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FU5
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Date: **October 13, 1995**
Refer to: EM/ER:95-556

SUBJECT: SUBMITTAL OF THE RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) REPORT FOR POTENTIAL RELEASE SITES (PRSs) IN TECHNICAL AREA 50

Dear Mr. Neleigh:

Enclosed are two copies of the Los Alamos National Laboratory's RFI Report covering PRSs 50-006(a), 50-006(c), 50-007, and 50-008. The report documents the field work performed as detailed in the approved RFI Work Plan for Operable Unit 1147 and the results of the sampling.

Please ask your office to contact Cheryl Rofer or Mike Gilgosch of our staffs at (505) 667-2988 or (505) 667-5794, respectively, if you have any questions.

Sincerely,

Jorg Jansen, Program Manager
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Sincerely,

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Enclosure: Submittal of RFI Report For PRSs In TA-50

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CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title: Submittal of RFI Report For PRSs In TA-50

Name: _____ Date: 10-5-95

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RFI Report for Potential Release Sites

50-006(c)
50-007
50-008
50-006(a)

(located in former Operable Unit 1147)

Field Unit 5

Environmental Restoration Project

September 1995

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-95-2738

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Joseph C. Vozella
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EXECUTIVE SUMMARY

This report describes the results of surface soil sampling on sites [potential release sites (PRSs) 50-006 (c), 50-007, and 50-008] that may have received airborne releases from three waste treatment facilities and the Ten Site Canyon outfall [PRS 50-006 (a)]. The three PRSs that may have received airborne releases overlap and were considered as a PRS aggregate; the Ten Site Canyon outfall is considered individually. The sources of possible airborne releases are the Liquid Waste Treatment Plant, the Incinerator Complex, and the Volume Reduction Facility. Ten Site Canyon is a small canyon that begins at Technical Area (TA) 50 and currently receives building and surface runoff from TA-50, Material Disposal Area (MDA) C, and TA-35. It received effluent from drain lines 55 and 67 until those drain lines were removed in 1981. In July and September 1974, untreated radioactive wastes and unknown chemicals were accidentally released to the head of Ten Site Canyon when a sump overflowed.

During the summer of 1993, surface soil samples were collected from 51 locations around the waste treatment facilities; no subsurface samples were collected. There were 53 sample locations in Ten Site Canyon starting at two discharge paths near the mouth of the outfall and continuing downstream for about 1300 ft. Samples were taken in the stream channel and from both banks. A surface sample was collected at each location, and subsurface samples were collected at one-third of the locations. All samples were analyzed for 12 metals, 13 radionuclides, volatile organic compounds, and semivolatile organic compounds. The data set is sufficiently complete and of sufficient quality to support decisions presented in this report.

The objective of this Phase I investigation was to confirm the presence or infer the absence of metals, radionuclides, and organic chemicals at these PRSs.

No Resource Conservation and Recovery Act (RCRA)-regulated chemicals appear to be associated with airborne releases at PRSs 50-006(c), 50-007, or 50-008. Some elevated concentrations of beryllium, cadmium, chromium, and silver were observed near a pipe rack that is currently being used; when those operations cease, that area should be characterized and cleaned up. All radionuclides were observed in concentrations within background, below human health screening action levels (SALs), or below preliminary remediation goals (PRGs). This PRS aggregate is recommended for no further action (NFA).

Elevated levels of PAHs (polycyclic aromatic hydrocarbons) were observed throughout the Ten Site Canyon outfall PRS. Elevated levels of PCBs (polychlorinated biphenyls) were observed at two locations approximately 100 ft apart. Elevated levels of thorium 232 were observed at one location near the outfall, one location about halfway down the canyon, and at two locations near the downstream boundary of the PRS. Elevated levels of cesium 137, cobalt 60, plutonium 238, plutonium 239/240, and strontium 90 were observed at several locations in a 150-ft reach in the upper one-third of the PRS. Samples taken from a hummock in the stream channel had the highest levels of radionuclides. Because the hummock could be dislodged during a rain event, an interim action to remove the hummock is recommended. Decisions regarding the remainder of the canyon should be made after Ten Site Canyon rim studies are completed and only while considering this PRS with the remainder of Ten Site Canyon. In particular, MDA C, which drains into Ten Site Canyon, may be identified as a possible source term if current drilling at MDA C reveals contaminant migration.

The investigation at TA-35 may also reveal one or more possible source terms for contamination in Ten Site Canyon. Field Unit 4 is conducting investigations at TA-35 and in the canyons. Further investigation and possible remedial actions on this PRS should be included in their studies.

Table ES-1 lists proposed actions for these PRSs.

TABLE ES-1

PROPOSED ACTIONS FOR THE PRSs

PRS or PRS Aggregate	HSWA	Proposed Action: NFA	Proposed Action: Interim Action	Proposed Action: Further Investigation	Rationale (Section #)
50-006(c), 50-007, 50-008 (Airborne releases)	Yes	X			No RCRA-regulated chemicals associated with these PRSs. All radionuclides within background, below human health SALs, or below PRGs (4.1.4).
50-006(a)	Yes		X	X	Significant concentrations of contaminants in an unstable hummock; rest of canyon needs more characterization (4.2.4).

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ACRONYMS

CFR	Code of Federal Regulations
COPC	Chemical of potential concern
EPA	Environmental Protection Agency
ER	Environmental restoration
ESAL	Ecotoxicological screening action level
ESG	Environmental Surveillance Group
FIMAD	Facility for Information Management, Analysis, and Display
HEPA	High-efficiency particulate air (filter)
IWP	Installation work plan
Laboratory	Los Alamos National Laboratory
LANL	Los Alamos National Laboratory
LCS	Laboratory control sample
MDA	Material disposal area
MS	Matrix spike
NFA	No further action
OU	Operable unit
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PRG	Preliminary remediation goal
PRS	Potential release site
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RPF	Records-Processing Facility
SAL	Screening action level
SCF	Sample Coordination Facility
SOP	Standard operating procedure
SVOC	Semivolatile organic compound
TA	Technical area
TSCA	Toxic Substances Control Act
UTL	Upper tolerance limits
VOC	Volatile organic compound

1.0 INTRODUCTION

Los Alamos National Laboratory (Laboratory) was established during World War II to design and test the first nuclear weapon. During the 1950s, 1960s, and early 1970s, Laboratory programs and facilities, most of which focused on nuclear weapons research and development, experienced significant growth. These programs produced various kinds of waste. Liquid and solid wastes, generated in large volumes, contained radioactive and hazardous components. Facilities for the treatment and disposal of some solid and low-level liquid wastes were constructed at Technical Area (TA) 50.

The Operable Unit (OU) 1147 Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan (LANL 1992, 0787) identified eleven potential release sites (PRSs) within TA-50 and the surrounding area. This report describes the results of sampling on sites [PRSs 50-006 (c), 50-007, and 50-008] that may have received airborne releases from three waste treatment facilities and the Ten Site Canyon outfall [PRS 50-006 (a)] (Figure 1-1). The sites that may have received airborne releases from the three facilities represent Aggregate 5, and the Ten Site Canyon outfall is part of Aggregate 6.

The approach to data assessment and analysis, the site-specific sampling results for Aggregate 5 and Ten Site Canyon, and the recommendations based on those sampling results are presented in this report.

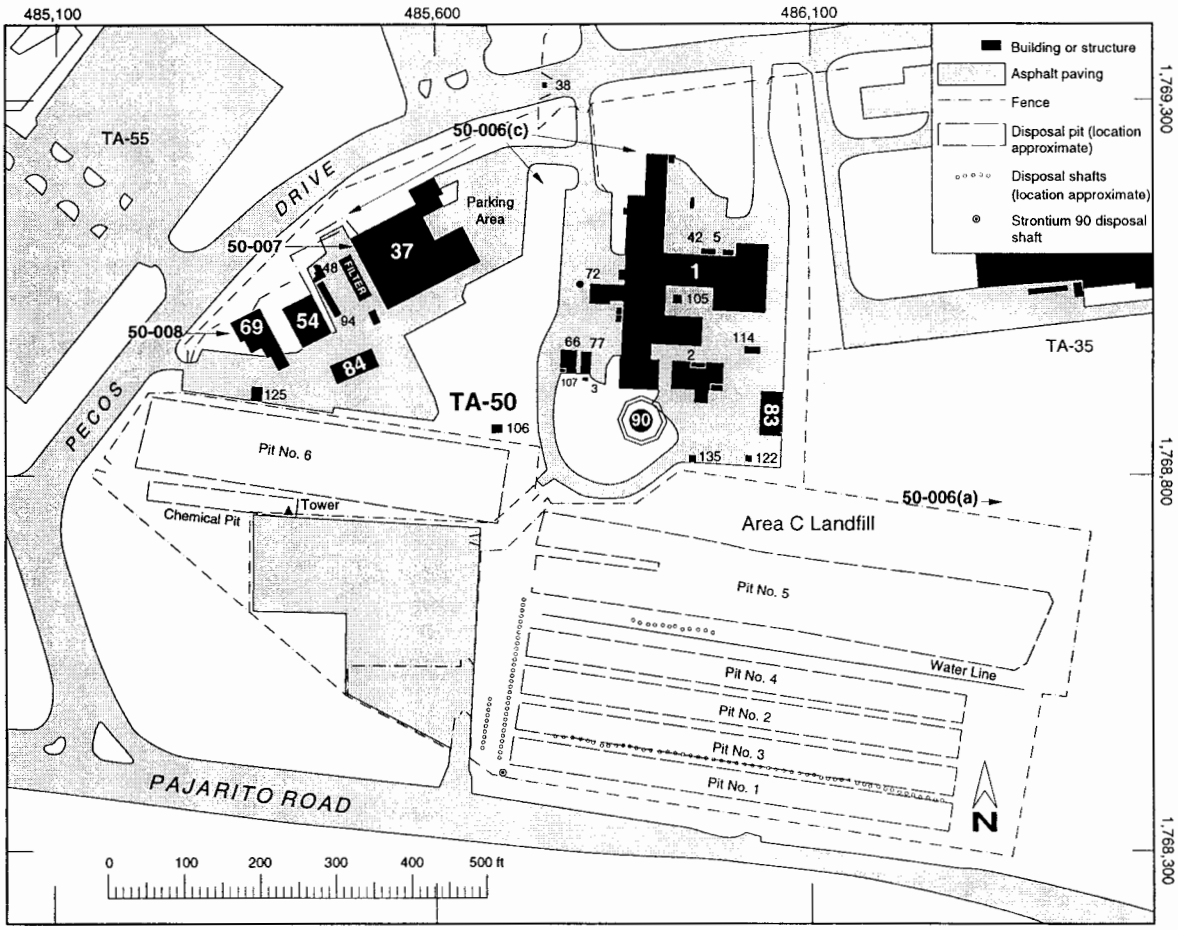

Figure 1-1. Locations of buildings and PRSs at TA-50.

1.1 Facility Background

The Liquid Waste Treatment Plant (TA-50-01) (called the Radioactive Liquid Waste Treatment Plant in the work plan) was built in 1963 to meet the need for treatment of the growing volume of waste and to locate a treatment facility closer to the TAs generating the waste (Figure 1-1). The plant receives liquid waste from many TAs, treats it to remove target chemicals, monitors the treated effluent, and releases this effluent to a National Pollutant Discharge Elimination System-permitted outfall in Mortandad Canyon. Treatment sludges go to Material Disposal Area (MDA) G at TA-54 for storage or disposal. Sites that may have received airborne releases from this plant are identified as PRS 50-006(c) .

The Incinerator Complex (now called the Controlled-Air Incinerator) is located in the Treatment Development Facility at TA-50-37 (Figure 1-1). The incinerator was built in 1975 and was originally conceived as a research and development project to demonstrate the application of commercially available incineration technology to the safe treatment of wastes contaminated with transuranics. From 1978 to 1987, 23 test burns were successfully conducted; these included both RCRA and Toxic Substances Control Act (TSCA) trial burns. The incinerator received Environmental Protection Agency (EPA) approval to incinerate polychlorinated biphenyls (PCBs) in 1984, and the state of New Mexico issued a RCRA hazardous waste operating permit in 1989. Actual waste streams incinerated under these permits included radioactively contaminated PCBs and scintillation cocktails. Operation of the incinerator was discontinued in 1987 to upgrade the system for routine waste treatment by improving control, reliability, and materials of construction. Sites that may have received airborne emissions from the incinerator are identified as PRS 50-007.

The Volume Reduction Facility, now called the Waste Characterization Reduction and Repackaging Facility, (TA-50-69), was built in 1979 (Figure 1-1). It was originally constructed to reduce the size of glove boxes and other metal objects contaminated with transuranic waste. The facility was upgraded and the ventilation system was modified in 1986. Gaseous wastes from the facility are now filtered by a double high-efficiency particulate air (HEPA) filter. The facility continues to be used for the original purpose as well as for experimental support in the transuranic waste arena and as a host location for process demonstrations that need to be contained in filtered air volume. The facility has produced no RCRA liquid waste. Sites that may have received airborne emissions from this facility are identified as PRS 50-008.

Ten Site Canyon is a small canyon that begins at TA-50. This canyon receives building and surface runoff from TA-50 and other sites. There have been accidental spills from TA-50 into Ten Site Canyon.

Operations continue at most of the facilities at TA-50, except the Incinerator Complex, which is currently inactive.

1.2 RFI Phase I Work Plan Overview

The OU 1147 work plan focuses on meeting site characterization requirements in a cost-effective manner. This approach incorporates a health-risk-based decision-making process [consistent with the installation work plan (IWP) (LANL 1993, 1017) and proposed Subpart S to 40 CFR 264] for recommending PRSs or PRS aggregates for no further action (NFA), expedited cleanup, voluntary corrective action, or further study. It also incorporates a

phased site-characterization methodology that follows EPA and IWP guidelines. The technical approach is described in chapter 4 of the RFI work plan (LANL 1992, 0787).

The primary purpose of the RFI at TA-50 was to determine the current distribution of radionuclides and chemicals in soil, sediment, and rock and compare analytical results with risk-based screening action levels (SALs). Objectives of the sampling and analysis were the following:

(1) determine the concentrations of chemicals;

(2) compare the data with background and/or SALs (section 3.2, "Screening Assessment Methodology") to identify chemicals of potential concern (COPCs); and

(3) determine whether NFA can be recommended, Phase II investigations are required, or corrective measures must be taken (section 3.4, "Development of Conclusions and Recommendations").

Specific objectives for the aggregates follow.

1.2.1 Aggregate 5: Sites Associated with Atmospheric Releases from the Liquid Waste Treatment Plant, the Incinerator Complex, and the Volume Reduction Facility

Phase I objectives of the surface soil sampling for sites associated with atmospheric releases were to (1) confirm available information on radionuclide concentrations in surface soils in unpaved areas and (2) measure the concentrations of hazardous chemicals.

Sampling locations on the unpaved areas around the TA-50 buildings were chosen in areas judged most likely to concentrate chemicals from atmospheric releases and local runoff: adjacent (within 5 feet) to pavement, within drainage channels (unpaved areas surrounding buildings), and in other areas where there is surface soil.

1.2.2 Ten Site Canyon Outfall

Phase I surface soil sampling objectives for Ten Site Canyon outfall were to (1) confirm available information on radionuclide concentrations in surface soils along the banks of the stream channels and in the stream channel sediments and (2) measure the concentrations of hazardous chemicals.

Sampling locations were chosen near former outfalls into Ten Site Canyon, on both banks of the drainage channel, and in the canyon drainage channel at regular intervals to about 1300 ft downstream from the boundary of TA-50. Additional sampling further downstream in Ten Site Canyon is being conducted by Field Unit 4 under the OU 1129 RFI work plan (LANL 1992, 0785).

1.3 Field Activities

Surface soil sampling was carried out for Aggregate 5 and Ten Site Canyon during the summer of 1993. Before samples were collected, each sampling site was field screened for organic vapors, using an hnu photoionization detector, and for radioactive materials, using an Eberline beta-gamma meter. (Typical detection limits for these instruments are 0.1 ppm for the photoionization detector and 100 cpm for the beta-gamma meter.) After collection, the samples were screened for gross alpha and beta radiation. At Ten Site Canyon, the gross alpha-beta screening revealed the presence of elevated alpha radiation at sample location 50-6512. An area upstream and downstream from 50-6512 was field screened for

radiological activity, and additional soil sampling points were selected and sampled. These additional samples, numbered 50-6550 through 50-6568, were analyzed for metals, radiation, and organics. For presentation and discussion of those results, see sections 4.2.3.2, 4.2.3.3, and 4.2.4.

Sampling plans are provided in detail in chapter 5 of the OU 1147 RFI work plan (LANL 1992, 0787) and follow protocols established in the IWP (LANL 1993, 1017) and in "Administrative and Quality Procedures for Environmental Restoration" (LANL 1993, 0951). Deviations from the approved sampling plans are noted in sections 4.1.2 and 4.2.2 of this report.

2.0 ENVIRONMENTAL SETTING

The Laboratory is located in Los Alamos County, in north-central New Mexico, approximately 62 mi. (100 km) north-northeast of Albuquerque and 25 mi. (40 km) northwest of Santa Fe. The 43-mi.^{2} (111-km^2) Laboratory site and the communities adjacent to it are situated on the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons containing ephemeral and intermittent streams that run from west to east. Mesa tops range in elevation from approximately 7870 ft (2400 m) on the eastern flank of the Jemez Mountains to about 5900 ft (1800 m) at their eastern termination above the Rio Grande Valley.

TA-50 is located on Mesita del Buey along Pajarito Road in the central northern half of the Laboratory. It is bounded by Two-Mile Canyon, Cañada del Buey, Ten Site Canyon, and Mortandad Canyon. Mesa elevations range from 7200 to 7280 ft (2194 to 2218 m).

2.1 Climate

Los Alamos County has a semiarid, temperate mountain climate. Wind speeds are less than 5.5 mph (2.5 m/s) about 40% of the time and greater than 11 mph (5 m/s) about 20% of the time. Strong winds occur mainly in the spring and during thunderstorm activity. The predominant wind direction, especially for strong winds, is toward the north-northeast. Forty percent of the precipitation on the Pajarito Plateau occurs as brief, intense thunderstorms during July and August; these often produce significant runoff of surface water. This suggests that water-driven erosion of surface soils may be an important mechanism for transporting surficial chemicals at TA-50. Winter snowfall averages 51 in. (130 cm) annually (ESG 1989, 0308). Summer temperatures range from 50°F (night) to 90°F (day). Winter temperatures typically range from 30°F to 50°F during the day and from 15°F to 25°F at night, occasionally dropping to 0°F or below (LANL 1993, 1017).

2.2 Geology

The Pajarito Plateau extends east from the Jemez Mountains and is on the western margin of the Española Basin segment of the Rio Grande rift. TA-50 is approximately midway between the mountains and the Rio Grande and is underlain by Miocene through Pleistocene volcanic and sedimentary rocks. Factors that may affect the geometry of subsurface units include abrupt lateral and vertical facies variations in the lower sedimentary rock units, significant relief on paleotopographic surfaces on which rock units were deposited, and fault offsets in the older sedimentary units that are masked by younger volcanic rocks (which themselves show little or no displacement). Soils in the vicinity of TA-50 are poorly developed, as is typical of soils derived from Bandelier Tuff bedrock and formed under semiarid climate conditions (Nyhan et al. 1978, 0161). Within TA-50 very little soil cover is

undisturbed because of building, parking lot, and disposal pit construction. Soil depth on the mesa is approximately 3 to 5 ft (0.9 to 1.5 m) (Rogers 1977, 0216). The mesas are intersected by canyons, e.g., Ten Site Canyon, which begins as the main drainage for surface runoff from TA-50. The canyon has experienced a period of accretion since the early activities at TA-50. Eroded soils have been deposited in the sediment on the canyon bottom and stream banks. These soils have the potential for redistribution downstream.

2.3 Hydrology

Surface water near TA-50 consists primarily of intermittent streams. Springs on the flanks of the Jemez Mountains supply base flow, the flow of water entering stream channels from ground water sources, into the upper reaches of some canyons. The amount of water, however, is insufficient to maintain surface flow across the site because it is depleted by evaporation, transpiration, and infiltration. Runoff from summer thunderstorms reaches a maximum discharge in less than two hours and generally dissipates in less than 24 hours. Spring snowmelt takes place at low discharge rates over a period of several weeks to several months. Although the long duration of flow results in the movement of significant masses of suspended and bed sediments, the total mass transported by snowmelt runoff is small compared with that carried by summer thunderstorm runoff (Purtymun et al. 1990, 0215).

Studies summarized in the IWP indicate that, for native soil profiles, infiltration of water into the tuff bedrock is not a significant mechanism for the movement of chemicals. Even with the prolonged presence of a water source, transfer of moisture to the tuff is limited. In vegetated areas, strong evaporative potential coupled with transpiration quickly removes water from the soil and upper tuff profiles.

Ground water exists in three modes in the Los Alamos area:

- water in shallow alluvium in canyons,
- perched water, and
- water in the main aquifer of the Los Alamos area.

The alluvium is quite permeable, and this characteristic causes downgradient movement of water in the alluvium. Perched water is found in limited areas beneath the lower Pueblo and Los Alamos canyons; however, it is not known to exist near or under TA-50. The main aquifer, which is mostly in the Santa Fe Group clastic rocks, is the only aquifer in the Los Alamos area capable of serving as a municipal water supply. The aquifer surface rises westward from the Rio Grande within the Tesuque Formation into the lower part of the Puye Formation beneath the central and western parts of the plateau. The aquifer depth is approximately 950 ft (290 m) at Ten Site Canyon and 1100 ft (335 m) on the mesa at TA-50.

2.4 Biological and Cultural Surveys

A biological survey, which included information on Ten Site Canyon, was conducted (Dunham 1993, 07-0070). No threatened and endangered species were identified. No floodplain/wetland issues were identified for the sites associated with atmospheric releases or for Ten Site Canyon.

A cultural survey, which included information on Ten Site Canyon, was also conducted (Manz et al. 1994, 07-0071). No historical or archeological sites were found in the areas discussed in this report.

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSIS

3.1 Summary of Quality Assurance/Quality Control Activities

Collection and analysis of samples and the collection of related location data were conducted according to quality assurance/quality control (QC) requirements described in sections 4.2.6 and 4.2.8 of the RFI work plan for OU 1147 (LANL 1992, 0787) and the "Generic Quality Assurance Project Plan for RCRA Facility Investigations," Appendix T, Vol. II, of the "Installation Work Plan for Environmental Restoration" (LANL 1991, 0553). The objective was to produce a complete, representative data set for each PRS.

The usability of the analytical data was determined by examining results from QC samples [blind samples, matrix spike (MS) samples, method blanks, and surrogate spike samples] and laboratory control samples (LCSs) (Appendix A). Because the screening assessment process compares analytical data for field samples with SALs, it is important to eliminate the possibility that these data may be biased low and show false negative results or be biased high and show false positive results. Only suspect or unusable analytical data for field samples are detailed in the following sections; all other data were usable. Usability of suspect data depends on several factors including

- the direction and degree of possible bias,
- information about all QC samples associated with the group,
- the type of decision to be made, and
- how the results will be used to support the decision.

All holding times were met.

Standard operating procedures (Appendix B) were used to ensure the quality of field and analytical data. Deviations from these procedures are noted.

3.1.1 Inorganic Analysis

EPA SW-846, method 6010 (inductively coupled plasma/mass spectroscopy or atomic absorption), was used to analyze for 12 RCRA-listed metals. Blind samples were included in each group sent to the analytical laboratories. MS analyses were conducted for approximately 5% of the samples in each group.

The analytical process was considered to be *in control* if at least 80% but not more than 120% of the spiked amount was recovered. When the process was *out of control*, field samples associated with that group were suspect (Table 3-1). Generally, there are several QC samples associated with a group, and the results may be conflicting.

All field sample results for inorganic analyses were judged to be sufficient to support screening decisions.

3.1.2 Organic Analysis

Gas chromatography coupled to mass spectroscopy identified and quantitated volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) according to EPA SW-846, methods 8260 and 8270. Gas chromatography coupled to electron capture identified and quantitated PCBs according to EPA SW-846, method 8080.

