300 ±1100	na
Uranium - 234	na	----	na	350000 ±140000	na
Uranium - 235	na	21500 ±1300	na	18700 ±1100	na
Uranium - 238[a]	na	<10400 ±1300	na	<13700 ±1200	na
Uranium - 238[b]	na	2190000 ±190000	na	1880000 ±150000	na
Uranium (all isotopes)[c]	6800000 ±680000	na	5140000 ±514000	na	116000 ±11600
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Potassium - 40	na	14200 ±2300	na	22700 ±1700	na
Manganese - 54	na	----	na	----	na
Cobalt - 56	na	----	na	----	na
Cobalt - 60	na	----	na	----	na
Cesium - 137	na	136 ±64.0	na	----	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.26.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-05	TA-05	TA-05	TA-05	TA-05
LOCATION	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S
TYPE OF LOCATION	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER
SAMPLE NUMBER	LA83601W	LA83602D	LA83602W	LA83603D	LA83603W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Thorium - 230	na	1300 ±300	na	1200 ±300	na
Thorium - 232[a]	<14000 ±1100	na	<14600 ±1000	na	<16900 ±12000
Uranium - 234	----	na	----	na	----
Uranium - 235	2470 ±210	na	796 ±91.0	na	238 ±39.0
Uranium - 238[a]	<14600 ±1200	na	<14800 ±1200	na	<17600 ±1200
Uranium - 238[b]	72200 ±7700	na	23200 ±4000	na	----
Uranium (all isotopes)[c]	na	44000 ±4400	na	8000 ±800	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Potassium - 40	26800 ±2100	na	28000 ±2300	na	30800 ±2400
Manganese - 54	----	na	----	na	----
Cobalt - 56	<66.0	na	<48.0	na	----
Cobalt - 60	----	na	----	na	----
Cesium - 137	977 ±90.0	na	679 ±60.0	na	652 ±80.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.26.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-05	TA-05	TA-05	TA-05	TA-05
LOCATION	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S
TYPE OF LOCATION	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER
SAMPLE NUMBER	LA83604D	LA83604W	LA83605D	LA83605W	LA83606D
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD
Alpha Emitters					
Thorium - 230	1500 ±300	na	1300 ±300	na	2200 ±300
Thorium - 232[a]	na	<15300 ±1100	na	<14000 ±1000	na
Uranium - 234	na	----	na	----	na
Uranium - 235	na	311 ±35.0	na	362 ±55.0	na
Uranium - 238[a]	na	<14600 ±1100	na	<13800 ±1200	na
Uranium - 238[b]	na	----	na	11000 ±950	na
Uranium (all isotopes)[c]	13000 ±1300	na	16000 ±1600	na	9000 ±900
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Potassium - 40	na	25400 ±1800	na	27900 ±2100	na
Manganese - 54	na	----	na	----	na
Cobalt - 56	na	28.0 ±25.0	na	----	na
Cobalt - 60	na	----	na	----	na
Cesium - 137	na	367 ±39.0	na	987 ±96.0	na

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.26.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-05	TA-05	TA-05	TA-05	TA-05
LOCATION	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S	D&D'D F.S
TYPE OF LOCATION	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER	X-CHAMBER
SAMPLE NUMBER	LA83606W	LA83607D	LA83607W	LA83608D	LA83608W
MEDIA	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	pCi/kgW	pCi/kgD	pCi/kgW	pCi/kgD	pCi/kgW
Alpha Emitters					
Thorium - 230	na	1700 ±300	na	1500 ±400	na
Thorium - 232[a]	<16300 ±1200	na	<18200 ±1300	na	<12700 ±890
Uranium - 234	----	na	----	na	----
Uranium - 235	140 ±82.0	na	165 ±38.0	na	127 ±27.0
Uranium - 238[a]	<19200 ±1500	na	<17500 ±1400	na	<11500 ±1000
Uranium - 238[b]	----	na	----	na	----
Uranium (all isotopes)[c]	na	10000 ±1000	na	6000 ±600	na
Plutonium - 238	na	na	na	na	na
Plutonium - 239,240	na	na	na	na	na
Beta Emitters					
Strontium - 90	na	na	na	na	na
Gamma Emitters					
Potassium - 40	30900 ±2600	na	30200 ±2900	na	24600 ±1900
Manganese - 54	----	na	----	na	----
Cobalt - 56	<43.0	na	----	na	----
Cobalt - 60	----	na	----	na	----
Cesium - 137	1023 ±87.0	na	2220 ±160	na	984 ±83.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

TABLE 4.26.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 26 (Continued)

AREA	TA-05	TA-05
LOCATION	D&D'D F.S	D&D'D F.S
TYPE OF LOCATION	X-CHAMBER	X-CHAMBER
SAMPLE NUMBER	LA83609D	LA83609W
MEDIA	SOIL	SOIL
UNITS	pCi/kgD	pCi/kgW
Alpha Emitters		
Thorium - 230	1500 ±500	na
Thorium - 232[a]	na	<10700 ±780
Uranium - 234	na	----
Uranium - 235	na	126 ±50.0
Uranium - 238[a]	na	<11150 ±840
Uranium - 238[b]	na	----
Uranium (all isotopes)[c]	13000 ±1300	na
Plutonium - 238	na	na
Plutonium - 239,240	na	na
Beta Emitters		
Strontium - 90	na	na
Gamma Emitters		
Potassium - 40	na	26100 ±1900
Manganese - 54	na	----
Cobalt - 56	na	----
Cobalt - 60	na	----
Cesium - 137	na	1027 ±77.0

a. Total unbroken chain activity in equilibrium.
b. Activity in excess of U238 natural chain.
c. Units are ug (/L, /kgW, or /kgD) instead of pCi (/L, /kgW, or /kgD).
d. This column contains the results of the radiological screening run.

4.27 Environmental Problem 27--TA-16 GMX-2 Site

- Request Number: LA840

- Requester: J. Clay/K. D. Sichelstiel

- Finding and Basis: Over 100 former LANL operational or processing sites potentially impacted the soils surrounding these sites, possibly creating an environmental problem.

The miscellaneous sites visited at the LANL facility during the survey were not directly related to the other finding categories. However, some of these sites are potential sources of residual contamination. One of these sites of concern will be addressed in the sampling and analysis phase. This site was used in the past for processing and trimming high explosive materials. The site has been decontaminated and decommissioned; however, insufficient information exists to determine the level of decontamination and the concentration of residual contaminants.

4.27.1 Sampling and Analysis Objectives

- Statement

The S&A objective was to determine the presence (above minimum detection limits) of high explosive and hazardous constituents in the soils surrounding an area formerly used in processing high explosives.

- Supporting Information

None.

4.27.2 Sampling and Analysis Design

- Samp ing Design

Subsurface soil samples were collected from the GMX-2 former high explosive processing area, which has undergone remedial action, decontamination, and decommissioning (see Figure 4.27.1).

It was assumed that all concrete floors and foundations were removed during cleanup activities. It was also assumed that significant excavation, backfilling, and grading operations during the cleanup action at this site distributed contaminants over the area, rendering biased or targeted sampling invalid. Furthermore, it was unlikely that much contamination would be found under the concrete floor and foundations (if still remaining). A total of six major structures existed in the area at one time. Twelve composite samples of subsurface soil, each consisting of three subsample cores from between 0 and 3 ft, were collected as planned systematically over the entire GMX area that received previous cleanup action.

Utility drawings, aerial photographs, and photogra s of the remedial activities were used to determine where the old buildings once stood and the cleanup boundaries. Because it was unknown if soil cover was placed over the area during the cleanup operation or regrading was performed, composite samples were collected systematically over the entire area. The actual sampling area of interest was expanded slightly from the S&A plan based on remediation photos and field observations. Sample depth was limited to less than 3 ft at certain locations due to encountering weathered tuff. Only 6 out of 12 samples for volatile organic analysis were collected due to the shallow depth of certain sample locations and lack of any detectable organic vapors using a photoionization detector.

- Analytical Design

Samples were analyzed as planned for volatile organic compounds, metals to ICP detection limits, and high explosives (see Table 4.27.1).

4.27.3 Field and Analytical Data

- Field Data

The high explosives field spot-test was negative for all samples. Organic vapor surveys demonstrated readings of 0 to 100 ppm, and were used to bias volatile organic analysis grab samples.

- Field Data Evaluation

None.

- Analytical Data

Analytical data are summarized in Tables 4.27.2 through 4.27.4.

All of the samples contained barium, chromium, and zinc in concentrations ranging from 88 to 280 mg/kg, 7 to 16 mg/kg, and 18 to 48 mg/kg, respectively. All of the samples except 03, 10, and 11 contained beryllium in concentrations ranging from 1 to 2 mg/kg. All samples except 02, 03, 10, and 11 contained cadmium in concentrations ranging from 3 to 5 mg/kg. Samples 01, 02, 04, 05, 06, and 08 contained copper in concentrations ranging from 7 to 53 mg/kg. Silver was detected only in sample 06 at 20.8 mg/kg. No high explosives were detected in any of the samples.

Six grab samples were collected for volatile organic analysis (01, 03, 04, 08, 10, and 12). Acetone was detected in all of the samples at concentrations ranging from 12 to 35 µg/kg. Toluene was detected in sample 03 at 2 µg/kg. A possible terpene isomer was tentatively identified in sample 04 at approximately 6 µg/kg. Terpenes may be a natural compound associated with native coniferous trees.

- Analytical Data Evaluation

<u>LA840: TA-16, GMX-2 Decontamination and Decommissioned Site</u>. All of the samples contained barium ranging from 88 to 280 mg/kg, chromium from 7 to 16 mg/kg, and zinc from 18 to 48 mg/kg. Beryllium was detected in all samples except 03, 10, and 11 at 1 to 2 mg/kg. Cadmium was detected in all samples except 02, 03, 10, and 11 at 3 to 5 mg/kg. Samples 01, 02, 04, 05, 06, and 08 contained copper at concentrations ranging from 7 to 53 mg/kg. Silver was only detected in sample 06 at 20.8 mg/kg.

No high explosives were detected in any of the samples.

Acetone was detected in all six volatile organic samples at 12 to 35 µg/kg and not found in the associated method blanks. However, given that acetone is a common laboratory contaminant and the amount of time that has past since any activity at this site, caution should be exercised in using these data. Terpene was detected in sample 04 at 6 µg/kg, and toluene was detected in sample 03 at 2 µg/kg.

- Radiological Data

All 12 samples contained natural activities; five samples contained ^{235}U (96 to 175 pCi/kgW); one contained ^{137}Cs (190 pCi/kgW); and three might contain ^{56}Co (<90 to <150 pCi/kgW).

- Radiological Data Evaluation

<u>LA840: TA-16, GMX-2 Decontamination and Decommissioned Site</u>. For this environmental problem, the only radiological measurements were gamma screens. The results of these measurements are given in Table 4.27.5.

In addition to the natural activities, ^{235}U was observed at 96 to 175 pCi/kgW in samples 06-08, 10, and 12; ^{137}Cs was observed at 190 pCi/kgW in sample 05; and limits for ^{56}Co were <90 to <150 pCi/kgW in samples 04, 06, and 08.

4.27.4 <u>Limitations and Qualifications</u>

- Data Quality Level

The sampling design, sample collection, and documentation are Quality Level I. Analytical data are generally Quality Level II with the Quality Level III exception for the volatile organic data (excessive holding times).

- Field Data

None.

- Analytical Data

<u>LA840: TA-16, GMX-2 Decontamination and Decommissioned Site</u>. The holding times for samples collected for volatile organic analysis were exceeded by 14 to 15 days, which may contribute to potential false negatives and/or low bias to the quantitative values obtained. The data user should be cautioned that toluene detected in sample 03 may be overestimated by as much as 50%, as indicated by high spike recovery for that compound in the matrix spike analysis.

The concentration of acetone detected in sample 01 is underestimated by a factor of 1.7, due to the high RRF (0.56) for the continuing calibration (72.5 %D). If the initial calibration average RRF of 0.33 is used to calculate the acetone concentration, the corrected value would be 59 μg/kg. The recalculated value for acetone detected for sample 03 would be 22 μg/kg, sample 04 would be 39 μg/kg, samples 08 and 10 would be 20 μg/kg, and sample 12 would be 26 μg/kg.

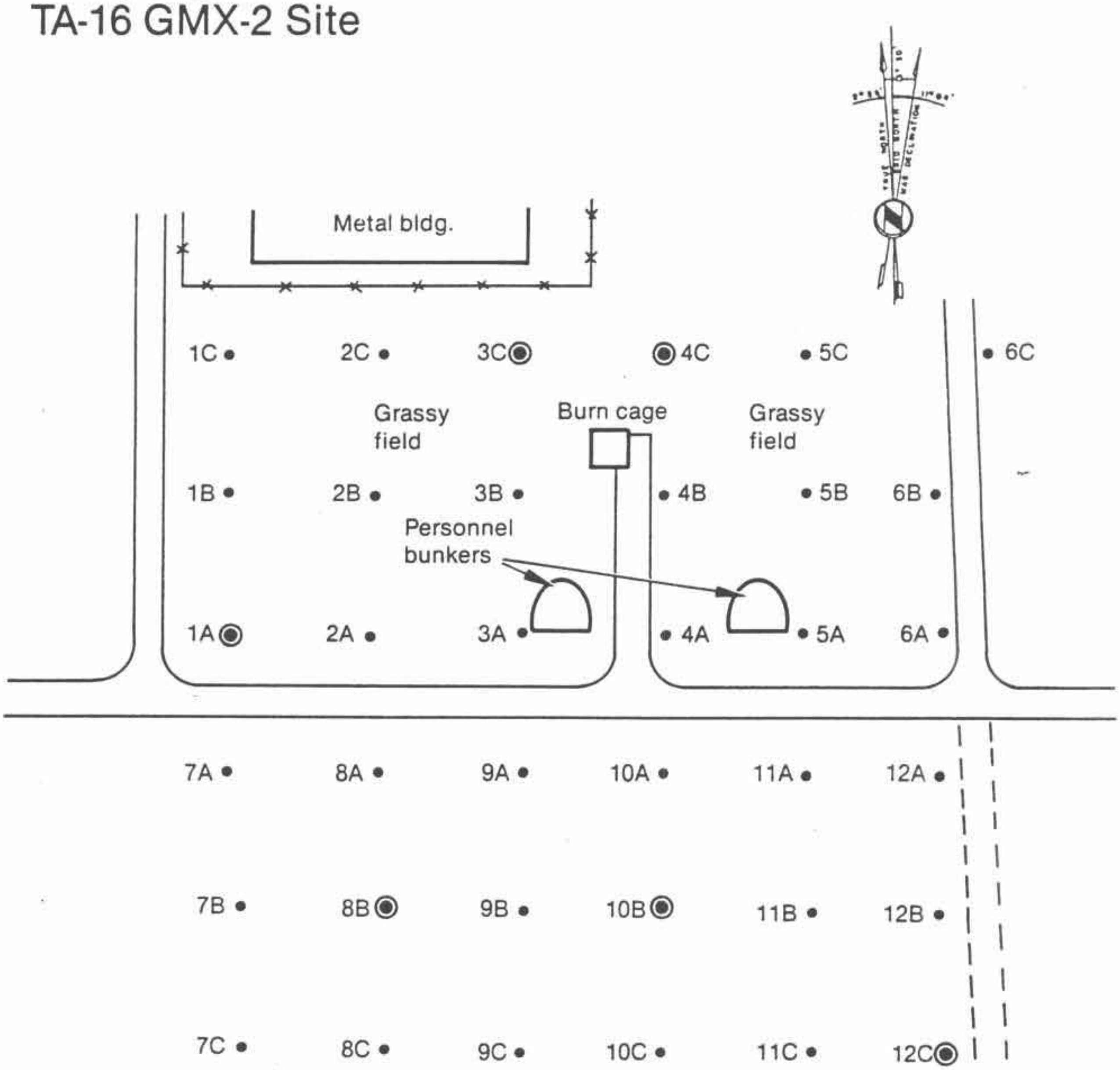
No munitions were detected in any of the samples in this environmental problem. The recovery of the high explosive HMX could not be quantitated due to an interference noted in the method blank. Recovery of RDX in the matrix spike analysis was 168%, possibly also due to the interference noted for HMX. A similar recovery pattern was noted for the matrix spike duplicate analysis. Because there were no munitions detected, there is no impact to the data usability.

Beryllium, copper, and silver were detected in the associated QC blanks at concentrations of up to 0.9 mg/kg, 2.2 mg/kg, and 10.1 mg/kg, respectively. Reported sample concentrations for these elements may be biased high by comparable amounts. Antimony, arsenic, lead, selenium, and thallium were inadvertently omitted from the matrix spike solution. Therefore, no data exist to confirm recovery of these analytes from the sample matrix.

- Radiological Data

The results of QC checks indicate that the performance of the gamma-ray instruments was adequate to ensure accuracy and reproducibility of the results obtained using them. In addition, the background seen by each instrument/detector was sufficiently low and constant to ensure accurate compensation for background effects.

Sampling Locations at
TA-16 GMX-2 Site



● – Composite subsample locations

◉ – VOA grab sample locations

APPROXIMATE SCALE: 1 in = 100 ft

(NOTE: Numbers 1-12 are the composite sample numbers letters A, B, and C are the subsample identifiers)

Figure 4.27.1

TABLE 4.27.1 LOS ALAMOS NATIONAL LABORATORY - COMPLETION TABLE - ENVIRONMENTAL PROBLEM 27

(Column Header Legend: P = Planned C = Collected A = Analyzed)
(Status Column Legend: Del = Deleted Dev = Deviation)

REQUEST NUMBER	SN	STAT	DATE COLLECTED mm/dd/yy	AREA	LOCATION	TYPE LOCATION	MEDIA	TYPE	NUMBER SAMPLES		VOLATILE			ICP METALS			HIGH EXPL		
									P	C	P	C	A	P	C	A	P	C	A
LA840	01		06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	1	1	1	1	1	1	1	1
LA840	02	DEV	06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	0	0	1	1	1	1	1	1
LA840	03		06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	1	1	1	1	1	1	1	1
LA840	04		06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	1	1	1	1	1	1	1	1
LA840	05	DEV	06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	0	0	1	1	1	1	1	1
LA840	06	DEV	06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	0	0	1	1	1	1	1	1
LA840	07	DEV	06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	0	0	1	1	1	1	1	1
LA840	08		06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	1	1	1	1	1	1	1	1
LA840	09	DEV	06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	0	0	1	1	1	1	1	1
LA840	10		06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	1	1	1	1	1	1	1	1
LA840	11	DEV	06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	0	0	1	1	1	1	1	1
LA840	12		06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	C	1	1	1	1	1	1	1	1	1	1	1
Totals for Problem Number 27									12	12	12	6	6	12	12	12	12	12	12

TABLE 4.27.2 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC DATA - ENVIRONMENTAL PROBLEM 27

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE
TYPE OF LOCATION	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2
SAMPLE NUMBER	LA84001XX	LA84003XX	LA84004XX	LA84008XX	LA84010XX	LA84012XX
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SDG NUMBER	LA84001XX	LA84001XX	LA84001XX	LA84001XX	LA84001XX	LA84001XX
FIELD MEASUREMENTS						
Depth (ft)	0-3	0-3	0-3	0-3	0-3	0-3
TARGET COMPOUNDS						
Acetone	35	13	23	12	12	15
Toluene	---	2 J	---	---	---	---
TENTATIVELY IDENTIFIED COMPOUNDS						
Poss Terpene	---	---	6 J	---	---	---
Total (Allowed) Hold Time	29(14)d*	29(14)d*	29(14)d*	28(14)d*	28(14)d*	28(14)d*
ELEVated/DECReased CRQL	ELEV	ELEV	ELEV	ELEV	ELEV	
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 4.27.3 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 27

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE
TYPE OF LOCATION	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2
SAMPLE NUMBER	LA84001XW	LA84002XW	LA84003XW	LA84004XW	LA84005XW	LA84006XW	LA84007XW	LA84008XW
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA20201XW	LA20201XW	LA20201XW	LA20201XW	LA20201XW	LA20201XW	LA20201XW	LA20201XW
FIELD MEASUREMENTS								
Depth (ft)	0-3	0-3	0-3	0-3	0-3	0-3	0-3	0-3
ANALYTES								
Antimony	---	---	---	---	---	---	---	---
Arsenic	---	---	---	---	---	---	---	---
Barium	277	165	87.5	174	192	240	242	216
Beryllium	1.4	1.1	---	1.1 B	1.5	1.8	1.5	1.4
Cadmium	3.8 B	---	---	2.9 B	4.1 B	3.9 B	4.5 B	3.7 B
Chromium	16.2	8.8	6.6	10.6	12.7	13.0	13.0	11.7
Copper	8.4	9.6	---	52.8	7.4	8.8	---	7.9
Lead	---	---	---	---	---	---	---	---
Mercury	NR	NR	NR	NR	NR	NR	NR	NR
Nickel	---	---	---	---	---	---	---	---
Selenium	---	---	---	---	---	---	---	---
Silver	---	---	---	---	---	20.8	---	---
Thallium	---	---	---	---	---	---	---	---
Zinc	36.6	24.9	24.2	47.5	32.7	35.4	28.8	27.8
% Solids	87.2	86.5	87.7	88.9	86.9	85.1	83.4	83.7
Total (Allowed) Hold Time[a]	156(182)d	156(182)d	156(182)d	156(182)d	156(182)d	156(182)d	156(182)d	156(182)d

a. ICP.