The analytical laboratory ran method blanks with each group. Methylene chloride was detected in three method blanks at concentrations of 0.0078, 0.0088, and 0.0073 mg/kg and in the

TABLE 3-1

FIELD SAMPLES ASSOCIATED WITH MS AND BLIND SAMPLES WITH LOW (LESS THAN 80%) OR HIGH (MORE THAN 120%) RECOVERIES

Aggregate	Report Number	Location Numbers	Sample Numbers	Comments
			Arsenic	
Ten Site	20620	50-6550 through 50-6564	AAA3200 through AAA3219, AAA3223 through AAA3225, AAA3228, AAA3229	Both MS low (70% & 70%)
Ten Site	20659	50-6500 through 50-6510	AAA2519 through AAA2529, AAA2687, AAA2688, AAA2715 through AAA2723	One MS (0%), one within limits
Ten Site	20862	50-6535 through 50-6543	AAA2650 through AAA2679	One LCS/blind outside limits, two within limits
Ten Site	20863	50-6523 through 50-6543	AAA2638 through AAA2649, AAA2680 through AAA2686, AAA2705, AAA2706	One LCS/blind outside limits, one within limits
Ten Site	22377	50-6512, 50-6514, 50-6565 through 50-6568	AAA3220 through AAA3222, AAA3226, AAA3227, AAA3230 through AAA3238, AAA3240, AAA3241	One LCS/blind outside limits, one within limits
Unpaved Areas	21578	50-5001 through 50-5009, 50-5020 through 50-5031	AAA2439 through AAA2459, AAA2490	One LCS/blind outside limits, six within limits
			Beryllium	
Ten Site	20870	50-6511 through 50-6522	AAA2530, AAA2532, AAA2534 through AAA2540, AAA2637, AAA2707 through AAA2714	MS high (140.3%)
Unpaved Areas	19538	50-5062 through 50-5069	AAA2470 through AAA2477	One LCS/blind outside limits, one within limits
Unpaved Areas	20196	50-5041 through 50-5048, 50-5060, 50-5061, 50-5070, 50-5080 through 50-5090	AAA2460 through AAA2469, AAA2478 through AAA2489, AAA2491	One LCS/blind outside limits, three within limits

TABLE 3-1 (continued)

Aggregate	Report Number	Location Numbers	Sample Numbers	Comments
			Lead	
Ten Site	22377	50-6512, 50-6514, 50-6565 through 50-6568	AAA3220 through AAA3222, AAA3226, AAA3227, AAA3230 through AAA3238, AAA3240, AAA3241	One MS high (1750%), one LCS/blind outside limits, one LCS/blind within limits
			Antimony	
Ten Site	20862	50-6535 through 50-6543	AAA2650 through AAA2679	Both MS low (45.2%, 48.8%)
Ten Site	20863	50-6523 through 50-6543	AAA2638 through AAA2649, AAA2680 through AAA2686, AAA2705, AAA2706	MS low (62.8%)
Ten Site	20870	50-6511, 50-6513, 50-6515 through 50-6522	AAA2530, AAA2532, AAA2534 through AAA2540, AAA2637, AAA2707 through AAA2714	MS low (47.5%)
			Selenium	
Ten Site	20620	50-6550 through 50-6564	AAA3200 through AAA3219, AAA3223 through AAA3225, AAA3228, AAA3229	Both MS low (60% and 70%)
Ten Site	20659	50-6500 through 50-6510	AAA2519 through AAA2529, AAA2687, AAA2688, AAA2716 through AAA2723	One MS low (70%), one within limits (94%)
Ten Site	20870	50-6511, 50-6513, 50-6515 through 50-6522	AAA2530, AAA2532, AAA2534 through AAA2540, AAA2637, AAA2707 through AAA2714	MS low (78%)
Ten Site	22377	50-6512, 50-6514, 50-6565 through 50-6568	AAA3220 through AAA3222, AAA3226, AAA3227, AAA3230 through AAA3238, AAA3240, AAA3241	One LCS/blind outside limits, one within limits, MS within limits (90%)
Unpaved Areas	21578	50-5001 through 50-5009, 50-5020 through 50-5031	AAA2439 through AAA2459, AAA2490	MS low (70%)

TABLE 3-1 (concluded)

Aggregate	Report Number	Location Numbers	Sample Numbers	Comments
		Thallium		
Ten Site	22377	50-6512, 50-6514, 50-6565 through 50-6568	AAA3220 through AAA3222, AAA3226, AAA3227, AAA3230 through AAA3238, AAA3240, AAA3241	MS high (158%)
Unpaved Areas	20196	50-5041 through 50-5048, 50-5060, 50-5061, 50-5070, 50-5080 through 50-5090	AAA2460 through AAA2469, AAA2478 through AAA2489, AAA2491	One LCS/blind outside limits, one within limits
		Silver		
Unpaved areas	20196	50-5041 through 50-5048, 50-5060, 50-5061, 50-5070, 50-5080 through 50-5090	AAA2460 through AAA2469, AAA2478 through AAA2489, AAA2491	Two LCS/blind outside limits, two within limits
		Chromium		
Unpaved Areas	20196	50-5041 through 50-5048, 50-5060, 50-5061, 50-5070, 50-5080 through 50-5090	AAA2460 through AAA2469, AAA2478 through AAA2489, AAA2491	One LCS/blind outside limits, two within limits

following associated field samples:

- sample AAA2655 at location 50-6540 at .0068 mg/kg,
- sample AAA2656 at location 50-6541 at .0073 mg/kg,
- sample AAA2659 at location 50-6535 at .0069 mg/kg,
- sample AAA2674 at location 50-6542 at .0081 mg/kg, and
- sample AAA2676 at location 50-6543 at .0071 mg/kg.

Because those results are undoubtedly the consequence of laboratory contamination, the methylene chloride results for those samples were dropped from the data set.

QC sample recoveries were compared with control limits set by the EPA (Tables 3-2 and 3-3). For MSs, the process was considered to be in control if the recovery was between the lower and upper limits. Lower and upper limits also exist for surrogate spikes, but the following additional guidelines apply.

TABLE 3-2

MS CONTROL LIMITS ESTABLISHED BY EPA

Class	Analyte	Lower Control Limit (percent of spiked amount)	Upper Control Limit (percent of spiked amount)
VOC	Benzene	66	142
	Chlorobenzene	60	133
	Dichloroethane [1,1-]	59	172
	Toluene	59	139
	Trichloroethene	62	137
SVOC	Acenaphthene	31	137
	Chloro-3-methylphenol [4-]	26	103
	Chlorophenol [o-]	25	102
	Dichlorobenzene (1,4) [p-]	28	104
	Nitrophenol [4-]	11	114
	Nitrosodi-n-propylamine [N-]	41	126
	Pentachlorophenol	17	109
	Phenol	26	90
	Pyrene	35	142
	Trichlorobenzene [1,2,4-]	38	107

TABLE 3-3

SURROGATE SPIKE CONTROL LIMITS ESTABLISHED BY EPA

Class	Analyte	Lower Control Limit*	Upper Control Limit*
VOC	Dichloroethane d4 [1,2-]	70	121
	Toluene d8	81	117
	Bromofluorobenzene [4-]	74	121
SVOC (acid-extractable)	Fluorophenol [2-]	25	121
	Phenol-d6	24	113
	Tribromophenol [2,4,6-]	19	122
SVOC base/neutrals	Nitrobenzene-d5	23	120
	Fluorobiphenyl [2-]	30	115
	Terphenyl-d14	18	137

* Indicates the percent of the spiked amount.

- If one or more of the VOC surrogate spike sample results are outside the limits, the associated field sample is labeled unusable according to the method guidelines. For the purposes of this assessment, the associated field sample was considered to be biased, and usability was determined according to the factors listed in section 3.1.
- If no more than one of the acid-extractable SVOC surrogate spike sample results and not more than one of the base/neutral SVOC surrogate spike sample results are outside the limits and all surrogate samples extracted at least 10%, the process is considered in control.
- If two or more of the acid extractable SVOC surrogate spike sample results or two or more of the base/neutral SVOC surrogate spike sample results are outside the limits but all surrogate samples extracted at least 10%, the associated field sample result is qualified as estimated, but the process is in control.

QC samples associated with processes that are out of control are presented in Table 3-4.

MS analyses were conducted for approximately 5% of the samples in each group. In every case where the MS recoveries were low, the field samples in that group did not have any detects for that analyte. Surrogate spike analyses were conducted for each sample. Analytical data may be biased low for samples where recoveries were less than the EPA lower limit and may be high for those above the EPA upper limit.

All SVOC results in report 19711 may be biased low, as indicated by the low MS recoveries. However, the surrogate spike recoveries for one sample, AAA2531 at location 50-6512, were high. The only SVOC detected in that sample was Aroclor 1260. Because the QC sample

TABLE 3-4

FIELD SAMPLES ASSOCIATED WITH MS AND SURROGATE SPIKE SAMPLES WITH LOW OR HIGH RECOVERIES

Aggregate	Report Number	Location Numbers	Sample Numbers	Comments
			SVOCs	
Ten Site	19969	50-6523 through 50-6533	AAA2638 through AAA2649, AAA2680 through AAA2686, AAA2705, AAA2706	Five of the MS had high recoveries
Ten Site	20483	50-6511, 50-6513, 50-6515 through 50-6522	AAA2520, AAA2532, AAA2534 through AAA2540, AAA2637, AAA2707 through AAA2714	Six of the MS had high recoveries
Ten Site	19711	50-6512, 50-6514	AAA2531, AAA2533	Six of the MS had low recoveries
Unpaved Areas	19073	50-5062 through 50-5069	AAA2470 through AAA2477	One of the MS had high recovery
Ten Site	19711	50-6512	AAA2531	Surrogate spike recovery high
Ten Site	20483	50-6518	AAA2714	Surrogate spike recoveries high
Ten Site	20358	50-6512, 50-6566	AAA3227, AAA3231	Surrogate spike recoveries high
			VOCs	
Ten Site	22503	50-6512, 50-6514, 50-6565 through 50-6568	AAA3220 through AAA3222, AAA3226, AAA3227, AAA3230 through AAA3241	Four of the MS had low recoveries
Ten Site	19504	50-6500 through 50-6510	AAA2519 through AAA2529, AAA2687, AAA2688, AAA2715 through AAA2723	Three of the MS had low recoveries

TABLE 3-4 (concluded)

Aggregate	Report Number	Location Numbers	Sample Numbers	Comments
			VOCs	
Ten Site	20046	50-6535 through 50-6543	AAA2650 through AAA2679	Two of the MS had low recoveries
Ten Site	19269	50-6523, 50-6525, 50-6526, 50-6528, 50-6529, 50-6532, 50-6534, 50-6533	AAA2638, AAA2640, AAA2641, AAA2643, AAA2644, AAA2646, AAA2647, AAA2649, AAA2680, AAA2681, AAA2683	Surrogate recoveries high
Ten Site	20046	50-6535 through 50-6543	AAA2650 through AAA2653, AAA2656, AAA2658, AAA2660, AAA2664 through AAA2667, AAA2670 through AAA2673, AAA2675, AAA2677, AAA2678	Surrogate recoveries high
Ten Site	19504	50-6502, 50-6503, 50-6506 through 50-6508, 50-6519, 50-6521, 50-6523	AAA2717, AAA2719 through AAA2723, AAA2726, AAA2727, AAA2729, AAA2687, AAA2688	Surrogate recoveries high
Ten Site	20780	50-6559, 50-6560	AAA3206, AAA3211	Surrogate recoveries high
Ten Site	22503	50-6512	AAA3227	Surrogate recoveries low
Ten Site	20780	50-6550 through 50-6564	AAA3200 through AAA3219, AAA3223 through AAA3225, AAA3228, AAA3229	Surrogate recoveries on LCSs/blinds low
Ten Site	19269	50-6514, 50-6528, 50-6565, 50-6567	AAA2682, AAA3221, AAA3222, AAA3226, AAA3234, AAA3241	Surrogate recoveries low

results were erratic, that result will be used with caution, i.e., it will not be discarded entirely but will be compared with other Aroclor 1260 results throughout the canyon. It is not the only observation of Aroclor 1260 above SAL but is greater than three times the next highest level. There was only one other field sample reported (AAA2533 at location 50-6514); it had no SVOCs detected.

Reports 19969, 20483, and 19073 indicated some high MS recoveries. In addition, several samples had MS recoveries within limits but had high surrogate spike recoveries. However, there were no SVOCs detected in those samples.

All VOC results in reports 19504 and 20046 may be biased low, as indicated by the low MS recoveries. Report 19504 included information on 11 locations. The only analytes detected were acetone (in 10 samples with a concentration range of 0.028 to 0.082 mg/kg) and tert-butylbenzene and 4-isopropyltoluene in the remaining sample (with concentrations of 0.009 and 0.035 mg/kg, respectively). Acetone and 4-isopropyltoluene were not detected in the blanks. Tert-butylbenzene was not analyzed for in the blanks. Report 20046 included information on 6 samples. Methylene chloride was detected in five of the six samples (and in the method blanks). Acetone was detected in two of the samples at 0.021 and 0.041 mg/kg but was not detected in the blanks.

The LCSs in report 20780 had low surrogate spike recoveries. However, there were no VOCs detected at levels above three orders of magnitude below SALs. Therefore, low bias of VOCs is negligible relative to SALs. Likewise, high surrogate recoveries are not of concern because VOC detections were below SALs.

3.1.3 Radiochemistry Analysis

Methods used to quantitate radionuclides are summarized in Table 3-5.

MS and blind samples were included with each group except for those groups that were going to be analyzed for tritium. In those cases, LCSs that contained known amounts of tritium were used. Results for MS samples were considered within limits if the recovery was at least 80% and not more than 120% of the spiked amount. Analytical data may be biased low for groups where recoveries were less than 80% and biased high if over 120%. Results for blind samples were considered to be outside limits when the analytical error exceeded two standard deviations based on counting statistics, using the assumption that counting error follows a Poisson distribution. There were two surrogate spike analyses for plutonium 242 tracer that recovered less than 80% (Table 3-6). The associated field samples may be biased low. However, there were numerous other field samples collected in the immediate vicinity whose plutonium 242 tracer samples were in control. Therefore, the site is adequately represented for screening assessment of plutonium 238 and plutonium 239/240. Three groups of tritium samples had low LCS/blind recoveries, and one group had no QC samples. The lowest LCS/blind recovery was 78.5%, whereas the highest measured concentration of tritium in a field sample was 19.1 pCi/g, an order of magnitude below the SAL of 800 pCi/g. Therefore, all tritium samples are usable for screening assessment.

3.1.4 High Explosives Analysis

No high explosives analyses were conducted at Ten Site Canyon or the unpaved areas.

TABLE 3-5

SUMMARY OF RADIOCHEMISTRY ANALYTICAL METHODS

Analytes	Method
Plutonium 238, plutonium 239/240, and americium 241	Alpha spectroscopy with chemical separation
Americium 241 and cesium 137	Gamma spectroscopy
Gross alpha/beta radioactivity and strontium 90 after chemical separation	Gas-flow proportional counting
Total uranium	Kinetic phosphorescence analysis
Tritium	Liquid scintillation
Percent water	Gravimetric

3.2 Screening Assessment Methodology

Simple comparisons of analytical results to SALs determine which chemicals require additional study and which do not. Chemicals requiring additional study are retained as COPCs. Chemicals not requiring additional study are dropped from further evaluation. A detailed discussion of screening assessment may be found in Chapter 4 and Appendix J of the Laboratory IWP (LANL 1993, 1017). The decision flow diagram (Figure 3-1) shows all the steps in the data analysis process except for the data quality assessment step. The screening assessment phase is indicated. Screening is conducted on all detected analytes at a site, and analytes that are not detected (nondetects) are eliminated from the screening process.

The results from the background evaluations, SAL comparisons, and an application of regulatory guidelines were used to determine the COPCs. This is in accordance with guidance for the screening assessment methodology from the IWP (LANL 1993, 1017); from Chapter 5 of "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)" (EPA 1989, 0305).

3.2.1 Background Comparison

Most inorganics and certain radionuclides occur naturally in soils. Other radionuclides occur in soils as a result of worldwide fallout, mostly from atmospheric testing of nuclear weapons. These COPCs were compared with background concentrations in comparable uncontaminated soils. The statistical comparisons to background in this report follow the general guidance in the Laboratory Environmental Restoration Project policy paper, "Statistical Comparisons to Background, Part I" (Environmental Restoration Project Assessments Council 1995, 1218).

This report uses methods described in the EPA guidance document, "Statistical Analysis of Ground-water Monitoring Data at RCRA Facilities" (EPA 1989,1141). The hot measurement test was used as the first statistically based screening tool for background comparisons of TA-50

TABLE 3-6

FIELD SAMPLES ASSOCIATED WITH LOW (LESS THAN 80%) OR HIGH (GREATER THAN 120%) RADIONUCLIDE QC SAMPLES

Aggregate	Report Number	Location Numbers	Sample Numbers	Comments
		Plutonium 242 Tracer		
Ten Site	30386	50-6026, 50-6512, 50-6514	AAA2531, AAA2533, AAA2730, AAA2737	All four MS recoveries low (58%, 72%, 70%, 76%)
		Plutonium 238		
Ten Site	22630	50-6535 through 50-6543	AAA2650 through AAA2679	One LCS/blind recovery above upper limit (145%), two within limits
		Plutonium 239/240		
Ten Site	22630	50-6535 through 50-6543	AAA2650 through AAA2679	One LCS/blind recovery above upper limit (368%), two within limits
		Tritium		
Unpaved Areas	21787	50-5041 through 50-5048, 50-5060, 50-5061, 50-5070, 50-5080 through 50-5090	AAA2460 through AAA2469, AAA2478 through AAA2489, AAA2491	LCS/blind recovery low (79.2%)
Ten Site	21732	50-6523 through 50-6534	AAA2638 through AAA2649, AAA2680 through AAA2686, AAA2705, AAA2706	LCS/blind recovery low (79.9%)
Ten Site	22051	50-6511, 50-6513, 50-6515 through 50-6522	AAA2530, AAA2532, AAA2534 through AAA2540, AAA2637, AAA2707 through AAA2714	LCS/blind recover low (78.5%)
Ten Site	27287	50-6026, 50-6512, 50-6514	AAA2531, AAA2533, AAA2730, AAA2737	No QC samples recorded for group

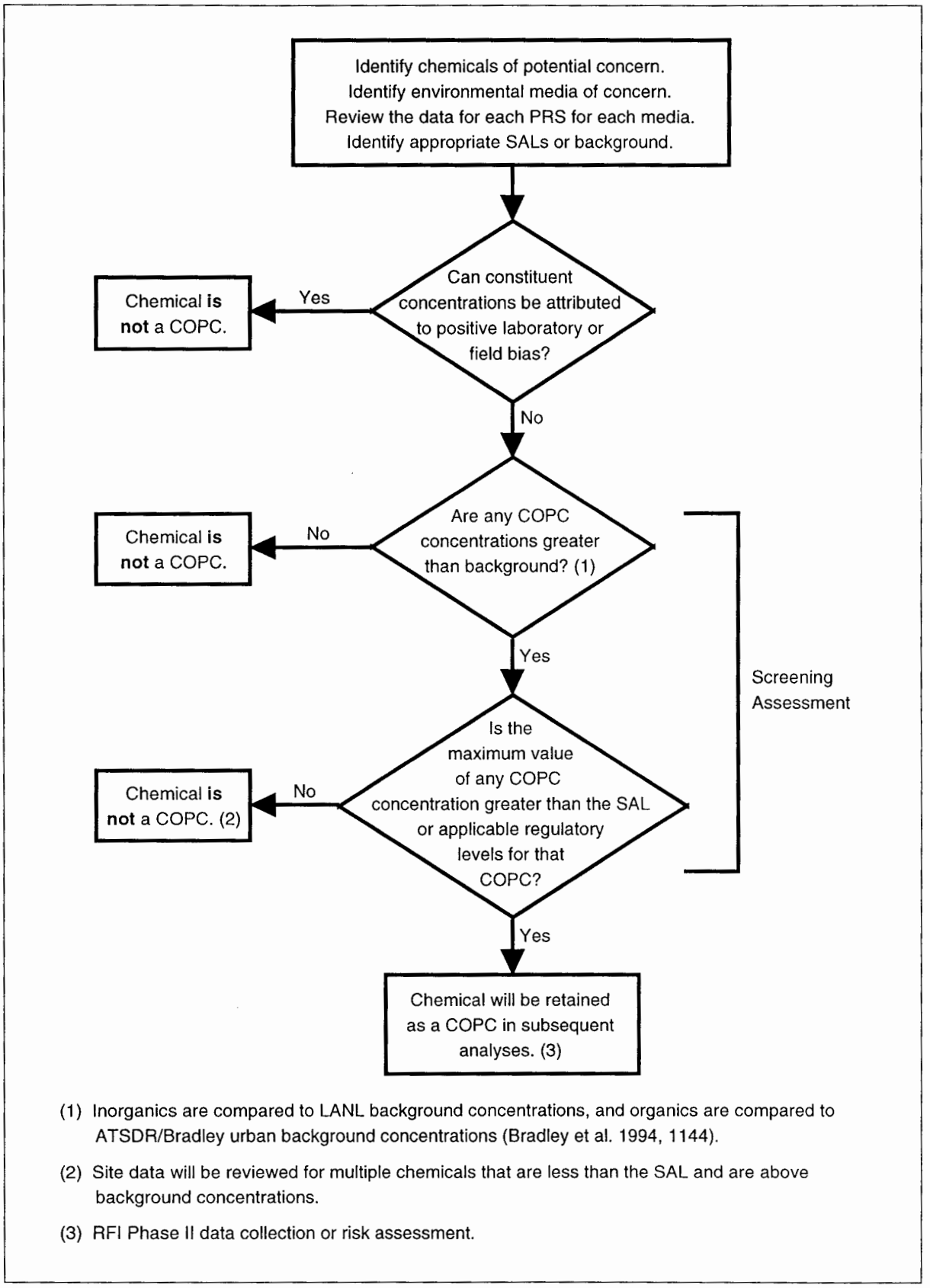

Figure 3-1. Data analysis flow chart for RFI reports.

data. This test identifies the site data that exceed background concentrations. It is based on the upper tolerance limits (UTLs) calculated for naturally occurring inorganics and radionuclides. The UTL is the 95% upper confidence level of the 99th percentile. The 99th percentile is a value, estimated from the data distribution, that will be exceeded by only 1% of the data. For more information on UTLs, see the Laboratory Environmental Restoration Project policy paper on background comparisons (Environmental Restoration Project Assessments Council 1995, 1218). UTLs were not calculated for inorganics with a detection frequency of 50% or less (antimony, cadmium, mercury, selenium, and thallium) nor for fallout radionuclides (plutonium 238, plutonium 239/240, cesium 137, and strontium 90). The background maximum from the Longmire et al. data set (1995, 1142) was used as a screening value for metals and naturally occurring radionuclides without UTLs. For each fallout radionuclide, the maximum value from environmental surveillance data from 1975 through 1989 was used as a screening value. A UTL was calculated for potassium 40 using the Longmire data set and multiplying total potassium by a factor of 0.00081736 to adjust for natural occurrence of potassium 40 and to convert from mg/kg to pCi/g. Inorganic chemicals with values less than their background UTLs are eliminated as COPCs.

A second test, the Wilcoxon rank sum test, was used to test for a distributional shift between the site data set and the background data set. It addresses the question, "Are the observed analyte concentrations in the site data consistently larger than those from the background data?" For more information on the Wilcoxon rank sum test, see the Laboratory Environmental Restoration Project policy paper on background comparisons (Environmental Restoration Project Assessments Council 1995, 1218). Requirements for the background data set to use in a Wilcoxon rank sum test are similar to the requirements for calculating a UTL. Therefore, the test is possible only for analytes with UTLs. For purposes of this test *only*, one-half the reporting limit was used in place of the reporting limit.

The Wilcoxon test was conducted for analytes that were less than their UTL and for arsenic and beryllium. Arsenic and beryllium were tested because there are no SALs for these metals, so both tests are useful in making screening decisions. A distributional shift should be considered for analytes with no SAL even if the maximum observed value is less than a UTL because a distributional shift may be evidence of a release.

3.2.2 SALs Comparison/Other Standards

SALs are conservative, risk-based levels (primarily based on proposed RCRA Subpart S) that are used for preliminary screening of data. Appendix K of the IWP (LANL 1993, 1017) provides an in-depth explanation of how SALs are derived. All analytes detected at concentrations greater than the contract laboratory reporting limit and background levels are compared with their respective SALs. This comparison places each analyte into one of the three following categories:

- *Equal to or Exceeds SAL.* At least one value from the analytical data for this analyte exceeds its respective SAL. Any chemical that is equal to or exceeds the SAL is evaluated further unless an applicable regulatory guideline takes precedence.
- *No SAL.* No SAL is available for comparison, and at least one value from analytical data is greater than the contract laboratory reporting limit. Regulatory guidelines are checked for other appropriate concentration levels for comparison.

- *Below SAL.* All values from analytical data are less than the corresponding SAL. Analytes whose concentrations all lie below their respective SALs do not pose a significant risk. However, these analytes are evaluated further to determine the potential for adverse health effects due to exposure to the analyte in combination with other chemicals.

Combinations of chemicals, those whose concentrations are near SALs but do not exceed them, could prove harmful to human health. For a multiple chemical evaluation, additive effects were assumed, and concentration data were normalized to SALs. If the sum of normalized concentrations for the COPCs is equal to or greater than one, then the combination of chemicals has the potential for adverse health effects. If the sum of normalized concentrations for the COPCs is less than one, then they are eliminated as COPCs. This evaluation is used for screening purposes only, and the sums do not indicate risk levels. The equation for calculating the appropriate sum is

$$M = \sum_{COPCs} C_i / SAL_i ,$$

where

M = sum of proportions over all COPCs,
C_i = maximum concentration of the ith chemical, and
SAL_i = chemical-specific SAL for the ith chemical.

If the sum of normalized concentrations for the COPCs is one or greater, then it is useful to calculate a similar sum for each sampling point to determine possible locations where the multiple chemical effect could occur. For each sampling point, j, the equation for calculating the appropriate sum is

$$M_j = \sum_{COPCs} C_{ji} / SAL_i$$

where

C_{ji} = concentration of ith chemical at sample point j.

Note that it is possible that M, calculated using the maximum concentration observed in the PRS, exceeds one but that no M_j exceeds one. However, if one or more M_j exceeds one, then M will necessarily exceed one. The two different sums provide different information about the site. Each result will be considered and discussed.

3.2.3 Ecological Screening Assessment Methodology

Methodology for evaluating effects to ecological endpoints at different PRS sites is under development by the Ecological Risk Team. The ecological screening assessment methodology used for this report

- considers the habitat in and around the PRSs of interest,
- compares measured analytical data to ecotoxicological SALs (ESALs) and UTLs, and
- accounts for the uncertainty in the calculations of risk ratios from ESALs and analytical data.

Figure 3-2 depicts the decision tree used for the screening assessment of the sites associated with atmospheric releases and Ten Site Canyon.

Analytical data for UTL comparisons were taken from the Facility for Information Management, Analysis, and Display (FIMAD) database. Ecological screening stopped if all analytical results were below UTLs; otherwise screening continued. The next step in the screening process was to evaluate the habitat at the PRS. The habitat screening model shown in the upper portion of Figure 3-2 factors land use (Landscape Condition) and exposure scenarios for different receptors (Receptor Access) into the decision. Heavy industrial use and low receptor access would suggest that further ecological screening is not appropriate, whereas little or no disturbance and a high probability of access by different organisms would suggest additional evaluation of possible adverse effects. An example of a habitat that would require more evaluation is a wetland (Landscape Condition 3) with continuous access by different plants and animals (Receptor Access 2 or 3). Another example is a habitat within which threatened and endangered species are known to exist.

PRSs with low scores from the habitat screening model would be suggested for no further ecological screening. If exposure is considered likely, however, analytical data would be compared to ESALs. ESALs are calculated from standard toxicological data (Ebinger et al. 1994, 07-0072) and adjusted for uncertainty in the extrapolation from the toxicological data to the organisms present in the PRS. Uncertainty factors range from 1 to 1000. Smaller uncertainty factors are applied for data of known quality and where little interspecies extrapolation is required, whereas larger factors are applied when the data quality are not well known and extrapolation from one species to another is needed. Soil concentrations less than ESALs suggest that the analytes do not constitute a significant risk to the ecosystems from the soil pathway. Thus, PRSs with soil concentrations less than ESALs will be suggested for no further ecological screening. Soils with concentrations greater than ESAL require additional evaluation starting with the calculations of risk ratios.

The risk ratio is defined as

$$\frac{\text{Concentration of Analyte in Soil}}{\text{ESAL}}$$

and is analogous to the hazard index in other literature. Risk ratios larger than one and larger than the uncertainty factors require additional evaluation of the ecosystem and contaminant pathways. Risk ratios less than the uncertainty factors and greater than one also indicate more evaluation of the ecosystems and pathways involved, although clear guidance is lacking on exactly the type of evaluation required. Risk ratios less than one indicate little potential for adverse effects to the ecosystem. At this stage, the ecological screening assessment is complete.

3.3 Risk Assessment Methodology

No human health risk assessment was performed for these PRSs.

3.4 Development of Conclusions and Recommendations

Conclusions are based on the outcome of the initial screening assessment performed on the analytical results of the soil samples. Recommendations are based on the potential for human health or ecological risk and on applicable regulations.

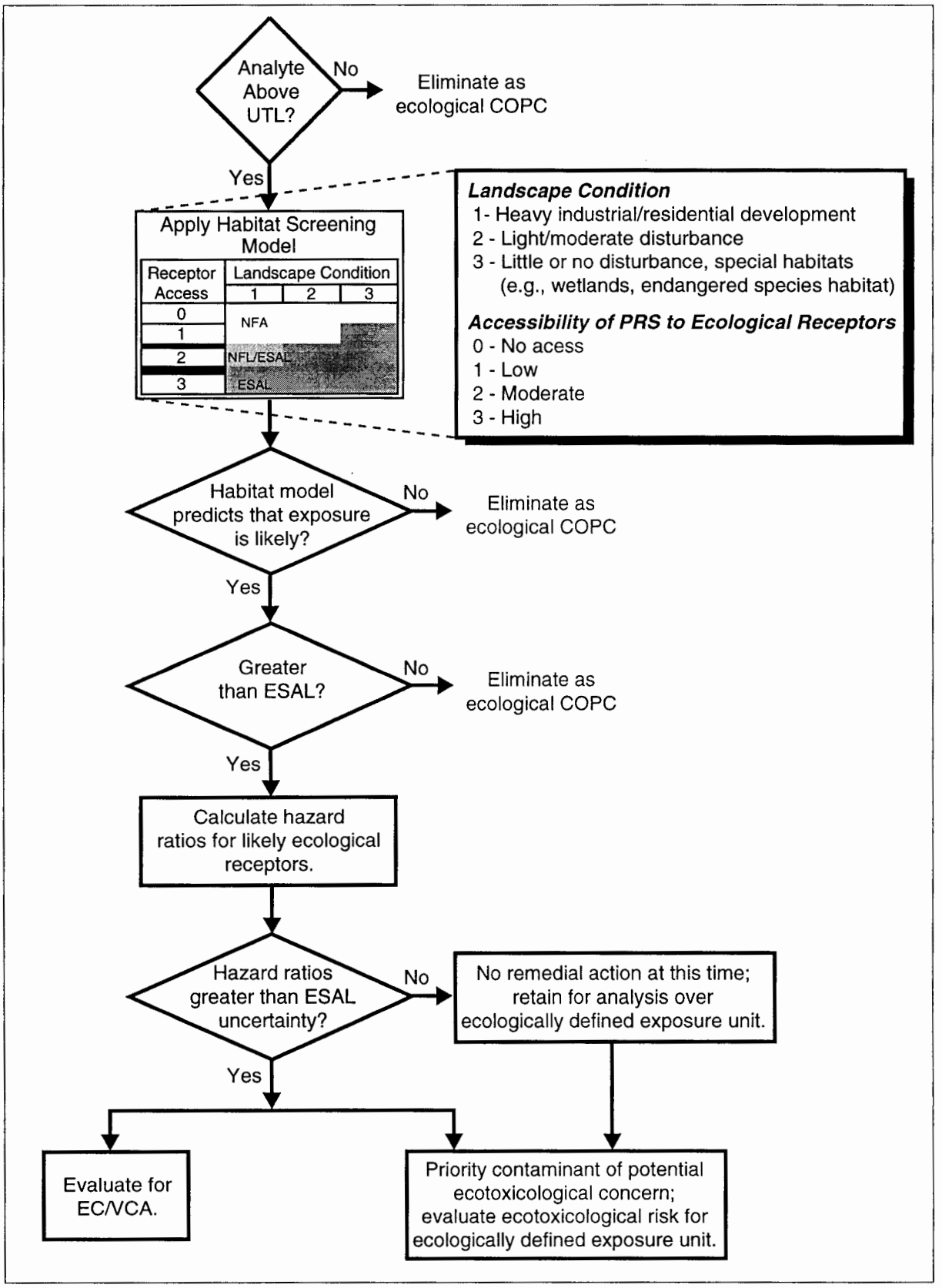

Figure 3-2. Logic diagram for ecological risk screening assessments.

4.0 SITE-SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

4.1 Aggregate 5: Sites Associated with Atmospheric Releases

PRSs in this aggregate are 50-006(c), 50-007, and 50-008 (Figure 1-1). Surface sites that may have received airborne releases from the Liquid Waste Treatment Plant (TA-50-1) are identified as 50-006(c); those that may have received airborne releases from the Incinerator Complex (TA-50-37) are identified as 50-007; and those that may have received airborne releases from the Volume Reduction Facility (TA-50-69) are identified as 50-008. Much of the surface area around structures at TA-50 is paved. The unpaved areas have been disturbed by past construction and decommissioning activities. The entire area slopes gently to the east and south, draining toward Ten Site Canyon at the southeast corner of the paved areas.

Emissions from these facilities came from a number of exhaust stacks that provided ventilation for hoods or for specific operations. All stacks on the Incinerator Complex and the Volume Reduction Facility and some on the Liquid Waste Treatment Plant have HEPA filtration systems to reduce levels of possible contaminants in emissions. All the stacks on these buildings have monitoring systems that measure mixed fission products and plutonium. In general, plutonium and mixed fission product releases have declined or remained steady over the years of operation, even though the volume of stack air has increased in recent years (LANL 1992, 0787).

Liquid Waste Treatment Plant. This facility treats liquid wastes from laboratory operations. The primary radionuclides that may have been released from this operation were plutonium and americium, and hazardous chemicals may also be present. This facility also continues to house analytical laboratories equipped with fume and dust hoods. Figure 4-1 shows the locations of the stacks in the facility.

Incinerator Complex. The Incinerator Complex (Figure 4-1) was constructed in 1975 to develop incineration methods for transuranic-containing wastes from the plutonium processing facility at TA-55 and for solid and liquid wastes containing chlorinated and fluorinated hydrocarbons and carcinogenic materials. Some radioactively contaminated PCBs and scintillation cocktails were incinerated at this facility. The incinerator was closed in 1987.

Volume Reduction Facility. The Volume Reduction Facility (Figure 4-1) was designed to reduce the volumes of metallic waste, such as metal ducts, plenums, and glove boxes, contaminated with transuranics. These are cut up, compacted, and packaged for storage at TA-54.

4.1.1 Previous Investigation

Plutonium concentrations exceeding fallout levels were measured in the nearby soils in a previous sampling event (Purtymun et al. 1990, 0215). These concentrations measured up to 0.017 pCi/g of plutonium 238 (compared with fallout levels of 0.001–0.003 pCi/g) and 6.98 pCi/g of plutonium 239/240 (compared with fallout levels of 0.005–0.05 pCi/g). Although these levels exceed fallout concentrations, they are below SALs.

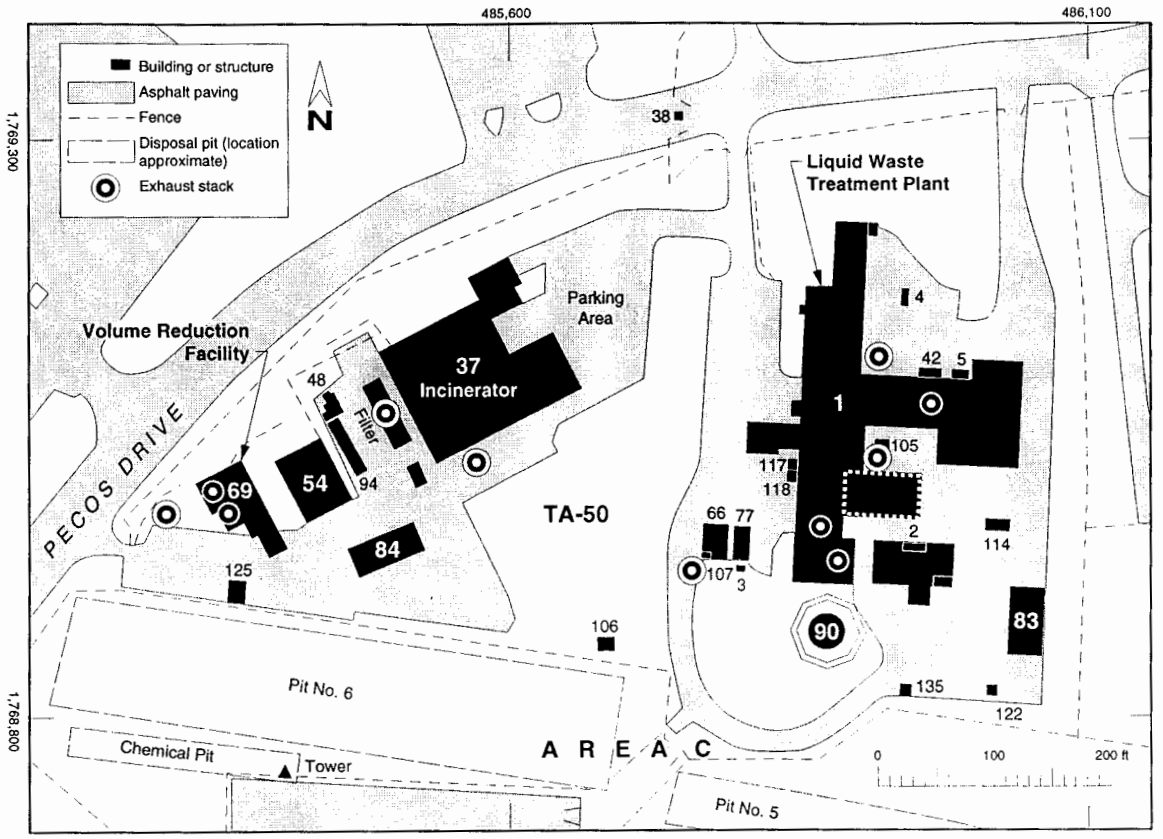

Figure 4-1. Location of facilities and stacks.

4.1.2 Field Investigation

Phase 1 sampling was designed to

- confirm the findings of (Purtyman et al. (1990, 0215) in unpaved areas and
- measure the concentrations of radionuclides and RCRA-listed chemicals for which there were no data when the RFI work plan was written.

Samples were collected from soils surrounding the buildings. Five unpaved areas were selected for sampling; these are designated A, B, C, D, and E in Figure 4-2. After the areas were surveyed to locate natural drainage channels, sampling locations were selected based on the criteria described in Chapter 5 of the RFI work plan (Figure 4-3).

Samples designated as 50-5001 through 50-5009 were collected north of the Liquid Waste Treatment Plant; 50-5020 through 50-5031 were collected east of the Liquid Waste Treatment Plant; 50-0041 through 50-5048 were collected south of the Liquid Waste Treatment Plant; 50-5060 through 50-5070 were collected east and southeast of the Incinerator Complex; and 50-5080 through 50-5090 were collected north and west of the Incinerator Complex.

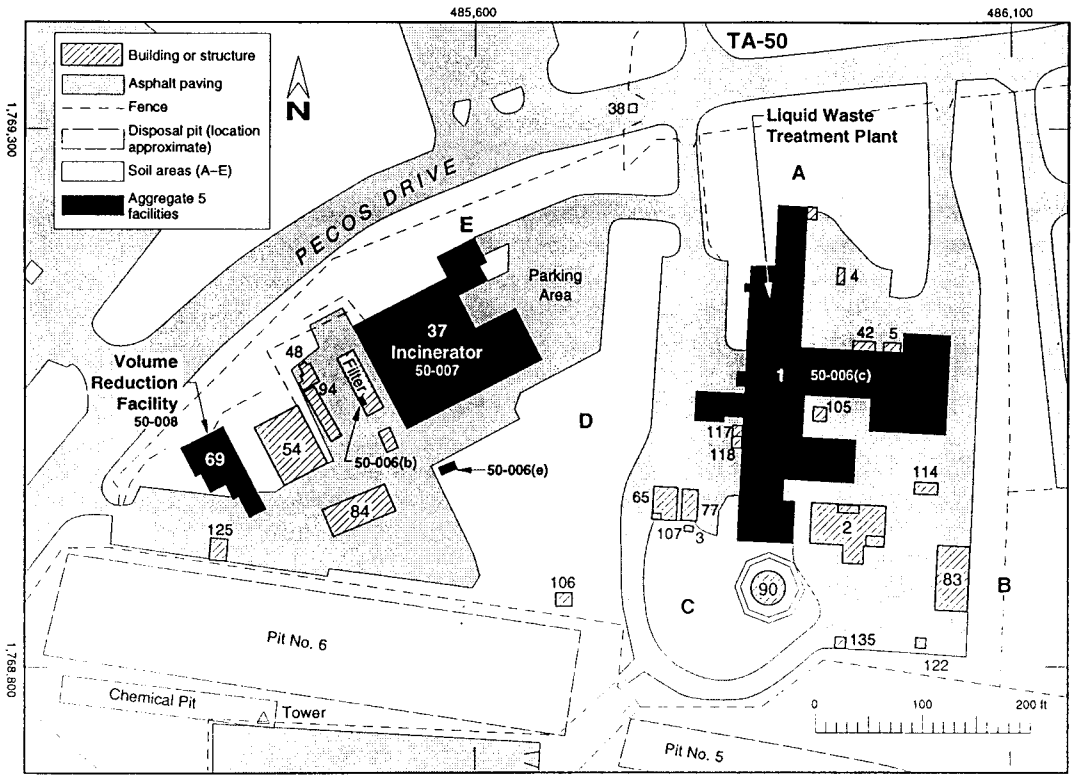

Figure 4-2. Location of unpaved areas designated for sampling.

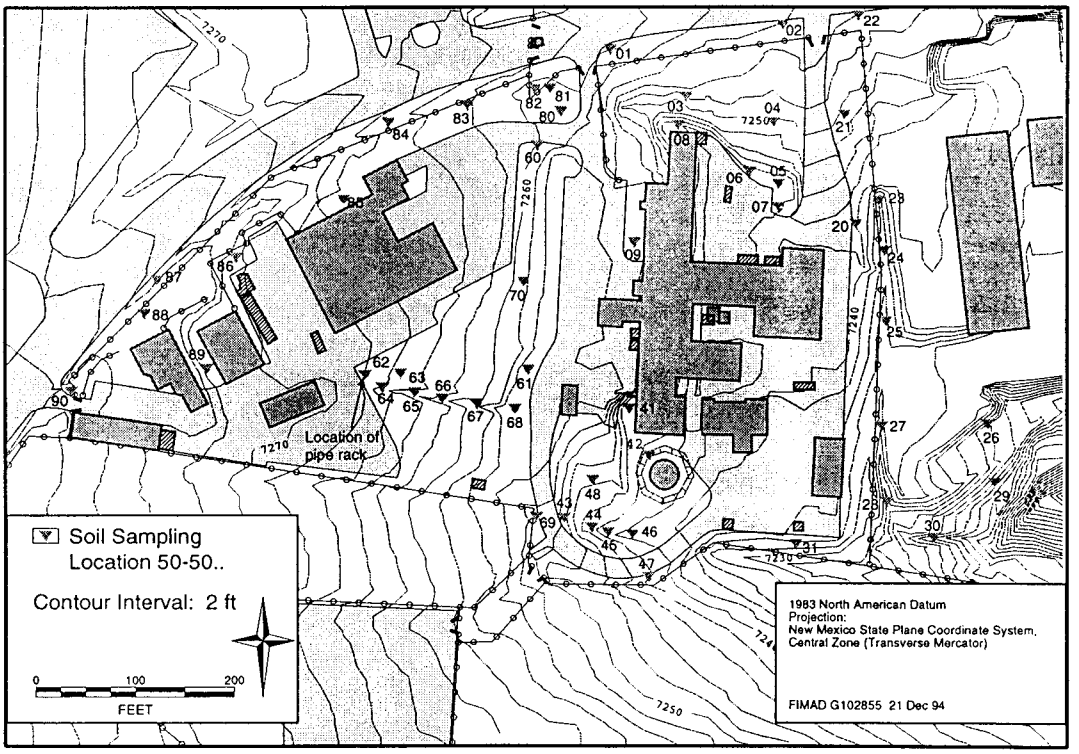

Figure 4-3. Sampling locations in unpaved areas.

The stainless steel coring tool referred to in Chapter 5 of the RFI work plan was not used because undisturbed samples were not required. Each sampling site was screened with hand-held alpha and beta-gamma meters before sample collection. Dedicated stainless steel scoops [ER-SOP-06.09, "Spade and Scoop Method for Collection of Soil Samples" (LANL, 0875)] were used to homogenize the soil to a depth of 6 in. at each sampling location. Care was taken to exclude twigs, leaves, and other vegetable matter from the soil before the samples were placed into appropriate containers. The containers were labeled and sealed with chain-of-custody tape, placed in a cooler (below 4°C), and delivered to the Sample Coordination Facility. The RFI work plan stated that all Aggregate 5 samples would be analyzed by a field laboratory, and a third of the samples would be submitted for analysis to an analytical laboratory. The field laboratory was not used because it was more practical to use an analytical laboratory; all the collected samples were submitted to an analytical laboratory.

4.1.3 Screening Assessment

Subsections 4.1.3.1, 4.1.3.2, and 4.1.3.5 describe the screening assessment performed for the analytical results from samples collected at the sites associated with atmospheric releases. Appendix C details the TA-50 data, which were used as the basis for the screening assessment.

4.1.3.1 Background Comparison

A comparison of inorganic analytical results for the sites associated with atmospheric releases to background soil concentrations for Los Alamos, described in section 3.2.1, is summarized in Table 4-1.

Comparisons of inorganic analytical results with background concentrations indicate that antimony, barium, selenium, and thallium are within the background range and can be eliminated as COPCs. Arsenic, beryllium, cadmium, chromium, lead, mercury, nickel, and silver exceed their respective background ranges in Los Alamos and will be evaluated in the next step of the screening process (the SAL comparison).

Comparisons of the radionuclide analytical results to available background concentrations are summarized in Table 4-2. No background information is available for cobalt 60, radium 226, and tritium.

Potassium 40, strontium 90, uranium 234, and uranium 238 were detected within background. Cesium 137, cobalt 60, plutonium 238, plutonium 239/240, radium 226, thorium 232, tritium, and uranium 235 had detected values above background or had no background values and will be evaluated in the next step of the screening assessment (the SAL comparison).

4.1.3.2 Human Health SAL Comparison

This section discusses the results of the SAL comparison for sites associated with atmospheric releases. Inorganic and organic chemical and radionuclide results are discussed. Only those chemicals above the reporting limit were compared to SALs.

4.1.3.2.1 Chemicals

Equal to or Exceeds SAL. Aroclor 1254, benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluoranthene, benzo (k) fluoranthene, cadmium, chromium (total), dibenzo (a,h) anthracene,

TABLE 4-1

INORGANIC ANALYTE SOIL CONCENTRATIONS COMPARED WITH BACKGROUND CONCENTRATIONS[a]

Analyte	Maximum Observed Value	UTL[b]	Wilcoxon Rank Sum Test Result	Comments
Analytes Observed Above Background				
Arsenic	12.3	11.6	Not above background distribution	(Both tests conducted for analytes without SALs.) Above UTL, but distribution indistinguishable from background. There was one *hot measurement* while the rest were indistinguishable from background.
Beryllium	150	3.31	Not above background distribution	(Both tests conducted for analytes without SALs.) Above UTL, but distribution indistinguishable from background. There was one *hot measurement* while the rest were indistinguishable from background.
Cadmium	170	2.7[c]	Test not conducted for analytes without background distribution data set	Above background maximum
Chromium	810	34.2	Test not conducted for analytes above UTL	Above UTL
Lead	45.0	39.0	Test not conducted for analytes above UTL	Above UTL
Mercury	0.23	0.1[c]	Test not conducted for analytes above background maximum	Above background maximum
Nickel	870	26.7	Test not conducted for analytes above UTL	Above UTL
Silver	410	2.5[c]	Test not conducted for analytes without background distribution data set	Above background maximum

a. All concentrations shown in mg/kg. TA-50 analytical data extracted from FIMAD on March 31, 1995.
b. Environmental Restoration Project Assessments Council 1995, 1218.
c. Maximum background value used instead of UTL.

TABLE 4-1 (concluded)

Analyte	Maximum Observed Value	UTL[b]	Wilcoxon Rank Sum Test Result	Comments
Analytes Observed Within Background				
Antimony	0.21	2.5[c]	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than background maximum
Barium	800	1140	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than UTL
Selenium	0.8	1.7[c]	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than background maximum
Thallium	0.14	0.9[c]	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than background maximum

c. Maximum background value used instead of UTL.

indeno (1,2,3-cd) pyrene, and silver fall within this category and will be evaluated in the next step of the screening process (the data interpretation). Table 4-3 summarizes results for these analytes.

No SAL. Arsenic, benzo [g,h,i] perylene, beryllium, and phenanthrene fall into this category. Arsenic was detected in a concentration above the upper tolerance limit of the background range (11.6 mg/kg) in 1 out of 53 samples. Beryllium was detected in a concentration above the UTL of the background range (3.31 mg/kg) in 2 out of 53 samples. The SALs in the modified RCRA Subpart S (EPA 1990, 0432) were not used here for arsenic and beryllium because Los Alamos background levels are naturally higher than the listed SALs. Arsenic is eliminated as a COPC based on frequency-of-detection guidance from the EPA (EPA 1989, 0305). Benzo [g,h,i] perylene was detected in six samples. Phenanthrene was detected in 10 samples. Benzo [g,h,i] perylene, beryllium, and phenanthrene will be evaluated further in the next step of the screening process.

Below SAL. Anthracene, Aroclor 1260, bis(2-ethylhexyl) phthalate, chrysene, di-n-butyl phthalate, fluoranthene, lead, mercury, nickel, and pyrene were detected in concentrations below their respective SALs and above the contract laboratory reporting limit. These analytes are further evaluated for multiple chemical effects.

TABLE 4-2

RADIONUCLIDE SOIL CONCENTRATIONS COMPARED WITH BACKGROUND CONCENTRATIONS[a]

Analyte	Maximum Observed Value	Background Comparison Values	Wilcoxon Rank Sum Test Results	Comments
Analytes Observed Above Background				
Cesium 137	2.05	1.4[b]	Test not conducted for analytes with no background distribution data set	Above background (maximum background occurred in 1988)
Plutonium 238	0.127	0.01[b]	Test not conducted for analytes with no background distribution data set	Above background (maximum background occurred in 1988)
Plutonium 239/240	0.52	0.0497[b]	Test not conducted for analytes with no background distribution data set	Above background (maximum background occurred in 1981)
Thorium 232	4.43	2.68[c]	Test not conducted for analytes above background maximum	Above background maximum
Uranium 235	0.152	0.088[c]	Test not conducted for analytes above background maximum	Above background maximum
Analytes Observed Within Background				
Potassium 40	33.23	36.1[d]	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than UTL
Strontium 90	0.74	1.0[b]	Test not conducted for analytes with no background distribution data set	Within background (maximum background occurred in 1976)
Uranium 234	1.53	2.03[c]	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than background maximum
Uranium 238	1.63	1.9[c]	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than background maximum

a. All concentrations shown in pCi/g.
b. Maximum background concentration used from environmental surveillance data, 1975-1989.
c. Environmental Restoration Project Assessments Council 1995, 1218
d. UTL calculated using method described in a report by the Environmental Restoration Project Assessments Council (1995, 1218) after the metallic potassium concentration was adjusted for percent of naturally occurring potassium 40.

To evaluate multiple chemical effects, analytes not exceeding their respective SALs were grouped according to their toxicological effects (carcinogenic or noncarcinogenic). Concentrations were normalized to SALs, and the normalized values were summed as described in section 3.2.2. Analysis of the data set is shown in Table 4-4.

The multiple chemical analysis for both carcinogenic and noncarcinogenic analytes shows a sum of less than one, indicating that adverse human health effects from exposure are unlikely. These analytes are therefore eliminated here as COPCs.

4.1.3.2.2 Radionuclides

Equal to or Exceeds SAL. Cobalt 60 and radium 226 fall within this category. Cobalt 60 was detected at 1.5 pCi/g at location 50-5024; the SAL is 0.9 pCi/g. Radium 226 was detected at 5.2 pCi/g at location 50-5085; the SAL is 5.0 pCi/g. They will be evaluated in the next step of the screening process (the data interpretation).

No SAL. No analytes fall into this category.

Below SAL. Cesium 137, plutonium 238, plutonium 239/240, thorium 232, tritium, and uranium 235 have concentrations below their respective SALs and above the contract laboratory reporting limits. These six analytes will be further evaluated for multiple chemical effects.

To evaluate multiple chemical effects for radionuclide analytes, concentrations were normalized to SALs, and the normalized values were summed as described in section 3.2.2. Analysis of the data set is shown in Table 4-5.