TABLE 4.27.3 LOS ALAMOS NATIONAL LABORATORY - INORGANIC DATA - ENVIRONMENTAL PROBLEM 27 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16
LOCATION	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE
TYPE OF LOCATION	GMX-2	GMX-2	GMX-2	GMX-2
SAMPLE NUMBER	LA84009XW	LA84010XW	LA84011XW	LA84012XW
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	mg/kg	mg/kg	mg/kg	mg/kg
SDG NUMBER	LA20201XW	LA20201XW	LA20201XW	LA20201XW
FIELD MEASUREMENTS				
Depth (ft)	0-3	0-3	0-3	0-3
ANALYTES				
Antimony	---	---	---	---
Arsenic	---	---	---	---
Barium	129	112	97.2	188
Beryllium	1.0 B	---	---	1.4
Cadmium	2.9 B	---	---	3.2 B
Chromium	8.7	6.9	7.3	12.2
Copper	---	---	---	---
Lead	---	---	---	---
Mercury	NR	NR	NR	NR
Nickel	---	---	---	---
Selenium	---	---	---	---
Silver	---	---	---	---
Thallium	---	---	---	---
Zinc	20.1	18.0	18.0	23.3
% Solids	91.4	86.6	90.4	83.4
Total (Allowed) Hold Time[a]	156(182)d	156(182)d	156(182)d	156(182)d

a. ICP.

TABLE 4.27.4 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 27

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE
TYPE OF LOCATION	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2
SAMPLE NUMBER	LA84001XY	LA84002XY	LA84003XY	LA84004XY	LA84005XY	LA84006XY
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL006	LANL006	LANL006	LANL006	LANL006	LANL006
FIELD MEASUREMENTS						
Depth (ft)	0-3	0-3	0-3	0-3	0-3	0-3
ANALYTES						
None detected						
Total (Allowed) Hold Time	3(14)d	3(14)d	3(14)d	3(14)d	3(14)d	3(14)d

TABLE 4.27.4 LOS ALAMOS NATIONAL LABORATORY - HIGH EXPLOSIVE DATA - ENVIRONMENTAL PROBLEM 27 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE
TYPE OF LOCATION	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2
SAMPLE NUMBER	LA84007XY	LA84008XY	LA84009XY	LA84010XY	LA84011XY	LA84012XY
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
SDG NUMBER	LANL006	LANL006	LANL006	LANL006	LANL006	LANL006
FIELD MEASUREMENTS						
Depth (ft)	0-3	0-3	0-3	0-3	0-3	0-3
ANALYTES						
None detected						
Total (Allowed) Hold Time	3(14)d	3(14)d	3(14)d	3(14)d	3(14)d	3(14)d

TABLE 4.27.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 27

AREA	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE
TYPE OF LOCATION	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2
SAMPLE NUMBER	LA84001W[d]	LA84002W[d]	LA84003W[d]	LA84005W[d]	LA84006W[d]
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW
Alpha Emitters					
Thorium - 232[a]	<13800 ±1600	<11600 ±1600	<9900 ±1300	<13400 ±2700	<13400 ±1600
Uranium - 235	----	----	----	----	150 ±100
Uranium - 238[a]	<13100 ±2100	<11800 ±1700	<10800 ±1500	<13400 ±3100	<12500 ±1800
Gamma Emitters					
Potassium - 40	15800 ±2400	18000 ±3400	24800 ±2800	10600 ±4800	14300 ±2200
Cobalt - 56	----	----	----	----	<150
Cesium - 137	----	----	----	190 ±180	----

a. Total unbroken chain activity in equilibrium.
d. This column contains the results of the radiological screening run.

TABLE 4.27.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 27 (Continued)

AREA	TA-16	TA-16	TA-16	TA-16	TA-16
LOCATION	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE	D&D'D SITE
TYPE OF LOCATION	GMX-2	GMX-2	GMX-2	GMX-2	GMX-2
SAMPLE NUMBER	LA84007W[d]	LA84008W[d]	LA84009W[d]	LA84010W[d]	LA84011W[d]
MEDIA	SS SOIL	SS SOIL	SS SOIL	SS SOIL	SS SOIL
UNITS	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW	pCi/kgW
Alpha Emitters					
Thorium - 232[a]	<14400 ±1800	<12800 ±1800	<11500 ±1600	<11300 ±1600	<12500 ±2000
Uranium - 235	130 ±120	175 ±79.0	----	96.0 ±72.0	----
Uranium - 238[a]	<13600 ±2200	<11200 ±1700	<8200 ±1900	<11300 ±1700	<10800 ±1500
Gamma Emitters					
Potassium - 40	17600 ±2600	14000 ±2200	20400 ±3600	22100 ±3600	24800 ±3000
Cobalt - 56	----	<90.0	----	----	----
Cesium - 137	----	----	----	----	----

a. Total unbroken chain activity in equilibrium.
d. This column contains the results of the radiological screening run.

TABLE 4.27.5 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM 27 (Continued)

AREA	TA-16
LOCATION	D&D'D SITE
TYPE OF LOCATION	GMX-2
SAMPLE NUMBER	LA84012W[d]
MEDIA	SS SOIL
UNITS	pCi/kgW
Alpha Emitters	
Thorium - 232[a]	<14400 ±1800
Uranium - 235	110 ±110
Uranium - 238[a]	<13100 ±2000
Gamma Emitters	
Potassium - 40	17000 ±2400
Cobalt - 56	----
Cesium - 137	----

a. Total unbroken chain activity in equilibrium.
d. This column contains the results of the radiological screening run.

5. QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

This section reviews quality assurance (QA) and quality control (QC) as addressed by QA/QC Plans covering the LANL (Survey Manual, Appendix F, and Section 6.0, Quality Assurance Plan, LANL S&A Plan). Section 5.1 briefly reviews the field QA/QC Plan for the LANL Sampling and Analysis effort. Quality control samples generated and collected in the field are listed, and results are discussed in the analytical section (Section 5.2).

Section 5.2 summarizes laboratory analytical QA/QC procedures for determination of nonradioactive contaminants; discussions of results are presented along with explanations of tables. Data limitations for specific samples are generally presented in Section 4 in each environmental problem discussion. Sections 5.3 addresses QA/QC for laboratory radiochemistry performed by UNC and INEL and field radiochemistry. Data management QA/QC is discussed in Section 5.4

Both the field and analytical sections (Sections 5.1 and 5.2) address external audits conducted by the EPA or other independent organizations.

To minimize repetition, extensive referencing of various sections of the S&A Plan is used in this document. Section 6.0 of the "LANL Sampling and Analysis Plan" (DOE, 1988b) primarily addresses field QA/QC. The format for Section 6.0 is consistent with the guidance provided in the August 1987 draft of The Environmental Survey Manual (DOE), and the essential elements as defined in the EPA's "Interim Guidelines and Specifications for Preparing Quality Assurance Plans" (EPA, 1983). These elements are as follows:

1. Introduction

2. Project description

3. Project organization and responsibility

4. QA objective for measurement data in terms of precision, accuracy, completeness, representativeness, and comparability

5. Design control

6. Procurement control

7. Sampling procedures

8. Sample custody

9. Instrument calibrations and preventive maintenance procedures and frequencies

10. Analytical procedures

11. Data reduction, assessment, analysis, and reporting

12. Document control

13. Identification and control of items

14. Handling, storage, and shipping

15. Internal QC checks and frequency

16. Internal performance and system inspections

17. Corrective action

18. Quality assurance records

19. QA reports to management.

5.1 Field QA/QC

The entire LANL S&A Plan, including the QA/QC section, was reviewed by EMSL-LV and approved by DOE. Selected field QA/QC items from Section 6 of the LANL S&A Plan and the Survey Manual are addressed in the paragraphs that follow.

QA Objectives for Completeness. The goal for completeness of field sampling was 100%, although 90% is acceptable (DOE, 1987). Field sampling completeness, expressed as a percentage, is based on the following:

$$\frac{\text{Number of samples collected and samples deleted (with DOE-HQ approval)}}{\text{Number of samples requested (S\&A Plan) + samples added (with DOE-HQ approval)}}$$

Overall completeness for the field samples effort was 99%.

Specific details regarding completions and explanations regarding uncollected samples are found in individual environmental problem sections of Section 4. Table 5.1 provides a field sampling completeness summary by media type.

Calibration Procedures and Frequency. An important factor in collecting accurate field data is instrument calibration. The guidance provided in Section 6.4.3 of the LANL S&A Plan was followed; dates, standards, and problems were recorded in the field logbooks. In some cases, instrument stabilization problems and suspect data are noted in the tables or text associated with each environmental problem (Section 4).

Internal Quality Control Checks. Section 6.8 of the LANL S&A Plan called for the collection of trip blanks for volatile organic analysis, rinsate samples for analysis for volatile organic and metals analysis and field preservative for analysis for metals. The planned number of samples and actual number collected for each of these types of QC samples are shown in Table 5.2. Analytical results are presented in Sections 5.2.2.1.5 and 5.2.2.2.2.

TABLE 5.1 FIELD SAMPLING COMPLETENESS

	Number of Samples				
Sample Type	Planned[a]	Added[b]	Collected	Deleted	Not Collected
Soil	116	--	113	--	3[h]
SS Soil	53	1	52	2[c]	--
Sediment	39	--	39	--	--
Sludge	4	--	4	--	--
Waste	13	2	9	6[d]	--
Water	12	8	12	8[e]	--
Soil Gas	51	5	40	16[f]	--
Geophysical	3	--	3	--	--
QC Samples	22	5	26	1[g]	--
TOTAL	313	21	298	33	3

a. From Los Alamos S&A Plan, Table 3.3.5.

b. Samples added based on field observations or measurements with DOE-HQ approval.

c. LA829, boring #2 and #3 deleted due to absence of perched water table.

d. LA316, no waste observed or collected.
LA601, construction activity had disturbed original proposed sampling location.

e. LA317, no flow during sampling program.
LA826, no water in sump.
LA830, well deleted per DOE-HQ based on hydrogeological data from boring #1.

f. Deletion of problem 20.

g. LA911, no logbook record of collection, shipping, or lab receipt.

h. LA803, inconsistency in number of samples requested in S&A Plan (3 vs. 6). Team leader and DOE-HQ agreed not to collect 3 samples.

TABLE 5.2 LOS ALAMOS NATIONAL LABORATORY - COMPLETION TABLE - QC REQUESTS

(Column Header Legend: P = Planned C = Collected A = Analyzed)
(Status Column Legend: Del = Deleted Dev = Deviation)

REQUEST NUMBER	SN	STAT	DATE COLLECTED mm/dd/yy	AREA	LOCATION	TYPE LOCATION	MEDIA	TYPE	NUMBER SAMPLES		VOLATILE			ICP METALS			GROSS A&B			GAMMA ANALYSIS		
									P	C	P	C	A	P	C	A	P	C	A	P	C	A
LA901			05/03/88	QC	QC	RINSATEWATE	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA902			05/03/88	QC	QC	PRES BLANK	WATER		1	1				1	1	1	1	1	1	1	1	1
LA903			05/04/88	QC	QC	TRIP BLANK	WATER		1	1	1	1	1									
LA904			05/05/88	QC	QC	RINSATEWATE	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA905		DEV	05/03/88	QC	QC	FIELD STD.	SOILGAS	GRAB	0	1	1	1	1									
LA906			05/05/88	QC	QC	TRIP BLANK	WATER		1	1	1	1	1									
LA907			05/10/88	QC	QC	RINSATEWATE	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA908			05/09/88	QC	QC	PRES BLANK	WATER		1	1				1	1	1	1	1	1	1	1	1
LA909			05/11/88	QC	QC	PRES BLANK	WATER		1	1				1	1	1	1	1	1	1	1	1
LA910			05/11/88	QC	QC	TRIP BLANK	WATER		1	1	1	1	1									
LA911		DEV	05/21/88	QC	QC	RINSATESOIL	WATER		1	0												
LA912			05/17/88	QC	QC	RINSATESOIL	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA913			05/17/88	QC	QC	TRIP BLANK	WATER		1	1	1	1	1									
LA914			05/24/88	QC	QC	RINSATESOIL	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA915			06/02/88	QC	QC	RINSATESOIL	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA916			06/01/88	QC	QC	RINSATESOIL	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA917			05/09/88	QC	QC	TRIP BLANK	SOILGAS		1	1	1	1	1									
LA918			05/05/88	QC	QC	TRIP BLANK	SOILGAS		1	1	1	1	1									
LA919			05/06/88	QC	QC	TRIP BLANK	SOILGAS		1	1	1	1	1									
LA920			06/03/88	QC	QC	RINSATESOIL	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA921			05/20/88	QC	QC	RINSATESOIL	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA922			05/04/88	QC	QC	TRIP BLANK	SOILGAS		1	1	1	1	1									
LA923			05/21/88	QC	QC	RINSATESOIL	WATER		1	1	1	1	1	1	1	1	1	1	1	1	1	1
LA924			05/11/88	QC	QC	METHANOL	WASTE		0	1	0	1	1									
LA925			05/11/88	QC	QC	DI WATER	WATER	GRAB	0	1	0	1	1									
LA926			05/11/88	QC	QC	DI WATER	WATER	GRAB	0	1	0	1	1									
LA927			05/26/88	QC	QC	DIST. WATER	WATER	GRAB	0	1	0	1	1									
Totals for Problem Number QA									22	26	19	23	23	13	13	13	13	13	13	13	13	13

Rinsate, trip blank, and preservative blank results were not reported to the field team during the field sampling phase.

Performance and System Audits. An EPA Audit Team conducted an on-site inspection to evaluate the sampling effort at LANL on May 16 to May 19, 1988. It was conducted to document the extent to which procedures identified in the S&A Plan were followed with respect to implementing specified field tests, field calibration, chain-of-custody, recordkeeping, QA, sample handling, sample shipment, and sample collection, and techniques. The field sampling effort, sample management facility, and the field radiological laboratory were the focus of the inspection.

The onsite EPA audit did not find any serious deficiencies in the sampling effort for the LANL Environmental Survey. The EPA inspection noted that most of the suggestions made by the audit team for improving sampling efficiency and for assuring sampling procedures were consistent with those presented in the field manual and were minor in nature. The majority of the suggested procedural changes were made during the visit to the site.

The complete text of the EPA audit of field sampling, the field radiological laboratory, and the response to deficiencies is found in Appendix C of this document.

5.2 Analytical QA/QC

Discussion of analytical QA/QC is divided into two major sections: analytical chemistry QA (Section 5.2.1) and analytical chemistry QC (Section 5.2.2). QC data associated with LANL nonradiological samples are provided in Appendix E of this document.

5.2.1 Analytical Chemistry QA

Design and implementation of analytical QA plans for the Environmental Survey have been based on the fundamental principle of "data of known quality." Although a survey program such as this can effectively utilize data of varying quality levels, it is important that the data users be provided with a data quality assessment for any given sample set. In this way, the Survey Team can interpret the analytical data from a programmatic perspective, while considering the analytical limitations imposed on the data. Data quality assessments require that all phases of laboratory support be designed to address the fundamental principles of precision, accuracy, representativeness, comparability, and completeness. The analytical QA program plan has accomplished this through the use of standard procedures, QC practices, data reporting requirements, and data quality evaluations. A brief summary of some of the major analytical QA components follows.

Sampling and analysis support to the Environmental Survey was a very large-scale effort, requiring the contributions of a number of laboratories. From an analytical perspective, data comparability was ensured when the procedures were followed, by adopting a program-wide set of standard analytical procedures, QC practices, and reporting requirements. These analytical procedures, which are documented in Appendix D of The Environmental Survey Manual (DOE, 1987), are based on a number of well documented, EPA-approved methods. The majority of the nonradiological determinations for this program utilize the EPA CLP protocols. Radiological determinations utilize a series of procedures that have been developed and/or tested within the DOE national laboratory system. In this way, all participant laboratories were required to meet standard performance criteria regarding the precision and accuracy of their analyses.

All participant laboratories developed a series of Standard Operating Procedures (SOPs) that establish policy and practice for all phases of laboratory operations. The SOPs provided the basis for day to day operation of the laboratory and serve as the foundation for a technical systems audit.

At a minimum, QC practices adopted by the individual laboratories were to include those items mandated by the analytical protocols. In the case of inorganic determinations, these include using preparation blanks, laboratory duplicate samples, laboratory control samples, matrix spikes, analytical spikes, interference check samples, and calibration verification solutions (blanks and known standards). For organic determinations, these include rigorous tuning criteria, and use of matrix spike samples, matrix spike duplicate samples, method blanks, internal standards, and surrogates. In addition to these requirements, which are imposed by the analytical protocols, the laboratory was required to monitor method performance over time.

Data-reporting procedures for the Environmental Survey program were established with the objective of providing a technically defensible, legally admissible data set. Deliverables include CLP reporting forms for organic and inorganic compounds and reporting forms that provide appropriate levels of QC data for non-CLP analyte parameters. Data comparability was achieved by adopting of a program-wide set of defined deliverables. Each laboratory responsible for a given site was required to maintain a comprehensive case file. This case file included all of the raw data and documentation associated with a site, in an auditable structure.

Evaluations of the quality of an analytical support effort to the Environmental Survey are made externally to provide an independent assessment of performance and technical systems. This external assessment of analytical performance includes participation in EPA round robins. All participant laboratories receive regular sets of performance evaluation samples from the EPA. These include quarterly blinds (CLP analytes) from EMSL-LV, water pollution series samples (classical analytes) from EMSL-Cincinnati, and quarterly round robin samples (radiological determinations) from EMSL-LV. In addition, a third-party auditor is providing an independent data audit of each laboratory. This consisted of an evaluation of the overall measurement system. A related, but distinct function was served by the technical systems audits performed by the EPA and National Enforcement Investigation Center (NEIC). In this case, on-site evaluation of the laboratory operation was performed on a routine basis. This audit was a qualitative evaluation of the overall laboratory operation, including facilities, equipment, documentation, data validation, and QC procedures.

5.2.2 Analytical Chemistry QC

Nonradiological Analytical support to the LANL sampling and analysis effort was provided by three of the participant laboratories (INEL, ORGDP and ORNL) with coordination by INEL. Detailed data quality assessments of results for samples associated with a given environmental problem are presented in the corresponding environmental problem discussion in Section 4. Analytical data quality assessments were made based on batch-specific (i.e., SDG-specific) and sample-specific concerns. Factors evaluated as part of the data quality/usability assessment process included documentation completeness, sample integrity/quality, analysis quality, and programmatic usability of the data. Documentation completeness was evaluated by examination of field logs, laboratory raw data and reports, and chain-of-custody logs for compliance with survey protocols. Several variables were examined to evaluate sample quality, including adherence to the LANL S&A Plan, sampling methods/materials used, field observations, maintenance of correct sample storage conditions, and total holding times. Factors considered during analytical quality assessment include review of reporting forms and case narratives, matrix-related interferences, elevated or decreased CRQLs/CRDLs, and procedural deviations from protocol. Utility of the data was assessed on an Environmental Problem basis, by determining if data completeness and quality were adequate to meet the problem S&A objectives.

In subsequent discussion, overall data quality for the LANL data set is presented in two formats:

- Accomplishment of data quality objectives

- Data quality by type of analysis.

5.2.2.1. Accomplishment of Data Quality Objectives. Objectives for overall data quality for the LANL data set were established in five data quality categories: completeness, representativeness, comparability, precision, and accuracy. Objectives for completeness and comparability were established in the The Environmental Survey Manual (DOE, 1987). Objectives for representativeness, precision, and accuracy were not firmly established before the start of LANL S&A activities. Although 100% adherence with specified QA/QC guidelines is an ideal objective, it is not realistic in a real sampling and analysis effort. Therefore, the objectives for representativeness, precision, and accuracy, as set forth in the following tables and discussion, were established to reflect realistic minimum requirements for production of data that will fulfill the analytical objectives for the LANL survey. Evaluations of the program's accomplishments within each data quality category follow.

5.2.2.1.1 Completeness. The characteristic of completeness measures the amount of data obtained compared to the amount expected or planned. The program objective was to obtain analytical data for 90% of all samples collected. Analytical data were generated and reported for >99% of all samples collected. Sampling and analytical completeness is summarized in tabular form for each environmental problem in Section 4 of this document.

5.2.2.1.2 Representativeness. Sampling and measurements were carefully conducted so that results were as representative as possible of the media (e.g., air, soil, and water) and conditions being measured. Sampling protocols were selected and developed where necessary to meet those objectives. Sample handling protocols (e.g., splitting into subsamples, field and travel blanks, preservation, storage, and transportation) were selected to evaluate and protect the representativeness of collected samples. Recording procedures were utilized to document adherence to proper protocols for sampling, identifying samples, and maintaining sample integrity.

Rinsates (VOA and Inorganics), preservative blanks (Inorganics), and trip blanks (VOA were collected and analyzed to provide information regarding possible sample contamination during sample collection, preservation and shipping activities. Analysis results of these field QC samples are shown in Tables 5.3, 5.4, 5.5, and 5.7. Three different water sources were used for the field blanks.

Rinsate and trip blank results indicate minor contamination of these QC samples during collection, storage, and/or transport. Many of the volatile organic compounds detected in these QC samples are ubiquitous in nature and not unexpected. Nine VOCs were detected in the rinsates and four of the same VOCs detected in the trip blanks (see Tables 5.3 and 5.4). Methylene chloride was detected in all trip blank, rinsate, and water blank samples. Acetone and 2-butanene were the next most prevalent organic contaminants in these QC samples.