The sum of normalized values from the multiple chemical evaluation equals 1.51. This protective screening tool adds the maximum normalized values of radionuclides observed in concentrations greater than background but less than SAL; the location of the observations is disregarded. The six observations used in this multiple chemical evaluation came from five different locations encompassing an area greater than 120,000 square feet. For a

TABLE 4-3

COMPARISON OF RCRA CHEMICAL RESULTS WITH SALs

Analyte	Concentration	SAL[a]	Sample Number	Location
Aroclor 1254	1.0	1	AAA2470	50-5003
Benzo (a) anthracene	1.8	1	AAA2469	50-5061
	1.2		AAA2445	50-5007
	1.2		AAA2476	50-5068
Benzo (a) pyrene	2.4	0.1	AAA2469	50-5061
	1.5		AAA2476	50-5068
	1.3		AAA2445	50-5007
	0.98		AAA2440	50-5002
	0.71		AAA2461	50-5042
	0.7		AAA2447	50-5009
	0.63		AAA2484	50-5084
	0.36		AAA2460	50-5041
Benzo (b) fluoranthene	2.2	1	AAA2469	50-5061
	1.4		AAA2445	50-5007
	1.4		AAA2476	50-5068
Benzo (k) fluoranthene	1.4	1	AAA2469	50-5061
	1.0		AAA2445	50-5007
Cadmium	120	39	AAA2473	50-5065
	170		AAA2471	50-5063
Dibenzo (a,h) anthracene	0.55	0.1	AAA2445	50-5007
	0.69		AAA2469	50-5061
Indeno (1,2,3-cd) pyrene	1.6	1	AAA2469	50-5061
	1.1		AAA2445	50-5007
Total chromium	810	400[b]	AAA2471	50-5063
Silver	410	400	AAA2472	50-5064

a. Data shown in units of mg/kg.
b. There is no SAL for total chromium; however, a comparison with the SAL for chromium VI was made.

TABLE 4-4

MULTIPLE CHEMICAL EVALUATION FOR RCRA CHEMICAL ANALYTES[a]

Analyte	Maximum Concentration[b]	Soil SAL	Normalized Value (maximum concentration ÷ SAL)
SAL Based on Carcinogenic Effects			
Aroclor 1260	0.52	1.0	0.52
Chrysene	2.9	96	0.03
Sum			**0.55**
SAL Based on Noncarcinogenic Effects			
Anthracene	0.41	24000	1.7×10^{-5}
Bis(2-ethylhexyl) phthalate	0.7	50	0.01
Di-n-butyl phthalate	1.8	8000	2.3×10^{-4}
Fluoranthene	4.1	3200	1.3×10^{-3}
Lead	45.0	400	0.11
Mercury	0.23	24.0	0.01
Nickel	870	1600	0.54
Pyrene	4.8	2400	2×10^{-3}
Sum			**0.68**

a. Data shown in mg/kg
b. Data extracted from FIMAD on March 31, 1995.

person to actually receive a dose that corresponds to a sum of normalized values of 1.51, the person would have to be at five different locations simultaneously. A second step in evaluating the risk due to exposure of multiple chemicals is to calculate the sum of normalized values at each sampling location in the PRS. Results for all sampling locations with a sum of normalized values greater than 0.5 are presented in Table 4-6. No sample location had a sum greater than or equal to 1. Therefore, these radionuclides are eliminated as COPCs because it is highly unlikely there is a health risk due to multiple radionuclide exposure.

TABLE 4-5

MULTIPLE CHEMICAL EVALUATION FOR RADIONUCLIDE ANALYTES*

Analyte	Maximum Concentration	Soil SAL	Normalized Value (maximum concentration ÷ SAL)
Cesium 137	2.05	4.0	0.51
Plutonium 238	0.127	20.0	0.01
Plutonium 239/240	1.606	18.0	0.09
Thorium 232	4.43	5.0	0.89
Tritium	0.3235	810	0.00
Uranium 235	0.152	18.0	0.01
Sum			**1.51**

* All values shown in pCi/g.

4.1.3.3 Data Interpretation

The chemicals retained as COPCs after the background comparison and the SAL comparison are Aroclor 1254, benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluoranthene, benzo [g,h,i] perylene, beryllium, benzo (k) fluoranthene, cadmium, chromium (total), dibenzo (a,h) anthracene, indeno (1,2,3-cd) pyrene, phenanthrene, silver, and the radionuclides cobalt 60 and radium 226.

The SAL for Aroclor 1254 is based on the TSCA cleanup action level. If Aroclor 1254 had been detected in concentrations above 1 mg/kg, a soil cleanup to 1 mg/kg would have been required for sites with no restricted access (TSCA subpart G, 40 CFR 761.125) (EPA 1993, 1244). However, because the highest detected value is below the cleanup concentration, no action is required, and Aroclor 1254 is deleted as a COPC. There is also no evidence of a PCB spill at the site.

Benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluoranthene, benzo (g,h,i) perylene, benzo (k) fluoranthene, dibenzo (a,h) anthracene, indeno (1,2,3-cd) pyrene, and phenanthrene are all members of a group of chemicals called polycyclic aromatic hydrocarbons (PAHs). They are found in asphalt used in road construction, as well as being products of incomplete combustion from sources including motor vehicles. With the exception of location 50-5041, all sample locations where PAHs were detected were adjacent to asphalt parking lots, and location 50-5041 is approximately 50 ft from asphalt parking. PAHs are noticeably absent from locations that are not near asphalt. Therefore, these PAHs are eliminated as COPCs because it is most likely that they originated from the adjacent asphalt parking lot and vehicle exhaust.

TABLE 4-6
SUM OF NORMALIZED VALUES AT SAMPLING LOCATIONS

Location ID	X-Coordinate	Y-Coordinate	Cs-137	Pu-238	Pu-239	Th-232	U-235	Tritium	Sum of Normalized Values
50-5003	485899.1	1769264	<0.663	0.017	0.072	3.491	0.087	0.157	0.71
50-5007	485994.8	1769151	<0.535	0.023	0.086	2.155	0.06	0.042	0.44
50-5009	485844.8	1769114	<0.888	0.09	0.206	4.246	0.065	0.323	0.87
50-5020	486076.2	1769133	<0.495	0.089	0.171	3.991	0.062	0.060	0.82
50-5021	486064.4	1769246	0.955	0.004	0.021	<3.51	0.091	0.047	0.25
50-5027	486102.3	1768925	<0.507	0.006	0.031	4.029	0.083	0.032	0.81
50-5031	486013.3	1768803	<0.43	0.02	0.691	<3.45	0.051	0.113	0.63
50-5046	485842.8	1768813	<0.449	0.022	0.615	2.19	0.051	0.029	0.48
50-5048	485801.9	1768869	2.050	0.127	0.744	<3.44	0.063	0.017	0.56
50-5064	485585.4	1768965	0.979	0.010	0.124	<4.61	0.069	0.250	0.26
50-5068	485721.1	1768942	<0.602	0.028	0.763	2.13	0.092	0.029	0.47
50-5069	485743.1	1768832	<0.331	0.006	0.13	2.2	0.088	0.039	0.45
50-5083	485672.4	1769255	<0.406	0.005	0.187	3.28	0.046	0.050	0.67
50-5086	485436	1769099	<0.69	0.017	1.395	4.43	0.095	0.053	0.97
50-5087	485356	1769076	<0.302	0.012	0.435	3.04	0.039	0.066	0.64
50-5088	485343.5	1769042	<0.498	0.004	0.017	4.3	0.055	0.089	0.86
50-5090	485269.6	1768961	<0.352	0.005	0.126	<3.57	0.093	0.110	0.51
50-5024	486105.4	1769106	-0.269	0.009	0.035	2.513	0.048	0.039	0.51
		SOIL SAL	4	20	18	5	18	820	

The remaining COPCs, therefore, are beryllium, cadmium, chromium, silver, cobalt 60, and radium 226. The rest of the analytes occur at levels below background or below SALs, and their contribution to the sum of normalized values was negligible.

The next step is to consider the location of the analytes that have been retained as COPCs and to characterize the site. The concentrations of the three metals that exceeded SALs and the one that exceeded background (beryllium, cadmium, chromium, and silver) were detected in an area near a pipe rack. A visit to the site in December 1994 showed that the locations where the samples were taken had been covered with asphalt since sampling. The pipe rack was still present.

Preliminary remediation goals (PRGs) for cobalt 60 and radium 226 were calculated using the program RESRAD, with parameters selected to simulate a very protective exposure scenario to an industrial worker with the basic dose limit of 15 mrem/year. Specific parameter values are listed in Appendix D. The PRG for cobalt 60 was 4.5 pCi/g; the PRG for radium 226 was 6.5 pCi/g. These PRGs exceed the maximum observed concentrations of cobalt 60 and radium 226. Therefore, no cleanup is warranted.

4.1.3.4 Human Health Risk Assessment

No human health risk assessment was performed for Aggregate 5.

4.1.3.5 Ecotoxicological Screening Assessment

Aggregate 5 supports little if any habitat of concern to the ecosystem because of the industrial nature of the area. The habitat screening model (Figure 3-2) predicted that exposure was unlikely, thus there should be little concern of adverse ecological effects from the chemicals present in Aggregate 5.

4.1.4 Conclusions and Recommendations

The elevated values for beryllium, cadmium, chromium, and silver most likely result from activities, such as cutting and soldering, associated with the pipe rack. Because the pipe rack is still in use, we recommend that this area be characterized and cleaned up when operations associated with the pipe rack cease.

No RCRA-regulated chemicals appear to be associated with airborne releases from PRSs 50-006(c), 50-007, and 50-008. All radionuclides were present in concentrations within background, below human health SALs, or below PRGs. NFA is recommended because the site has been adequately characterized in accordance with current state and federal regulations, and the available data indicate that chemicals and radionuclides are present in concentration that would pose an acceptable level of risk under industrial land use. A Class III permit modification will be requested to remove these PRSs from the Hazardous and Solid Waste Amendments Module of the Laboratory's RCRA operating permit.

4.2 Ten Site Canyon

Ten Site Canyon is a small canyon whose head is at TA-50 (Figure 4-4). This canyon currently receives building and surface runoff from TA-50, including the paved areas and MDA C, and from TA-35. It formerly received effluent from drain lines 55 and 67; these drain lines were removed in 1981 (Elder et al. 1986, 0456). In July and September 1974, untreated

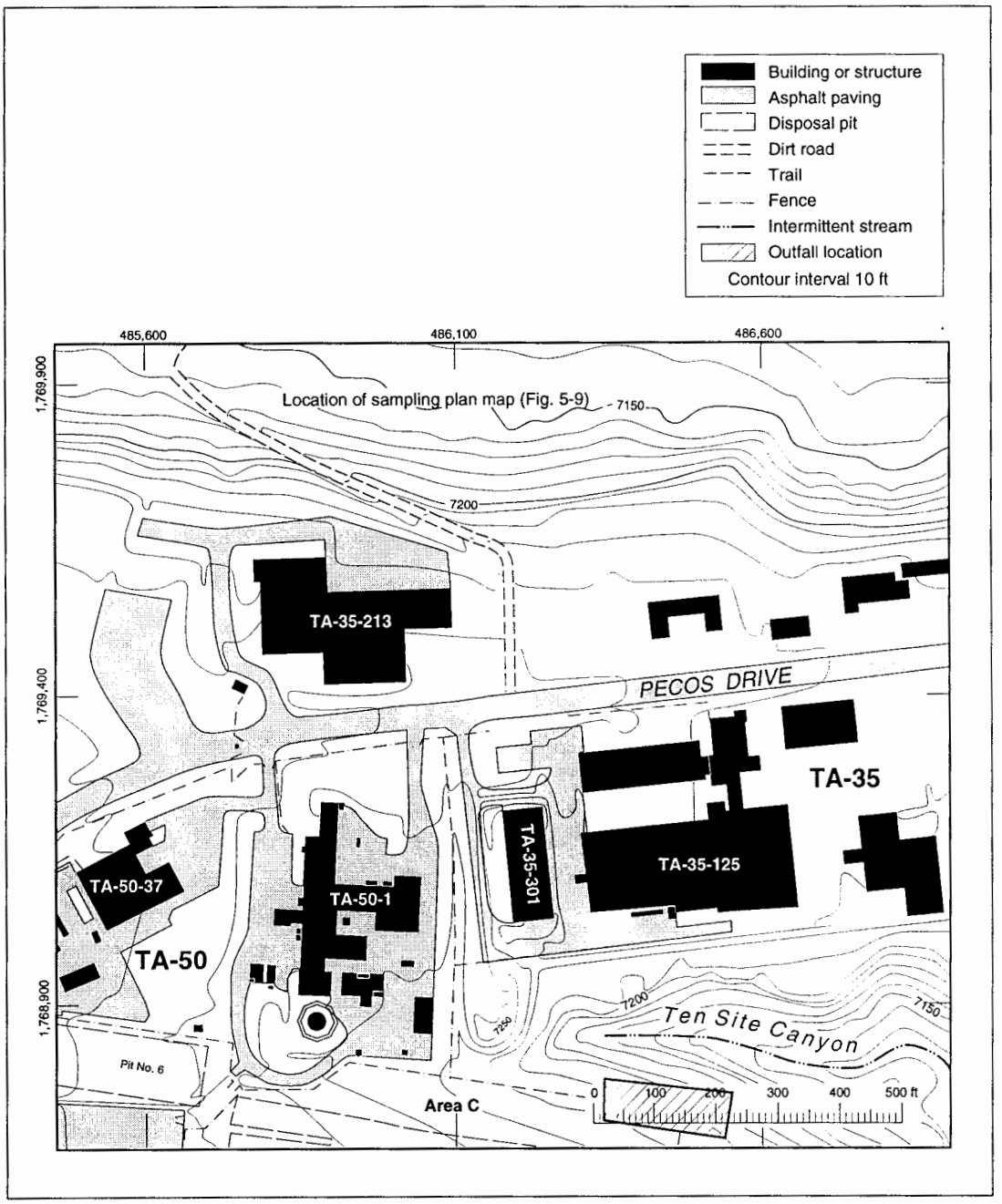

Figure 4-4. Location of outfalls at TA-50.

radioactive wastes and unknown chemicals were accidentally released to the head of Ten Site Canyon. The cause of the releases was the overflow of a sump in TA-50-2.

4.2.1 Previous Investigations

A soil sample was collected at the outfall after drain line 67 was plugged (February 28, 1975) and was analyzed on March 5, 1975. It showed a gross alpha activity of 30,000 dpm/g. Soil samples were collected on September 9, 1966, near the outfall of drain line 67 and on the

canyon bottom. Near the drain line outfall, the maximum gross alpha was observed at 50,000 pCi/g; 30 to 300 m (98 to 984 ft) from the outfall, the maximum gross alpha observed was 300 pCi/g. Of 27 soil samples collected on the canyon bottom, however, the maximum gross alpha observed was 70 pCi/g, and all other samples were below 20 pCi/g. Radionuclides encountered during the removal of the drain lines (1981) were primarily plutonium 239/240, ruthenium 106, cesium 137, strontium 89, and yttrium 90. The outfall area was partially decontaminated in 1981 by soil removal (70 m^3 total). Maximum surface contamination levels measured after decontamination were 400 pCi/g of gross alpha activity and 40 pCi/g of gross beta activity. No measurements for other chemicals were made. Information regarding previous investigations is incomplete and is provided here for anecdotal purposes only; it was not used for decisions, conclusions, or recommendations.

The EPA-approved work plan did not require sampling for ruthenium 106, strontium 89, or yttrium 90. Ruthenium 106 has a half-life of approximately one year. It decays to rhodium 106 (half-life of 2 hr) and then becomes stable. Strontium 89 has a 50-day half-life and decays to yttrium 89, a stable isotope. Because these radionuclides decay so quickly to stable isotopes, significant concentrations would not be expected to be found, and they were not of concern for this investigation. Yttrium 90 is a daughter product of strontium 90; they exist in equilibrium. Therefore, it is not necessary to analyze for both yttrium 90 and strontium 90.

4.2.2 Field Investigation

One sample was taken from each of the two discharge paths (near the mouth of the outfalls), and three samples were taken where the paths converge (Figure 4-5). From the point of convergence, transects were laid out at approximately 100-ft intervals and approximately perpendicular to the stream channel. Samples were taken along each transect at three points (at the center of the drainage and on each bank). The lateral spacing of the three sampling points in each transect was determined by surface morphology. Spacing increased downstream because the stream channel widens down the canyon. Sample depth was from 0 to 6 in. One-third of the locations (randomly selected) were also sampled at 18 to 24 in. and/or at 36- to 42-in. depths to provide an estimate of the vertical concentration distribution.

Sampling along the line of drainage went to approximately 1300 ft from the outfall. Additional samples were taken where elevated radiation levels were detected by field screening. Elevated gross alpha/beta levels were measured at sample location 50-6512, approximately 325 ft downstream from the outfall pipes. Location 50-6512 is on a hummock located on the south side of the drainage channel. The hummock contains approximately one barrel of sediment. Based on these elevated radiation levels, additional sampling points were established upstream and downstream from location 50-6512. A total of 134 samples (127 samples and 7 replicates) at 53 locations were taken during this Phase 1 investigation.

Dedicated stainless steel scoops were used to collect the surface soil samples, and dedicated stainless steel hand augers were used to collect the samples at depth. Soil collected with the hand augers was placed into dedicated stainless steel bowls. For those samples requiring VOC analysis, aliquots of the soil were promptly placed into appropriate vials. The remaining portions of soil in the stainless steel bowls were broken up with stainless steel

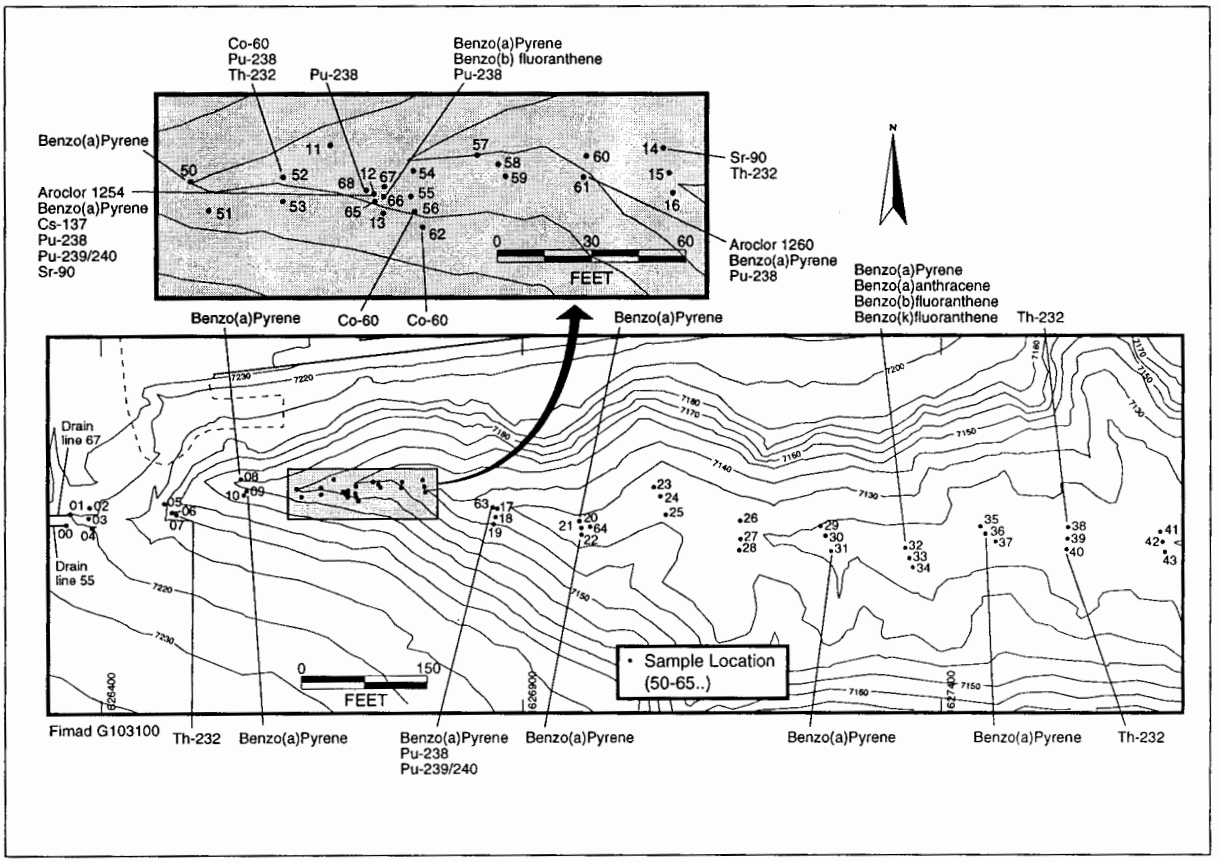

Figure 4-5. Locations of Ten Site Canyon outfall sampling holes.

hammers, homogenized with stainless steel scoops, and placed into sample containers. The RFI work plan stated that all of the Ten Site Canyon samples would be analyzed by a field laboratory, and a third of the samples would be submitted for analysis by an analytical laboratory. All samples were submitted to an analytical laboratory, and the field laboratory was not used because it was more practical to use an analytical laboratory.

4.2.3 Screening Assessment

4.2.3.1 Background Comparison

Inorganic analytical results from Ten Site Canyon were compared with Los Alamos background concentrations. These results are summarized in Table 4-7.

These comparisons indicate that antimony, arsenic, barium, beryllium, cadmium, chromium, and selenium are within their respective background ranges. Lead, mercury, nickel, silver, and thallium exceed their respective background ranges or UTLs and will be evaluated in the next step of the screening process (the SAL comparison).

Comparison of Ten Site Canyon radionuclide analytical results to Los Alamos background concentrations is summarized in Table 4-8. No background information is available for cobalt 60, radium 226, tritium, and americium 241. All other radionuclides were observed in concentrations above background UTLs. The Wilcoxon rank sum test was not conducted.

No radionuclide was found to be within background. Therefore, all radionuclides will be evaluated in the next step of the screening assessment (the SAL comparison).

4.2.3.2 Human Health SAL Comparison

This section discusses the results of the SAL comparison. Inorganic and organic chemicals and radionuclides are discussed.

4.2.3.2.1 Chemicals

Equal to or Exceeds SAL. Aroclor 1254, Aroclor 1260, benzo [a] anthracene, benzo [a] pyrene, benzo [b] fluoranthene, and benzo [k] fluoranthene fall within this category and will be evaluated in the next step of the screening process. Table 4-9 summarizes results for these analytes.

TABLE 4-7

INORGANIC ANALYTE SOIL CONCENTRATIONS[a] COMPARED WITH BACKGROUND CONCENTRATIONS

Analyte	Maximum Observed Value	Background UTL[b]	Wilcoxon Rank Sum Test Result	Comments
Analytes Observed Above Background				
Lead	44.0	39.0	Test not conducted for analytes above background maximum	Above background maximum
Mercury	2.0	0.1[c]	Test not conducted for analytes above background maximum	Above background maximum
Nickel	58.9	26.7	Test not conducted for analytes above UTL	Above UTL
Silver	33.0	2.5[c]	Test not conducted for analytes without background distribution data set	Above background maximum
Thallium	2.3	0.9[c]	Test not conducted for analytes above background maximum	Above background maximum

a. All concentrations are in mg/kg. TA-50 analytical data extracted from FIMAD on March 31, 1995.

b. Environmental Restoration Project Assessments Council 1995, 1218.

c. Maximum background value used instead of UTL.

TABLE 4-7(concluded)

Analytes Observed Within Background

Analyte	Maximum Observed Value	Background UTL[b]	Wilcoxon Rank Sum Test Result	Comments
Antimony	0.53	2.5[c]	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than background maximum
Arsenic	4.7	11.6	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than UTL
Barium	230.0	1140	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than UTL
Beryllium	2.8	3.31	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than UTL
Cadmium	1.7	2.7[c]	Test not conducted for analytes without background distribution data set	Observed sample maximum less than background maximum
Chromium	20.0	34.2	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than UTL
Selenium	0.62	1.7[c]	Not above background distribution	Distribution indistinguishable from background and maximum observed value is less than background maximum

c. Maximum background value used instead of UTL.

No SAL. Tert-butylbenzene (detected in 1 out of 110 samples), 2-hexanone (detected in 1 out of 134 samples), and 4-isopropyltoluene (detected in 1 out of 110 samples) fall into this category. These chemicals are eliminated as COPCs based on frequency-of-detection guidance from the EPA (EPA 1989, 0305).

Below SAL. Acenaphthene, acetone, anthracene, bis (2-ethylhexyl) phthalate, butyl benzyl phthalate, chrysene, di-n-butyl phthalate, fluoranthene, fluorene, indeno (1,2,3-cd) pyrene, lead, mercury, nickel, silver, thallium, pyrene, and toluene have measured concentrations below their respective SALs and above the contract laboratory reporting limits. These analytes will be further evaluated for multiple chemical effects.

TABLE 4-8

RADIONUCLIDE SOIL CONCENTRATIONS COMPARED WITH BACKGROUND CONCENTRATIONS[a]

Analyte	Maximum Concentration	Background UTL	Comments
Cesium 137	72.83	1.4[b]	Above background (maximum background occurred in 1988)
Plutonium 238	5190	0.01[b]	Above background (maximum background occurred in 1988)
Plutonium 239/240	453	0.0497[b]	Above background (maximum background occurred in 1981)
Potassium 40	52.505	36.1[d]	Above background
Strontium 90	57.7	1.0[b]	Above background (maximum background occurred in 1976)
Thorium 232	6.5209	2.68[c]	Above background
Uranium 234	5.295	2.03[c]	Above background
Uranium 235	0.255	0.088[c]	Above background
Uranium 238	3.049	1.9[c]	Above background

a. All concentrations in pCi/g.
b. Maximum background concentration used from environmental surveillance data, 1975-1989.
c. Environmental Restoration Project Assessments Council 1995, 1218
d. UTL calculated using method described in Environmental Restoration Project Assessments Council report (1995, 1218) after the metallic potassium concentration was adjusted for percent of naturally occurring potassium 40.

To evaluate multiple chemical effects for the Ten Site Canyon data set, analytes were grouped according to their toxicological effects (carcinogenic or noncarcinogenic). Concentrations were normalized to SALs, and the normalized values were summed as described in section 3.2.2. Analysis of the data set is shown in Table 4-10.

The multiple chemical evaluation for carcinogenic and noncarcinogenic analytes shows a sum of less than one, indicating that adverse human health effects from exposures are unlikely. These analytes are therefore eliminated as COPCs.

4.2.3.2.2 Radionuclides

Equal to or Exceeds SAL. Cesium 137, cobalt 60, plutonium 238, plutonium 239/240, strontium 90, and thorium 232 fall within this category. They will be evaluated in the next step of the screening process (the data interpretation). These results are summarized in Table 4-11.

TABLE 4-9

COMPARISON OF RCRA CHEMICAL RESULTS WITH SALs

Analyte	Concentration	SAL	Sample Numbers	Location
Aroclor 1254	6.0	1	AAA2531	50-6512
Aroclor 1260	1.52	1	AAA3207	50-6561
Benzo [a] anthracene	1.1	1	AAA2647	50-6532
Benzo [a] pyrene	1.2	0.1	AAA2647	50-6532
	1.1		AAA3230	50-6566
	0.67		AAA2528	50-6509
	0.6		AAA2661	50-6536
	0.59		AAA3200	50-6563
	0.55		AAA2646	50-6531
	0.54		AAA3229	50-6550
	0.53		AAA2713	50-6520
	0.41		AAA2637	50-6522
	0.37		AAA3207	50-6561
Benzo [b] fluoranthene	1.50	1	AAA3230	50-6566
	1.10		AAA2647	50-6532
Benzo [k] fluoranthene	1.13	1	AAA2647	50-6532

* Data in units of mg/kg.

No SAL. Potassium 40 falls into this category. It will be evaluated in the next step of the screening process (the data interpretation).

Below SAL. Americium 241, radium 226, tritium, uranium 234, uranium 235, and uranium 238 have measured activities below their respective SALs and above their contract laboratory reporting limits. These radionuclides will be further evaluated for multiple chemical effects.

To evaluate multiple chemical effects for the Ten Site Canyon radionuclide data set, concentrations were normalized to SALs, and the normalized values were summed as described in section 3.2.2. The data set is shown in Table 4-12. SALs are based on the radioactive effects (not toxicological effects) of the metal.

TABLE 4-10

MULTIPLE CHEMICAL EVALUATION[a] FOR SOIL SAMPLES

Analyte	Maximum Concentration[b]	Soil SAL	Normalized Value (maximum concentration ÷ SAL)
SAL Based on Carcinogenic Effects			
Bis(2-ethylhexyl) phthalate	1.1	50	0.02
Chrysene	1.40	96	0.01
Indeno (1,2,3-cd) pyrene	0.66	1	0.66
Sum			**0.69**
SAL Based on Noncarcinogenic Effects			
Acenaphthene	0.51	4800	1.1×10^{-4}
Acetone	0.082	8000	1.0×10^{-5}
Anthracene	0.90	24000	3.8×10^{-5}
Butyl benzyl phthalate	0.51	16000	3.2×10^{-5}
Di-n-butyl phthalate	3.0	8000	3.8×10^{-4}
Fluoranthene	2.40	3200	7.5×10^{-4}
Fluorene	0.47	3200	1.5×10^{-4}
Lead	44	400	0.11
Mercury	2.0	24.0	0.08
Nickel	58.9	1600	0.04
Pyrene	2.40	2400	1×10^{-3}
Silver	33.0	400	0.08
Thallium	2.3	6.4	0.36
Toluene	0.022	910	2.4×10^{-5}
Sum			**0.67**

a. Concentrations given in mg/kg.
b. Data extracted from FIMAD March 31, 1995.

TABLE 4-11

COMPARISON OF RESULTS WITH SALs[a]

Analyte	Concentration	SAL	Sample Number	Location
Cesium 137	72.83	4.0	AAA3227	50-6512
Cobalt 60	1.30	0.9	AAA3213	50-6556
Plutonium 238	5190	20.0	AAA2531	50-6512
	67.82		AAA3207	50-6561
	37.38		AAA3230	50-6566
	23.31		AAA3231	50-6566
	33.87		AAA3237	50-6568
	31.71		AAA3200	50-6563
	25.99		AAA3219	50-6552
Plutonium 239/240	453	18	AAA2531	50-6512
	19.51		AAA3200	50-6563
Strontium 90	57.70	5.9	AAA2533	50-6514
	50.70		AAA2531	50-6512
Thorium 232	5.26	5.0	AAA2655	50-6540
	5.21		AAA2526	50-6507
	6.52		AAA3240[b]	50-6514
	5.25		AAA2665[b]	50-6538
	5.07		AAA3216[b]	50-6552

a. Data in units of pCi/g.

b. The SAL is 5.0 averaged over the first 15 cm (6 in.) and then 15.0 pCi/g averaged over each additional 15 cm. These samples were collected at a depth of 1.5 ft; therefore, these samples are not above the SAL.

TABLE 4-12

MULTIPLE CHEMICAL EVALUATION* FOR RADIONUCLIDE DATA SET

Analyte	Maximum Concentration	Soil SAL	Normalized Value (maximum concentration ÷ SAL)
Americium 241	4.172	17.0	0.25
Radium 226	4.0943	5.0	0.82
Tritium	19.123	810.0	0.02
Uranium 234	5.295	86.0	0.06
Uranium 235	0.255	18.0	0.01
Uranium 238	3.049	59.0	0.05
Sum			**1.21**

* Concentrations expressed in pCi/g.

The sum of normalized values for the multiple chemical evaluation equals 1.21. This protective screening tool adds the maximum normalized values of radionuclides observed in concentrations greater than background but less than SAL; the location of the observations is disregarded. The six observations used in this multiple chemical evaluation came from six different locations. However, the radionuclides that contributed nearly 90% to the sum were americium 241 and radium 226, and the maximum observations of these radionuclides came from two sample locations that were less than 150 ft apart. A second step in evaluating the risk due to exposure of multiple chemicals is to calculate the sum of normalized values at each sampling location in the PRS to identify individual sample locations that may equal or exceed 1.0. Results for all sampling locations with a sum of normalized values greater than 0.5 are presented in Table 4-13. No sample location had a sum greater than or equal to 1.0, but location 50-6556 had a sum of 0.99. At this location, americium 241 and radium 226 were again the dominant contributors to the sum. Because both steps in the multiple chemical evaluation indicate it is likely that there may be risk to human health because of a multiple chemical exposure, americium 241 and radium 226 are retained as COPCs and will be discussed in section 4.2.3.3.

4.2.3.3 Data Interpretation

The chemicals retained as COPCs after the background comparison, the SAL comparison, and the multiple chemical evaluation are Aroclor 1254, Aroclor 1260, benzo [a] anthracene, benzo [a] pyrene, benzo [b] fluoranthene, benzo [k] fluoranthene, and the radionuclides americium 241, cesium 137, cobalt 60, plutonium 238, plutonium 239/240, potassium 40, radium 226, strontium 90, and thorium 232.

Benzo [a] anthracene, benzo [a] pyrene, benzo [b] fluoranthene, and benzo [k] fluoranthene are all members of a group of chemicals called PAHs. They are found in asphalt used in

TABLE 4-13

SUM OF NORMALIZED VALUES AT SAMPLING LOCATIONS

Location ID	X-Coordinate	Y-Coordinate	Am-241	Ra-226	U-234	U-235	U-238	Tritium	Sum of Normalized Values
50-6503	486141.3	1768811	—	3.09	1.25	0.10	1.28	0.199	0.66
50-6506	486239.1	1768817	—	3.10	1.27	0.12	1.18	0.141	0.66
50-6511	486430.8	1768856	—	2.34	1.87	0.15	1.84	0.062	0.53
50-6512	486444.6	1768841	—	2.42	5.30	0.19	2.67	19.123	0.62
50-6514	486536.7	1768855	0.14	3.08	1.59	0.14	1.36	1.501	0.68
50-6517	486625.9	1768822	—	3.43	2.06	0.16	2.53	0.262	0.76
50-6519	486621.5	1768803	—	3.66	1.50	0.07	1.45	0.108	0.78
50-6523	486812.8	1768847	—	2.75	2.06	0.13	2.53	0.207	0.62
50-6528	486914.1	1768771	—	3.27	1.53	0.08	2.21	0.101	0.71
50-6529	487012.2	1768800	—	2.42	2.47	0.18	2.75	0.062	0.57
50-6531	487024.3	1768770	—	2.45	1.58	0.15	1.66	0.066	0.54
50-6533	487117.4	1768762	—	2.89	1.23	0.07	1.68	0.050	0.62
50-6535	487201.9	1768800	—	3.01	1.98	0.16	2.21	0.198	0.67
50-6538	487306.8	1768799	—	3.32	1.91	0.11	2.19	0.113	0.73
50-6539	487306.2	1768785	—	2.40	1.07	0.07	1.05	0.038	0.51
50-6540	487305	1768772	—	3.22	1.70	0.12	1.61	0.111	0.70
50-6541	487416.5	1768794	—	3.24	1.65	0.08	1.47	0.038	0.70
50-6542	487419.4	1768781	—	2.67	1.54	0.07	1.51	0.092	0.58
50-6543	487422.3	1768769	—	2.13	2.43	0.09	2.69	0.102	0.50
50-6551	486392.3	1768836	0.12	4.09	1.48	0.10	1.55	0.096	0.87
50-6552	486415.8	1768846	2.53	2.95	1.46	0.10	1.34	0.125	0.78

TABLE 4-13 (concluded)

Location ID	X-Coordinate	Y-Coordinate	Am-241	Ra-226	U-234	U-235	U-238	Tritium	Sum of Normalized Values
50-6553	486415.7	1768839	0.36	3.20	1.06	0.07	1.14	0.029	0.70
50-6554	486457.2	1768848	0.26	2.89	2.59	0.14	3.05	0.184	0.68
50-6556	486457.6	1768835	2.84	3.79	1.91	0.15	2.13	0.436	0.99
50-6557	486477.5	1768853	0.35	2.82	1.48	0.09	1.96	0.202	0.64
50-6561	486511.3	1768846	4.17	1.40	1.97	0.07	2.14	1.264	0.59
50-6563	486620.5	1768823	3.22	1.83	1.35	0.08	1.39	0.059	0.60
50-6565	486445	1768839	1.83	3.24	1.87	0.07	2.11	0.374	0.82
50-6566	486447.7	1768840	1.64	1.83	1.56	0.05	1.48	0.065	0.51
50-6567	486448	1768843	0.67	2.15	1.58	0.12	1.68	0.137	0.52
50-6568	486442.2	1768842	1.43	3.66	1.58	0.12	1.63	0.468	0.87
		SOIL SAL	17.00	5.00	86.00	18.00	59.00	820.00	

road construction, as well as being products of incomplete combustion from sources including motor vehicles. Historical concentration of PAHs is approximately 1 ppm. These PAHs are eliminated as COPCs because it is most likely that they originated from runoff from asphalt adjacent to Ten Site Canyon.

The remaining COPCs, therefore, are americium 241, Aroclor 1254, Aroclor 1260, cesium 137, cobalt 60, plutonium 238, plutonium 239/240, potassium 40, radium 226, strontium 90, and thorium 232. The rest of the analytes occur at levels below background or below SALs, and their contribution to the sum was negligible.

The next step is to consider the location of the analytes that have been retained as COPCs and characterize the site. The PCBs Aroclor 1254 and Aroclor 1260 were detected above SALs at location 50-6512. Arolcor 1254 was detected above SAL at location 50-6561. Potassium 40 was detected above background UTL at 17 locations throughout the canyon. Thorium 232 was detected above SAL at one location at the top of the canyon and two locations near the eastern boundary of the PRS. All other radionuclides above SALs were detected between sample locations 50-6552 and 50-6561 (Figure 4-5).

4.2.3.4 Human Health Risk Assessment

No human health risk assessment was performed for Ten Site Canyon.

4.2.3.5 Ecotoxicological Screening Assessment

Ecological screening assessment is underway for Ten Site Canyon. Other facilities such as MDA C and OU 1129 are potential contributors of chemicals to Ten Site Canyon, thereby

complicating the assessment. MDA C is a part of OU 1147. Sampling for MDA C is nearly complete, and results will be analyzed during fiscal year 1996. Continued assessment of Ten Site Canyon will be conducted as the MDA C investigation continues.

4.2.4 Conclusions and Recommendations

The situation at Ten Site Canyon is complicated by several factors.

- Ten Site Canyon receives runoff from 11.8-acre MDA C, also at TA-50 and a part of former OU 1147. MDA C contains a variety of buried hazardous and radioactive materials. Preliminary surface soil results indicate no surface contamination of that site; however, drilling beneath the disposal area to investigate the possibility of contaminant migration is not complete. If evidence of contaminant migration toward Ten Site Canyon is found, then Ten Site Canyon should be considered for inclusion in further investigations or remedial activity conducted at MDA C because MDA C would then be identified as a new source term for contamination in Ten Site Canyon.
- Field Unit 4 is currently preparing a work plan for investigation of canyon systems at Los Alamos. The upper portion of Ten Site Canyon sampled and reported here needs to be treated as an integral part of the canyon system. Ecological risk and the degree of impact on the ecosystem resulting from various options such as administrative control, remediation, or NFA need to be evaluated on a canyon-system basis.
- Field Unit 4 is currently investigating the area on the north rim of Ten Site Canyon (TA-35). The upper and lower portions of the canyon should be integrated if results from that investigation indicate further study or remediation is needed in the canyon.
- The hummock near location 50-6512 contains high levels of cesium 137, plutonium 238, plutonium 239/240, and strontium 90. While it has remained a relatively stable feature for the last several years, a large storm event could dislodge it. The hummock is easy to remove and could be removed with little disturbance to the ecosystem. Field instruments should be sufficient to verify that cleanup levels are achieved. The small possibility of destabilization and accelerated migration rate of any residual contamination is very minor compared to the benefit of removing the large hummock containing high concentrations of contaminants.

Ten Site Canyon cannot be recommended for NFA based on the screening assessment presented in this report, and more information is needed before Ten Site Canyon can be recommended for further study. Because MDA C is adjacent to Ten Site Canyon and part of the same former OU, it is important to eliminate the possibility that MDA C may be a source term for contamination in Ten Site Canyon before proposing further investigation in Ten Site Canyon. This cannot be accomplished until analysis of the drilling investigation is complete. In addition, upper Ten Site Canyon must not be treated separately from the canyon system. Analyses of upper and lower Ten Site Canyon should be combined and interpreted using expertise available on the canyons technical team.

The hummock should be removed because it contains significant levels of several contaminants that could be dispersed by a single storm event. It is recommended that an interim action plan to remove the hummock be written and executed during the 1996 field season.

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APPENDIX A

QUALITY CONTROL SAMPLES

Table A-1 defines types of quality control samples and describes the purpose of each.

TABLE A-1

QC SAMPLE TYPES

Sample Type	Definition	Purpose
Blank	Analyte-free matrix material that is collected, prepared, and analyzed in the same manner and at the same time as the sample material	To test for various types of contamination and to provide a correction factor for bias
Blind	Sample whose composition is known to submitter but is unknown to analyst.	To assess bias
Field duplicate (also called field replicate)	Field split of a routine field sample	To assess precision including variability associated with sample collection and laboratory analysis processes
Laboratory duplicate (also called laboratory replicate)	Laboratory split of a homogenized routine field sample; treated as two independent samples	To estimate total measurement variability arising from the subsampling process and the intrinsic sample variability
Matrix spike/matrix spike duplicate	Splits from a routine sample to which have been added, before analysis, predetermined quantities of stock solution of certain analytes	To assess analytical precision
Method blank	Analyte-free reagent water that is taken through the laboratory digestion/extraction process	To calibrate the method and to test for laboratory-induced contamination
Nonblind	Sample whose composition is known to submitter and analyst	To assess bias

TABLE A-1 (concluded)

Sample Type	Definition	Purpose
Rinsate	Sample obtained by running distilled, deionized water through sampling equipment after decontamination but before reuse	To test for contamination of equipment
Surrogate spike	Sample to which has been added, before analysis, organic compounds that are similar to analytes of interest but are not normally found in environmental samples	To assess analytical performance by determining percent recovery of analytes in the sample based on percent recoveries calculated for each surrogate
System blank	Analyte-free deionized water that is analyzed after instrument calibration	To assess analytical instrumentation-system contamination
Trip blank	Analyte-free water prepared in the laboratory, transported to the field, stored, and transported with the routine samples collected	To test for shipping container or storage contamination

APPENDIX B

STANDARD OPERATING PROCEDURES AND GOOD INVESTIGATORY PRACTICES

Approved standard operating procedures (SOPs) were followed where possible, and good investigatory procedures were followed at all times whether or not approved SOPs were available. The following SOPs (Table B-1) and good investigatory procedures (Table B-2) were used to ensure the quality of field and analytical data (any deviations to the SOPs are noted).

TABLE B-1

STANDARD OPERATING PROCEDURES

Document Number	Document Title	Comments
LANL-ER-SOP 01.01	"General Instructions for Field Investigations"	The integrity of the field data collection was ensured by keeping daily activity logs and sample collection logs and by using unique sample identification, location, and chain-of-custody numbers; preprinted sample labels; chain-of-custody forms; and sample container custody seals. Records from these sampling activities are archived in the Environmental Restoration Records Processing Facility (RPF). *Deviations*: Some minor clerical deviations to this SOP (e.g., incorrect date formats) were reported in an independent audit. None of these deviations compromised the accuracy or quality of the data.
LANL-ER-SOP 01.02	"Sample Containers and Preservation"	The proper sizes and types of precleaned sample containers were used for the collection of surface soil samples. Samples were promptly placed in insulated sample coolers after collection and maintained at 4°C until delivery at the Sample Coordination Facility (SCF).
LANL-ER-SOP 01.03	"Handling, Packaging and Shipping of Samples"	All samples were hand delivered to the SCF and custody was officially transferred to the recipient. The chain-of-custody for all sample transfers was documented according to this SOP.
LANL-ER-SOP 01.04	"Sample Control and Field Documentation"	Sample control and documentation was provided by the use of unique sample bar code stickers, preprinted sample labels, sample collection logs, master sample collection logs, chain-of-custody/request for analysis forms, custody seals, and daily activity logs.

TABLE B-1 (concluded)

Document Number	Document Title	Comments
LANL-ER-SOP 01.05	"Field Quality Control Samples"	Five background samples were collected under the same collection procedures in a presumed contaminant-free area south of Materials Disposal Area C and Pajarito Road. *Deviations*: Rinsate samples were not collected because no field decontamination was conducted. Instead, dedicated sampling equipment was used at each sampling site. Equipment was decontaminated at the Waste Site Studies Laboratory at Technical Area 59 after use.
LANL-ER-SOP 06.09	"Spade and Scoop Method for Collection of Soil Samples"	This procedure was followed for the collection of soil samples to a maximum depth of 12 in.
LANL-ER-SOP 06.10	"Hand Auger and Thin-Wall Sampler"	This procedure was followed for the collection of soil samples at depths greater than 12 in.
LANL-ER-SOP 06.11 (draft)	"Field Surveying of Sample Locations"	This draft procedure was followed for staking out sampling grids and to determine the state plane coordinates of all the sampling locations. These data were then reviewed for accuracy by the field team leader and then transferred to the Facility for Information Management, Analysis, and Display (FIMAD) database. Draft maps of the sample locations were plotted by FIMAD, reviewed for mistakes, and changes were made as needed.

TABLE B-2

GOOD INVESTIGATORY PROCEDURES

Procedure	Comments
Calibration Procedures and Frequency	Field instruments were calibrated by internal Laboratory-certified calibration services; results are on file. Analyses done by contract laboratories are discussed in the results reports, and calibrations by Laboratory analytical laboratories are on file.
Data Tracking	Computer spreadsheets were used to tabulate the sample information obtained from field documentation and analytical service agreements, including field sample numbers, location identifiers, sample depths, screening data, laboratory sample numbers, group request numbers, dates of collection, and analyte suites. These spreadsheets were used to provide information to the FIMAD database. The spreadsheets were also used to verify sample information associated with completed laboratory analytical reports.
Data Verification	Analytical data were reviewed for gross errors, e.g., incorrect analytical units, missing analytes, quality control reporting errors, and out-of-range values, both on hard copy reports and on the FIMAD computer database. Errors discovered were reported to the SCF and corrected reports were obtained.
Data Reduction, Validation, and Reporting	Data were submitted to the FIMAD data storage facility after one level of verification. No data reduction was conducted because the analytical results were used as reported. Data were further validated by reference to the quality control materials for a specific analysis and by proofing against appropriate records, by ensuring that correct codes and units were used, and by checking for reasonableness for the level of the analyte and the specific sample location. Obvious errors and anomalous results were corrected where possible.
System Audits	An internal audit was conducted from December 6 through December 17, 1993. This audit evaluated all of Operable Unit 1147 work conducted for field collection and measurement, laboratory analysis, and sample tracking. Results of the audit are reported in ER-94-02, "Data Collection, Management, and Validation, January 25, 1994." Corrective actions were taken where appropriate and are documented in the RPF.

APPENDIX C
ANALYTICAL RESULTS

Tables C-1 through C-6 give the detailed analytical results for these potential release sites. The units for all inorganic and organic chemical values are given in mg/kg. The units for all radionuclides are given in pCi/g. A "<" symbol preceding the value indicates the analyte was not detected above the reporting limit; the value given is the reporting limit. Tables C-2 and C-5 list only those organic analytes that were detected above the reporting limit. Blank cells in an analyte column indicate that the sample was not analyzed for that analyte. An "R" after the sample ID indicates that there was a laboratory replicate; a "2" after the R means that there were 2 laboratory replicates. An "FD" in the Field Sample Code column indicates the sample was a field duplicate. Sample values that are in bold equal or exceed screening action levels (SALs). Shaded sample values exceed background comparison values.

TABLE C-1

SITES ASSOCIATED WITH ATMOSPHERIC RELEASES (INORGANICS)

Location ID	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-5001		485819.9	1769313	AAA2439	<1	1.5	62	0.32	<0.4	7.9	<0.1	2	22	<0.025	<0.2	0.18
				AAA2439R							<0.1					
				AAA2439R2							<0.1					
50-5002		485999.5	1769338	AAA2440	<1	1.7	99	0.34	<0.4	4.5	<0.1	2	12	<0.025	0.3	0.17
				AAA2440R							<0.1					
				AAA2440R2							<0.1					
50-5003		485899.1	1769264	AAA2441	<1	2	94	0.76	<0.4	5.6	<0.1	3	22	0.03	<0.2	0.25
				AAA2441R							<0.1					
				AAA2441R2							<0.1					
50-5004		485989.9	1769238	AAA2442	<1	3.5	190	1.2	<0.4	12	<0.1	8.6	20	<0.025	<0.2	0.44
				AAA2442R							<0.1					
				AAA2442R2							<0.1					
50-5005		485995	1769174	AAA2443	<1	1.3	56	0.25	<0.4	5.7	<0.1	<2	18	<0.025	0.4	0.07
				AAA2443R							<0.1					
				AAA2443R2							<0.1					
50-5006		485964.9	1769187	AAA2444	<1	1.3	66	0.51	<0.4	3.8	<0.1	3	18	<0.025	<0.2	0.08
				AAA2444R							<0.1					
				AAA2444R2							<0.1					
50-5007		485994.8	1769151	AAA2445	<1	1	47	0.19	<0.4	5.3	<0.1	2	8	0.06	0.3	0.03
				AAA2445R							<0.1					
				AAA2445R2							<0.1					
50-5008		485891	1769235	AAA2446	<1	1.4	110	0.41	<0.4	11	<0.1	5	41	<0.025	<0.2	0.16
				AAA2446R							<0.1					
				AAA2446R2							<0.1					
50-5009		485844.8	1769114	AAA2447	<1	3.7	140	0.97	<0.4	65	0.23	8	31	0.06	0.5	0.42
				AAA2447R							0.22					
				AAA2447R2							0.23					
50-5020		486076.2	1769133	AAA2448	<1	2.5	100	0.62	<0.4	6.7	<0.1	5	17	<0.025	0.5	0.28
				AAA2448R							<0.1					
				AAA2448R2							<0.1					

TABLE C-1 (continued)

Location ID	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-5021		486064.4	1769246	AAA2449	<1	2.3	130	0.99	<0.4	8.2	<0.1	3	16	<0.025	0.4	0.33
				AAA2449R							<0.1					
				AAA2449R2							<0.1					
50-5022		486078.2	1769348	AAA2450	<1	2.1	66	0.49	<0.4	5.5	<0.1	3.8	15	<0.025	0.5	0.26
				AAA2450R							<0.1					
				AAA2450R2							<0.1					
50-5023		486099.1	1769157	AAA2451	1	1.3	56	0.42	<0.4	4.8	<0.1	4	14	<0.025	0.4	0.14
				AAA2451R							<0.1					
				AAA2451R2							<0.1					
50-5024		486105.4	1769106	AAA2452	2	1.3	38	0.46	<0.4	4.1	<0.1	<2	15	<0.025	0.4	0.14
				AAA2452R							<0.1					
				AAA2452R2							<0.1					
50-5024	RD	486105.4	1769106	AAA2490	<1	2	42	0.28	<0.4	3.6	<0.1	<2	8.1	<0.125	0.8	<0.125
				AAA2490R							<0.1					
				AAA2490R2							<0.1					
50-5025		486107	1769034	AAA2453	<1	1.3	49	0.4	<0.4	6.2	<0.1	9	13	<0.025	0.4	0.1
				AAA2453R		1.2					<0.1			<0.025	0.3	0.08
				AAA2453R2							<0.1					
50-5026		486211.9	1768927	AAA2454	<1	1.4	49	0.57	<0.4	3.3	<0.1	10	5	<0.125	0.6	<0.125
				AAA2454R							<0.1					
				AAA2454R2							<0.1					
50-5027		486102.3	1768925	AAA2455	<1	1.4	57	0.4	<0.4	4.4	<0.1	<2	5.8	<0.125	0.4	<0.125
				AAA2455R							<0.1					
				AAA2455R2							<0.1					
50-5028		486107.8	1768847	AAA2456	1	1.6	55	0.49	<0.4	4.7	<0.1	3	7.4	<0.125	0.5	<0.125
				AAA2456R	2		60	0.58	<0.4	5	<0.1	<2				
				AAA2456R2							<0.1					
50-5029		486219.1	1768867	AAA2457	<1	3	54	0.41	<0.4	2.4	<0.1	<2	4.5	<0.125	0.7	<0.125
				AAA2457R							<0.1					
				AAA2457R2							<0.1					

TABLE C-1 (continued)