Miscellaneous QC data is found in Table 5.5. These data include results for a field standard for soil gas, a methanol sample (to check for purity), and three different deionized/distilled water samples collected to assess the purity of water used for blank makeup and equipment rinsing. No major QC problems were indicated.

Antimony, arsenic, cobalt, sodium, iron, and zinc concentrations occasionally exceeded their respective CRDLs in the rinsate and preservative blank samples (see Tables 5.5 and 5.6). The metals contamination observed in the rinsate QC samples may be due to impurities in the water or chemical preservative rather than to sampling procedures.

1,1,1-Trichloroethane was detected in three of the four soil gas canister trip blanks. The soil gas sample canisters also contained comparable concentrations of 1,1,1-trichloroethane, and therefore this compound was not reported in the section 4 results tables because it appeared to be a contaminant associated with the evacuated canisters used for sample collection.

Analytical program objectives for representativeness were established for each analysis type. The QC requirements monitored in the laboratory to evaluate representativeness were the analyte-specific analytical holding times. Table 5.3 shows the actual adherence to analytical holding times and program objectives as percentages of samples analyzed.

Analytical holding time objectives were not met for analyses of VOAs in soil, mercury in soil, and cyanide in soil. Data are not available to quantitatively evaluate the impact of holding time violations; it is usually assumed such violations imply the results of the affected analyses underestimate true values or for volatile chemical species may result in possible false negatives.

The analytical holding time is most useful in evaluating laboratory adherence to analytical protocol. When evaluating sample representativeness on a holding time basis, the total holding time (i.e., from date of collection to date of sample preparation/analysis) must be considered. The total holding time is comprised of three components: field storage holding time, which is time in transit/storage between sample collection and shipping, during which storage conditions are controlled; shipment time, which is time in transit between the sampling site and laboratory; and analytical holding time, which is time between sample receipt and analysis at the laboratory. Adherence to total holding times as percentages of samples analyzed are also shown in Table 5.3. Objectives for total holding time adherence were not established; however, the typical goal is 100%.

In general, when analytical holding times are exceeded, total holding time requirements are also exceeded. Even though analytical holding time requirements are met, total holding times may still be exceeded, depending on the combined field storage and shipping times. Field/shipping time, analytical holding time, and total holding time for each sample are provided in Appendix E.

TABLE 5.3 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC QC RINSATE DATA

AREA	QC	QC	QC	QC	QC	QC	QC
LOCATION	QC	QC	QC	QC	QC	QC	QC
TYPE OF LOCATION	RINSATEWATE	RINSATEWATE	RINSATEWATE	RINSATESOIL	RINSATESOIL	RINSATESOIL	RINSATESOIL
SAMPLE NUMBER	LA90101XA	LA90401XA	LA90701XA	LA91201XA	LA91401XA	LA91501XA	LA91601XA
MEDIA	WATER	WATER	WATER	WATER	WATER	WATER	WATER
UNITS	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
SDG NUMBER	LA30901XA	LA30901XA	LA80302XX	LA31401XA	LA82003XA	LA92001XA	LA92001XA
TARGET COMPOUNDS							
Chloromethane	---	---	---	---	---	2 J	---
Methylene Chloride	15 B	26 B	25 B	26 B	62 B	2 JB	2 JB
Acetone	---	10 JB	---	12	120	17	14
Carbon Disulfide	---	---	---	6	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	8 B	8 B
2-Butanone	21000 EB	55 B	2 JB	11 B	---	---	---
Trichloroethene	---	---	---	---	---	---	---
Toluene	---	---	2 J	---	---	0.6 J	0.6 J
Total (Allowed) Hold Time	6(30)d	7(30)d	6(30)d	9(30)d	3(30)d	7(30)d	8(30)d
ELEVated/DECReased CRQL							
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 5.3 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC QC RINSATE DATA (Continued)

AREA	QC	QC	QC	QC
LOCATION	QC	QC	QC	QC
TYPE OF LOCATION	RINSATESOIL	RINSATESOIL	RINSATESOIL	RINSATESOIL
SAMPLE NUMBER	LA92001XA	LA92101XA	LA92301XA	LA92301XBDL
MEDIA	WATER	WATER	WATER	WATER
UNITS	ug/L	ug/L	ug/L	ug/L
SDG NUMBER	LA92001XA	LA82003XA	LA82003XA	LA82003XA
TARGET COMPOUNDS				
Chloromethane	---	---	---	---
Methylene Chloride	2 JB	21 B	22 B	26 B
Acetone	540 E	170	2100 E	600 B
Carbon Disulfide	---	---	15	---
1,1-Dichloroethene	---	---	---	10 J
Chloroform	8 B	---	---	---
2-Butanone	---	10 B	9 BJ	63 B
Trichloroethene	---	---	---	12 J
Toluene	0.6 J	---	---	14 J
Total (Allowed) Hold Time	6(30)d	6(30)d	5(30)d	10(30)d
ELEVated/DECReased CRQL				ELEV
Dilution Factor	1.000	1.000	1.000	0.200

TABLE 5.4 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC QC TRIP BLANK DATA

AREA	QC	QC	QC	QC	QC	QC	QC
LOCATION	QC	QC	QC	QC	QC	QC	QC
TYPE OF LOCATION	TRIP BLANK	TRIP BLANK	TRIP BLANK	TRIP BLANK	TRIP BLANK	TRIP BLANK	TRIP BLANK
SAMPLE NUMBER	LA90301XA	LA90601XA	LA91001XA	LA91301XA	LA91701XZ	LA91801XZ	LA91901XZ
MEDIA	WATER	WATER	WATER	WATER	SOILGAS	SOILGAS	SOILGAS
UNITS	ug/L	ug/L	ug/L	ug/L	mg/m3	mg/m3	mg/m3
SDG NUMBER	LA30901XA	LA30901XA	LA31401XA	LA31401XA	LA85501XZ	LA80813XZ	LA80813XZ
TARGET COMPOUNDS							
Methylene Chloride	13 B	33 B	61 B	60 B	8 BQ	0.2 J	---
Acetone	---	19	5 J	4 J	---	0.8 J	---
2-Butanone	183 B	400 BE	---	---	0.7 JBQ	2 B	1 JB
1,1,1-Trichloroethane	---	---	---	---	0.8 J	---	0.4 J
Toluene	---	1 J	2 J	---	---	---	---
Total (Allowed) Hold Time	5(30)d	21(30)d	16(30)d	10(30)d	6(ns)d	16(ns)d	15(ns)d
ELEVated/DECReased CRQL					DECR	DECR	DECR
Dilution Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 5.4 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC QC TRIP BLANK DATA (Continued)

AREA	QC
LOCATION	QC
TYPE OF LOCATION	TRIP BLANK
SAMPLE NUMBER	LA92201XZ
MEDIA	SOILGAS
UNITS	mg/m3
SDG NUMBER	LA90501XZ
TARGET COMPOUNDS	
Methylene Chloride	0.3 JB
Acetone	2 Q
2-Butanone	---
1,1,1-Trichloroethane	2
Toluene	---
Total (Allowed) Hold Time	16(ns)d
ELEVated/DECReased CRQL	DECR
Dilution Factor	1.000

TABLE 5.5 LOS ALAMOS NATIONAL LABORATORY - VOLATILE ORGANIC QC MISCELLANEOUS DATA

AREA	QC	QC	QC	QC	QC
LOCATION	QC	QC	QC	QC	QC
TYPE OF LOCATION	FIELD STD	METHANOL	DIST WATER	DIST WATER	DIST WATER
SAMPLE NUMBER	LA90501XZ	LA92401XA	LA92501XA	LA92601XA	LA92701XA
MEDIA	SOILGAS	WASTE	WATER	WATER	WATER
UNITS	mg/m3	ug/L	ug/L	ug/L	ug/L
SDG NUMBER	LA90501XZ	LA30901XA	LA30901XA	LA30901XA	LA81503XX
TARGET COMPOUNDS					
Methylene Chloride	0.3 JB	26 B	28 B	28 B	5 B
Acetone	2 Q	4 JB	7 JB	---	9 BJ
2-Butanone	---	6 JB	4 JB	---	---
1,1,1-Trichloroethane	2	---	---	---	---
Toluene	---	---	1 J	---	2 J
Xylene (total)	---	---	3 J	---	---
Total (Allowed) Hold Time	17(ns)d	1(30)d	1(30)d	1(30)d	5(30)d
ELEVated/DECReased CRQL					
Dilution Factor	1.000	1.000	1.000	1.000	

TABLE 5.6 LOS ALAMOS NATIONAL LABORATORY - INORGANIC RINSATE DATA

AREA	QC	QC	QC	QC	QC	QC	QC	QC
LOCATION	RINSATE	RINSATE	RINSATE	RINSATE	RINSATE	RINSATE	RINSATE	RINSATE
TYPE OF LOCATION	WATER	WATER	WATER	SOIL	SOIL	SOIL	SOIL	SOIL
SAMPLE NUMBER	LA90101XH	LA90401XH	LA90701XH	LA91201XH	LA91401XH	LA91501XH	LA91601XH	LA92001XH
MEDIA	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
UNITS	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
SDG NUMBER	LA30901XH	LA30901XH	LA30901XH	LA30901XH	LA82001XH	LA91601XW	LA91601XW	LA91601XW
ANALYTES								
Aluminum	---	166 B	---	130 B	---	79.3 B	41.7 B	---
Antimony	---	118 B	---	177	---	---	---	---
Arsenic	283	264	---	---	203 B	---	---	---
Barium	---	---	---	---	---	2.7 B	2.7 B	2.1 B
Beryllium	---	---	---	---	---	---	---	---
Cadmium	---	---	---	---	---	---	---	---
Calcium	---	---	---	---	---	395 B	334 B	417 B
Chromium	---	---	---	---	---	---	---	---
Cobalt	41.7 B	41.1 B	---	55.6	---	---	---	---
Copper	---	---	---	---	---	---	---	---
Iron	88.7 B	---	---	---	---	25.8 B	---	14.8 B
Lead	---	158 B	---	---	---	---	---	---
Magnesium	---	---	---	---	---	115 B	95.6 B	104 B
Manganese	---	4.6 B	---	---	---	1.9 B	---	---
Mercury								
Nickel	---	---	---	---	---	---	---	---
Potassium	---	---	---	1670 B	---	847 B	---	879 B
Selenium	---	---	---	---	---	---	---	---
Silver	---	---	12.3 B	---	15.2 B	---	---	---
Sodium	---	---	---	---	---	755 B	546	614 B
Thallium	---	---	---	---	---	---	---	---
Vanadium	---	---	---	---	---	---	---	---
Zinc	24.3	---	---	40.6	---	14.9 B	2.0 B	6.7 B
Total (Allowed) Hold Time[a]	21(182)d	18(182)d	14(182)d	7(182)d	175(182)d	48(182)d	48(182)d	49(182)d

a. ICP.

TABLE 5.6 LOS ALAMOS NATIONAL LABORATORY - INORGANIC RINSATE DATA (Continued)

AREA	QC	QC
LOCATION	RINSATE	RINSATE
TYPE OF LOCATION	SOIL	SOIL
SAMPLE NUMBER	LA92101XH	LA92301XH
MEDIA	WATER	WATER
UNITS	ug/L	ug/L
SDG NUMBER	LA82001XH	LA82001XH
ANALYTES		
Aluminum	---	---
Antimony	98.8 B	---
Arsenic	---	---
Barium	---	---
Beryllium	---	---
Cadmium	---	---
Calcium	---	---
Chromium	---	---
Cobalt	---	---
Copper	---	---
Iron	---	---
Lead	---	---
Magnesium	---	---
Manganese	---	---
Mercury		
Nickel	---	---
Potassium	---	---
Selenium	---	---
Silver	12.8 B	13.5 B
Sodium	---	---
Thallium	---	---
Vanadium	---	---
Zinc	---	---
Total (Allowed) Hold Time[a]	179(182)d	178(182)d

a. ICP.

TABLE 5.7 LOS ALAMOS NATIONAL LABORATORY - INORGANIC PRESERVED BLANK DATA

AREA	QC	QC	QC
LOCATION	PRESERVED	PRESERVED	PRESERVED
TYPE OF LOCATION	BLANK	BLANK	BLANK
SAMPLE NUMBER	LA90201XH	LA90801XH	LA90901XH
MEDIA	WATER	WATER	WATER
UNITS	ug/L	ug/L	ug/L
SDG NUMBER	LA30901XH	LA82001XH	LA30901XH
ANALYTES			
Aluminum	130 B	---	---
Antimony	208	---	---
Arsenic	---	---	---
Barium	---	---	---
Beryllium	---	---	---
Cadmium	---	---	---
Calcium	---	---	---
Chromium	---	---	---
Cobalt	---	---	---
Copper	---	---	---
Iron	100	---	---
Lead	---	---	---
Magnesium	---	---	---
Manganese	---	---	---
Mercury			
Nickel	---	---	---
Potassium	---	---	---
Selenium	---	---	---
Silver	---	16.9 B	19.4 B
Sodium	---	---	---
Thallium	---	---	---
Vanadium	---	---	---
Zinc	---	---	---
Total (Allowed) Hold Time[a]	21(182)d	190(182)d*	13(182)d

a. ICP.

TABLE 5.8. ADHERENCE TO HOLDING TIME REQUIREMENTS

	Water Samples				Soil Samples			
	Analyses Within Analytical Holding Time Requirements				Analyses Within Total Holding Time Requirements			
Analysis Type	Number of Analyses	Analyses (%)	Objective (%)	Analyses (%)	Number of Analyses	Analyses (%)	Objective (%)	Analyses (%)
VOA	37	97	90	97	141	74	90	74
SVOA	0	NA	85	NA	63	100	85	100
Pest/PCB	0	NA	85	NA	55	94	85	94
Metals								
ICP-AES	22	100	98	86	209	99	85	99
GFAAS	0	NA	98	NA	79	100	85	100
Mercury	0	NA	85	NA	48	81	85	75
Cyanide	0	NA	90	NA	3	0	90	0

NA = Not applicable.

5.2.2.1.3 Comparability. The characteristic of comparability reflects both internal consistency of measurements and expression of results in units consistent with other organizations reporting similar data. Generating comparable data requires utilizing methodologies that produce comparable results (e.g., metals data obtained by total dissolution of soil are not comparable to data obtained by incomplete dissolution of soil such as the normally used acid leaching methods) and conducting analyses with calibrated analytical instruments within the proper calibration ranges. To ensure comparability of analytical results, all program laboratories utilized the same analytical methods for each group of analytes. Additionally, appropriate standard units were utilized for each measurement system, which yielded internally and externally comparable results assuming other comparability criteria were met.

To monitor the ability of the laboratories to generate comparable data, quarterly blind (QB) and water pollution (WP) performance evaluation samples from the EPA were analyzed in conjunction with analysis of LANL samples. The analytical program objective for comparability was to generate acceptable results for the performance evaluation samples. A summary of the results for the performance evaluation samples for each laboratory is provided in Table 5.9. Copies of the performance evaluation reports and responses are provided in Appendix C.

The performance evaluation results are generally consistent with the results of QC measurements summarized and discussed throughout this section. Specific deficiencies identified by the PE evaluations are described in detail in the corrective action letter responses included in Appendix C, immediately following the corresponding PE results.

To quantitatively evaluate the PE results, Table 5.9 lists percentages of analyte concentrations reported within the PE acceptance ranges and the EPA-provided percentage scores for the QB PEs. Percentages of reported concentrations within the PE acceptance ranges for VOA, SVOA, pesticide/PCB, and inorganics results usually exceed 80%. The low percentages of

TABLE 5.9. PERFORMANCE EVALUATIONS

EPA Performance Evaluation	Analyte Category	Matrix	Samples Received (date)	Results Due (date)	Results Submitted (date)	Evaluation of Results Received (date)	Corrective Actions: Response Required (yes/no)	Corrective Actions: Response Due (date)	Corrective Actions: Response Submitted (date)	Analyte Conc. Required (number)	Analyte Conc. Submitted (number)	Analyte Conc. Acceptable (number)	Analyte Conc. Acceptable (%)	Analyte Conc. Unacceptable (number)	Analyte Conc. Unacceptable (%)	EPA Provided Score* (%)
INEL - Winter 1987-1988																
WP020	Cyanide	Water	3/01/88	4/10/88	UNK	6/24/88	Yes	NE	NS	2	0	0	0	2	100	NP
INEL - Spring 1988																
QB3 FY88	VOA	Water	5/04/88	6/14/88	6/20/88	7/10/88	Yes	7/25/88	9/01/88	30	30	13	43	17	57	35.9
QB3 FY88	SV	Water	4/29/88	6/08/88	6/20/88	7/10/88	Yes	7/25/88	9/01/88	26	26	26	100	0	0	35.9
QB3 FY88	Pest/PCB	Water	4/29/88	6/08/88	6/20/88	7/10/88	Yes	7/25/88	9/01/88	10	10	10	100	0	0	35.9
QB3 FY88	Metals	Soil	4/21/88	6/01/88	7/14/88	10/16/88	Yes	10/31/88	12/07/88	23	23	20	87	3	13	72.0
QB3 FY88	Metals	Water	4/21/88	6/01/88	7/14/88	10/16/88	Yes	10/31/88	12/07/88	23	23	19	83	4	17	72.0
ORGDP - Spring 1988																
QB3 FY88	VOA	Water	UNK	UNK	UNK	7/XX/88	Yes	7/XX/88	7/25/88	30	30	30	100	0	0	68.8
QB3 FY88	SV	Water	UNK	UNK	UNK	7/XX/88	Yes	7/XX/88	7/25/88	26	26	21	81	5	19	68.8
QB3 FY88	Pest/PCB	Water	UNK	UNK	UNK	7/XX/88	Yes	7/XX/88	7/25/88	10	10	10	100	0	0	68.8
QB3 FY88	Metals	Soil	UNK	UNK	UNK	7/XX/88	No	NR	NR	23	23	23	100	0	0	96.8
QB3 FY88	Metals	Water	UNK	UNK	UNK	7/XX/88	Yes	7/XX/88	NS	23	23	22	96	1	4	96.8
INEL - Summer 1988																
WP021	Cyanide	Water	8/25/88	10/03/88	11/07/88	12/29/88	Yes	NE	1/31/89	2	0	0	0	2	100	NP

TABLE 5.9. (contintued)

EPA Performance Evaluation	Analyte Category	Matrix	Samples Received (date)	Results Due (date)	Results Submitted (date)	Evaluation of Results Received (date)	Corrective Actions: Response Required (yes/no)	Corrective Actions: Response Due (date)	Corrective Actions: Response Submitted (date)	Analyte Conc. Required (number)	Analyte Conc. Submitted (number)	Analyte Conc. Acceptable (number)	Analyte Conc. Acceptable (%)	Analyte Conc. Unacceptable (number)	Analyte Conc. Unacceptable (%)	EPA Provided Score* (%)
INEL - Summer 1988																
QB4 FY88	VOA	Soil	7/28/88	9/06/88	9/07/88	1/12/89	Yes	1/27/89	3/06/89	1	1	1	100	0	0	91.2
QB4 FY88	VOA	Water	7/28/88	9/06/88	9/07/88	1/12/89	Yes	1/27/89	3/06/89	29	29	29	100	0	0	83.0
QB4 FY88	SV	Soil	9/02/88	10/12/88	10/05/88	1/12/89	Yes	1/27/89	3/06/89	10	10	10	100	0	0	91.2
QB4 FY88	SV	Water	9/02/88	10/12/88	10/05/88	1/12/89	Yes	1/27/89	3/06/89	44	43	40	91	0	9	83.0
QB4 FY88	Pest/PCB	Soil	7/28/88	9/06/88	9/28/88	1/12/89	No	NR	NR	0	0	0	100	0	0	91.2
QB4 FY88	Pest/PCB	Water	7/28/88	9/06/88	9/28/88	1/12/89	No	NR	NR	15	15	15	100	0	0	83.0
QB4 FY88	Metals	Soil	7/19/88	8/28/88	12/06/88	2/16/89	Yes	3/01/89	2/09/89	23	23	20	87	3	13	69.2
QB4 FY88	Metals	Water	7/19/88	8/28/88	12/06/88	2/16/89	Yes	3/01/89	2/09/89	23	23	19	83	4	17	69.2
ORGDP - Summer 1988																
QB4 FY88	VOA	Soil	UNK	UNK	UNK	1/XX/89	Yes	1/XX/89	9/14/88	1	0	0	0	1	100	NP
QB4 FY88	VOA	Water	UNK	UNK	UNK	1/XX/89	Yes	1/XX/89	9/14/88	29	29	29	100	0	0	95.6
QB4 FY88	SV	Soil	UNK	UNK	UNK	1/XX/89	Yes	1/XX/89	9/14/88	10	0	0	0	10	100	NP
QB4 FY88	SV	Water	UNK	UNK	UNK	1/XX/89	Yes	1/XX/89	9/14/88	44	0	0	0	44	100	NP
QB4 FY88	Pest/PCB	Soil	UNK	UNK	UNK	1/XX/89	Yes	1/XX/89	9/14/88	0	0	0	0	0	100	NP
QB4 FY88	Pest/PCB	Water	UNK	UNK	UNK	1/XX/89	Yes	1/XX/89	9/14/88	15	15	14	93	1	7	95.6
QB4 FY88	Metals	Soil	UNK	UNK	UNK	10/XX/88	Yes	10/XX/88	11/17/88	23	23	22	96	1	4	96.6
QB4 FY88	Metals	Water	UNK	UNK	UNK	10/XX/88	Yes	10/XX/88	11/17/88	23	23	23	100	0	0	96.6