Location ID	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-5030		486156.7	1768810	AAA2458	<1	1.6	53	0.29	<0.4	3	<0.1	<2	5.9	<0.125	0.6	<0.125
				AAA2458R							<0.1					
				AAA2458R2							<0.1					
50-5031		486013.3	1768803	AAA2459	<1	12.3	76	0.58	<0.4	4.5	0.1	<2	8.4	<0.125	0.7	<0.125
				AAA2459R							0.1					
				AAA2459R2							0.1					
50-5041		485839.5	1768943	AAA2460	<1	2.09	79	0.18	<0.4	5.1		<2	8	0.21	0.29	<0.08
				AAA2460R							<0.1					
				AAA2460R2							<0.1					
50-5042		485860.7	1768894	AAA2461	<1	2.59	59	0.53	<0.4	5		<2	11	<0.08	<0.2	0.1
				AAA2461R							<0.1					
				AAA2461R2							<0.1					
50-5043		485772.1	1768830	AAA2462	<1	4.11	96	0.68	<0.4	7.7		<2	12	<0.08	<0.2	0.18
				AAA2462R							<0.1					
				AAA2462R2							<0.1					
50-5044		485800.9	1768821	AAA2463	<1	1.63	63	0.16	<0.4	6.3		<2	31	<0.08	0.37	<0.08
				AAA2463R							<0.1					
				AAA2463R2							<0.1					
50-5045		485817.6	1768815	AAA2464	<1	1.92	47	0.21	<0.4	3.1		<2	9	<0.08	0.41	0.09
				AAA2464R							<0.1					
				AAA2464R2							<0.1					
50-5046		485842.8	1768813	AAA2465	<1	2.35	47	0.23	<0.4	2.5		<2	10	<0.08	<0.2	0.12
				AAA2465R							<0.1					
				AAA2465R2							<0.1					
50-5047	FD	485859.8	1768769	AAA2491	<1	2.46	59	0.42	<0.4	4.8		<2	13	<0.08	0.26	0.11
				AAA2491R							<0.1					
				AAA2491R2							<0.1					
50-5047		485859.8	1768769	AAA2466	<1	2.57	56	0.45	<0.4	3.8		<2	12	<0.08	<0.2	<0.08
				AAA2466R							<0.1					
				AAA2466R2							<0.1					

TABLE C-1 (continued)

Location ID	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-5048		485801.9	1768869	AAA2467	<1	2.43	49	0.35	<0.4	3		<2	8	<0.08	<0.2	<0.08
				AAA2467R							<0.1					
				AAA2467R2							<0.1					
50-5060		485744.4	1769214	AAA2468	<1	3.45	110	0.52	<0.4	6.9		<2	14	<0.08	<0.2	0.15
				AAA2468R							<0.1					
				AAA2468R2							<0.1					
50-5061		485734.6	1768983	AAA2469	<1	3.27	69	0.41	<0.4	4.4		<2	23	<0.08	<0.2	0.14
				AAA2469R							<0.1					
				AAA2469R2							<0.1					
50-5062		485567.8	1768978	AAA2470	<1	2.9	94	0.62	<0.4	9.3	<0.2	<2	35	0.09	<0.2	0.12
				AAA2470R							<0.2					
				AAA2470R2							<0.2					
50-5063		485603.8	1768980	AAA2471	17	2.8	800	150	**170**	810	<0.2	870	6	0.09	<0.2	0.09
				AAA2471R							<0.2					
				AAA2471R2							<0.2					
50-5064		485585.4	1768965	AAA2472	**410**	3.6	0.54	<0.08	<0.4	1.1	<0.2	<2	28	0.11	<0.2	0.13
				AAA2472R							<0.2					
				AAA2472R2							<0.2					
50-5065		485618.1	1768960	AAA2473	<1	2.5	<0.1	9.3	**120**	190	<0.2	<2	12	0.06	<0.2	0.12
				AAA2473R							<0.2					
				AAA2473R2							<0.2					
50-5066		485646.6	1768953	AAA2474	<1	2.1	68	0.43	0.5	18	<0.2	14	13	0.11	<0.2	0.09
				AAA2474R							<0.2					
				AAA2474R2							<0.2					
50-5067		485682.3	1768948	AAA2475	<1	3	53	0.41	<0.4	7	<0.2	<2	15	0.14	0.2	0.18
				AAA2475R							<0.2					
				AAA2475R2							<0.2					
50-5068		485721.1	1768942	AAA2476	<1	2	140	0.81	0.7	51	<0.2	9	11	0.1	<0.2	0.16
				AAA2476R							<0.2					
				AAA2476R2							<0.2					

TABLE C-1 (continued)

Location ID	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-5069		485743.1	1768832	AAA2477	<1	2.1	92	0.73	<0.4	8.9	<0.2	<2	9	0.12	<0.2	0.09
				AAA2477R							<0.2					
				AAA2477R2							<0.2					
50-5070		485729.9	1769074	AAA2478	<1	3.83	83	0.62	<0.4	4		<2	10	<0.08	<0.2	0.14
				AAA2478R	<1		73	0.56	<0.4		<0.1	<2				
				AAA2478R2							<0.1					
50-5080		485768.8	1769249	AAA2479	<1	2.65	52	0.2	<0.4	5		7.3	45	<0.08	<0.2	<0.08
				AAA2479R							<0.1					
				AAA2479R2							<0.1					
50-5081		485757.5	1769272	AAA2480	<1	4.25	100	0.59	<0.4	8.2		8.1	15	<0.08	<0.2	0.15
				AAA2480R							<0.1					
				AAA2480R2							<0.1					
50-5082		485741.5	1769272	AAA2481	<1	3.93	120	0.59	<0.4	8.2		6.4	26	<0.08	<0.2	0.15
				AAA2481R							<0.1					
				AAA2481R2							<0.1					
50-5083		485672.4	1769255	AAA2482	<1	3.75	160	0.51	<0.4	6.6		7	17	<0.08	<0.2	0.24
				AAA2482R							<0.1					
				AAA2482R2							<0.1					
50-5084		485591.6	1769238	AAA2483	<1	4.08	110	0.62	<0.4	9.5		13	29	<0.08	<0.2	0.14
				AAA2483R							<0.1					
				AAA2483R2							<0.1					
50-5085		485546.4	1769158	AAA2484	<1	4.87	160	0.94	<0.4	11		9	21	<0.08	0.39	0.29
				AAA2484R		5.2					<0.1				<0.2	
				AAA2484R2							<0.1					
50-5086		485436	1769099	AAA2485	<1	2.81	130	0.78	<0.4	7.6		7.3	13	<0.07	0.3	0.16
				AAA2485R							<0.1					
				AAA2485R2							<0.1					
50-5087		485356	1769076	AAA2486	<1	3.18	140	0.81	<0.4	10		7.3	18	<0.07	0.33	0.18
				AAA2486R							<0.1					
				AAA2486R2							<0.1					

TABLE C-1 (concluded)

Location ID	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-5088		485343.5	1769042	AAA2487	<1	2.69	190	1.1	<0.4	11		10	11	<0.07	0.39	0.21
				AAA2487R							<0.1					
				AAA2487R2							<0.1					
50-5089		485406.4	1768985	AAA2488	<1	0.82	22	0.34	<0.4	2.5		<2	8	<0.07	<0.2	<0.06
				AAA2488R							<0.1					
				AAA2488R2							<0.1					
50-5090		485269.6	1768961	AAA2489	<1	3.08	140	0.78	<0.4	11		8	22	<0.07	<0.2	0.15
				AAA2489R							<0.1					
				AAA2489R2							<0.1					
				SOIL SAL	**400**		**5600**		**39**		**24**	**1600**	**500**	**32**	**400**	**6.4**
				Background UTL for soil		11.6	1140	3.31	2.7	34.2	0.1	26.7	39	2.5	1.7	0.9

TABLE C-2
SITES ASSOCIATED WITH ATMOSPHERIC RELEASES (ORGANICS)

Location ID	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-5002		485999.5	1769338	AAA2440	Benzo[a]pyrene	0.98	0.10	*
				AAA2440	Benzo[a]anthracene	0.79	1.00	
				AAA2440	Phenanthrene	0.67	NA	
				AAA2440	Pyrene	2.1	2400.00	
				AAA2440	Benzo[g,h,i]perylene	1	NA	
				AAA2440	Indeno[1,2,3-cd]pyrene	0.76	1.00	
				AAA2440	Benzo[b]fluoranthene	0.93	1.00	
				AAA2440	Fluoranthene	1.5	3200.00	
				AAA2440	Benzo[k]fluoranthene	0.53	1.00	
				AAA2440	Chrysene	0.91	96.00	
50-5003		485899.1	1769264	AAA2441	Phenanthrene	0.64	NA	
				AAA2441	Pyrene	0.74	2400.00	
				AAA2441	Fluoranthene	0.75	3200.00	
				AAA2441	Aroclor 1260	0.29	1.0	
50-5004		485989.9	1769238	AAA2442	Aroclor 1260	0.07	1.0	
50-5005		485995	1769174	AAA2443	Aroclor 1260	0.14	1.0	
50-5006		485964.9	1769187	AAA2444	Aroclor 1260	0.52	1.0	
50-5007		485994.8	1769151	AAA2445	Benzo[a]pyrene	1.3	0.10	*
				AAA2445	Dibenzo[a,h]anthracene	0.55	0.10	*
				AAA2445	Benzo[a]anthracene	1.2	1.00	*
				AAA2445	Phenanthrene	1	NA	
				AAA2445	Pyrene	2.1	2400.00	
				AAA2445	Benzo[g,h,i]perylene	1.2	NA	
				AAA2445	Indeno[1,2,3-cd]pyrene	1.1	1.00	*

TABLE C-2 (continued)

Location ID	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-5007		485994.8	1769151	AAA2445	Benzo[b]fluoranthene	1.4	1.00	*
				AAA2445	Fluoranthene	2.8	3200.00	
				AAA2445	Benzo[k]fluoranthene	1	1.00	*
				AAA2445	Chrysene	1.5	96.00	
				AAA2445	Aroclor 1260	0.13	1.0	
50-5009		485844.8	1769114	AAA2447	Benzo[a]pyrene	0.7	0.10	*
				AAA2447	Benzo[a]anthracene	0.61	1.00	
				AAA2447	Phenanthrene	1.8	NA	
				AAA2447	Pyrene	1.8	2400.00	
				AAA2447	Benzo[g,h,i]perylene	0.5	NA	
				AAA2447	Indeno[1,2,3-cd]pyrene	0.55	1.00	
				AAA2447	Benzo[b]fluoranthene	0.66	1.00	
				AAA2447	Fluoranthene	2.1	3200.00	
				AAA2447	Benzo[k]fluoranthene	0.43	1.00	
				AAA2447	Chrysene	0.68	96.00	
				AAA2447	Aroclor 1260	0.17	1.0	
50-5021		486064.4	1769246	AAA2449	Aroclor 1260	0.1	1.0	
50-5041		485839.5	1768943	AAA2460	Benzo[a]pyrene	0.36	0.10	*
				AAA2460	Phenanthrene	0.38	NA	
				AAA2460	Pyrene	0.74	2400.00	
				AAA2460	Fluoranthene	0.7	3200.00	
				AAA2460	Chrysene	0.37	96.00	
50-5042		485860.7	1768894	AAA2461	Benzo[a]pyrene	0.71	0.10	*
				AAA2461	Benzo[a]anthracene	0.67	1.00	
				AAA2461	Di-n-butyl phthalate	1.8	8000.00	

TABLE C-2 (continued)

Location ID	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-5042		485860.7	1768894	AAA2461	Phenanthrene	1.8	NA	
				AAA2461	Anthracene	0.41	24000.00	
				AAA2461	Pyrene	2	2400.00	
				AAA2461	Benzo[g,h,i]perylene	0.58	NA	
				AAA2461	Indeno[1,2,3-cd]pyrene	0.54	1.00	
				AAA2461	Benzo[b]fluoranthene	0.57	1.00	
				AAA2461	Fluoranthene	1.9	3200.00	
				AAA2461	Benzo[k]fluoranthene	0.51	1.00	
				AAA2461	Chrysene	0.74	96.00	
50-5044		485800.9	1768821	AAA2463	Bis(2-ethylhexyl)phthalate	0.7	50.00	
50-5047		485859.8	1768769	AAA2466	Phenanthrene	0.91	NA	
				AAA2466	Pyrene	0.93	2400.00	
				AAA2466	Fluoranthene	0.89	3200.00	
	FD			AAA2491	Fluoranthene	0.42	3200.00	
50-5061		485734.6	1768983	AAA2469	Benzo[a]pyrene	2.4	0.10	*
				AAA2469	Dibenzo[a,h]anthracene	0.69	0.10	*
				AAA2469	Benzo[a]anthracene	1.8	1.00	*
				AAA2469	Phenanthrene	2.1	NA	
				AAA2469	Pyrene	4.8	2400.00	
				AAA2469	Benzo[g,h,i]perylene	1.4	NA	
				AAA2469	Indeno[1,2,3-cd]pyrene	1.6	1.00	*
				AAA2469	Benzo[b]fluoranthene	2.2	1.00	*
				AAA2469	Fluoranthene	4.1	3200.00	
				AAA2469	Benzo[k]fluoranthene	1.4	1.00	*
				AAA2469	Chrysene	2.9	96.00	

TABLE C-2 (concluded)

Location ID	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-5062		485567.8	1768978	AAA2470	Aroclor 1254	1	1.0	
50-5068		485721.1	1768942	AAA2476	Benzo[a]pyrene	1.5	0.10	*
				AAA2476	Benzo[a]anthracene	1.2	1.00	*
				AAA2476	Phenanthrene	1.7	NA	
				AAA2476	Pyrene	2.7	2400.00	
				AAA2476	Benzo[g,h,i]perylene	0.64	NA	
				AAA2476	Indeno[1,2,3-cd]pyrene	0.79	1.00	
				AAA2476	Benzo[b]fluoranthene	1.4	1.00	*
				AAA2476	Fluoranthene	2.4	3200.00	
				AAA2476	Benzo[k]fluoranthene	0.98	1.00	
				AAA2476	Chrysene	1.8	96.00	
50-5070		485729.9	1769074	AAA2478	Aroclor 1260	0.17	1.0	
50-5084		485591.6	1769238	AAA2484	Benzo[a]pyrene	0.63	0.10	*
				AAA2484	Benzo[a]anthracene	0.45	1.00	
				AAA2484	Phenanthrene	0.63	NA	
				AAA2484	Bis(2-ethylhexyl)phthalate	0.69	50.00	
				AAA2484	Pyrene	1.1	2400.00	
				AAA2484	Benzo[b]fluoranthene	0.5	1.00	
				AAA2484	Fluoranthene	0.95	3200.00	
				AAA2484	Benzo[k]fluoranthene	0.42	1.00	
				AAA2484	Chrysene	0.67	96.00	
50-5086		485436	1769099	AAA2485	Aroclor 1260	0.21	1.0	
				AAA2491	Pyrene	0.41	2400.00	

TABLE C-3

SITES ASSOCIATED WITH ATMOSPHERIC RELEASES (RADIONUCLIDES)

Location ID	Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-5001		485819.9	1769313	AAA2439	<6.51	0.639	<0.684	11.389	0.008	0.016	<1.85	0.13	<3.16	0.835	0.051	0.953	0.03475936
50-5002		485999.5	1769338	AAA2440	<6.26	<0.526	<0.24	23.246	0.004	0.014	<1.87	0.12	<2.73	0.866	0.082	0.982	0.02258064
50-5003		485899.1	1769264	AAA2441	<9.49	<0.439	<0.663	33.229	0.017	0.072	2.297	0.12	3.491	1.321	0.087	1.502	0.1574661
50-5004		485989.9	1769238	AAA2442	<7.46	<0.67	<0.678	30.089	0.006	0.069	2.405	0.26	<3.24	1.136	0.079	1.28	0.06823129
50-5005		485995	1769174	AAA2443	<8.04	<0.649	<0.692	<23.5	0.013	0.07	3.528	0.14	<3.59	0.722	0.043	0.92	0.02303797
50-5006		485964.9	1769187	AAA2444	<7.81	0.742	<0.791	30.431	0.016	0.033	<2.46	0.55	<3.62	1.072	0.091	0.915	0.02966292
50-5007		485994.8	1769151	AAA2445	<6.85	<0.41	<0.535	<21.4	0.023	0.086	<1.93	0.1	2.155	0.703	0.06	0.726	0.04152542
50-5008		485891	1769235	AAA2446	<7.58	<0.462	<0.633	14.965	0.006	0.018	3.04	0.61	<3.41	0.768	0.095	0.985	0.04187287
50-5009		485844.8	1769114	AAA2447	<8.01	<0.415	<0.888	<26.3	0.09	0.206	<2.27	<0.06	4.246	1.186	0.065	1.313	0.3234597
50-5020		486076.2	1769133	AAA2448	<5.33	<0.388	<0.495	21.048	0.089	0.171	3.663	0.16	3.991	1.189	0.062	1.153	0.05961039
				AAA2448R					0.078	0.274							
50-5021		486064.4	1769246	AAA2449	<9.64	<0.544	0.955	29.501	0.004	0.021	<2.3	0.21	<3.51	1.146	0.091	1.228	0.04721973
				AAA2449R										1.462	0.105	1.434	
50-5022		486078.2	1769348	AAA2450	<8.19	<0.237	<0.467	11.57	0.003	0.002	<2.09	<0.04	<3.03	0.911	0.07	1.053	0.03160085
50-5023		486099.1	1769157	AAA2451	<5.9	<0.578	<0.599	25.446	0.002	0.017	3.886	<0.19	<3.13	0.771	0.045	0.945	0.03767442
50-5024		486105.4	1769106	AAA2452	<8.86	**1.519**	<0.694	18.492	0.021	0.042	<2.53	<0.32	<2.95	0.989	0.092	0.983	0.04521739
	FD			AAA2490	<7.84	<0.83	<0.269	<31.7	0.009	0.035	<2.24	<0.21	2.513	0.927	0.048	1.012	0.0387931
50-5025		486107	1769034	AAA2453	<7.11	<0.966	<0.624	16.406	0.004	0.015	<2.04	<0.17	<4.02	1.06	0.103	1.141	0.0420304
50-5026		486211.9	1768927	AAA2454	<6.41	<0.402	<0.52	32.649	0.005	0.01	3.333	<0.15	<3.35	1.153	0.152	1.185	0.02967033
				AAA2454R					0.003	0.017							

TABLE C-3 (continued)

Location ID	Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-5027		486102.3	1768925	AAA2455	<7.36	<0.849	<0.507	33.118	0.006	0.031	<2.15	<0.28	4.029	0.848	0.083	0.897	0.0318646
50-5028		486107.8	1768847	AAA2456	<8.04	<0.323	<0.498	18.027	0.007	0.041	<1.95	<0.35	<3.23	0.869	0.029	0.836	0.04888889
50-5029		486219.1	1768867	AAA2457	<9.18	<0.678	<0.811	<26.4	0.003	0.017	2.963	<0.35	<3.26	1.12	0.047	1.296	0.056875
50-5030		486156.7	1768810	AAA2458	<8.74	<0.695	<0.72	<36.7	0.014	0.066	<2.37	<0.18	<3.99	0.786	0.027	0.901	0.03636872
50-5031		486013.3	1768803	AAA2459	<7.85	<0.564	<0.43	<27.9	0.02	0.691	2.043	<0.36	<3.45	1.391	0.051	1.402	0.1127894
				AAA2459R	<7.81	<0.496	<0.312	<27.5			<2.29		2.948				
50-5041		485839.5	1768943	AAA2460	<3.78	<0.479	<0.516	18.29	0.025	0.055	<1.73	<0.32	<3.04	0.888	0.059	0.822	0.04027689
				AAA2460R	<9.1	<0.462	<0.499	<22.5			<1.97		<2.77				
50-5042		485860.7	1768894	AAA2461	<5.2	<0.629	<0.633	22.75	0.009	0.456	<2.19	<0.43	<3.73	1.025	0.05	1.103	0.07742081
50-5043		485772.1	1768830	AAA2462	<6.29	<0.432	<0.623	16.8	0.033	0.121	<2.06	0.1	<3.81	1.531	0.071	1.634	0.03946429
50-5044		485800.9	1768821	AAA2463	<3.69	<0.258	<0.309	16.68	0.021	0.094	<2.19	<0.2	<2.77	0.742	0.068	0.752	0.02598705
				AAA2463R					0.02	0.074					0.041		
50-5045		485817.6	1768815	AAA2464	<7.42	<0.429	<0.688	17.01	0.033	0.791	1.67	0	<2.98	0.908	0.074	0.744	0.02314465
50-5046		485842.8	1768813	AAA2465	<8.89	<0.559	<0.449	13.25	0.022	0.615	4.04	0.07	2.19	0.802	0.051	0.788	0.02894737
50-5047		485859.8	1768769	AAA2466	<4.61	<0.418	<0.492	<24.6	0.013	0.285	<2.36	<0.33	<3.2	1.139	0.146	1.316	0.04231177
				AAA2466R								<0.41		1.291	0.041	1.14	
	FD			AAA2491	<7.91	<0.572	<0.331	25.51	0.013	0.275	1.67	0.5	<2.9	1.15	0.075	1.13	0.05161017
	FD			AAA2491R										1.192	0.047	1.432	
50-5048		485801.9	1768869	AAA2467	<9.15	<0.453	2.05	2.69	0.127	0.744	<2.07	0.19	<3.44	1.221	0.063	1.489	0.01668449
50-5060		485744.4	1769214	AAA2468	<7.18	<0.283	<0.457	17.02	0.005	0.023	<2.05	0.4	<3.15	1.048	0.06	1.254	0.02598705
50-5061		485734.6	1768983	AAA2469	<7.46	<0.552	<0.527	28.34	0.052	1.606	<2.15	0.08	<3.14	1.037	0.076	0.966	0.05469783

TABLE C-3 (continued)

Location ID	Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-5062		485567.8	1768978	AAA2470	<8.24	<0.69	<0.554	14.08	0.01	0.097	3.57	0.31	<3.55	0.935	0.067	0.934	0.035311
50-5063		485603.8	1768980	AAA2471		<0.39	<0.528	29.61	0.006	0.001	1.34	0.21	<2.92	0.706	0.034	0.841	0.008773006
50-5064		485585.4	1768965	AAA2472		<0.681	0.979	18.76	0.01	0.124	<2.81	0	<4.61	1.204	0.069	1.248	0.2496534
50-5065		485618.1	1768960	AAA2473		<0.402	<0.605	23.51	0.039	0.979	<2.04	0.03	<3.28	1.162	0.06	1.28	0.04803668
50-5066		485646.6	1768953	AAA2474		<0.702	<0.456	19.026	0.017	0.251	4.05	0.02	<3.78	1.017	0.069	1.28	0.04675448
50-5067		485682.3	1768948	AAA2475		<0.626	<0.439	<27.9	0.008	0.049	<2.7	<0.33	<4.39	1.185	0.083	1.037	0.03591241
50-5068		485721.1	1768942	AAA2476		<0.773	<0.602	29.13	0.028	0.763	3.01	0.43	2.13	1.065	0.092	1.02	0.02894737
50-5069		485743.1	1768832	AAA2477		<0.294	<0.331	28.18	0.006	0.13	<1.78	0.21	2.2	1.22	0.088	1.23	0.03910603
				AAA2477R								0.06					
50-5070		485729.9	1769074	AAA2478		<0.76	<0.577	<23.9	0.015	0.316	<3.08	0.7		1.132	0.099	1.405	0.04704595
				AAA2478R							4.34						
50-5080		485768.8	1769249	AAA2479		<0.405	<0.536	11.17	0.003	0.023	<2.05	0.13	<3.14	0.849	0.079	0.855	0.05318182
50-5081		485757.5	1769272	AAA2480		<0.681	<0.752	16.66	0.004	0.027	1.91	0.27	<3.05	0.979	0.043	1.062	0.03573858
50-5082		485741.5	1769272	AAA2481		<0.438	<0.484	<19.7	0.019	0.162	<1.81	0.26	<2.58	1.024	0.013	1.204	0.07503417
50-5083		485672.4	1769255	AAA2482		<0.473	<0.406	14.33	0.005	0.187	<1.78	0.73	3.28	0.937	0.046	0.919	0.04982437
50-5084		485591.6	1769238	AAA2483		<0.409	<0.477	20.77	0.005	0.076	3.85	0.74	<3.24	1.143	0.046	1.375	0.06267857
50-5085		485546.4	1769158	AAA2484		<0.565	<0.588	15.65	0.006	0.027	**5.22**	0.33	<2.99	1.315	0.077	1.405	0.112065
				AAA2484R					0.005	0.088							

TABLE C-3 (concluded)

Location ID	Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-5086		485436	1769099	AAA2485		<0.486	<0.69	29.67	0.017	1.395	<1.99	0.34	4.43	1.016	0.095	1.049	0.05334096
50-5087		485356	1769076	AAA2486		<0.569	<0.302	19.01	0.012	0.435	<1.91	0.25	3.04	1.157	0.039	1.118	0.06620047
50-5088		485343.5	1769042	AAA2487		<0.696	<0.498	23.17	0.004	0.017	1.97	0.3	4.3	1.36	0.055	1.323	0.08892815
				AAA2487R		<0.463	<0.256	<24.9			<2.39		<3.56				
50-5089		485406.4	1768985	AAA2488		<0.658	<0.585	19.7	0.002	0.012	<1.86	0.45	3.52	1.094	0.085	1.147	0.0519774
50-5090		485269.6	1768961	AAA2489		<0.539	<0.352	13.01	0.005	0.126	<1.97	0.25	<3.57	1.128	0.093	1.195	0.1098693
				AAA2489R													
				SOIL SAL	**17**	**0.09**	**4**		**20**	**18**	**5**	**5.9**	**5**	**86**	**18**	**59**	**820**
				BACKGROUND UTL FOR SOIL			1.4		0.014	0.052		1	2.68	2.03	0.088	1.9	

TABLE C-4

TEN SITE CANYON (INORGANICS)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6500	0	0.5		486115.2	1768803	AAA2519	<1	2.2	53	0.46	<0.4	6.2	<0.1	4	8	<0.04	<0.2	0.06
						AAA2519R							<0.1					
						AAA2519R2							<0.1					
50-6501	0	0.5		486119.9	1768816	AAA2520	<1	1.9	64	0.51	<0.4	5.4	<0.1	5	9	<0.04	<0.2	0.07
						AAA2520R							<0.1					
						AAA2520R2							<0.1					
50-6502	0	0.5		486142.2	1768823	AAA2521	<1	1.9	57	0.75	<0.4	3.5	<0.1	5	9	<0.04	<0.2	0.05
						AAA2521R							<0.1					
						AAA2521R2							<0.1					
50-6502	3	4	FD	486142.2	1768823	AAA2719	<1	2.5	78	0.81	<0.4	5.7	<0.1	5	10	<0.04	<0.2	0.09
						AAA2719R							<0.1					
						AAA2719R2							<0.1					
50-6502	3	4		486142.2	1768823	AAA2721	<1	2.2	100	0.92	<0.4	6.7	<0.1	6.3	7	<0.04	<0.2	0.08
						AAA2721R							<0.1					
						AAA2721R2							<0.1					
50-6503	0	0.5		486141.3	1768811	AAA2522	<1	2.4	66	0.64	<0.4	6.1	<0.1	5	6	<0.04	<0.2	0.08
						AAA2522R							<0.1					
						AAA2522R2							<0.1					

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6503	1.5	2.5		486141.3	1768811	AAA2715	<1	4.6	190	1.1	<0.4	13	<0.1	10	14	<0.04	0.4	0.2
						AAA2715R							<0.1					
						AAA2715R2							<0.1					
50-6503	3	4		486141.3	1768811	AAA2720	<1	3.9	180	1.1	<0.4	13	<0.1	9	13	<0.04	0.3	0.19
						AAA2720R							<0.1					
						AAA2720R2							<0.1					
50-6504	0	0.5		486144.8	1768799	AAA2523	<1	3.3	120	0.9	<0.4	11	<0.1	9	11	<0.04	<0.2	0.13
						AAA2523R							<0.1					
						AAA2523R2							<0.1					
50-6505	0	0.5		486229.9	1768827	AAA2524	<1	0.9	52	0.8	<0.4	2.8	<0.1	4	6	<0.06	<0.2	0.07
						AAA2524R		1.1					<0.1			0.08	<0.2	0.05
						AAA2524R2							<0.1					
50-6506	0	0.5		486239.1	1768817	AAA2525	<1	0.7	30	0.09	<0.4	1.1	<0.1	<2	4	<0.04	<0.2	<0.04
						AAA2525R	<1		17	0.26	<0.4	2.4	<0.1	3				
						AAA2525R2							<0.1					
50-6506	1.5	2.5		486239.1	1768817	AAA2716	<1	2.4	65	0.66	<0.4	5.5	<0.1	5.5	6	<0.04	<0.2	0.06
						AAA2716R							<0.1					
						AAA2716R2							<0.1					

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6506	3	4		486239.1	1768817	AAA2722	<1	1.1	24	0.64	<0.4	2	<0.1	<2	5	<0.04	<0.2	<0.04
						AAA2722R							<0.1					
						AAA2722R2							<0.1					
50-6507	0	0.5		486244.6	1768814	AAA2526	<1	3.3	110	2.8	0.6	8.1	<0.1	8	15	<0.06	<0.2	0.13
						AAA2526R							<0.1					
						AAA2526R2							<0.1					
50-6507	0	0.5	FD	486244.6	1768814	AAA2687	<1	2.6	98	0.64	<0.4	6.1	<0.1	6.7	12	<0.06	<0.2	0.09
						AAA2687R							<0.1					
						AAA2687R2							<0.1					
50-6507	1.5	2.5		486244.6	1768814	AAA2717	<1	1.8	47	0.32	<0.4	3.2	<0.1	3	6	<0.06	<0.2	<0.04
						AAA2717R							<0.1					
						AAA2717R2							<0.1					
50-6507	1.5	2.5	FD	486244.6	1768814	AAA2718	<1	0.8	42	0.34	<0.4	3	<0.1	3	7.6	<0.06	<0.2	<0.04
						AAA2718R							<0.1					
						AAA2718R2							<0.1					
50-6508	0	0.5		486320.5	1768857	AAA2527	<1	2	68	0.65	<0.4	5.7	<0.1	5.1	9	<0.04	<0.2	0.07
						AAA2527R							<0.1					
						AAA2527R2							<0.1					

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6508	1.5	2.5		486320.5	1768857	AAA2688	<1	3.7	160	0.93	<0.4	10	<0.1	8	11	<0.04	<0.2	0.15
						AAA2688R							<0.1					
						AAA2688R2							<0.1					
50-6508	3	4		486320.5	1768857	AAA2723	<1	2.1	76	0.71	<0.4	5.4	<0.1	5.3	8	<0.04	<0.2	0.06
						AAA2723R							<0.1					
						AAA2723R2							<0.1					
50-6509	0	0.5		486327.3	1768843	AAA2528	<1	1.1	29	0.36	<0.4	3.3	<0.1	3	5	<0.04	<0.2	<0.04
						AAA2528R							<0.1					
						AAA2528R2							<0.1					
50-6510	0	0.5		486324	1768838	AAA2529	<1	3.2	160	0.92	<0.4	8.9	<0.1	9	14	<0.04	<0.2	0.12
						AAA2529R	<1	3	160	0.94	<0.4	9	<0.1	9	24	<0.04	<0.2	0.12
						AAA2529R2							<0.1					
50-6511	0	0.5		486430.8	1768856	AAA2530	<1.4	2.1	59.7	0.67	<0.8	3.9	<0.02	2.9	7.8	<11.2	<0.6	<1
						AAA2530R	<1.4	1.6	60.7	0.71	1.2	3.6	<0.02	2.9	7.7	<11.2	<0.6	<1
50-6511	1.5	2.5		486430.8	1768856	AAA2709	<1.4	1.2	33.4	0.5	0.84	2.6		<2.8	5.8	<11.2	<0.6	<1
50-6512	0	0.5		486444.6	1768841	AAA2531	33	2.6	230	2.7	1.1	20	2	2.9	44	<1.2	<0.2	2.3
						AAA2531R							2					
						AAA2531R2							2					

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6512	1.5	2.5		486444.6	1768841	AAA3227	<1	3.2	65	0.7	<0.5	5	<0.1	<2	12	<0.24	<0.2	0.15
						AAA3227R							<0.1					
						AAA3227R2							<0.1					
50-6512	3	4		486444.6	1768841	AAA3222	<1	3.9	71	0.78	<0.5	4	<0.1	3	11.9	<0.24	<0.2	0.5
						AAA3222R							<0.1					
						AAA3222R2							<0.1					
50-6513	0	0.5		486447.6	1768835	AAA2532	<1.4	1.5	69.3	0.47	<0.8	3.8		4.4	10.8	<11.2	<0.6	<1
50-6514	0	0.5		486536.7	1768855	AAA2533	3.5	1.6	100	1.8	<1.2	7.3	0.2	9.9	11.3	<1.2	<0.2	<1.2
						AAA2533R							0.1					
						AAA2533R2							0.2					
50-6514	1.5	2.5		486536.7	1768855	AAA3240	<1	2.3	72	0.64	<0.5	5	<0.1	<2	9.7	<0.24	<0.2	0.14
						AAA3240R							<0.1					
						AAA3240R2							<0.1					
50-6514	3	4		486536.7	1768855	AAA3241	<1	1.6	33	0.51	<0.5	3	<0.1	<2	6.6	<0.24	<0.2	<0.12
						AAA3241R							<0.1					
						AAA3241R2							<0.1					
50-6515	0	0.5		486538.6	1768848	AAA2534	<1.4	1.2	41.8	0.26	<0.8	5.5		4.1	5.2	<11.2	<0.6	<1
50-6516	0	0.5		486539.8	1768841	AAA2535	<1.4	1.5	83.1	0.55	0.91	5.6		5	11.2	<11.2	<0.6	<1
50-6517	0	0.5		486625.9	1768822	AAA2536	<1.4	2.4	102	0.62	1	6.3		9.1	16.6	<11.2	<0.6	<1
50-6517	3	4				AAA2711	<1.4	1.1	43.3	0.49	0.87	2.9		3.1	5.6	<11.2	<0.6	<1

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6518	0	0.5		486623.8	1768811	AAA2537	<1.4	1.1	31	<0.2	<0.8	1.5		3.6	3.9	<11.2	<0.6	<1
50-6518	1.5	2.5				AAA2708	<1.4	1.2	32.3	0.24	<0.8	2.8		3.6	5.2	<11.2	<0.6	<1
50-6518	3	4				AAA2714	<1.4	1.1	36.3	0.32	<0.8	2.9		3	5.3	<11.2	<0.6	<1
50-6519	0	0.5		486621.5	1768803	AAA2538	<1.4	1.6	77.6	0.59	<0.8	4.1		6.6	12.7	<11.2	<0.6	<1
50-6520	0	0.5		486723.6	1768807	AAA2539	<1.4	1.5	53.4	0.36	<0.8	3.4		<2.8	11.6	<11.2	<0.6	<1
50-6520	1.5	2.5				AAA2710	<1.4	1.3	47.6	0.36	0.98	3.8		3.7	7.5	<11.2	<0.6	<1
50-6520	3	4				AAA2713	<1.4	1.3	53.8	0.5	<0.8	3.2		<2.8	5.2	<11.2	<0.6	<1
50-6521	0	0.5		486725.9	1768798	AAA2540	<1.4	1	42.7	0.22	1.4	4.2		<2.8	6.9	<11.2	<0.6	<1
50-6522	0	0.5		486726.2	1768790	AAA2637	<1.4	1.4	63	0.47	<0.8	4.2		4.7	9.6	<11.2	<0.6	<1
50-6522	1.5	2.5				AAA2707	<1.4	1.1	36.5	0.71	<0.8	3.3		2.9	6.6	<11.2	<0.6	<1
50-6522	3	4				AAA2712	<1.4	1.3	31.1	0.64	<0.8	2.3		<2.8	6.1	<11.2	<0.6	<1
50-6523	0	0.5		486812.8	1768847	AAA2638	<1.4	2.2	84	0.55	1	5.5		8.5	10.2	<11.2	<0.6	<1
50-6523	0	0.5	FD			AAA2680	<1.4	2.4	82	0.58	0.87	4.6		6.6	6.2	<11.2	<0.6	<1
50-6524	0	0.5		486820.6	1768836	AAA2639	<1.4	2.1	35.5	<0.2	1	3		8.2	8.8	<11.2	<3	<1
50-6525	0	0.5		486827.1	1768814	AAA2640	<1.4	3.6	79.5	0.51	1.7	5.6		5.6	12.4	<11.2	<3	<1
50-6526	0	0.5		486915.4	1768807	AAA2641	<1.4	1.8	27	0.3	1	1.2	<0.02	3.2	12.6	<11.2	<0.66	<1
						AAA2641R	<1.4	1.5	26.7	0.29	1.1	3.4	<0.02	6.2	12.6	<11.2	<0.6	<1
50-6527	0	0.5		486915.7	1768785	AAA2642	<1.4	1.3	47.5	<0.2	1.1	4.3		4.5	4.9	<11.2	<0.6	<1
50-6528	0	0.5		486914.1	1768771	AAA2643	<1.4	2.5	99.1	0.56	1.2	7.3		11.4	17.7	<11.2	<0.6	<1
50-6528	1.5	2.5				AAA2682	<1.4	1.6	85.4	0.47	1.3	7.5		5.8	39.1	<11.2	<0.6	<1

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6528	3	4				AAA2685	<1.4	1.9	34.8	0.59	<0.8	2.6		3.7	6.4	<11.2	<0.6	<1
50-6529	0	0.5		487012.2	1768800	AAA2644	<1.4	2.7	36.4	0.43	<0.8	2.4		4	13.8	<11.2	<0.6	<1
50-6529	1.5	2.5				AAA2683	<1.4	1.2	38	0.46	1.1	1.7		<2.8	4.6	<11.2	<0.6	<1
50-6529	3	4				AAA2684	<1.4	0.76	36.5	0.51	<0.8	1.7		<2.8	7.8	<11.2	<0.6	<1
50-6530	0	0.5		487017.9	1768789	AAA2645	<1.4	1.4	52.3	<0.2	0.84	4.5		5.5	12	<11.2	<0.6	<1
50-6531	0	0.5		487024.3	1768770	AAA2646	<1.4	2.5	74.1	0.41	0.83	6.7		5	20.4	<11.2	<0.6	<1
50-6531	1.5	2.5				AAA2705	<1.4	2.7	52.1	0.48	1.3	3.6		9.7	7.4	<11.2	<0.6	<1
50-6531	3	4				AAA2706	<1.4	3	38.2	0.52	1.3	3.8		5.3	4.2	<11.2	<0.6	<1
50-6532	0	0.5		487112.5	1768774	AAA2647	<1.4	1.4	77.3	0.47	<0.8	4.6		4.5	14.4	<11.2	<0.6	<1
50-6533	0	0.5		487117.4	1768762	AAA2648	<1.4	1.3	44.8	<0.2	<0.8	5.4		4.3	8.7	<11.2	0.62	<1
50-6533	1.5	2.5				AAA2681	<1.4	1.2	129	0.23	<0.8	4.3		7	11.4	<11.2	<0.6	<1
50-6533	3	4				AAA2686	<1.4	1.5	35.6	0.22	<0.8	3.1	<0.02	3.9	5.6	<11.2	<0.6	<1
50-6534	0	0.5		487121.6	1768751	AAA2649	<1.4	2.3	97.1	0.63	1.2	5.6		9.3	15.7	<11.2	<0.6	<1
50-6535	0	0.5		487201.9	1768800	AAA2650	<1.4	1.8	89.8	0.68	<0.8	5.2	0.02	5.1	14.4	<11.2	<0.6	<1
						AAA2650R	<1.4	1.7	89.4	0.7	<0.8	5.1	0.02	5.2	14.6	<11.2	<0.6	<1
50-6535	1.5	2.5				AAA2659	<1.4	2.2	87.7	0.76	<0.8	5.7		6.4	19.3	<11.2	<0.6	<1
50-6535	3	4				AAA2660	<1.4	2	47.4	0.65	<0.8	3.1		4.1	8.6	<11.2	<0.6	<1
50-6536	0	0.5		487207.8	1768791	AAA2651	<1.4	1.1	44.4	0.29	<0.8	2.3		<2.8	7.9	<11.2	<0.6	<1
50-6536	1.5	2.5				AAA2661	<1.4	3.3	120	0.79	0.92	8		7.1	30.4	<11.2	<0.6	<1
50-6536	3	4				AAA2662	<1.4	1.5	83.2	0.55	<0.8	5.2		5.3	18.7	<11.2	<0.6	<1

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6537	0	0.5		487219.8	1768782	AAA2652	<1.4	2.5	86.3	0.52	0.92	4.7		5.8	13.6	<11.2	<0.6	<1
50-6537	1.5	2.5				AAA2663	<1.4	2.4	46.3	0.65	<0.8	3.1		<2.8	6.8	<11.2	<0.6	<1
50-6537	3	4				AAA2664	<1.4	1.9	27	0.7	<0.8	3.1		<2.8	5.8	<11.2	<0.6	<1
50-6538	0	0.5		487306.8	1768799	AAA2653	<1.4	2.1	62.9	0.62	<0.8	4.8		3.5	12	<11.2	<0.6	<1
50-6538	1.5	2.5				AAA2665	<1.4	2.1	55.1	1.2	<0.8	4		4.5	6.3	<11.2	<0.6	<1
50-6538	3	4				AAA2666	<1.4	2	35.4	0.83	<0.8	2.7		<2.8	4.6	<11.2	<3	<1
50-6539	0	0.5		487306.2	1768785	AAA2654	<1.4	1.2	41.1	0.21	<0.8	1.7		4	6.2	<11.2	<0.6	<1
50-6539	1.5	2.5				AAA2667	<1.4	1.3	49.9	0.34	<0.8	3.7		5.8	23.8	<11.2	<0.6	<1
50-6539	3	4				AAA2668	<1.4	1.4	57.5	0.31	<0.8	3.7		3.1	15.7	<11.2	<0.6	<1
50-6540	0	0.5		487305	1768772	AAA2655	<1.4	1.5	90.7	0.69	<0.8	5.2		6.3	13.1	<11.2	<0.6	<1
50-6540	1.5	2.5				AAA2669	<1.4	1.9	66.5	0.71	<0.8	4.6		7.6	11.7	<11.2	<0.6	<1
50-6540	3	4				AAA2670	<1.4	1.6	51.1	0.95	<0.8	3.7	<0.0001	5.1	6.3	<11.2	<0.6	<1
						AAA2670R	<1.4	2.6	51.5	1.03	<0.8	3.1	<0.0001	5.1	5.8	<11.2	<0.6	<1
50-6541	0	0.5		487416.5	1768794	AAA2656	<1.4	2.2	53.5	0.42	<0.8	3.6		58.9	9.5	<11.2	<0.6	<1
50-6541	1.5	2.5				AAA2671	<1.4	3	57.4	0.52	<0.8	3.6		<2.8	9.2	<11.2	<0.6	<1
50-6541	3	4				AAA2672	<1.4	2.4	72.1	0.61	<0.8	3.7		3.7	9.3	<11.2	<0.6	<1
50-6542	0	0.5		487419.4	1768781	AAA2657	<1.4	1.2	38.7	0.23	<0.8	2.3		<2.8	6.2	<11.2	<0.6	<1
50-6542	1.5	2.5				AAA2673	<1.4	2.4	82.6	0.59	<0.8	5.4		4.8	13.6	<11.2	<0.6	<1
50-6542	3	4				AAA2674	<1.4	3.5	114	0.77	<0.8	5.9		7.1	8.7	<11.2	<0.6	<1
50-6543	0	0.5		487422.3	1768769	AAA2658	<1.4	2.8	97.1	0.54	<0.8	4.7		4.6	15.4	<11.2	<0.6	<1

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6543	1.5	2.5				AAA2675	<1.4	1.8	97.5	0.77	<0.8	4.9		5.4	8.9	<11.2	<0.6	<1
50-6543	3	4				AAA2676	<1.4	2	66.5	0.8	<0.8	4.3		3.7	8.8	<11.2	<0.6	<1
50-6540	0	0.5	FD	487305	1768772	AAA2677	<1.4	1.8	89	0.67	<0.8	5.2		5	14.4	<11.2	<0.6	1.1
50-6540	1.5	2.5	FD			AAA2678	<1.4	2.4	68.5	0.75	<0.8	4.8		5.8	11.1	<11.2	<0.6	<1
50-6540	3	4	FD			AAA2679	<1.4	1.3	48.5	0.88	<0.8	4.7		5.5	6.1	<11.2	<0.6	<1
						AAA2686R	<1.4	1.4	37.2	<0.2	1	3.4	<0.02	<2.8	5.5	<11.2	<0.6	<1
50-6550	0	0.5		486386.6	1768845	AAA3229	<1	1.2	58	0.54	<0.4	4.1	<0.1	3.2	11	<0.04	0.2	<0.04
						AAA3229R							<0.1					
						AAA3229R2							<0.1					
50-6551	0	0.5		486392.3	1768836	AAA3228	<1	2.4	130	0.96	<0.4	8	<0.1	6.5	16	<0.04	0.3	0.08
						AAA3228R							<0.1					
						AAA3228R2							<0.1					
50-6551	1.5	2.5		486392.3	1768836	AAA3218	<1	1.4	54	0.6	<0.4	3.8	<0.1	4	7.4	<0.04	<0.2	<0.04
						AAA3218R							<0.1					
						AAA3218R2							<0.1					
50-6551	3	4		486392.3	1768836	AAA3212	<1	1	47	0.6	<0.4	4	<0.1	4.3	10	<0.04	<0.2	<0.04
						AAA3212R							<0.1					
						AAA3212R2							<0.1					

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6552	0	0.5		486415.8	1768846	AAA3219	<1	1.5	55	0.57	<0.4	5	0.2	3.6	12	<0.04	<0.2	<0.04
						AAA3219R							0.2					
						AAA3219R2							<0.1					
50-6552	3	4		486415.8	1768846	AAA3216	<1	1.7	50	0.66	<0.4	4.2	<0.1	6.7	8	<0.04	<0.2	<0.04
						AAA3216R							<0.1					
						AAA3216R2							<0.1					
50-6553	0	0.5		486415.7	1768839	AAA3215	<1	1.1	47	0.52	<0.4	2.9	<0.1	3.2	9	<0.04	<0.2	<0.04
						AAA3215R							<0.1					
						AAA3215R2							<0.1					
50-6554	0	0.5		486457.2	1768848	AAA3205	<1	2	94	0.81	<0.4	5.7	<0.1	6.1	22	<0.04	<0.2	0.09
						AAA3205R							<0.1					
						AAA3205R2							<0.1					
50-6554	1.5	2.5		486457.2	1768848	AAA3210	<1	0.8	41	0.55	<0.4	2.6	<0.1	2.7	5	<0.04	<0.2	<0.04
						AAA3210R							<0.1					
						AAA3210R2							<0.1					
50-6554	3	4		486457.2	1768848	AAA3209	<1	1.2	40	0.57	<0.4	3.6	<0.1	3	4.6	<0.04	<0.2	<0.04
						AAA3209R							<0.1					
						AAA3209R2							<0.1					

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6555	0	0.5		486456.4	1768840	AAA3203	<1	2.3	95	0.8	<0.4	6.6	<0.1	6	16	<0.04	<0.2	0.05
						AAA3203R							<0.1					
						AAA3203R2							<0.1					
50-6556	0	0.5		486457.6	1768835	AAA3213	<1	0.8	55	0.84	<0.4	4	<0.1	5	12	<0.04	<0.2	<0.04
						AAA3213R							<0.1					
						AAA3213R2							<0.1					
50-6556	1.5	2.5		486457.6	1768835	AAA3217	<1	1.1	34	0.6	<0.4	3	<0.1	4	7	<0.04	<0.2	<0.04
						AAA3217R							<0.1					
						AAA3217R2							<0.1					
50-6557	0	0.5		486477.5	1768853	AAA3223	<1	1.6	80	0.7	<0.4	4.1	<0.1	4	18	<0.04	<0.2	0.04
						AAA3223R							<0.1					
						AAA3223R2							<0.1					
50-6557	1.5	2.5		486477.5	1768853	AAA3224	<1	1.3	68	0.69	<0.4	3.9	<0.1	4	8	<0.04	<0.2	0.11
						AAA3224R	<1		66	0.76	<0.4	4.2	<0.1	3	6			
						AAA3224R2							<0.1					
50-6557	3	4		486477.5	1768853	AAA3208	2	0.8	29	0.78	0.4	3.1	<0.1	5.3	<4	<0.04	<0.2	0.05
						AAA3208R							<0.1					
						AAA3208R2							<0.1					

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6558	0	0.5		486484.2	1768850	AAA3225	<1	0.9	39	0.37	<0.4	5.1	<0.1	4	8	<0.04	<0.2	<0.04
						AAA3225R							<0.1					
						AAA3225R2							<0.1					
50-6558	1.5	2.5		486484.2	1768850	AAA3201	<1	1	27	0.29	<0.4	5.3	<0.1	7	8	<0.04	<0.2	<0.04
						AAA3201R							<0.1					
						AAA3201R2							<0.1					
50-6558	3	4		486484.2	1768850	AAA3202	<1	1.8	41	0.62	<0.4	4.1	<0.1	3.8	12	<0.04	<0.2	<0.04
						AAA3202R							<0.1					
						AAA3202R2							<0.1					
50-6559	0	0.5		486486.6	1768847	AAA3211	<1	1.8	65	0.56	<0.4	4.3	<0.1	5	13	<0.04	<0.2	0.06
						AAA3211R		1.8					<0.1			<0.04	<0.2	0.06
						AAA3211R2							<0.1					
50-6560	0	0.5		486512.2	1768853	AAA3206	<1	3	120	0.77	0.5	5.5	<0.1	5.8	19	0.53	0.5	0.55
						AAA3206R		2.8					<0.1			<0.04	<0.2	0.02
						AAA3206R2							<0.1					
50-6561	0	0.5		486511.3	1768846	AAA3207	<1	2.3	87	0.83	0.6	7.1	0.1	6.3	16	0.47	0.5	0.52
						AAA3207R							0.1					
						AAA3207R2							<0.1					

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6562	0	0.5		486460.1	1768830	AAA3214	1	1	17	0.63	0.4	1.7	<0.1	2.6	12	0.48	0.4	0.45
						AAA3214R							<0.1					
						AAA3214R2							<0.1					
50-6563	0	0.5		486620.5	1768823	AAA3200	<1	2	48	0.51	<0.4	5.4	<0.1	6	8	0.5	0.6	0.45
						AAA3200R							<0.1					
						AAA3200R2							<0.1					
50-6564	0	0.5		486736.3	1768800	AAA3204	<1	1.1	40	0.35	0.4	5.3	<0.1	4	11	0.52	0.5	0.55
						AAA3204R							<0.1					
						AAA3204R2							<0.1					
50-6565	1.5	2.5		486445	1768839	AAA3220	<1	4	77	0.62	<0.5	5	<0.1	3	16.2	<0.24	<0.2	0.15
						AAA3220R	<1	3.6	89	0.7	<0.5	6	<0.1	4	14.5	<0.24	<0.2	0.17
						AAA3220R2							<0.1					
50-6565	0	0.5		486445	1768839	AAA3221	<1	1.6	64	0.41	<0.5	2.8	<0.1	2.7	6.4	<0.24	<0.2	<0.12
						AAA3221R							<0.1					
						AAA3221R2							<0.1					
50-6565	3	4		486445	1768839	AAA3226	<1	2.3	60	0.48	<0.5	3	<0.1	<2	14	<0.24	<0.2	0.3
						AAA3226R							<0.1					
						AAA3226R2							<0.1					