TABLE 5.9. (contintued)

EPA Performance Evaluation	Analyte Category	Matrix	Samples Received (date)	Results Due (date)	Results Submitted (date)	Evaluation of Results Received (date)	Corrective Actions: Response Required (yes/no)	Corrective Actions: Response Due (date)	Corrective Actions: Response Submitted (date)	Analyte Conc. Required (number)	Analyte Conc. Submitted (number)	Analyte Conc. Acceptable (number)	Analyte Conc. Acceptable (%)	Analyte Conc. Unacceptable (number)	Analyte Conc. Unacceptable (%)	EPA Provided Score* (%)
INEL - Fall 1988																
QB1 FY89	VOA	Water	10/20/88	11/29/88	11/29/88	2/09/89	Yes	2/24/89	9/05/89	10	10	9	90	1	10	83.8
QB1 FY89	SV	Water	11/08/88	12/18/88	11/29/88	2/09/89	Yes	2/24/89	9/05/89	27	27	26	96	1	4	83.8
QB1 FY89	Pest/PCB	Water	10/20/88	11/29/88	12/15/88	2/09/89	Yes	2/24/89	9/05/89	11	11	10	91	1	9	83.8
QB1 FY89	Metals	Soil	10/24/88	12/03/88	1/23/89	6/16/89	Yes	7/01/89		23	23	23	100	0	0	69.7
QB1 FY89	Metals	Water	10/24/88	12/03/88	1/23/89	6/16/89	Yes	7/01/89		23	23	15	65	8	35	69.7
ORGDP - Fall 1988																
QB1 FY89	VOA	Water	UNK	UNK	UNK	1/XX/89	Yes	1/XX/89	2/28/89	10	10	10	100	0	0	47.3
QB1 FY89	SV	Water	UNK	UNK	UNK	1/XX/89	Yes	1/XX/89	2/28/89	27	27	20	74	7	26	47.3
QB1 FY89	Pest/PCB	Water	UNK	UNK	UNK	1/XX/89	Yes	1/XX/89	2/28/89	11	11	11	100	0	0	47.3
QB1 FY89	Metals	Soil	UNK	UNK	UNK	1/XX/89	No	1/XX/89	2/22/89	23	23	23	100	0	0	94.3
QB1 FY89	Metals	Water	UNK	UNK	UNK	1/XX/89	No	1/XX/89	2/22/89	23	23	22	96	1	4	94.3
INEL - Winter 1988-1989																
QB2 FY89	VOA	Water	1/27/89	3/08/89	3/05/89	6/14/89	Yes	6/29/89		17	17	17	100	0	0	71.9
QB2 FY89	SV	Water	1/27/89	3/08/89	NS	6/14/89	Yes	6/29/89		36	NS	0	0	36	100	71.9
QB2 FY89	Pest/PCB	Water	1/27/89	3/08/89	3/15/89	6/14/89	Yes	6/29/89		3	3	2	67	1	33	71.9
QB2 FY89	Metals	Soil	1/24/89	3/05/89	3/06/89	4/04/89	Yes	4/19/89		23	23	23	100	0	0	82.0
QB2 FY89	Metals	Water	1/24/89	3/05/89	3/06/89	4/04/89	Yes	4/19/89		23	23	19	83	4	17	82.0

TABLE 5.9. (contintued)

EPA Performance Evaluation	Analyte Category	Matrix	Samples Received (date)	Results Due (date)	Results Submitted (date)	Evaluation of Results Received (date)	Corrective Actions: Response Required (yes/no)	Corrective Actions: Response Due (date)	Corrective Actions: Response Submitted (date)	Analyte Conc. Required (number)	Analyte Conc. Submitted (number)	Analyte Conc. Acceptable (number)	Analyte Conc. Acceptable (%)	Analyte Conc. Unacceptable (number)	Analyte Conc. Unacceptable (%)	EPA Provided Score* (%)
INEL - Winter 1988-1989																
WP022	Cyanide	Water	2/27/89	4/10/89	NS	6/19/89	Yes	NE		2	NS	0	0	2	100	NP
Spring 1989																
QB3 FY89	VOA	Water	4/21/89	5/31/89	6/14/89											
QB3 FY89	SV	Water	4/21/89	5/31/89												
QB3 FY89	Pest/PCB	Water	4/21/89	5/31/89	6/15/89											
QB3 FY89	Metals	Soil	4/17/89	5/27/89	5/25/89	6/14/89	Yes	6/30/89		24	24	23	96	1	4	83.5
QB3 FY89	Metals	Water	4/17/89	5/27/89	5/25/89	6/14/89	Yes	6/30/89		23	23	20	87	3	13	83.5

* EPA scoring system for the Contract Laboratory Program (CLP). The scoring categories are as follows: (1) 100 to 90%, acceptable performance, no corrective action necessacy, (2) 90 to 75%, acceptable performance, corrective action necessary, and (3) below 75%, unacceptable performance, corrective action mandatory. In addition to the analyte concentrations provided in this table, the EPA scoring system includes other quality control measurement results (e.g., blanks, duplicate variation, matrix spike recovery).

˜ Includes the following analyte categories: oil and grease, total organic carbon, total dissolved solids, and total suspended solids.

NE = Not established

NP = Not provided

acceptable analyte concentrations reported for cyanide in the WP PEs are consistent with deficiencies indicated by QC measurements and discussed in Section 5.2.2.1.4 and Section 5.2.2.2.5.

5.2.2.1.4 Precision. Precision, the ability to replicate an analytical value, was evaluated through duplicate analyses on 5 to 10% of the samples analyzed per analysis type. The program objectives for the precision of analytical measurements were to satisfy the CLP precision control limits for 80% of water samples and 70% of soil samples. By analysis type, duplicate analyses results as the percentages satisfying CLP acceptance criteria are reported in Table 5.10.

For organic analyses, the program objectives were satisfied.

For inorganic analyses, the program objectives were satisfied except for cyanide analyses of soil samples.

In the case of the three cyanide analyses of soil samples, it is not possible to determine the precision uncertainty (one standard deviation confidence interval) associated with the results because replicate analyses were not conducted.

5.2.2.1.5 Accuracy. Accuracy, the ability to obtain a true value, is optimized and evaluated for an analytical system through specific QC procedures and measurements. The exact QC procedures and measurements required to ensure acceptable accuracy depend on the method, but all chemical methods generally require instrument calibration, method (preparation) blank analysis, check standard or laboratory control sample analysis (i.e., analysis of a sample of known analyte concentration), and matrix spike analysis. Analyses of organic compounds usually incorporate additional QC procedures to optimize accuracy; the additional procedures referred to are internal standards and surrogate compounds added to every sample.

TABLE 5.10. ADHERENCE TO PRECISION REQUIREMENTS

	Water Samples			Soil Samples		
		Analyses Within Precision Requirements			Analyses Within Precision Requirements	
Analysis Type	Number of Duplicate Analyses[a]	Analyses (%)	Objective (%)	Number of Duplicate Analyses[a]	Analyses (%)	Objective (%)
VOA	30	90	80	80	86	70
SVOA	0	NA	80	81	88	70
Pest/PCB	0	NA	80	30	90	70
Metals	27	100	80	350	94	70
Cyanide	0	NA	80	0	NA	70

NA = Not applicable.

a. The number of duplicate analyses is equal to the number of duplicate samples times the number of analytes per sample.

The results of accuracy QC measurements associated with the LANL data set are summarized in the categories of calibration (Table 5.11), method blanks (Table 5.12), control samples (Table 5.13), and matrix spikes (Table 5.14). Also listed in the summaries for comparison are program objectives, when established.

The percentages of acceptable calibrations for volatile organics, semivolatile organics, pesticide/PCB, and metals analyses exceed the program objectives. Cyanide calibration results do not fulfill program objectives. For the three cyanide analyses of soil samples, the calibration measurements indicate a calibration inaccuracy of approximately - 35%; reported cyanide results may have a similar inaccuracy introduced by the inaccurate calibration.

Method blank measurements satisfied the program objectives except for a slight deficiency for metal analyses of water samples and imply relatively laboratory contamination free analyses.

Laboratory control water sample results exceed program objectives for VOA, SVOA, pesticide/PCB, and metals analyses. Cyanide control sample results do not satisfy the program objectives; inaccurate calibration is the most likely explanation. Control soil sample analyses were not performed for volatile organics, semivolatile organics, and pesticide/PCB soil samples because such samples were not available.

For water sample analyses, all matrix spike results satisfy the program objectives. For soil sample analyses, matrix spike results exceed program objectives except for cyanide. Again, an inaccurate cyanide calibration is the most likely explanation for the deficiency in the cyanide matrix spike results.

5.2.2.2 Data Quality by Type of Analysis. General observations and facts that should be considered when interpreting data from the LANL Site are provided in this section. The discussions are presented by general type of analysis in the following order: volatile organic compounds, semivolatile organic compounds, pesticide/PCBs, metals, cyanide, high explosives, and asbestos.

TABLE 5.11. ADHERENCE TO CALIBRATION REQUIREMENTS

	Water Samples			Soil Samples		
		Analyses With Acceptable Calibrations			Analyses With Acceptable Calibrations	
Analysis Type	Number of Analyses[a]	Analyses (%)	Objective (%)	Number Analyses[a]	Analyses (%)	Objective (%)
VOA[b]	154	100	90	363	100	90
SVOA	0	NA	90	289	96	90
Pest/PCB	0	NA	90	30	100	90
Metals	271	96	90	1741	97	90
Cyanide	0	NA	90	1	0	90

NA = Not applicable.

a. The number of analyses is equal to the number of daily calibration standards and calibration verification standards multiplied by the number of analytes per standard.

b. For VOA analyses of soil gas samples, 66 calibration analyses were performed, and 100% of those analyses were acceptable.

TABLE 5.12. ADHERENCE TO METHOD BLANK REQUIREMENTS

	Water Samples			Soil Samples		
		Analyses with Method Blanks Below CRQL/CRDL			Analyses with Method Blanks Below CRQL/CRDL	
Analysis Type	Number of Analyses[a]	Analyses (%)	Objective (%)	Number of Analyses[a]	Analyses (%)	Objective (%)
VOA	448	96	95	1156	97	95
SVOA	0	NA	95	520	99	95
Pest/PCB	0	NA	95	189	100	95
Metals	44	93	95	370	96	95
Cyanide	0	NA	95	1	100	95

NA = Not applicable.

a. For metals and anions, the number of analyses is equal to the number of method (preparation) blanks multiplied by the potential number of target analytes per blank.

b. For VOA analyses of soil gas samples, 238 method blank analyses were conducted, and 99% of those analyses' results were below the CRQL.

TABLE 5.13. ADHERENCE TO CONTROL SAMPLE REQUIREMENTS

	Water Samples			Soil Samples		
		Analyses Within Acceptable Control Sample Analyses			Analyses with Acceptable Control Sample Analyses	
Analysis Type	Number of Analyses[a]	Analyses (%)	Objective (%)	Number of Analyses[a]	Analyses (%)	Objective (%)
VOA	32	100	80	0	NA	70
SVOA	9	100	80	0	NA	70
Pest/PCB	4	100	80	0	NA	70
Metals	40	88	80	375	98	70
Cyanide	0	NA	80	1	0	70

NA = Not applicable.

a. The number of analyses is equal to the number of laboratory control samples multiplied by the number of analytes per sample.

TABLE 5.14. ADHERENCE TO MATRIX SPIKE REQUIREMENTS

	Water Samples			Soil Samples		
		Analyses With Acceptable Matrix Spike Recoveries			Analyses With Acceptable Matrix Spike Recoveries	
Analysis Type	Number of Analyses[a]	Analyses (%)	Objective (%)	Number of Analyses[a]	Analyses (%)	Objective (%)
VOA (IS/SC)	222	96	80	852	92	80
VOA (TC)	55	89	70	150	89	70
SVOA (IS/SC)	0	NA	90	745	89	80
SVOA (TC)	0	NA	80	173	87	70
Pest/PCB (SC)	0	NA	90	45	84	80
Pest/PCB (TC)	0	NA	80	64	72	70
Metals	54	96	80	252	83	70
Cyanide	0	NA	80	1	0	70

NA = Not applicable.

IS = Internal standards.

SC = Surrogate compounds.

TC = Target compounds.

a. The number of analyses equals the number of matrix spikes multiplied by the number of analytes per matrix spike.

b. For VOA analyses of soil gas samples, 252 matrix spike analyses (IS/SC) were conducted, and 98% of those analyses were acceptable.

5.2.2.2.1 Volatile Organic Compounds. Samples are prone to loss and contamination of volatile organic analyses (VOAs) due to the volatile nature of these compounds. A number of VOCs measured in some samples are suspected to be introduced external contaminants rather than attributable to the sample. Common and occasional laboratory contaminants identified by method blank analyses are reported in Tables 5.15 and 5.16. Acetone and 2-butanone frequently occurred in method blank analyses at concentrations exceeding their CRQLs. Other VOAs observed in method blank analyses occurred at concentrations below their CRQLs or in less than 25% of the analyses.

If the measured concentration for a common contaminant VOC in a sample does not exceed the 95% confidence interval for the mean contaminant concentration (Tables 5.15 and 5.16), it is not reported in the results tables in Section 4. A VOA result is also not reported in results tables in Section 4 if the sample value is less than twice the value measured in the specific method blank, rinsate blank, or trip blank associated with the sample.

Quality control performance limits (e.g., holding times, detection limits, spike recovery limits, etc.) have not been established for the analytical procedure used for evacuated canister soil gas samples. It was assumed that matrix interferences for evacuated canisters would be minimal. Therefore, control limits used for comparison, were those established by the CLP for water samples. Trip blank results are reported in Table 5.17 and 5.18.

True method blanks were not conducted for volatile organic compound soil analyses because soil was not included in the method blank analyzed. If cross contamination occurred during the processing of soil samples, it is possible such contamination was not indicated by the method blank.

It should be understood that a reported VOA sample concentration below the CRQL is an estimate. The CRQL establishes concentration levels above which the maximum uncertainty (at the one standard deviation confidence level) in the reported value is usually 33% of the value. A reported value that is

TABLE 5.15. METHOD BLANK RESULTS FOR VOLATILE ORGANIC COMPOUND ANALYSES OF SOIL AND WATER SAMPLES

Volatile Organic Compound	Number of Blank Analyses	Number of Occurrences	Descriptive Values for Compound Occurrences: Concentration Range (μg/L)	Mean Concentration (μg/L)	Standard Deviation of Mean (μg/L)	95% Confidence Interval of Mean (μg/L)
Common Contaminants[a]						
Acetone	47	37	1-53	14.2	14.0	9.7-18.7
2-Butanone	47	23	1-32	9.4	13.6	3.5-18.7
2-Hexanone	47	18	1-21	4.7	4.3	2.6-6.8
Methylene chloride	47	16	1-6	4.1	1.2	3.5-4.7
Occasional Contaminants[b]						
Chloroform	47	10	2-8	4.4	1.9	3.0-5.8
Carbon disulfide	47	1	---	1	---	---

a. Common contaminants occurred in more than 25% ($n>11$) of blank analyses.

b. Occasional contaminants occurred in less than 25% ($n\leq11$) of blank analyses.

TABLE 5.16. METHOD BLANK RESULTS FOR VOLATILE ORGANIC COMPOUND ANALYSES OF SOIL SAMPLES

Volatile Organic Compound	Number of Blank Analyses	Number of Occurrences	Descriptive Values for Compound Occurrences: Concentration (Range μg/L)	Mean Concentration (μg/L)	Standard Deviation of Mean (μg/L)	95% Confidence Interval of Mean (μg/L)
Common Contaminants[a]						
Acetone	8	4	0.2-9	6.3	4.1	0-13
2-Butanone	8	4	1-3	1.8	0.96	0.3-3.3
2-Hexanone	8	7	0.6-1	0.87	0.14	0.74-1.0
Methylene chloride	8	4	0.7-1	0.90	0.14	0.68-1.1

a. Common contaminants occurred in more than 25% (n>2) of blank analyses.

TABLE 5.17. RINSATE AND TRIP BLANK RESULTS FOR VOLATILE ORGANIC COMPOUND ANALYSES OF SOIL AND WATER SAMPLES

Volatile Organic Compound	Number of Blank Analyses	Number of Occurrences	Descriptive Values for Compound Occurrences: Concentration (Range µg/L)	Mean Concentration (µg/L)	Standard Deviation of Mean (µg/L)
Rinsate Blanks					
Acetone	11	9	12-2100	400	680
2-Butanone	11	7	2-63[a]	25[a]	27[a]
Carbon disulfide	11	2	6-15	10	6.4
Chloroform	11	3	8-8	8	0
Chloromethane	11	1	--	2	--
1,1-Dichloroethene	11	1	--	10	--
Methylene chloride	11	11	2-62	21	17
Toluene	11	5	0.6-14	3.6	5.9
Trichloroethene	11	1	--	12	--
Trip Blanks					
Acetone	4	3	4-19	9.3	8.4
2-Butanone	4	1	--	180	--
1,2-Dichloroethane	4	1	--	400	--
Methylene chloride	4	4	13-61	42	23

a. One high measured concentration for 2-butanone (i.e., 21000 mg/L) is not included in the reported values.)

TABLE 5.18. RINSATE AND TRIP BLANK RESULTS FOR VOLATILE ORGANIC COMPOUND ANALYSES OF SOIL GAS SAMPLES

			Descriptive Values for Compound Occurrences		
Volatile Organic Compound	Number of Blank Analyses	Number of Occurrences	Concentration (Range µg/L)	Mean Concentration (µg/L)	Standard Deviation of Mean (µg/L)
Trip Blanks					
Acetone	4	2	0.8-2	1.4	0.8
2-Butanone	4	3	0.7-2	1.2	0.7
Methylene chloride	4	3	0.2-8	2.8	4.5
1,1,1-Trichloroethane	4	3	0.4-2	1.1	0.8

below the CRQL is a positive compound identification but an estimated concentration (i.e., greater than 33% uncertainty in concentration). Therefore, concentrations below the CRQLs can be detected; however, the contaminant must be present at a higher concentration to more accurately quantitate the concentration.

5.2.2.2.2 Semivolatile Organic Compounds. Semivolatile organic analyses (SVOA) are prone to their own unique set of contamination problems. Phthalates are a very common contaminant in SVOA analyses. These compounds are used as plasticizers, are easily extracted with organic solvents, and are often introduced to samples or their associated extracts at numerous points in the sample analysis process. Therefore, phthalate data are not included in the Section 4 tables. All phthalates detected are reported in the tables found in Appendix E.

Review of the raw data received from ORGDP (K-25) for the SVOA revealed a number of false positives that had been reported. Although these data are reported in Appendix E, they were not reported in the Section 4 results tables based on the professional judgment of the chemists at the INEL responsible for reviewing and reporting the data.

While the SVOA matrix spike recoveries for water samples satisfied the program objectives, it should be noted that the bulk of the unacceptable recoveries actually indicated excellent data quality. The INEL uses liquid/liquid extractors as the SVOC extraction method for water samples. This technique has commonly shown excellent recoveries for SVOCs. In our opinion, the recoveries of SVOCs exceeding the QC control limits do not indicate deficiencies in data quality, but rather reflect QC limits biased low because of the poor efficiencies of extraction techniques employed by many laboratories (e.g., separators funnel extractions) from which the limits were derived.

It should be understood that a reported SVOC sample concentration below the CRQL is an estimate. The CRQL establishes concentration levels above which the maximum uncertainty (at the one standard deviation confidence level) in the reported value is usually 33% of the value. A reported value, which is below the CRQL is a positive compound identification but an estimated concentration (i.e., greater than 33% uncertainty in concentration). Therefore, concentrations below the CRQLs can be detected; however, the contaminant must be present at a higher concentration to more accurately quantitate the concentration.

5.2.2.2.3 Pesticides and Polychlorinated Biphenyls. Several of the samples analyzed contained the pesticide 4,4'-DDT or its breakdown products 4,4'-DDE and 4,4'-DDD, at concentrations less than the CRQLs. These concentrations are estimates and have associated with them larger analytical uncertainties than concentrations above the CRQL. These analytical uncertainties make both qualitative and quantitative interpretation of chromatograms difficult. The fact that 4,4'-DDT, 4,4'-DDE, and 4,4'-DDD were not always observed together in a sample is most likely a result of the large relative analytical uncertainty (i.e., low signal-to-noise ratio) in the chromatogram and is an unavoidable analytical limitation of the analysis technique at very low pesticide concentrations.

Dieldrin martix spike standards were inadvertently spiked into the samples at one half the correct concentration for the INEL data. This error was not detected until after the data were reported. Consequently, the percent recoveries for dieldrin are reported at one half the correct percentage (i.e., 50% should be reported as 100%). Because the lower martix spike control limits for dieldrin (soil = 31%) are set low, the reported recoveries for two of the four matrix spike/martix spike duplicate analyses were still within the control limits.

5.2.2.2.4 Metals. The CLP protocol for preparing solid samples for metals determination requires that samples of 1 g wet weight be measured out for analysis. Several soil sediment samples from LANL for metals analysis contained as little as 10 to 30% solids. For these samples, the dry weight IDL/CRDLs were elevated.

Control limits for the solid laboratory control sample (LCS) are not based on the percent recoveries given in the QC tables. Control limits for the LCS are based on results of an interlaboratory comparison evaluation and are set at the upper and low 95% confidence limits. Thus, percent recoveries of less than 80% or greater than 120% for the LCS do not necessarily reflect an out-of-control situation for solid samples as they would for aqueous samples. All out-of-control results for LCSs are flagged with an asterisk in the Appendix E tables.

In most cases, reported metals concentrations below the CRDL/MDLs (i.e., with "B" qualifiers) are estimates. The degree of uncertainty in the quantitation depends on the relative magnitudes of the IDL and CRDL/MDL for a particular element. If the CRDL/MDL is less than a factor of two greater than the IDL, quantitations for that element at concentrations less than the CRDL/MDL have uncertainties approaching 33% (at the one standard deviation confidence level), and false positives and negatives are possible.

Several factors contribute to the high uncertainty associated with reported low concentrations. The low analyte signal-to-noise ratio makes it difficult to distinguish very low level analyte signals from spectral background. The peak search routine used by the INEL sequential instrument sometimes mistakes structured background for the analyte peak in the absence of analyte, resulting in reported false positives. Interferences caused by sample matrices (i.e., high concentrations of Al, Ca, Mg, and Fe compared to analyte concentrations) introduce a larger percentage error to low concentrations than to higher values.

5.2.2.2.5 Cyanide. Total allowed holding times were exceeded for all samples by 7 days. The holding time violations may have introduced low bias to the reported results. The laboratory control sample result suggests calibration inaccuracy introduced at least a 35% negative bias in the samples' measurement results. The cyanide matrix spike analysis result indicates chemical interferences may also have been introduced from the samples' composition (i.e., low matrix spike recovery); however, the low matrix spike recovery may be entirely a result of inaccurate calibration. Considering the holding time violations plus the control sample and matrix spike results, the reported cyanide results probably underestimate true values by at least a factor of three.

5.2.2.2.6 High Explosives. High explosives were only reported in the section 4 tables when the analyte in question was detected on two different analytical chromatographic columns, thus providing confirmation of the presence. All high explosives reported in the Appendix E QC tables are flagged with a "C1" if the analyte was detected on the primary column and/or a "C2" if the analyte was detected on the confirmation column. Consequently only analytes flagged with "C1,C2" in the Appendix E tables are reported in the section 4 tables.

Because there are no EPA approved analytical procedures for high explosives analysis, there are no established control limits for holding times, matrix spike control limits, or established instrument calibration requirements, etc. In general, the standard QC practices for monitoring precision, accuracy, representativeness, etc. were used for the high explosives analyses and the data quality are acceptable for the purposes of the survey.

5.2.2.2.7 Asbestos. The microscopy technique used for this analysis is fundamentally a matter of determining presence (number of fibers) or absence of fibers. There were no QA/QC data associated with the asbestos data reported by the analytical laboratory.

5.3 Radiochemistry QA/QC

5.3.1 Radiological Quality Assurance (Laboratory)

Approximately 10% of the total number of samples analyzed for the study were control samples. A control sample could be any of the following:

Spike - A subsample with a known amount of analyte added

In house - An in-house sample with a known analyte concentration

EMSL - A control sample from the EPA laboratory (EMSL) in Las Vegas.

Results of preservative blank QC samples are provided in Table 5.19, and show minimal contamination.

5.3.1.1 Laboratory Radiochemistry - UNC Measurements. Tables D.8 through D.8 in Appendix D present the QC data for the ^{241}Am, ^{238}Pu, $^{239+240}Pu$, ^{230}Th, ^{226}Ra, ^{90}Sr, and total uranium measurements performed by UNC. Examination of the data indicates that about 70% of the QC checks gave results that differed from the known values by $\leq$5%, about 17% differed from the known values by 5-10%, about 6% differed from the known values by 10-15%, about 3% differed from the known values by 15-20%, and about 4% differed from the known values by >20%. In general the QC checks indicate that the ^{241}Am, ^{238}Pu, $^{239+240}Pu$, and ^{230}Th results seem to be accurate to about 10%, the ^{90}Sr to about 8%, and the ^{226}Ra and total uranium to about 3%.

The results obtained using the standards indicate that the instruments were functioning properly during the LANL sample measurements.

During the period of the LANL measurements, the UNC laboratory participated in the EPA Cross Check Program for gross alpha, gross beta, and gamma-emitting isotopes in water. The results measured by the laboratory did not exceed the warning limits, indicating that sufficiently accurate results were obtained by the procedures and instruments.

5.3.2 Field Radiochemistry

The basic purpose of the QA program for the INEL Mobile Radiological Laboratory (IMRL) is to ensure that the data produced are of sufficient quality, accuracy, and completeness so that valid interpretations can be made. This purpose is accomplished by ensuring that (a) proper sample procedures are followed; (b) the instruments yield accurate, reproducible results; and (c) adequate information is available concerning each sample. Threfore, all aspects of the work carried out in the IMRL are thoroughly documented.

TABLE 5.19 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM QC

AREA	QC	QC	QC	QC	QC
LOCATION	QC	QC	QC	QC	QC
TYPE OF LOCATION	RINSATEWATE	PRES BLANK	RINSATEWATE	RINSATEWATE	PRES BLANK
SAMPLE NUMBER	LA90101W	LA90201W	LA90401W	LA90701W	LA90801W
MEDIA	WATER	WATER	WATER	WATER	WATER
UNITS	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L
Gross Alpha	nd[e]	nd[e]	14.1 ±9.6	nd[e]	3.6 ±4.3
Gross Beta	8.1 ±9.2	nd[e]	nd[e]	61.0 ±18.0	13.9 ±9.8
Alpha Emitters					
Thorium - 232[a]	----	<441 ±418	----	----	----
Gamma Emitters					

a. Total unbroken chain activity in equilibrium.
e. No gross activity detected.

TABLE 5.19 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM QC (Continued)

AREA	QC	QC	QC	QC	QC
LOCATION	QC	QC	QC	QC	QC
TYPE OF LOCATION	PRES BLANK	RINSATESOIL	RINSATESOIL	RINSATESOIL	RINSATESOIL
SAMPLE NUMBER	LA90901W	LA91201W[d]	LA91401W[d]	LA91501W[d]	LA91601W[d]
MEDIA	WATER	WATER	WATER	WATER	WATER
UNITS	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L
Gross Alpha	nd[e]	nd[e]	nd[e]	nd[e]	nd[e]
Gross Beta	5.8 ±8.7	nd[e]	nd[e]	nd[e]	nd[e]
Alpha Emitters					
Thorium - 232[a]	----	----	----	----	----
Gamma Emitters					

a. Total unbroken chain activity in equilibrium.
d. This column contains the results of the radiological screening run.
e. No gross activity detected.

TABLE 5.19 LOS ALAMOS NATIONAL LABORATORY - RADIOLOGICAL DATA - ENVIRONMENTAL PROBLEM QC (Continued)

AREA	QC	QC	QC
LOCATION	QC	QC	QC
TYPE OF LOCATION	RINSATESOIL	RINSATESOIL	RINSATESOIL
SAMPLE NUMBER	LA92001W[d]	LA92101W[d]	LA92301W[d]
MEDIA	WATER	WATER	WATER
UNITS	pCi/L	pCi/L	pCi/L
Gross Alpha	nd[e]	nd[e]	nd[e]
Gross Beta	nd[e]	nd[e]	nd[e]
Alpha Emitters			
Thorium - 232[a]	----	----	----
Gamma Emitters			

a. Total unbroken chain activity in equilibrium.
d. This column contains the results of the radiological screening run.
e. No gross activity detected.

The QA program for the IMRL has many aspects (see the LANL Sampling Plan). Only the QC aspects of the QA program that concern accuracy or reproducibility of measurements, however, are summarized in this data report. These aspects include results of routine standards (both primary and secondary), blanks (or background measurements), and analyses of interlaboratory comparison standards.

5.3.2.1 Gross Alpha and Gross Beta Measurements (IMRL). To ensure accuracy of the results obtained by the gross alpha and gross beta measurements, both alpha and beta standards traceable to NIST (or equivalent) were counted for radioactivity daily when the instrument was in use, and blanks (i.e., backgrounds) were obtained routinely for each mode of instrument operation (i.e., alpha-only, beta-only, and alpha + beta). Because background measurements require very long count times, they could not be performed as frequently as the measurements of alpha and beta standards. In addition to these routine checks, before initiation of the measurements of LANL samples, the instrument underwent full calibration. This included determining energy plateaus and calibration to determine the effects of self-absorption due to the mass of the sample itself. This self-absorption determination was accomplished by preparing a series of calibration standards by adding known amounts of soluble salt to standard alpha and beta solutions, drying known aliquots of these calibration standard solutions, counting the samples, and developing calibration curves for the efficiencies of self absorption for the alpha-only and beta-only modes. These self-absorption calibration curves were entered into the computer and allowed for correction for the effects of dissolved salts.

The results of the daily calibration checks with the alpha standard (^{241}Am standard number 182-16) and the beta standard (^{137}Cs standard number 174-81-2) are presented in Appendix D Tables D.2 and D.3, respectively. These data indicate that the mean alpha efficiency was 25.9% with a standard deviation of 0.3% and a range of 25.3% to 26.5%. All alpha efficiency measurement checks indicated a result within the expected range of 26 $\pm$ 3%. The mean beta efficiency was 46.1% with a standard deviation of 0.6% and a range of 45.0% to 47.4%. All beta efficiency measurement checks indicated a result within the expected range of 46 $\pm$ 5%. These results indicate that the alpha-beta instrument can be considered to have been accurately calibrated and sufficiently constant during the period of the measurements of the LANL samples.

Background measurements indicated that the background was relatively constant during the period of the LANL sample measurements. Because the IMRL is a mobile laboratory located in a trailer, it does not have the ability to control the background as well as do fixed laboratory buildings. The background, therefore, can be expected to vary with weather conditions (i.e., wind, inversions, etc.) and changing emission rates of natural radon gas from local soil, rock, and nearby buildings.

5.3.2.2 Gamma Spectral Measurements (IMRL). To ensure accuracy and reproducibility of results obtained by the gamma spectral measurements (gamma scans), secondary standards (^{228}Th) were counted for radioactivity daily when gamma spectral measurements were being performed; a mixed-radioactive standard traceable to NIST (or equivalent) was counted routinely; and backgrounds (i.e., blanks) were counted routinely. The ^{228}Th standards are used to check the energy calibration of the precision pulser that automatically provides an energy calibration for each spectrum and checks out the operation of the total instrument (both electronics and software). In addition, the ^{228}Th standards are used to ensure that the efficiency of the instrument remains constant. The mixed-radioactive standard is used as an additional verification of proper instrument operation and a check of the energy and efficiency calibration.

The IMRL utilizes two gamma-ray detectors (ML-1 and ST-2), which are attached to a common computer (NOVA) for data collection, A common computer (MicroVAX II) is used for data analysis. Appendix D Tables D.6 and D.7 present the results of the daily checks with the ^{228}Th standards for ML-1 and ST-2, respectively. The count rates, centroids, and peak widths for five gamma rays that span the energy range from 238 keV to 2614 keV are used in the QC check. Examination of the data in these tables indicates that the peak widths were very constant during the LANL measurements. The centroids exhibited only slight variations, and these variations were accounted for by the precision pulser that provides an energy calibration for each gamma-ray spectrum. The count rates for each of the five gamma rays were also relatively constant, showing a range (minimum-to-maximum value) of 5% or less (except 8% for the 1620 keV gamma ray, which is relatively weak and is expected to exhibit wider variation). The results indicate that the efficiency of each detector was constant during the period of the LANL measurements.

Results of the QC checks using the mixed-radioactive standard are given in Appendix D Tables D.4 and D.5 for the two gamma-ray detectors. The results for ML-1 indicate that the differences between the measured and true values were all less than the 6% uncertainty in the true values or the uncertainty (i.e., twice the standard deviation) in the measured values except for five values scattered throughout the table. For these five values, the differences between the measured and true values were 1.1 times the uncertainty in one case, 1.2 times the uncertainty in three cases, and 1.3 times the uncertainty in one case. These five cases are considered to be spurious and due to random counting statistics.

The results for ST-2 indicate that the differences between the measured and true values were all less than the 6% uncertainty in the true values or the uncertainty (i.e., twice the standard deviation) in the measured values except for ten values scattered throughout the table. For most of these ten cases (all except for ^{109}Cd on May 11, 1988, and June 20, 1988) the differences were 1.3 times the uncertainty or less and are attributable to random counting statistics. The ^{109}Cd results for May 11, 1988, and June 20, 1988, were 1.6 and 1.7 times the uncertainty, respectively. The ^{228}Th QC checks for these dates indicated no anomalies; therefore, these two values are considered to be spurious and probably due to random counting statistics.

The results using the mixed-radionuclide standards, therefore, substantiate the results obtained using the ^{228}Th standards (i.e., both gamma-ray spectrometers were functioning properly during the period of the LANL measurements).

The results of background (i.e., blank) measurements for both gamma-ray detectors indicate that (despite changing weather conditions) the backgrounds were relatively constant throughout the measurement period for the LANL samples. The gamma-ray backgrounds were sufficiently low in the radionuclides of interest (e.g., ^{137}Cs) that the desired detection limits were attained for all analysis runs.

Because the IMRL is a mobile laboratory located in a trailer, it does not have the ability to control the background as well as do fixed laboratory buildings. The backgrounds, therefore, can be expected to vary with weather conditions (e.g., winds, inversions, etc.) and changing emission rates of natural radon gas from local soil, rocks, and nearby buildings.

5.3.2.3 Interlaboratory Comparisons. During the period of the LANL measurements, the IMRL participated in the EPA Cross Check Program for gross alpha and gross beta radioactivity in water and in the EML Quality Assessment Program for gamma-emitting isotopes in water and on air filters. The results measured by the laboratory did not exceed the warning limits in the EPA program and compared favorably with the known results in the EML program. This indicates that sufficiently accurate results were obtained by the procedures and instruments.

5.3.2.4 Conclusions. The results of the QC checks presented above indicate that the performance of the alpha/beta instrument and the gamma-ray spectrometers was adequate to ensure accuracy and reproducibility of the results obtained using them. In addition, the background seen by each instrument/detector was sufficiently low and constant to ensure accurate removal of background effects.

5.4 Data Management QA/QC

All analytical data entered in to the Data Management System (DMS) go through some degree of QA/QC. After entry into the DMS, data for all analysis types are checked for accuracy through visual screening.

For all analysis types, the integrity of the DMS is supported by use of hardware known as WORM (Write Once Read Many). After a data set has been entered and visually screened, the data are "backed up" on the WORM. The WORM, while allowing for updates to be made to the most current version of the data base, provides two crucial features. First, the original version of the data base is always preserved (write once). Second, a documentation trail is created for any changes to the original version of the data base reflected in the updated version (read many).

For organic compounds (volatile, semivolatile, and pesticide/PCB) and inorganic analytes, the data are checked through use of the EPA's Contract Compliance Screening (CCS) procedures. The CCS procedures assesses the analytical data in terms of completeness and noncompliance per the Statement of Work (SOW) used for generating and reporting the analytical data. The CCS documents used for organics and inorganics are references (EPA, 1987a), (EPA, 1987b), (EPA, 1987c), and (EPA, 1987d).

6. REFERENCES

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APPENDIX A
UPDATED LIST OF SAMPLING AND ANALYTICAL REQUESTS

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ACRONYMS

(Abbreviations in sampling and analysis request tables)

ACTIVE F.S.	Active firing site
AM	Americium
ASBB	Bulk asbestos
ASBE	Environmental asbestos
C	Composite
CS	Cesium
CN	Cyanide analysis
DELETED	Samples deleted with DOE-ID approval
D&D'D FS	Decontaminated and decommissioned firing site
DEVIATION	Deviations from original Sampling and Analysis Plan
DIST WATER	Distilled water
DP TANKFARM	DP tank farm
FPC	Low proportional composite (sample)
GABA	Gross alpha and gross beta analysis
GSA	Gamma screening analysis
GEOPHYS	Geophysical survey
GEOSURVEY	Geophysical survey, no samples collected
GRAB	Grab sample
HE	High explosive
HG	Mercury
ICP MET	Inductively coupled plasma atomic emission spectrometry for metals: metals to ICP detection limits
INACTIVE F.S.	Inactive firing site
L. SLOBBOVIA	Lower Slobbovia

LWD POND	Liquid Waste Disposal Pond
MDA	Material Disposal Area
NPDES	National Pollutant Discharge Elimination System
NUMB SAMP	Number of samples to be collected
PB	Lead
PCB	Polychlorinated biphenyl
PRES BLANK	Preservative blank
PRIMARY E&W	Primary east and west
PST	Pesticide analysis (CLP list)
PU	Plutonium
QC	Quality control
RA	Radium
RINSATE	QA sample for checking equipment decontamination
S COMP	Spatial composite sample
SED	Sample matrix is surface soil or sediment
SEMI VOLS	Semivolatile organic analysis
SR	Strontium
SS SOIL	Subsurface soil
STP	Sewage treatment plant
SURFACE IMP	Surface impoundment
TA	Technical area
TCLP MET	Toxicity characteristic leaching procedure metals
TCLP SEMI	Toxicity characteristic leaching procedure semivolatile organic compounds
TH	Thorium
TU	Total uranium

TRIP BLANK	QA sample for volatile samples during shipping
USTS	Underground storage tanks
VOL ORG	Volatile organic analysis (CLP list)
WWT LAGOONS	Waste water lagoons

APPENDIX A

UPDATED LIST OF SAMPLING AND ANALYTICAL REQUEST

INTRODUCTION

Requests for sampling and analysis are listed in this Appendix and grouped by environmental problem. The request number, type of program, environmental problem number, date collected, status, location, and media of the sample are included with corresponding analytical requests. Acronyms in the S&A tables are explained at the front of this Appendix and in the quick reference guide associated with this document.

The "status" column on Table A-1 indicates if there were deviations or deletions from the original S&A Plan. A deviation indicates that samples for one or more analytical requests were not collected or were added.

This Appendix provides a quick and comprehensive guide to sample request number, the associated environmental problem, and the analytical requests.

TABLE A.1 ANALYTICAL REQUESTS AND QC SAMPLES (SORTED BY ENVIRONMENTAL PROBLEM AND REQUEST NUMBER)

PROB NUMB	REQUEST NUMBER	STATUS	DATE COLLECTED	AREA	LOCATION	TYPE OF LOCATION	MEDIA	PLANNED NUMBER OF SAMPLES	TYPE	VOL ORG	SEMI VOLS	TCLP SEMI	PCB	PST	HE	ICP MET	TCLP MET	HG	PB	CN	ASBB	ASBE	GABA	GSA	PU	TU	TH	RA	SR	AM	CS
** PROBLEM - QC																															
	LA901		05/03/88	QC	QC	RINSATEWATE	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA902		05/03/88	QC	QC	PRES BLANK	WATER	1		0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA903		05/04/88	QC	QC	TRIP BLANK	WATER	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA904		05/05/88	QC	QC	RINSATEWATE	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA905	DEVIATION	05/03/88	QC	QC	FIELD STD.	SOILGAS	0	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA906		05/05/88	QC	QC	TRIP BLANK	WATER	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA907		05/10/88	QC	QC	RINSATEWATE	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA908		05/09/88	QC	QC	PRES BLANK	WATER	1		0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA909		05/11/88	QC	QC	PRES BLANK	WATER	1		0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA910		05/11/88	QC	QC	TRIP BLANK	WATER	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA911	DEVIATION	05/21/88	QC	QC	RINSATESOIL	WATER	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA912		05/17/88	QC	QC	RINSATESOIL	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA913		05/17/88	QC	QC	TRIP BLANK	WATER	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA914		05/24/88	QC	QC	RINSATESOIL	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA915		06/02/88	QC	QC	RINSATESOIL	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA916		06/01/88	QC	QC	RINSATESOIL	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA917		05/09/88	QC	QC	TRIP BLANK	SOILGAS	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA918		05/05/88	QC	QC	TRIP BLANK	SOILGAS	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA919		05/06/88	QC	QC	TRIP BLANK	SOILGAS	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA920		06/03/88	QC	QC	RINSATESOIL	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA921		05/20/88	QC	QC	RINSATESOIL	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA922		05/04/88	QC	QC	TRIP BLANK	SOILGAS	1		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA923		05/21/88	QC	QC	RINSATESOIL	WATER	1		1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	LA924	DEVIATION	05/11/88	QC	QC	METHANOL	WASTE	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA925	DEVIATION	05/11/88	QC	QC	DIST WATER	WATER	0	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA926	DEVIATION	05/11/88	QC	QC	DIST WATER	WATER	0	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LA927	DEVIATION	05/26/88	QC	QC	DIST WATER	WATER	0	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								22		19	0	0	0	0	0	13	0	0	0	0	0	0	13	13	0	0	0	0	0	0	0
** PROBLEM - 1																															
1	LA201	Lock In	05/25/88	TA-40-15	ACTIVE F.S.	FIRING SITE	SOIL	3	S.COMP	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	LA202		06/16/88	TA-36	ACTIVE F.S.	L.SLOBBOVIA	SOIL	5	S.COMP	0	0	0	0	0	5	5	0	5	5	0	0	0	0	5	0	5	5	0	0	0	0
1	LA205	Lock In	06/13/88	TA-15-44	ACTIVE F.S.	FIRE SITE	SOIL	4	S.COMP	0	0	0	0	0	4	4	0	4	4	0	0	0	0	4	0	4	4	0	0	0	0
** Subtotal **								12		0	0	0	0	0	12	12	0	9	9	0	0	0	0	9	0	9	9	0	0	0	0
** PROBLEM - 2																															
2	LA207		06/09/88	TA-14	BURN AREAS	INCINERATOR	WASTE	3	GRAB	0	3	3	0	0	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	LA208		06/09/88	TA-14	BURN AREAS	TRASH PILE	SOIL	3	GRAB	3	0	0	0	0	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	LA209		06/16/88	TA-36	L.SLOBBOVIA	PIT	SOIL	3	GRAB	3	0	0	0	0	3	3	3	3	3	0	0	0	0	3	0	3	3	0	0	0	0
** Subtotal **								9		6	3	3	0	0	9	9	9	3	3	0	0	0	0	3	0	3	3	0	0	0	0

TABLE A.1 ANALYTICAL REQUESTS AND QC SAMPLES (SORTED BY ENVIRONMENTAL PROBLEM AND REQUEST NUMBER)

PROB NUMB	REQUEST NUMBER	STATUS	DATE COLLECTED	AREA	LOCATION	TYPE OF LOCATION	MEDIA	PLANNED NUMBER OF SAMPLES	TYPE	VOL ORG	SEMI VOLS	TCLP SEMI	PCB	PST	HE	ICP MET	TCLP MET	HG	PB	CN	ASBB	ASBE	GABA	GSA	PU	TU	TH	RA	SR	AM	CS
** PROBLEM - 3																															
3	LA216		06/23/88	TA-49	AREA 11	DRAIN FIELD	SS SOIL	6	GRAB	6	6	0	0	0	0	6	0	0	0	0	0	0	0	6	6	6	0	0	0	6	0
** Subtotal **								6		6	6	0	0	0	0	6	0	0	0	0	0	0	0	6	6	6	0	0	0	6	0
** PROBLEM - 6																															
6	LA302		05/17/88	TA-21-257	OUTFALL	NPDES 50	SED	3	S.COMP	0	0	0	0	0	0	3	0	3	3	0	0	0	0	3	3	3	3	0	3	0	0
** Subtotal **								3		0	0	0	0	0	0	3	0	3	3	0	0	0	0	3	3	3	3	0	3	0	0
** PROBLEM - 9																															
9	LA308		05/06/88	TA-50	OUTFALL	NPDES 51	SED	4	S.COMP	4	4	0	0	0	0	4	0	0	0	0	0	0	0	4	4	4	0	0	4	0	0
** Subtotal **								4		4	4	0	0	0	0	4	0	0	0	0	0	0	0	4	4	4	0	0	4	0	0
** PROBLEM - 10																															
10	LA30901		05/03/88	TA-16-340	OUTFALL	NPDES54(UP)	WATER	1	FPC	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
10	LA30902		05/04/88	TA-16-340	OUTFALL	NPDES54(UP)	WATER	1	FPC	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
10	LA30903		05/05/88	TA-16-340	OUTFALL	NPDES54(UP)	WATER	1	FPC	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
10	LA31001		05/03/88	TA-16-340	OUTFALL	NPDES 54	WATER	1	FPC	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
10	LA31002		05/04/88	TA-16-340	OUTFALL	NPDES 54	WATER	1	FPC	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
10	LA31003		05/05/88	TA-16-340	OUTFALL	NPDES 54	WATER	1	FPC	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
10	LA311		05/05/88	TA-16-340	OUTFALL	NPDES 54	SED	3	S.COMP	3	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	LA31401		05/11/88	TA-16-300	OUTFALL	NPDES 58	WATER	1	FPC	1	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
10	LA31402		05/12/88	TA-16-300	OUTFALL	NPDES 58	WATER	1	FPC	1	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
10	LA31403		05/13/88	TA-16-300	OUTFALL	NPDES 58	WATER	1	FPC	1	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
10	LA315		05/10/88	TA-16-300	OUTFALL	NPDES 58	SED	3	S.COMP	3	0	0	0	0	3	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
10	LA31601	DELETED	/ /	TA-16-300	OUTFALL	NPDES 58	WASTE	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	LA31602	DELETED	/ /	TA-16-300	OUTFALL	NPDES 58	WASTE	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	LA31603	DELETED	/ /	TA-16-300	OUTFALL	NPDES 58	WASTE	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	LA31701	DELETED	/ /	TA-16-342	OUTFALL	NPDES 62	WATER	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	LA31702	DELETED	/ /	TA-16-342	OUTFALL	NPDES 62	WATER	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	LA31703	DELETED	/ /	TA-16-342	OUTFALL	NPDES 62	WATER	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	LA318	DEVIATION	05/16/88	TA-16-342	OUTFALL	NPDES 62	SED	3	S.COMP	1	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	LA327		05/19/88	TA-16-STP	STP	SLUDGE BEDS	WASTE	3	GRAB	3	0	0	0	0	3	3	0	0	0	0	0	0	0	3	3	3	0	0	3	0	0
** Subtotal **								27		19	0	0	0	0	21	21	0	0	0	0	0	6	6	9	3	3	0	0	3	0	0
** PROBLEM - 13																															
13	LA500		06/03/88	TA-53	WWT LAGOONS	PRIMARY E&W	SED	6	S.COMP	6	6	6	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								6		6	6	6	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE A.1 ANALYTICAL REQUESTS AND QC SAMPLES (SORTED BY ENVIRONMENTAL PROBLEM AND REQUEST NUMBER)

PROB NUMB	REQUEST NUMBER	STATUS	DATE COLLECTED	AREA	LOCATION	TYPE OF LOCATION	MEDIA	PLANNED NUMBER OF SAMPLES	TYPE	VOL ORG	SEMI VOLS	TCLP SEMI	PCB	PST	HE	ICP MET	TCLP MET	HG	PB	CN	ASBB	ASBE	GABA	GSA	PU	TU	TH	RA	SR	AM	CS
** PROBLEM - 14																															
14	LA501		05/19/88	TA-39	ANCHOCANYON	LANDFILL	SOIL	3	GRAB	3	0	0	0	0	3	3	3	0	3	0	0	0	0	0	0	3	0	0	0	0	0
14	LA50701		05/19/88	TA-39	ANCHOCANYON	LANDFILLBOR	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
14	LA50702	DEVIATION	05/19/88	TA-39	ANCHOCANYON	LANDFILLBOR	SS SOIL	0	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	LA50801	DEVIATION	06/23/88	TA-39	ANCHOCANYON	LANDFILLBOR	SOILGAS	0	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	LA50802	DEVIATION	06/23/88	TA-39	ANCHOCANYON	LANDFILLBOR	SOILGAS	0	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	LA50803	DEVIATION	06/23/88	TA-39	ANCHOCANYON	LANDFILLBOR	SOILGAS	0	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								4		8	0	0	0	0	4	4	3	0	4	0	0	0	0	0	0	4	0	0	0	0	0
** PROBLEM - 16																															
16	LA503		05/03/88	TA-35-125	TA-35-125	SURFACE IMP	SED	3	GRAB	3	3	3	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								3		3	3	3	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** PROBLEM - 19																															
19	LA601	DELETED	/ /	TA-35-125	SPILL	STAIN	WASTE	3	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	LA602		06/08/88	TA-35-67	DRUMSTORAGE	STAIN	SOIL	3	GRAB	3	0	0	3	0	0	3	0	0	0	0	0	0	0	3	3	3	0	0	3	0	0
19	LA603		06/06/88	TA-33-22	DRUMSTORAGE	STAIN	SOIL	3	GRAB	3	0	0	3	0	0	3	0	0	0	0	0	0	0	3	3	3	0	0	3	0	0
19	LA604		06/08/88	TA-21-003	DRUMSTORAGE	STAIN	SOIL	3	GRAB	3	3	0	3	0	0	3	0	0	0	0	0	0	0	3	3	3	0	0	3	0	0
19	LA605		05/17/88	TA-46-001	DRUMSTORAGE	STAIN	SOIL	3	GRAB	3	0	0	3	0	0	3	0	0	0	0	0	0	0	3	3	3	0	0	3	0	0
** Subtotal **								15		12	3	0	12	0	0	12	0	0	0	0	0	0	0	12	12	12	0	0	12	0	0
** PROBLEM - 20																															
20	LA60701	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60702	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60703	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60704	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60705	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60706	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60707	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60708	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60709	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60710	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60711	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60712	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60713	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60714	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60715	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	LA60716	DELETED	/ /	TA-21	DP TANKFARM	USTS	SOILGAS	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								16		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE A.1 ANALYTICAL REQUESTS AND QC SAMPLES (SORTED BY ENVIRONMENTAL PROBLEM AND REQUEST NUMBER)

PROB NUMB	REQUEST NUMBER	STATUS	DATE COLLECTED	AREA	LOCATION	TYPE OF LOCATION	MEDIA	PLANNED NUMBER OF SAMPLES	TYPE	VOL ORG	SEMI VOLS	TCLP SEMI	PCB	PST	HE	ICP MET	TCLP MET	HG	PB	CN	ASBB	ASBE	GABA	GSA	PU	TU	TH	RA	SR	AM	CS
** PROBLEM - 21																															
21	LA612		05/18/88	TA-35-125	LEAK/SPILL	CANYON WALL	SOIL	3	GRAB	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								3		3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** PROBLEM - 22																															
22	LA80001	GEO SURVEY	04/28/88	TA-21-259	INACTIVE	COLD DUMP	GEOPHYS	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA803	DEVIATION	05/06/88	TA-06	INACTIVE	DISPOSALPIT	SOIL	6	GRAB	3	0	0	3	0	3	3	0	3	0	0	0	0	0	3	3	3	0	0	3	0	0
22	LA80401	GEO SURVEY	04/29/88	TA-39	INACTIVE	DISPOSALPIT	GEOPHYS	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA805		06/20/88	TA-33-26	INACTIVE	LANDFILL	SOIL	3	S.COMP	3	0	0	0	0	3	3	0	0	0	0	0	0	0	3	3	3	3	0	0	0	0
22	LA806		05/17/88	TA-46	INACTIVE	LANDFILL	SOIL	4	S.COMP	4	4	0	4	0	0	4	0	0	0	0	0	4	0	4	4	4	4	0	4	0	0
22	LA80701		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80702		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80703		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80704		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80705		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80706		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80707		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80708		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80709		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80710		06/17/88	TA-00L	INACTIVE	LANDFILL	SS SOIL	1	S.COMP	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
22	LA80801	DEVIATION	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80802	DEVIATION	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80803	DEVIATION	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80804	DEVIATION	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80805	DEVIATION	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80806	DEVIATION	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80807	DEVIATION	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80808	DEVIATION	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80809	DEVIATION	05/04/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80810	DEVIATION	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80811	DEVIATION	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80812	DEVIATION	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80813	DEVIATION	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80814	DEVIATION	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80815	DEVIATION	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80816	DEVIATION	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80817	DEVIATION	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA80818	DEVIATION	05/05/88	TA-0	INACTIVE	MDA-C	SOILGAS	1	GRAB	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA810	DEVIATION	06/20/88	TA-20	INACTIVE	AREA 1 PIT	SS SOIL	4	S.COMP	0	0	0	0	0	4	4	0	0	0	0	0	0	0	4	0	4	4	0	0	0	0
22	LA847	DEVIATION	05/17/88	TA-33-26	INACTIVE	LANDFILL	SED	3	GRAB	0	0	0	0	0	3	3	0	0	0	0	0	0	0	3	3	3	3	0	0	0	0
22	LA848		05/20/88	TA-50	INACTIVE	MDA-C	SOIL	3	GRAB	3	3	0	3	0	0	3	0	0	0	0	0	0	0	3	3	3	0	3	3	0	0
22	LA853	DEVIATION	05/06/88	TA-06	INACTIVE	DISPOSALPIT	SOILGAS	9	GRAB	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	LA855		05/10/88	TA-21-259	INACTIVE	COLD DUMP	SOILGAS	8	GRAB	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								70		59	7	0	20	10	23	30	0	3	0	0	0	4	0	30	16	30	14	3	10	0	0

TABLE A.1 ANALYTICAL REQUESTS AND QC SAMPLES (SORTED BY ENVIRONMENTAL PROBLEM AND REQUEST NUMBER)

PROB NUMB	REQUEST NUMBER	STATUS	DATE COLLECTED	AREA	LOCATION	TYPE OF LOCATION	MEDIA	PLANNED NUMBER OF SAMPLES	TYPE	VOL ORG	SEMI VOLS	TCLP SEMI	PCB	PST	HE	ICP MET	TCLP MET	HG	PB	CN	ASBB	ASBE	GABA	GSA	PU	TU	TH	RA	SR	AM	CS
** PROBLEM - 23																															
23	LA811		06/10/88	TA-0	OPEN DUMP	MDA-M	SOIL	7	GRAB	7	7	0	0	0	0	7	0	0	0	0	0	7	0	7	7	7	0	0	7	0	0
23	LA813		05/24/88	TA-15	OPEN DUMP	MDA-Z	SOIL	5	GRAB	0	0	0	0	0	5	5	0	0	0	0	0	0	0	5	0	5	5	0	0	0	0
23	LA815		05/23/88	TA-22	MARSHY AREA	DISPOSAL	SOIL	3	S.COMP	3	0	0	0	0	3	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
23	LA817		05/16/88	TA-14	BONEYARD	OLD DRUMS	SOIL	3	S.COMP	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	3	3	0	0	3	0	0
23	LA818		05/25/88	TA-36	BONEYARD	BONEYARD	SOIL	6	GRAB	0	0	0	0	0	6	6	0	0	0	0	0	0	0	6	0	6	0	0	0	0	0
23	LA850	DEVIATION	06/10/88	TA-0	OPEN DUMP	MDA-M	WASTE	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
23	LA851		05/24/88	TA-15	OPEN DUMP	MDA-Z	SOIL	4	S.COMP	4	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	LA852		06/22/88	TA-36	BONEYARD	BONEYARD	SOIL	6	GRAB	6	0	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	LA856		05/24/88	TA-22	MARSHY AREA	DISPOSAL	SS SOIL	5	S.COMP	5	0	0	0	0	5	5	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
** Subtotal **								40		25	7	0	0	0	29	39	0	0	0	0	3	15	0	21	10	21	5	0	10	0	0
** PROBLEM - 24																															
24	LA819		06/21/88	TA-16	INACTIVE	LWD POND	SED	5	GRAB	5	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82001		05/12/88	TA-16	INACTIVE	LWD POND	WATER	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82002		05/13/88	TA-16	INACTIVE	LWD POND	WATER	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82003		05/18/88	TA-16	INACTIVE	LWD POND	WATER	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82101	DEVIATION	06/01/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82102	DEVIATION	06/01/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82103	DEVIATION	06/02/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82104	DEVIATION	06/02/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82105	DEVIATION	06/02/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82106	DEVIATION	06/02/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82107	DEVIATION	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82108	DEVIATION	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82109	DEVIATION	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82110	DEVIATION	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82111	DEVIATION	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82112	DEVIATION	06/22/88	TA-16	BACKFILLED	LWD POND	SS SOIL	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82301		05/03/88	TA-08-59	INACTIVE	SEPTIC TANK	SLUDGE	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0
24	LA82302		05/03/88	TA-08-59	INACTIVE	SEPTIC TANK	SLUDGE	1	GRAB	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0
24	LA824		05/16/88	TA-16-093	INACTIVE	OUTFALL	SED	3	GRAB	0	0	0	0	0	3	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
24	LA82501		05/09/88	TA-46-070	INACTIVE	SUMPS	SLUDGE	1	GRAB	1	1	0	1	0	0	1	0	1	0	0	0	0	0	1	1	1	1	0	1	0	0
24	LA82502		05/09/88	TA-46-070	INACTIVE	SUMPS	SLUDGE	1	GRAB	1	1	0	1	0	0	1	0	1	0	0	0	0	0	1	1	1	1	0	1	0	0
24	LA82601	DELETED	05/09/88	TA-46-070	INACTIVE	SUMPS	WATER	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82602	DELETED	/ /	TA-46-070	INACTIVE	SUMPS	WATER	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA828		05/05/88	TA-35-34	RUNOFFBASIN	WEST BASIN	SED	3	GRAB	3	3	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82901		05/17/88	TA-10	BAYO CANYON	BORINGS	SS SOIL	1	GRAB	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0
24	LA82902	DELETED	/ /	TA-10	BAYO CANYON	BORINGS	SS SOIL	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA82903	DELETED	/ /	TA-10	BAYO CANYON	BORINGS	SS SOIL	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA83001	DELETED	/ /	TA-10	BAYO CANYON	NEW WELLS	WATER	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA83002	DELETED	/ /	TA-10	BAYO CANYON	NEW WELLS	WATER	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	LA83003	DELETED	/ /	TA-10	BAYO CANYON	NEW WELLS	WATER	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
** Subtotal **								38		28	6	0	5	0	25	31	0	2	0	3	0	0	0	5	4	4	2	0	6	0	0

TABLE A.1 ANALYTICAL REQUESTS AND QC SAMPLES (SORTED BY ENVIRONMENTAL PROBLEM AND REQUEST NUMBER)

PROB NUMB	REQUEST NUMBER	STATUS	DATE COLLECTED	AREA	LOCATION	TYPE OF LOCATION	MEDIA	PLANNED NUMBER OF SAMPLES	TYPE	VOL ORG	SEMI VOLS	TCLP SEMI	PCB	PST	HE	ICP MET	TCLP MET	NG	PB	CN	ASBB	ASBE	GABA	GSA	PU	TU	TH	RA	SR	AM	CS
** PROBLEM - 25																															
25	LA831		05/19/88	TA-35-207	SPILL	STAIN	SOIL	3	S.COMP	3	3	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	LA832		06/08/88	TA-46-031	STORAGEAREA	STAIN	SOIL	6	GRAB	6	6	0	6	0	0	6	0	6	0	0	0	0	0	6	6	6	0	0	6	0	0
25	LA846		06/09/88	TA-32	STORAGETANK	SPILL/STAIN	SOIL	3	GRAB	3	3	3	3	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								12		12	12	3	12	0	0	12	3	6	0	0	0	0	0	6	6	6	0	0	6	0	0
** PROBLEM - 26																															
26	LA834		06/07/88	TA-08	INACTIVE FS	MOUNDS	SOIL	6	S.COMP	0	0	0	0	0	6	6	0	0	0	0	0	0	0	6	6	6	0	0	6	0	0
26	LA835		05/17/88	TA-15	INACTIVE FS	G-POINT	SOIL	3	S.COMP	3	0	0	0	0	3	3	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0
26	LA836		06/06/88	TA-05	D&D'D F.S	X-CHAMBER	SOIL	9	GRAB	0	0	0	0	0	9	9	0	0	0	0	0	0	0	9	0	9	9	0	0	0	0
26	LA857	GEO SURVEY	04/27/88	TA-08	INACTIVE FS	MOUNDS	GEOPHYS	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								19		3	0	0	0	0	18	18	0	0	0	0	0	0	0	18	6	18	9	0	6	0	0
** PROBLEM - 27																															
27	LA84001		06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84002	DEVIATION	06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84003		06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84004		06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84005	DEVIATION	06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84006	DEVIATION	06/14/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84007	DEVIATION	06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84008		06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84009	DEVIATION	06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84010		06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84011	DEVIATION	06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	LA84012		06/15/88	TA-16	D&D'D SITE	GMX-2	SS SOIL	1	C	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
** Subtotal **								12		12	0	0	0	0	12	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** Total ****								321		225	57	15	52	10	153	235	24	26	19	3	3	25	19	139	70	123	45	3	60	6	0

APPENDIX B
BACKGROUND CONCENTRATION LEVELS OF ANALYTES

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APPENDIX B

BACKGROUND CONCENTRATION LEVELS OF ANALYTES

The purpose of this appendix is to provide data on the level of contaminants in environmental samples that are expected from sources other than site operations. The data provided in the following tables are from Environmental Surveillance at Los Alamos During 1987 and include a limited amount of background data for radionuclides in ground water, surface water, soils, and sediment. This data was not obtained as part of the survey.

Because toxic organics and most radionuclides in ground water are not expected to occur in environmental samples from sources other than site operations, most background levels for those constituents can be assumed to be below instrument detection limits.

TABLE B-1. TRANSURANICS IN MORTANDAD CANYON
(Channel Alluvium, June 16, 1987[a])

Station	^{238}Pu (pCi/g)	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)
Effluent Canyon			
1	0.012 (0.007)	0.024 (0.011)	-0.008 (0.002)
2	0.011 (0.006)	0.033 (0.011)	0.130 (0.050)
TA-50 Outfall	0.712 (0.058)	1.81 (0.107)	0.970 (0.050)
Mortandad Canyon			
A	0.005 (0.009)	0.033 (0.010)	0.02 (0.002)
GS-1	3.91 (0.330)	16.2 (1.20)	11.72 (0.14)
3	7.69 (0.580)	17.6 (1.30)	16.79 (0.17)
GS-2	7.00 (0.560)	24.6 (1.80)	31.96 (0.24)
4	7.27 (0.550)	26.2 (1.80)	33.81 (0.24)
4.2	11.7 (0.070)	39.3 (2.30)	22.08 (0.20)
4.5	4.69 (0.37)	18.9 (1.30)	19.85 (0.20)
4.8	4.26 (0.390)	18.1 (1.40)	28.76 (0.22)
5	7.11 (0.690)	29.7 (2.20)	20.51 (0.19)
GS-3	4.67 (0.450)	20.1 (1.60)	22.60 (0.19)
5.5	5.67 (0.430)	24.5 (1.60)	27.71 (0.22)
6	6.29 (0.610)	16.2 (1.40)	14.60 (0.16)
7	3.30 (0.171)	12.2 (0.519)	16.53 (0.17)
Sediment Trap 1	18.2 (1.30)	58.9 (3.90)	79.50 (0.40)
Sediment Trap 2	9.71 (0.750)	35.8 (2.60)	51.42 (0.31)
Sediment Trap 3	2.06 (0.126)	7.06 (0.329)	10.11 (0.13)
3	2.13 (0.24)	7.17 (0.64)	12.53 (0.15)
8.2	0.105 (0.018)	0.399 (0.037)	0.56 (0.03)
10	0.09 (0.02)	0.33 (0.04)	0.31 (0.03)
11	0.095 (0.024)	0.330 (0.042)	0.01 (0.002)
12	-0.025 (0.017)	0.010 (0.012)	0.1 (0.01)
13	-0.010 (0.011)	0.089 (0.020)	0.8 (0.002)

a. Location of sediment stations shown on Figure B-1; counting uncertainty in parentheses.

TABLE B-2. MAXIMUM CONCENTRATIONS OF RADIOACTIVITY IN SOILS AND SEDIMENTS FROM REGIONAL, PERIMETER, AND ON-SITE STATIONS

	Number of Stations	^{3}H (10^{-6} μCi/mL)	^{137}Cs (pCi/g)	Total U (μg/g)	^{238}Pu (pCi/g)	$^{239,240}Pu$ (pCi/g)	Gross Gamma Counts/min/g
Analytical Limits of Detection	--	0.7	0.1	0.03	0.003	0.002	0.1
Soil							
Background (1974-1986)[a]	--	7.2	1.09	3.4	0.005	0.025	6.6
Regional Stations	7	13	0.60	5.4	0.002	0.016	6.4
Perimeter Stations	6	2.8 (0)[c]	1.3 (1)	5.3 (5)	0.029 (1)	0.026 (1)	9.0 (4)
On-site Stations	10	10	0.79 (0)	4.6 (7)	0.005 (0)	0.038 (1)	7.5 (3)
Sediments							
Background (1976-1986)[a]	--	13	0.44	4.4	0.006	0.023	7.9
Regional Stations[b]	7	0.7	0.38	8.5	0.001	0.007	3.8
Perimeter Stations	17	0.5	0.39	3.2	0.002 (0)	0.006 (0)	2.5 (10)
On-site Station, Effluent Release Areas							
Acid-Pueblo Canyon	6	--	0.27 (0)	3.4 (0)	0.026 (1)	0.612 (3)	0.8 (0)
DP-Los Alamos Canyon	11	--	10.7 (6)	5.0 (1)	0.196 (8)	0.615 (10)	5.8 (0)
Mortandad Canyon	7	--	38 (3)	4.8 (1)	7.59 (2)	30.7 (2)	54 (2)

a. $\bar{x}$ + 2s of a number of background analyses for soils and bed sediments (Purtymun 1987).

b. Regional background 1987.

c. Number in parentheses indicates number of stations exceeding background concentrations.

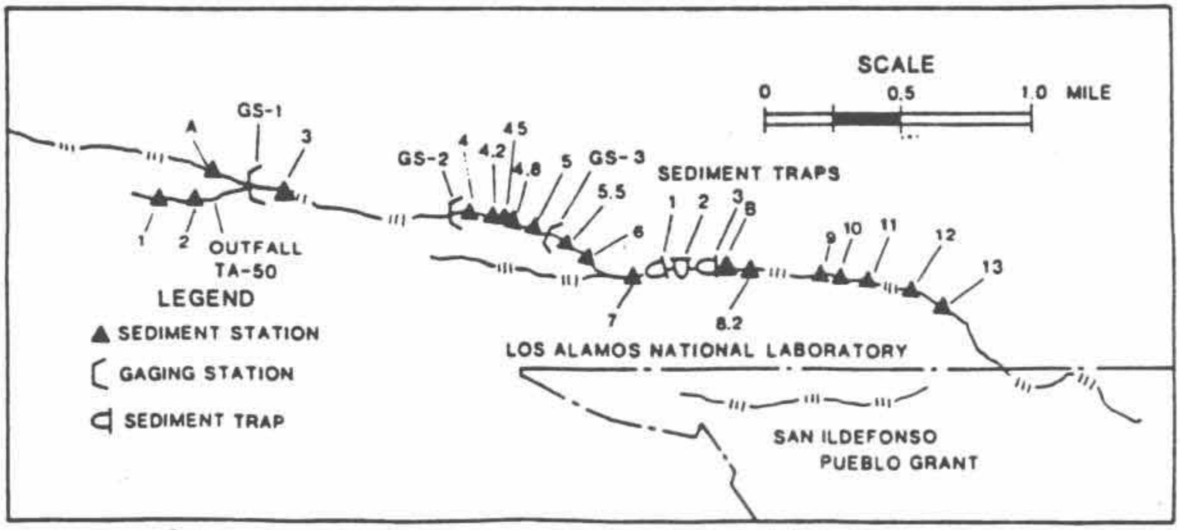

Figure B-1. Sediment sampling stations in Mortandad Canyon.

TABLE B-3. LOCATIONS OF SOIL AND SEDIMENT SAMPLING STATIONS

Station	Latitude or N-S Coordant	Longitude E-W Coordant	Map Designation[a]
Regional Sediments			
Chamita	36°05′	106°07′	--
Embudo	36°12′	105°58′	--
Otowi	35°52′	106°08′	--
Sandia	S060	E490	--
Pajarito	S185	E410	--
Ancho	S305	E335	--
Frijoles	S375	E235	--
Cochiti	35°37′	106°19′	--
Bernalillo	35°17′	106°36′	--
Jemez River	35°40′	106°44′	--
Perimeter Sediments			
Guaje at SR-4	N135	E480	12
Bayo at SR-4	N100	E455	13
Sandia at SR-4	N025	E315	14
Mortandad at SR-4	S030	E350	15
Canada del Buey at SR-4	S090	E360	16
Pajarito at SR-4	S105	E320	17
Potrillo at SR-4	S145	E295	18
Water at SR-4	S170	E260	19
Ancho at SR-4	S255	E250	20
Frijoles at National Monument Headquarters	S280	E185	21
Effluent Release Area Sediments			
Acid-Pueblo Canyon			
Acid Weir	N125	E070	22
Pueblo 1	N130	E085	23
Pueblo 2	N120	E145	24
Hamilton Bend Spring	N105	E255	25
Pueblo 3	N090	E315	26
Pueblo at SR-4	N070	E350	27

TABLE B-3. (cont'd)

Station	Latitude or N-S Coordinant	Longitude E-W Coordinant	Map Designation[a]
DP-Los Alamos Canyon			
DPS-1	N090	E160	28
DPS-4	N075	E205	29
Los Alamos at:			
Bridge	N095	E020	30
LAO-1	N080	E120	31
GS-1	N075	E200	32
LAO-3	N075	E215	33
LAO-4.5	N065	E270	34
SR-4	N065	E355	35
Totavi	N065	E405	36
LA-2	N125	E510	37
Otowi	N100	E560	38
Mortandad Canyon			
Mortandad near CMR	N060	E036	39
Mortandad west of GS-1	N045	E095	40
Mortandad at GS-1	N040	E105	41
Mortandad at MCO-5	N035	E155	42
Mortandad at MCO-7	N025	E190	43
Mortandad at MCO-9	N030	E215	44
Mortandad at MCO-13	N015	E250	45
Regional Soils			
Rio Chama	36°05′	106°07′	--
Embudo	36°12′	105°58′	--
Otowi	35°52′	106°08′	--
Near Santa Cruz	35°59′	105°54′	--
Cochiti	35°37′	106°19′	--
Bernalillo	35°17′	106°36′	--
Jemez	35°40′	106°44′	--
Perimeter Soils			
Sportsman's Club	N240	E215	S1
North Mesa	N134	E168	S2
TA-8	N060	W075	S3
TA-49	S165	E085	S4
White Rock (east)	S055	E385	S5
Tsankawi	N020	E310	S6

TABLE B-3. (cont'd)

Station	Latitude or N-S Coordinant	Longitude E-W Coordinant	Map Designation[a]
Onsite Soils			
TA-21	N095	E140	S7
East of TA-53	N051	E218	S8
TA-50	N035	E095	S9
Two Mile Mesa	N025	E030	S10
East of TA-54	S080	E295	S11
R-Site Road East	S042	E103	S12
Potrillo Drive	S065	E195	S13
S-Site	S035	W025	S14
Near Test Well DT-9	S150	E140	S15
Near TA-33	S245	E225	S16

a. Soil sampling locations in Figures B-2 and B-3; sediment sampling locations in Figures B-2 and B-4.

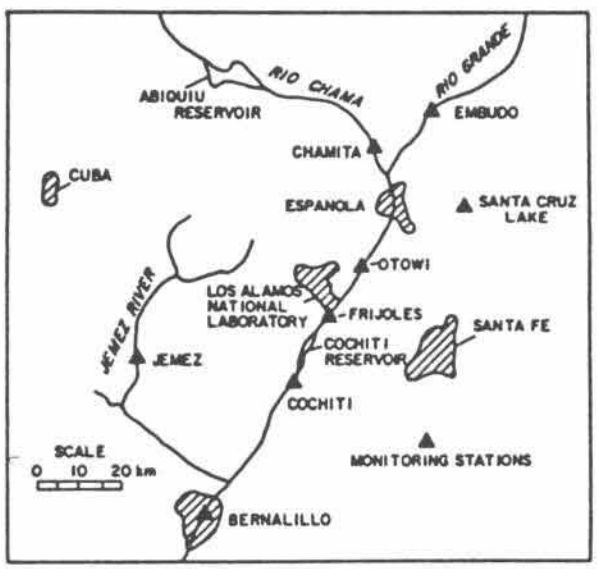

Figure B-2. Sediment sampling stations in Mortandad Canyon.

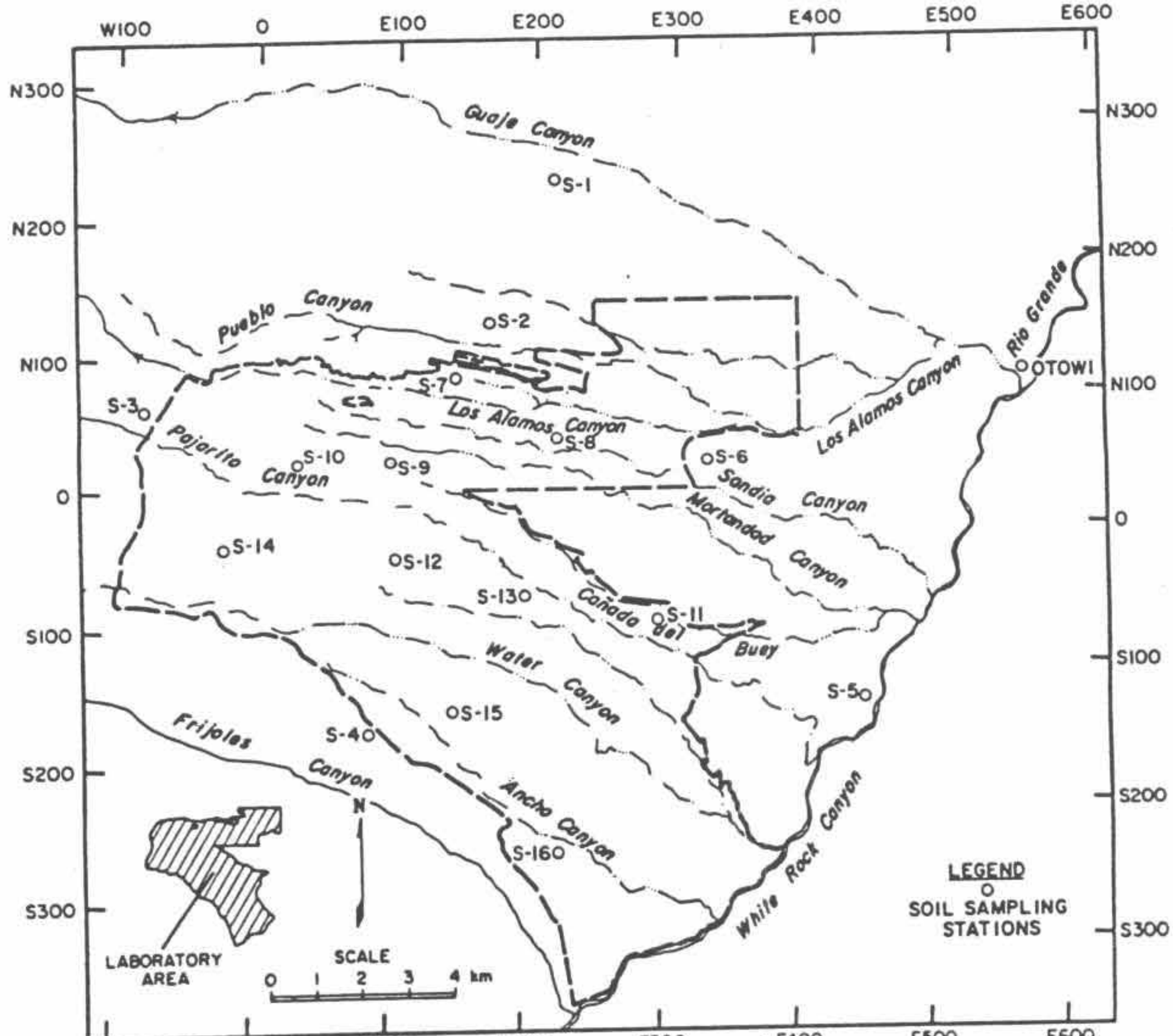

Figure B-3. Soil sampling on and near the laboratory site.

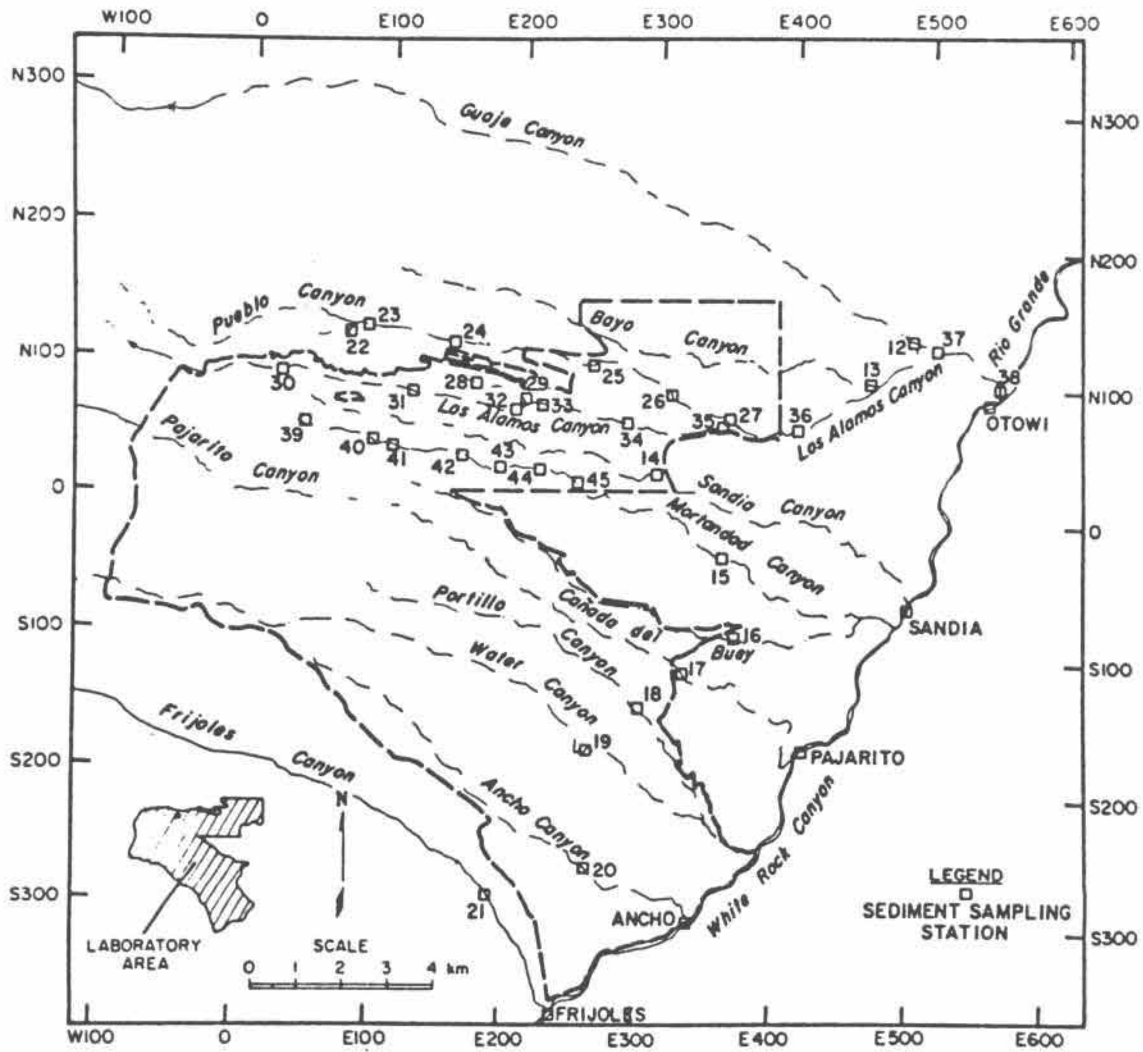

Figure B-4. Sediment sampling locations on and near the laboratory site.

TABLE B-4 RADIOCHEMICAL ANALYSES OF REGIONAL SOILS AND SEDIMENTS[a]

Location	^{3}H (10^{-6} μCi/mL)	^{137}Cs (pCi/g)	Total U (μg/g)	^{238}Pu pCi/g	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)	Gross Gamma (counts/min/g)
Soils							
Chamita	0.2 (0.5)	0.24 (0.07)	5.4 (0.5)	0.002 (0.001)	0.008 (0.002)	--	6.4 (0.8)
Embudo	0.1 (0.5)	0.25 (0.10)	4.8 (0.5)	0.000 (0.001)	0.007 (0.002)	--	6.0 (0.8)
Otowi	-0.8 (0.5)	0.02 (0.06)	5.0 (0.5)	0.000 (0.001)	0.008 (0.002)	--	6.1 (0.8)
Near Santa Cruz Lake	--	0.41 (0.10)	3.1 (0.3)	0.000 (0.001)	0.007 (0.002)	--	4.6 (0.7)
Cochiti	4.7 (0.7)	0.43 (0.09)	3.0 (0.3)	0.000 (0.001)	0.016 (0.003)	--	4.1 (0.7)
Bernalillo	13 (1.0)	0.60 (0.13)	1.9 (0.2)	0.002 (0.001)	0.013 (0.003)	--	1.7 (0.7)
Jemez	4.3 (0.7)	0.23 (0.08)	2.1 (0.2)	0.001 (0.001)	0.010 (0.003)	--	1.7 (0.6)
Summary							
Number of Analyses	6	7	7	7	7	--	7
Average	3.6	0.31	3.6	0.001	0.010	--	4.7
S	5.2	0.19	1.4	0.001	0.003	--	1.7
Minimum	-0.8 (0.5)	0.02 (0.06)	1.9 (0.2)	0.000 (0.001)	0.007 (0.002)	--	1.7 (0.6)
Maximum	13 (1.0)	0.60 (0.13)	5.4 (0.5)	0.002 (0.001)	0.016 (0.003)	--	6.4 (0.8)
Sediments							
Rio Chama at Chamita	--	0.00 (0.06)	1.9 (0.2)	-0.001 (0.001)	-0.002 (0.001)	-0.160 (0.081)	-3.5 (0.7)
Rio Grande at Embudo	--	0.14 (0.10)	2.3 (0.2)	0.000 (0.001)	0.000 (0.001)	-0.146 (0.177)	-4.1 (0.7)
Rio Grande at Otowi	--	0.06 (0.06)	2.0 (0.2)	0.001 (0.002)	0.000 (0.001)	-0.078 (0.081)	-5.5 (0.8)
Rio Grande at Sandia	0.7 (0.4)	0.38 (0.11)	8.5 (0.9)	0.001 (0.002)	0.002 (0.001)	--	3.8 (0.7)
Rio Grande at Pajarito	0.2 (0.4)	0.12 (0.10)	3.4 (0.4)	0.000 (0.001)	0.007 (0.002)	--	1.8 (0.6)
Rio Grande at Ancho[b]	--	--	--	--	--	--	--
Rio Grande at Frijoles[b]	--	--	--	--	--	--	--
Rio Grande at Bernalillo	--	.13 (0.09)	2.8 (0.3)	0.000 (0.001)	0.004 (0.002)	-3.26 (0.520)	-1.6 (0.6)
Jemez River at Jemez	--	0.09 (0.08)	1.1 (0.2)	0.000 (0.002)	0.001 (0.001)	--	--

TABLE B-4 (cont'd)

Location	^{3}H (10^{-6} $\mu Ci/mL$)	^{137}Cs (pCi/g)	Total U ($\mu g/g$)	^{238}Pu pCi/g	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)	Gross Gamma (counts/min/g)
Summary							
Number of Analyses	2	7	7	7	7	4	6
Average	0.4	0.13	3.1	0.000	0.002	-0.911	-1.5
S	0.3	0.12	2.5	0.001	0.003	1.57	3.6
Minimum	0.2 (0.4)	0.00 (0.06)	1.1 (0.2)	-0.001 (0.001)	-0.002 (0.001)	-3.26 (0.520)	-3.5 (0.7)
Maximum	0.7 (0.4)	0.38 (0.11)	8.5 (0.9)	0.001 (0.002)	-0.007 (0.002)	-0.78 (0.081)	3.8 (0.7)
Limits of Detection	0.7	0.1	0.3	0.003	0.002	0.01	0.1

a. Samples collected in April; counting uncertainty in parentheses.

b. Sampling station covered by reservoir.

TABLE B-5 RADIOCHEMICAL ANALYSES OF PERIMETER SOILS AND SEDIMENTS[a]

Location	^{3}H (10^{-6} µCi/mL)	^{137}Cs (pCi/g)	Total U (µg/g)	^{238}Pu (pCi/g)	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)	Gross Gamma (counts/min/g)
Perimeter Soils							
Sportsmans Club	1.1 (0.5)	0.29 (0.09)	4.2 (0.4)	0.001 (0.001)	0.018 (0.003)	--	4.4 (0.7)
North Mesa	0.4 (0.5)	0.25 (0.08)	3.8 (0.4)	0.001 (0.001)	0.008 (0.002)	--	6.3 (0.8)
TA-8	0.6 (0.5)	1.3 (0.22)	3.1 (0.3)	0.002 (0.001)	0.026 (0.004)	--	7.3 (0.9)
TA-49	-0.1 (0.5)	0.34 (0.09)	4.8 (0.5)	0.000 (0.001)	0.004 (0.002)	--	7.1 (0.9)
White Rock	2.8 (0.6)	0.24 (0.08)	4.0 (0.4)	0.001 (0.001)	0.010 (0.002)	--	7.5 (0.9)
Tsankawi	1.5 (0.5)	0.27 (0.07)	5.3 (0.5)	0.029 (0.004)	0.009 (0.002)	--	9.0 (1.0)
Summary							
Number of Analyses	6	6	6	6	6	--	6
Average	1.0	0.44	4.2	0.006	0.013	--	6.9
S	1.0	0.42	0.8	0.011	0.008	--	1.5
Minimum	-0.1 (0.5)	0.24 (0.08)	3.1 (0.3)	0.000 (0.001)	0.004 (0.002)	--	4.4 (0.7)
Maximim	2.8 (0.6)	1.3 (0.22)	5.3 (0.5)	0.029 (0.004)	0.026 (0.004)	--	9.0 (1.0)
Perimeter Sediments							
Guaje at SR-4	--	0.06 (0.06)	2.8 (0.3)	0.000 (0.001)	0.002 (0.001)	-0.016 (0.068)	-2.4 (0.6)
Bayo at SR-4	--	0.34 (0.11)	3.2 (0.3)	-0.001 (0.002)	0.002 (0.002)	0.028 (0.202)	-0.8 (0.6)
Sandia at SR-4	--	0.06 (0.06)	1.8 (0.2)	0.001 (0.001)	0.001 (0.001)	0.010 (0.081)	-2.1 (0.6)
Mortandad at SR-4	--	0.00 (0.07)	1.7 (0.2)	-0.000 (0.001)	0.002 (0.001)	--	-1.2 (0.6)
Canada del Buey at SR-4	--	0.13 (0.09)	2.1 (0.2)	0.002 (0.002)	0.001 (0.002)	0.054 (0.179)	-23 (2.0)
Pajarito at SR-4	--	0.10 (0.06)	2.6 (0.3)	-0.001 (0.002)	0.005 (0.003)	0.043 (0.096)	0.2 (0.6)
Potrillo at SR-4	--	0.04 (0.09)	2.5 (0.3)	0.001 (0.001)	0.002 (0.001)	0.311 (0.188)	-1.6 (0.6)
Water at SR-4	--	0.15 (0.08)	1.7 (0.2)	0.000 (0.001)	0.002 (0.001)	--	-2.6 (0.6)
Ancho at SR-4	--	0.12 (0.07)	2.3 (0.3)	0.000 (0.001)	0.006 (0.002)	0.110 (0.097)	-1.2 (0.6)
Frijoles at Bandelier	--	0.24 (0.10)	3.2 (0.3)	-0.001 (0.001)	0.001 (0.001)	0.230 (0.185)	-0.9 (0.6)
Sandia at Rio Grande	--	0.39 (0.12)	2.0 (0.2)	-0.000 (0.001)	0.001 (0.002)	--	-1.5 (0.6)
Canada del Ancha at Rio Grande	--	0.14 (0.09)	1.3 (0.2)	-0.001 (0.001)	0.001 (0.001)	--	-0.8 (0.6)

TABLE B-5 (cont'd)

Location	^{3}H (10^{-6} µCi/mL)	^{137}Cs (pCi/g)	Total U (µg/g)	^{238}Pu (pCi/g)	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)	Gross Gamma (counts/min/g)
Mortandad at Rio Grande	0.3 (0.4)	0.03 (0.10)	1.7 (0.2)	0.000 (0.000)	0.002 (0.001)	--	-0.7 (0.6)
Pajarito at Rio Grande	0.5 (0.4)	0.36 (0.11)	2.9 (0.3)	0.000 (0.001)	0.003 (0.002)	--	-0.0 (0.6)
Water at Rio Grande	--	0.09 (0.09)	1.8 (0.2)	0.001 (0.001)	0.001 (0.001)	--	-2.9 (0.6)
Ancho at Rio Grande	0.2 (0.4)	0.08 (0.08)	1.2 (0.2)	0.000 (0.001)	0.000 (0.001)	--	-4.8 (0.7)
Frijoles at Rio Grande	0.4 (0.4)	0.13 (0.10)	2.8 (0.3)	-0.001 (0.001)	0.002 (0.001)	--	2.5 (0.6)
Summary							
Number of Analyses	4	17	17	17	17	8	17
Average	0.3	0.14	2.2	0.000	0.002	0.096	-2.6
Std. Dev.	0.1	0.12	0.6	0.001	0.002	0.116	5.5
Minimum	0.2 (0.4)	0.00 (0.07)	1.2 (0.2)	-0.001 (0.002)	0.000 (0.001)	-0.016 (0.068)	-2.3 (2.0)
Maximum	0.5 (0.4)	0.39 (0.12)	3.2 (0.3)	0.002 (0.002)	0.006 (0.002)	0.311 (0.188)	2.5 (0.6)
Limits of Detection	0.7	0.1	0.3	0.003	0.002	0.002	0.1

a. Samples collected in April; counting uncertainty in parentheses.

TABLE B-6. SUBURANIC AND GROSS GAMMA ANALYSES OF ON-SITE SOILS AND SEDIMENTS[a]

Location	^{3}H (10^{-6} μCi/mL)	^{137}Cs (pCi/g)	Gross Gamma (counts/min/g)
On-site Soils			
TA-21	1.9 (0.5)	-0.01 (0.08)	6.6 (0.9)
East of TA-54	1.0 (0.5)	0.17 (0.08)	7.5 (0.9)
TA-50	2.3 (0.5)	0.11 (0.08)	6.8 (0.9)
Two-Mile Mesa	0.7 (0.5)	0.51 (0.11)	4.7 (0.7)
East of TA-54	-0.5 (0.5)	0.14 (0.07)	6.0 (0.8)
R-Site Road East	0.4 (0.5)	0.05 (0.05)	6.4 (0.8)
Potrillo Drive	2.4 (0.6)	0.25 (0.09)	5.2 (0.8)
S-Site	0.7 (0.5)	0.12 (0.06)	5.8 (0.8)
Near DT-9	-0.2 (0.5)	0.79 (0.15)	5.1 (0.7)
Near TA-33	10 (1.0)	0.25 (0.07)	7.2 (0.9)
Summary			
Number of Analyses	10	10	10
Average	1.9	0.24	6.1
S	3.0	0.24	0.9)
Minimum	-0.5 (0.5)	-0.01 (0.08)	4.7 (0.7)
Maximum	10 (1.0)	0.79 (0.15)	7.5 (0.9)
Sediments: Effluents Release Areas			
Pueblo Canyon			
Acid Weir	--	0.18 (0.10)	0.8 (0.6)
Pueblo 1	--	0.20 (0.10)	-2.2 (0.6)
Pueblo 2	--	-0.02 (0.06)	-0.8 (0.6)
Hamilton Bend Spring	--	0.27 (0.09)	-0.3 (0.6)
Pueblo 3	--	0.02 (0.07)	-1.3 (0.6)
Pueblo at SR-4	--	-0.01 (0.09)	-3.4 (0.7)
Summary			
Number of Analyses	--	6	6
Average	--	0.11	-1.2
S	--	0.12	1.5
Minimum	--	-0.02 (0.06)	-3.4 (0.7)
Maximum	--	0.27 (0.09)	0.8 (0.6)

TABLE B-6. (cont'd)

Location	^{3}H (10^{-6} μCi/mL)	^{137}Cs (pCi/g)	Gross Gamma (counts/min/g)
Los Alamos Canyon			
DP Canyon at DPS-1	--	7.2 (1.1)	5.4 (0.8)
DP Canyon at DPS-4	--	10.7 (1.6)	--
Los Alamos at Bridge	--	0.30 (0.10)	-3.9 (0.7)
Los Alamos at LAO-1	--	1.1 (0.19)	1.1 (0.6)
Los Alamos at GS-1	--	0.20 (0.09)	3.6 (0.7)
Los Alamos at LAO-3	--	0.20 (0.07)	-0.9 (0.6)
Los Alamos at LAO-4.5	--	0.62 (0.14)	0.9 (0.6)
Los Alamos at SR-4	--	1.8 (0.28)	3.5 (0.7)
Los Alamos at Totavi	--	0.85 (0.16)	3.4 (0.7)
Los Alamos at LA-2	--	0.31 (0.09)	3.6 (0.7)
Los Alamos at Otowi	--	0.30 (0.10)	0.8 (0.6)
Summary			
Number of Analyses	--	11	10
Average	--	2.1	1.8
S	--	3.5	2.7
Minimum	--	-0.20 (0.09)	-3.9 (0.7)
Maximum	--	10.7 (1.6)	5.4 (0.8)
Mortandad Canyon			
Mortandad at CMR	--	0.08 (0.06)	-1.4 (0.6)
Mortandad West of GS-1	--	0.11 (0.09)	-2.1 (0.6)
Mortandad at GS-1	--	-0.06 (0.06)	0.2 (0.6)
Mortandad at MCO-5	--	38 (5.7)	54 (5.0)
Mortandad at MCO-7	--	16 (2.4)	17 (2.0)
Mortandad at MCO-9	--	0.28 (0.10)	4.9 (0.8)
Mortandad at MCO-13	--	0.56 (0.13)	--
Summary			
Number of Analyses	--	7	16
Average	--	7.85	12
S	--	14.5	22
Minimum	--	-0.06 (0.06)	-2.1 (0.6)
Maximum	--	38 (5.7)	54 (5.0)
Limits of Detection	0.7	0.1	0.1

a. Samples collected in April and May; counting uncertainty in parentheses.

TABLE B-7. URANIUM AND TRANSURANIC RADIOCHEMICAL ANALYSES OF ON-SITE SOILS AND SEDIMENTS[a]

Location	Total U ($\mu g/g$)	^{238}Pu (pCi/g)	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)
On-site Soils				
TA-21	3.8 (0.4)	0.005 (0.004)	0.002 (0.002)	--
East of TA-53	4.6 (0.5)	0.000 (0.002)	0.012 (0.001)	--
A-50	4.2 (0.5)	0.002 (0.001)	0.038 (0.003)	--
Two-Mile Mesa	2.9 (0.3)	0.002 (0.002)	0.020 (0.005)	--
East of TA-54	3.4 (0.3)	0.002 (0.002)	0.008 (0.004)	--
R-Site Road East	3.9 (0.4)	0.003 (0.001)	0.002 (0.002)	--
Potrillo Drive	3.9 (0.4)	0.000 (0.001)	0.000 (0.001)	--
S-Site	4.1 (0.4)	0.001 (0.002)	0.000 (0.001)	--
Near DT-9	3.1 (0.4)	0.000 (0.001)	0.016 (0.003)	--
Near TA-33	3.6 (0.4)	0.001 (0.001)	0.009 (0.0021)	--
Summary				
Number of Analyses	10	10	10	
Average	3.7	0.002	0.011	--
S	0.5	0.002	0.012	--
Minimum	2.9 (0.3)	0.000 (0.002)	0.000 (0.001)	--
Maximum	4.6 (0.5)	0.005 (0.004)	0.038 (0.003)	--
Sedments: Effluents Release Areas Pueblo Canyon				
Acid Weir	3.2 (0.3)	0.001 (0.002)	0.004 (0.002)	1.28 (0.251)
Pueblo 1	2.4 (0.2)	-0.036 (0.018)	0.009 (0.027)	-1.83 (0.330)
Pueblo 2	2.9 (0.3)	0.026 (0.014)	0.612 (0.062)	2.51 (0.401)
Hamilton Bend Spring	3.4 (0.3)	0.001 (0.008)	0.167 (0.010)	2.29 (0.373)
Pueblo 3	3.2 (0.2)	0.000 (0.001)	0.004 (0.002)	1.31 (0.254)
Pueblo at SR-4	2.7 (0.3)	0.002 (0.001)	0.399 (0.021)	2.37 (0.382)

TABLE B-7. (cont'd)

Location	Total U (µg/g)	^{238}Pu (pCi/g	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)
Summary				
Number of Analyses	6	6	6	6
Average	2.9	-0.001	0.199	1.93
S	0.4	0.020	0.254	0.54
Minimum	2.4 (0.2)	-0.036 (0.018)	0.004 (0.002)	1.28 (0.251)
Maximum	3.4 (0.3)	0.026 (0.014)	0.612 (0.062)	2.51 (0.401)
Sediments: Effluents Release Area				
Los Alamos Canyon				
DP Canyon at DPS-1	2.5 (0.3)	0.067 (0.019)	0.139 (0.026)	2.88 (0.457)
DP Canyon at DPS-4	5.0 (0.5)	0.196 (0.012)	0.609 (0.029)	--
Los Alamos at Bridge	2.8 (0.3)	-0.001 (0.001)	0.002 (0.011)	-1.27 (0.223)
Los Alamos at LAO-1	3.4 (0.3)	0.021 (0.004)	0.239 (0.014)	1.65 (0.301)
Los Alamos at GS-1	4.4 (0.4)	0.002 (0.001)	0.516 (0.026)	1.38 (0.291)
Los Alamos at LAO-3	3.0 (0.3)	0.005 (0.002)	0.183 (0.011)	1.37 (0.260)
Los Alamos at LAO-4.5	3.2 (0.3)	0.008 (0.002)	0.267 (0.015)	-1.48 (0.278)
Los Alamos at SR-4	4.2 (0.4)	0.029 (0.004)	0.414 (0.023)	1.24 (0.246)
Los Alamos at Totavi	4.4 (0.4)	0.062 (0.006)	0.493 (0.025)	-2.71 (0.442)
Los Alamos at LA-2	4.3 (0.4)	0.006 (0.00)	0.615 (0.030)	2.43 (0.390)
Los Alamos at Otowi	3.6 (0.4)	0.006 (0.002)	0.131 (0.010)	-2.43 (0.391)
Summary				
Number of Analyses	11	11	11	10
Average	3.7	0.036	0.328	0.306
S	0.8	0.058	0.211	2.06
Minimum	2.5 (0.3)	0.001 (0.001)	0.002 (0.011)	-2.43 (0.391)
Maximum	5.0 ().5)	0.196 (0.012)	0.615 (0.030)	2.88 (0.457)

TABLE. B-7 (cont'd)

Location	Total U ($\mu g/g$)	^{238}Pu (pCi/g	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)
Sediments: Effluents Release Area Mortandad Canyon				
Mortandad at CMR	1.8 (0.2)	0.021 (0.003)	0.006 (0.002)	1.16 (0.225)
Mortandad West of GS-1	1.5 (0.2)	0.008 (0.017)	0.000 (0.001)	1.39 (0.290)
Mortandad at GS-1	2.3 (0.2)	-0.028 (0.013)	-0.005 (0.012)	3.99 (0.613)
Mortandad at MCO-5	2.9 (0.3)	7.59 (0.520)	30.7 (1.90)	24.6 (3.71)
Mortandad at MCO-7	1.7 (0.2)	1.52 (0.082)	6.02 (0.246)	4.22 (0.649)
Mortandad at MCO-9	4.8 (0.5)	-0.035 (0.013)	0.005 (0.011)	1.50 (0.304)
Mortandad at MCO-13	2.4 (0.2)	0.002 (0.001)	0.023 (0.003)	--
Summary				
Number of Analyses	7	7	7	6
Average	2.5	1.30	5.25	6.14
S 1.1	2.83	11.4	9.14	
Minimum	1.5 (0.2)	-0.035 (0.013)	0.005 (0.012)	1.16 (0.225)
Maximum	4.8 (0.5)	7.59 (0.520)	30.7 (1.90)	24.6 (3.71)
Limits of Detection	1	0.003	0.002	0.001

a. Samples collected in April and May; counting uncertainty in parentheses.

TABLE B-8. ANALYTICAL METHODS FOR VARIOUS STABLE CONSTITUENTS

Technique	Stable Constituents Measured	References
Standard Chemical Methods	Total alkalinity, hardness, SO_3^{-2}, SO_4^{-2}, TDS, conductivity, COD	C6, C65
Color Spectrophotometry	NO_3^-, PO_4^{-3}, Si, Pb, Ti, B	C6, C65
Neutron Activation Instrumental Thermal	Al, Sb, As, Ba, Br, Ca, Ce, Cs, Cl, Cr, Co, Dy, Eu, Au, Hf, In, I, Fe, La, Lu, Mg, Mn, K, Rb, Sm, Sc, Se, Na, Sr, S, Ta, Tb, Th, Ti, W, V, Yb, Zn	C7, C12, C13, C14, C15, C65
Instrumental Epithermal	Al, Sb, As, Ba, Br, Cs, Cr, F, Ga, Au, In, I, La, Mg, Mn, Mo, Ni, K, Sm, Se, Si, Na, Sr, Th, Ti, W, U, Zn, Zr	C7, C9, C16, C17, C18, C19, C20, C21, C65
Thermal Neutron Capture Gamma Ray	Al, B, Ca, Cd, C, Gd, H, Fe, Mg, N, P, K, Si, Na, S, Ti	C7, C22, C23, C24, C25, C26, C27, C29, C65
Radiochemical	Sb, As, Cu, Au, Ir, Hg, Mo, Os, Pd, Pt, Ru, Se, Ag, Te, Th, W, U, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Yb, Lu, $^{235}U/^{238}U$, ^{238}Pu, ^{239}Pu	C5, C6, C7, C30, C31, C32, C33, C34, C35, C36, C37, C38, C51, C65
Delayed Neutron Assay	U	C7, C8, C10, C11, C39, C40, C65
Atomic Absorption	Sb, As, Ba, Be, Bi, Cd, Ca, Cr, Co, Cu, Ga, In, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, K, Se, Ag, Na, Sr, Te, Tl, Sn, Ti, V, Zn, Al	C6, C41, C44, C45, C46, C47, C48, C52, C53, C54, C65
Inductively Coupled Plasma Mass Spectrometry	Sb, As, Ba, Be, B, Bi, Cd, Cr, Co, Cu, Ga, In, Pb, Li, Mn, Hg, Mo, Ni, Se, Br, Ag, Sr, Te, Ti, Sn, V, Zn	C65

TABLE B-8. (Continued)

Technique	Stable Constituents Measured	References
Ion Chromatography	F^-, Cl^-, Br^-, NO_2^-, NO_3^- SO_4^{-2}, PO_4^{-3}	C49, C65
Potentiometric	F^-, NH_4^+, pH, Br^-, Cl_2 (total) Cl_2 (free)	C50, C55, C65
Combustion	C, N, H, S, Total Organic carbon	C29, C62, C63, C65
Corrosivity	--	C56, C57
Ignitability (flash point)	--	C56, C58
Automated Colorimetry	CN^-, NH_4^-, PO_4^{-3}, NO_3^- NO_2^-, Cl^{-4}, COD, TKN, Si, B, SO_4^{-2}, Cr^{+6}	C6, C59, C60, C62, C65

TABLE B-9. METHOD SUMMARY (Organics)

Analyte	Matrix	Method	Technique[a]	Reference
Volatiles	Air	--	GC/MS	C65
Volatiles	Soil	8010 8020	PT/GC/MS	C64 C65 C66
Volatiles	Water	625	PT/GC/MS	C64
EP Toxicity	Soil	1310, 8080, 8150	GC/ECD	C66
PCBs	Water Soil Oil	606 8080 IH 320	GC/ECD GC/ECD GC/ECD	C64 C66 C65

a. GC--gas chromatography; PT--purge and trap; ECD--electron capture detection; and MS--mass spectrometry.

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