TABLE C-4 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6566	0	0.5		486447.7	1768840	AAA3230	<1	1.9	48	0.41	<0.5	4	<0.1	2.7	9.2	<0.24	<0.2	<0.12
						AAA3230R							<0.1					
						AAA3230R2							<0.1					
50-6566	1.5	2.5		486447.7	1768840	AAA3231	<1	2.3	44	0.45	<0.5	3	<0.1	<2	10.3	<0.24	<0.2	<0.12
						AAA3231R							<0.1					
						AAA3231R2							<0.1					
50-6566	3	4		486447.7	1768840	AAA3232	<1	1.9	44	0.54	<0.5	4	<0.1	3	6.8	<0.24	<0.2	<0.12
						AAA3232R							<0.1					
						AAA3232R2							<0.1					
50-6567	0	0.5		486448	1768843	AAA3233	<1	1.5	42	0.35	<0.5	3	<0.1	<2	6.3	<0.24	<0.2	<0.12
						AAA3233R							<0.1					
						AAA3233R2							<0.1					
50-6567	1.5	2.5		486448	1768843	AAA3234	<1	2.7	53	0.62	<0.5	5	<0.1	<2	9.3	<0.24	<0.2	<0.12
						AAA3234R							<0.1					
						AAA3234R2							<0.1					
50-6567	3	4		486448	1768843	AAA3235	<1	1.3	19	0.41	<0.5	2	<0.1	<2	5.5	<0.24	<0.2	<0.12
						AAA3235R							<0.1					
						AAA3235R2							<0.1					

TABLE C-4 (concluded)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Silver	Arsenic	Barium	Beryllium	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Selenium	Thallium
50-6568	0	0.5		486442.2	1768842	AAA3236	<1	4.7	93	0.62	<0.5	7	<0.1	5	23.6	<0.24	<0.2	0.29
						AAA3236R							<0.1					
						AAA3236R2							<0.1					
50-6568	1.5	2.5		486442.2	1768842	AAA3237	<1	3.1	70	0.6	<0.5	5	<0.1	4	8.6	<0.24	<0.2	<0.12
						AAAA3237R							<0.1					
						AAA3237R2							<0.1					
50-6568	3	4		486442.2	1768842	AAA3238	<1	2	44	0.51	<0.5	3	<0.1	<2	6.7	<0.24	<0.2	<0.12
						AAA3238R							<0.1					
						AAA3238R2							<0.1					
						SOIL SAL	**400**		**5600**		**39**		**24**	**1600**	**500**	**32**	**400**	**6.4**
						BACKGROUND UTL FOR SOIL		11.6	1140	3.31	2.7	34.2	0.1	26.7	39	2.5	1.7	0.9

TABLE C-5
TEN SITE CANYON (ORGANICS)

Location ID	Begin Depth	End Depth	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-6500	0	0.5		486115.2	1768803	AAA2519	Acetone	0.0370	8000.00	
50-6501	0	0.5		486119.9	1768816	AAA2520	Acetone	0.0440	8000.00	
						AAA2520	Aroclor 1260	0.0560	1.0	
50-6502	0	0.5		486142.2	1768823	AAA2521	Acetone	0.0280	8000.00	
						AAA2523	Acetone	0.0320	8000.00	
	3	4	FD	486142.2	1768823	AAA2719	Acetone	0.0270	8000.00	
50-6503	3	4		486141.3	1768811	AAA2720	Acetone	0.0820	8000.00	
50-6504	0	0.5		486144.8	1768799	AAA2523	Aroclor 1260	0.1200	1.0	
50-6505	0	0.5		486229.9	1768827	AAA2524	Acetone	0.0490	8000.00	
50-6506	0	0.5		486239.1	1768817	AAA2525	Acetone	0.0560	8000.00	
	3	4		486239.1	1768817	AAA2722	Acetone	0.0420	8000.00	
50-6507	0	0.5		486244.6	1768814	AAA2526	Acetone	0.0440	8000.00	
50-6508	0	0.5		486320.5	1768857	AAA2527	Aroclor 1260	0.0540	1.0	
	3	4		486320.5	1768857	AAA2723	Butylbenzene [tert-]	0.0090	NA	
						AAA2723	Isopropyltoluene [4-]	0.0350	NA	
50-6509	0	0.5		486327.3	1768843	AAA2528	Benzo[a]pyrene	0.6700	0.10	*
						AAA2528	Benzo[a]anthracene	0.4400	1.00	
						AAA2528	Pyrene	1.2000	2400.00	
						AAA2528	Benzo[b]fluoranthene	0.8700	1.00	
						AAA2528	Fluoranthene	1.0000	3200.00	
						AAA2528	Chrysene	0.7200	96.00	

TABLE C-5 (continued)

Location ID	Begin Depth	End Depth	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-6511	0	0.5		486430.8	1768856	AAA2530	Di-n-butyl phthalate	0.7900	8000.00	
						AAA2530	Bis(2-ethylhexyl)phthalate	0.5100	50.00	
	1.5	2.5		486430.8	1768856	AAA2709	Di-n-butyl phthalate	1.3000	8000.00	
50-6512	0	0.5		486444.6	1768841	AAA2531	Aroclor 1254	6.0000	1.0	*
	1.5	2.5		486444.6	1768841	AAA3227	Bis(2-ethylhexyl)phthalate	0.5600	50.00	
50-6513	0	0.5		486447.6	1768835	AAA2532	Di-n-butyl phthalate	1.8000	8000.00	
50-6515	0	0.5		486538.6	1768848	AAA2534	Di-n-butyl phthalate	2.5000	8000.00	
50-6516	0	0.5		486539.8	1768841	AAA2535	Di-n-butyl phthalate	0.8500	8000.00	
						AAA2535	Aroclor 1260	0.0590	1.0	
50-6517	0	0.5		486625.9	1768822	AAA2536	Di-n-butyl phthalate	0.4600	8000.00	
						AAA2536	Aroclor 1260	0.0540	1.0	
	3	4		486625.9	1768822	AAA2711	Di-n-butyl phthalate	0.5800	8000.00	
50-6518	0	0.5		486623.8	1768811	AAA2537	Di-n-butyl phthalate	0.4200	8000.00	
50-6519	0	0.5		486621.5	1768803	AAA2538	Di-n-butyl phthalate	2.6000	8000.00	
50-6520	0	0.5		486723.6	1768807	AAA2539	Di-n-butyl phthalate	2.4000	8000.00	
	1.5	2.5		486723.6	1768807	AAA2710	Di-n-butyl phthalate	3.0000	8000.00	
	3	4		486723.6	1768807	AAA2713	Benzo[a]pyrene	0.5300	0.10	*
						AAA2713	Benzo[a]anthracene	0.6800	1.00	
						AAA2713	Acenaphthene	0.5100	4800.00	
						AAA2713	Di-n-butyl phthalate	2.7000	8000.00	
						AAA2713	Phenanthrene	3.1000	NA	
						AAA2713	Fluorene	0.4700	3200.00	
						AAA2713	Anthracene	0.9000	24000.00	

TABLE C-5 (continued)

Location ID	Begin Depth	End Depth	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-6520	3	4		486723.6	1768807	AAA2713	Pyrene	2.0000	2400.00	
						AAA2713	Benzo[b]fluoranthene	0.4400	1.00	
						AAA2713	Fluoranthene	2.4000	3200.00	
						AAA2713	Benzo[k]fluoranthene	0.5300	1.00	
						AAA2713	Chrysene	0.7200	96.00	
50-6521	0	0.5		486725.9	1768798	AAA2540	Di-n-butyl phthalate	2.5000	8000.00	
50-6522	0	0.5		486726.2	1768790	AAA2637	Benzo[a]pyrene	0.4100	0.10	*
						AAA2637	Benzo[a]anthracene	0.3700	1.00	
						AAA2637	Phenanthrene	0.3900	NA	
						AAA2637	Pyrene	0.7500	2400.00	
						AAA2637	Benzo[g,h,i]perylene	0.3700	NA	
						AAA2637	Benzo[b]fluoranthene	0.3800	1.00	
						AAA2637	Fluoranthene	1.0000	3200.00	
						AAA2637	Benzo[k]fluoranthene	0.3600	1.00	
						AAA2637	Chrysene	0.4900	96.00	
						AAA2637	Aroclor 1260	0.0760	1.0	
	1.5	2.5		486726.2	1768790	AAA2707	Di-n-butyl phthalate	0.4400	8000.00	
50-6523	0	0.5		486812.8	1768847	AAA2638	Di-n-butyl phthalate	1.9000	8000.00	
						AAA2638	Pyrene	0.4500	2400.00	
						AAA2638	Fluoranthene	0.6100	3200.00	
			FD			AAA2680	Di-n-butyl phthalate	0.7400	8000.00	
						AAA2680	Pyrene	0.4700	2400.00	
50-6524	0	0.5		486820.6	1768836	AAA2639	Di-n-butyl phthalate	1.1000	8000.00	

TABLE C-5 (continued)

Location ID	Begin Depth	End Depth	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-6525	0	0.5		486827.1	1768814	AAA2640	Di-n-butyl phthalate	1.1000	8000.00	
						AAA2643	Di-n-butyl phthalate	1.5000	8000.00	
50-6528	0	0.5		486914.1	1768771	AAA2643	Fluoranthene	0.4500	3200.00	
50-6529	0	0.5		487012.2	1768800	AAA2644	Di-n-butyl phthalate	1.1000	8000.00	
	1.5	2.5		487012.2	1768800	AAA2683	Di-n-butyl phthalate	0.4000	8000.00	
50-6530	0	0.5		487017.9	1768789	AAA2645	Di-n-butyl phthalate	0.8800	8000.00	
50-6531	0	0.5		487024.3	1768770	AAA2646	Benzo[a]pyrene	0.5500	0.10	*
						AAA2646	Benzo[a]anthracene	0.5000	1.00	
						AAA2646	Di-n-butyl phthalate	1.5000	8000.00	
						AAA2646	Phenanthrene	0.4400	NA	
						AAA2646	Butyl benzyl phthalate	0.5100	16000.00	
						AAA2646	Pyrene	0.8800	2400.00	
						AAA2646	Benzo[b]fluoranthene	0.5900	1.00	
						AAA2646	Fluoranthene	1.1000	3200.00	
						AAA2646	Benzo[k]fluoranthene	0.5300	1.00	
						AAA2646	Chrysene	0.6000	96.00	
	1.5	2.5		487024.3	1768770	AAA2705	Di-n-butyl phthalate	2.0000	8000.00	
	3	4		487024.3	1768770	AAA2706	Di-n-butyl phthalate	1.9000	8000.00	
50-6532	0	0.5		487112.5	1768774	AAA2647	Benzo[a]pyrene	1.2000	0.10	*
						AAA2647	Benzo[a]anthracene	1.1000	1.00	*
						AAA2647	Di-n-butyl phthalate	0.7200	8000.00	
						AAA2647	Phenanthrene	1.1000	NA	
						AAA2647	Pyrene	2.4000	2400.00	

TABLE C-5 (continued)

Location ID	Begin Depth	End Depth	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-6532	0	0.5		487112.5	1768774	AAA2647	Benzo[g,h,i]perylene	0.6600	NA	
						AAA2647	Indeno[1,2,3-cd]pyrene	0.6600	1.00	
						AAA2647	Benzo[b]fluoranthene	1.1000	1.00	*
						AAA2647	Fluoranthene	1.9000	3200.00	
						AAA2647	Benzo[k]fluoranthene	1.1300	1.00	*
						AAA2647	Chrysene	1.4000	96.00	
50-6533	0	0.5		487117.4	1768762	AAA2648	Di-n-butyl phthalate	0.4400	8000.00	
	1.5	2.5		487117.4	1768762	AAA2681	Di-n-butyl phthalate	0.5400	8000.00	
50-6534	0	0.5		487121.6	1768751	AAA2649	Di-n-butyl phthalate	1.8000	8000.00	
						AAA2649	Pyrene	0.5300	2400.00	
50-6535	0	0.5		487201.9	1768800	AAA2650	Pyrene	0.5400	2400.00	
						AAA2650	Fluoranthene	0.4800	3200.00	
50-6536	1.5	2.5		487207.8	1768791	AAA2661	Benzo[a]pyrene	0.6000	0.10	*
						AAA2661	Benzo[a]anthracene	0.4600	1.00	
						AAA2661	Phenanthrene	0.5000	NA	
						AAA2661	Pyrene	1.2000	2400.00	
						AAA2661	Benzo[b]fluoranthene	0.6600	1.00	
						AAA2661	Fluoranthene	1.0000	3200.00	
						AAA2661	Chrysene	0.5400	96.00	
50-6538	3	4		487306.8	1768799	AAA2666	Acetone	0.0250	8000.00	
50-6540	0	0.5		487305	1768772	AAA2655	Acetone	0.0410	8000.00	
50-6550	0	0.5		486386.6	1768845	AAA3229	Benzo[a]pyrene	0.5400	0.10	*
						AAA3229	Phenanthrene	0.4600	NA	

TABLE C-5 (continued)

Location ID	Begin Depth	End Depth	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-6550	0	0.5		486386.6	1768845	AAA3229	Pyrene	0.9500	2400.00	
						AAA3229	Benzo[b]fluoranthene	0.4200	1.00	
						AAA3229	Fluoranthene	1.0000	3200.00	
						AAA3229	Benzo[k]fluoranthene	0.4400	1.00	
						AAA3229	Chrysene	0.6500	96.00	
50-6551	0	0.5		486392.3	1768836	AAA3228	Acetone	0.0240	8000.00	
	1.5	2.5		486392.3	1768836	AAA3218	Acetone	0.0140	8000.00	
50-6552	0	0.5		486415.8	1768846	AAA3219	Acetone	0.0110	8000.00	
						AAA3219	Aroclor 1260	0.7800	1.0	
	3	4		486415.8	1768846	AAA3216	Aroclor 1260	0.1200	1.0	
50-6553	0	0.5		486415.7	1768839	AAA3215	Pyrene	0.3900	2400.00	
						AAA3215	Fluoranthene	0.3700	3200.00	
						AAA3215	Aroclor 1260	0.1160	1.0	
50-6554	0	0.5		486457.2	1768848	AAA3205	Acetone	0.0340	8000.00	
						AAA3205	Aroclor 1260	0.2300	1.0	
50-6555	0	0.5		486456.4	1768840	AAA3203	Acetone	0.0150	8000.00	
						AAA3203	Aroclor 1260	0.3500	1.0	
50-6556	0	0.5		486457.6	1768835	AAA3213	Acetone	0.0220	8000.00	
						AAA3213	Toluene	0.0220	910.00	
						AAA3213	Aroclor 1260	0.7500	1.0	
	1.5	2.5		486457.6	1768835	AAA3217	Aroclor 1260	0.2570	1.0	
50-6557	0	0.5		486477.5	1768853	AAA3223	Aroclor 1260	0.2000	1.0	
50-6558	0	0.5		486484.2	1768850	AAA3225	Acetone	0.0110	8000.00	

TABLE C-5 (continued)

Location ID	Begin Depth	End Depth	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-6559	0	0.5		486486.6	1768847	AAA3211	Acetone	0.0270	8000.00	
						AAA3211	Toluene	0.0160	910.00	
						AAA3211	Aroclor 1260	0.8000	1.0	
50-6560	0	0.5		486512.2	1768853	AAA3206	Fluoranthene	0.4200	3200.00	
						AAA3206	Aroclor 1260	0.1100	1.0	
50-6561	0	0.5		486511.3	1768846	AAA3207	Benzo[a]pyrene	0.3700	0.10	*
						AAA3207	Phenanthrene	0.6100	NA	
						AAA3207	Pyrene	0.8600	2400.00	
						AAA3207	Fluoranthene	0.7800	3200.00	
						AAA3207	Chrysene	0.4000	96.00	
						AAA3207	Aroclor 1260	1.5200	1.0	*
50-6562	0	0.5		486460.1	1768830	AAA3214	Acetone	0.0190	8000.00	
50-6563	0	0.5		486620.5	1768823	AAA3200	Benzo[a]pyrene	0.5900	0.10	*
						AAA3200	Benzo[a]anthracene	0.4800	1.00	
						AAA3200	Bis(2-ethylhexyl)phthalate	0.4700	50.00	
						AAA3200	Pyrene	0.9500	2400.00	
						AAA3200	Benzo[g,h,i]perylene	0.4300	NA	
						AAA3200	Indeno[1,2,3-cd]pyrene	0.4100	1.00	
						AAA3200	Benzo[b]fluoranthene	0.4300	1.00	
						AAA3200	Fluoranthene	1.2000	3200.00	
						AAA3200	Benzo[k]fluoranthene	0.6400	1.00	
						AAA3200	Chrysene	0.7100	96.00	
						AAA3200	Hexanone [2-]	0.0140	NA	

TABLE C-5 (concluded)

Location ID	Begin Depth	End Depth	Field Sample Code	X-Coordinate	Y-Coordinate	Sample ID	Analyte	Sample Value	Soil SAL	* If Above SAL
50-6563	0	0.5		486620.5	1768823	AAA3200	Aroclor 1260	0.1200	1.0	
50-6564	0	0.5		486736.3	1768800	AAA3204	Acetone	0.0150	8000.00	
50-6566	0	0.5		486447.7	1768840	AAA3230	Benzo[a]pyrene	1.1000	0.10	*
						AAA3230	Benzo[a]anthracene	0.9100	1.00	
						AAA3230	Phenanthrene	1.0000	NA	
						AAA3230	Pyrene	2.0000	2400.00	
						AAA3230	Benzo[g,h,i]perylene	0.5300	NA	
						AAA3230	Indeno[1,2,3-cd]pyrene	0.6300	1.00	
						AAA3230	Benzo[b]fluoranthene	1.5000	1.00	*
						AAA3230	Fluoranthene	1.9000	3200.00	
						AAA3230	Benzo[k]fluoranthene	0.4800	1.00	
						AAA3230	Chrysene	1.1000	96.00	
	1.5	2.5		486447.7	1768840	AAA3231	Bis(2-ethylhexyl)phthalate	1.1000	50.00	

TABLE C-6

TEN SITE CANYON (RADIONUCLIDES)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6500	0	0.5		486115.2	1768803	AAA2519		<0.27	<0.39	36.9	0.03	0.05	1.51	<0.02	2.16	1.12	0.04	1.11	0.0696
						AAA2519R													0.0726
50-6501	0	0.5		486119.9	1768816	AAA2520		<0.44	<0.49	20.8	0.01	0.06	<1.59	0.34	<2.66	1.38	0.06	1.39	0.0390
						AAA2520R					0	0.03							
50-6502	0	0.5		486142.2	1768823	AAA2521		<0.47	0.46	34.1	0.01	0.02	<1.67	<0.35	2.75	1.16	0.09	1.23	0.0269
	3	4	FD			AAA2719		<0.38	<0.27	35.5	0.06	1.42	<1.77	0.24	2.59	2.17	0.12	2.03	0.1235
	3	4				AAA2721		<0.48	<0.54	35.9	0.05	1.45	1.23	0.25	4.01	1.51	0.1	1.63	0.0953
50-6503	0	0.5		486141.3	1768811	AAA2522		<0.23	<0.4	23.4	0.07	0.19	2.4	0.18	<2.34	1.04	0.06	1.17	0.0519
	1.5	2.5				AAA2715		<0.55	<0.35	23.1	0.01	0.02	2.22	0.39	3.72	1.25	0.07	1.27	0.0969
						AAA2715R					0.01	0.02				1.22	0.06	1.24	
	3	4				AAA2720		<0.34	<0.64	26.6	0.01	0.01	3.09	0.22	<3.36	1.22	0.1	1.28	0.1986
50-6504	0	0.5		486144.8	1768799	AAA2523		<0.43	0.51	25.4	1.14	3.83	<1.54	0.11	2.7	1.69	0.08	1.63	0.1170
50-6505	0	0.5		486229.9	1768827	AAA2524		<0.43	<0.43	38.2	0.01	0.02	<1.61	<0.02	<2.67	1.36	0.08	1.4	0.0199
50-6506	0	0.5		486239.1	1768817	AAA2525		<0.26	<0.58	26.7	0.07	0.04	<1.27	<0.44	1.9	0.65	0.02	0.63	0.0322
	1.5	2.5				AAA2716		<0.32	<0.59	32.8	0.27	0.28	<1.67	0.25	<2.87	1.02	0.06	0.96	0.0878
	3	4				AAA2722		<0.32	<0.42	22.4	0.04	0.04	3.1	0.17	<2.43	1.27	0.12	1.18	0.1407

TABLE C-6 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6507	0	0.5		486244.6	1768814	AAA2526		<0.65	0.34	24.3	0.61	0.54	1.66	0.21	**5.21**	1.39	0.05	1.29	0.1100
	0	0.5	FD			AAA2687		<0.32	<0.34	32.7	0.39	0.42	2.09	<0.39	<2.6	1.34	0.09	1.43	0.1454
	1.5	2.5				AAA2717		<0.45	<0.29	32.2	0.09	0.05	1.75	<0.58	2.15	1.32	0.01	1.5	0.0848
						AAA2717R		<0.34	<0.36	36.14			<1.78		<2.29				
	1.5	2.5	FD			AAA2718		<0.44	<0.28	33.7	0.1	0.05	3.14	0.48	2.72	1.27	0.04	1.33	0.0806
						AAA2718R										1.21	0.07	1.22	
50-6508	0	0.5		486320.5	1768857	AAA2527		<0.31	0.72	26.7	1.67	0.75	<1.81	0.82	4.08	1.51	0.1	1.68	0.1765
	1.5	2.5				AAA2688		<0.41	<0.28	30.6	1.73	1.07	<1.94	0.56	2.35	1.29	0.07	1.37	0.4193
	3	4				AAA2723		<0.49	<0.72	26.3	6.02	2.21	<1.52	2.11	<2.39	1.64	0.09	1.6	0.5552
50-6509	0	0.5		486327.3	1768843	AAA2528		<0.47	0.6	47.3	0.14	0.07	<1.66	0.13	3	1.22	0.08	1.07	0.0464
						AAA2528R		<0.4	<0.55	37.73			<1.56		<2.06				
50-6510	0	0.5		486324	1768838	AAA2529		<0.44	1.27	25.4	2.95	2.42	1.77	1.17	<2.87	2.39	0.1	2.72	0.7323
						AAA2529R								1.34					
50-6511	0	0.5		486430.8	1768856	AAA2530		<0.23	<0.48	24.46	0.01	0.36	<1.59	0.43	<2.72	1.87	0.15	1.84	0.0615
	1.5	2.5				AAA2709		<0.52	<0.46	19.02	0.01	0.04	2.34	<0.08	<2.95	1.35	0.08	1.18	0.0307
50-6512	0	0.5		486444.6	1768841	AAA2531		0.64	**68.86**	<1	**5190**	**453**	2.42	**50.7**	<0.16	5.3	0.19	2.67	19.1235
50-6512	1.5	2.5				AAA3227	0.74	<0.25	1.42	<26	18.67	2.1	<2	1	<2.68	1.78	0.09	1.58	0.0989
	3	4				AAA3222	0.79	<0.53	<0.6	<24.7	11.81	2.86	1.65	1.16	4.17	1.37	0.13	1.5	0.4088
50-6513	0	0.5		486447.6	1768835	AAA2532		<0.74	1.73	30.33	0.08	3.99	<1.78	0.54	3.41	2.27	0.11	2.7	0.0678

TABLE C-6 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6514	0	0.5		486536.7	1768855	AAA2533		<0.06	2.35	<0.98	19.55	3.66	<0.26	**57.7**	<0.15	1.59	0.08	1.36	1.5011
	1.5	2.5				AAA3240	0.14	<0.44	<0.74	28.94	2.28	0.41	<2.15	0.45	**6.52**	1.36	0.14	1.19	0.0474
	3	4				AAA3241	0.08	<0.5	<0.54	<25.1	1.52	0.24	3.08	0.27	<3.57	1.26	0.06	1.24	0.0346
50-6515	0	0.5		486538.6	1768848	AAA2534		<0.3	<0.55	33.02	1.26	0.23	<1.62	0.16	<3.21	0.88	0.07	0.66	0.0352
50-6516	0	0.5		486539.8	1768841	AAA2535		<0.5	2.18	35.18	15.07	3.67	<1.95	0.93	2.87	1.65	0.1	1.77	0.1877
50-6517	0	0.5		486625.9	1768822	AAA2536		<0.62	<0.75	25.93	8.74	2.14	<1.81	0.16	<2.97	2.06	0.16	2.53	0.2616
	3	4				AAA2711		<0.71	0.59	39.4	0.6	0.11	3.43	0.32	<2.64	1.26	0.11	1.35	0.0882
50-6518	0	0.5		486623.8	1768811	AAA2537		<0.5	0.91	35.31	8.16	1.45	<1.62	0.54	<2.87	0.91	0.08	0.73	0.0760
	1.5	2.5				AAA2708		<0.57	<0.46	28.64	1.65	0.5	<1.53	<0.39	<2.55	0.72	0.03	0.82	0.0340
						AAA2708R					1.7	0.49				0.75	0.06	0.86	
	3	4				AAA2714		<0.57	0.84	17.66	2.57	0.74	1.35	0.08	<2.91	0.81	0.05	0.77	0.0667
50-6519	0	0.5		486621.5	1768803	AAA2538		<0.61	1.25	24.29	7.49	1.83	3.66	0.16	4.36	1.5	0.07	1.45	0.1078
50-6520	0	0.5		486723.6	1768807	AAA2539		<0.25	0.79	13.75	4.46	0.75	<1.68	0.3	<2.3	1.1	0.08	1.15	0.0644
						AAA2539R					4.52	0.88							
	1.5	2.5				AAA2710		0.5	<0.42	25.19	2.69	1.22	<1.52	<0.29	2.35	1.09	0.08	1.05	0.0638
	3	4				AAA2713		<0.48	<0.34	25.19	0.42	0.11	1.09	<0.1	<2.38	1.49	0.08	1.5	0.0308
50-6521	0	0.5		486725.9	1768798	AAA2540		<0.27	<0.55	23.14	0.65	0.17	<1.37	0.07	1.67	0.62	0.04	0.72	0.0401
50-6522	0	0.5		486726.2	1768790	AAA2637		<0.54	<0.57	36.92	3.68	0.73	<1.63	<0.3	3.68	1.41	0.06	1.38	0.0805
						AAA2637R										1.54	0.05	1.43	

TABLE C-6 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6522	1.5	2.5		486726.2	1768790	AAA2707		<0.31	<0.52	36.39	1.16	0.29	<1.7	0.38	3.25	1.78	0.11	1.76	0.0646
	3	4				AAA2712		<0.6	<0.63	30.17	0.17	0.05	<1.77	0.3	2.34	1.59	0.08	1.68	0.0598
						AAA2712R								<0.26					
50-6523	0	0.5		486812.8	1768847	AAA2638		<0.31	1.34	23.71	5.91	1.72	<2.12	<0.3	<3.11	1.84	0.1	1.94	0.2067
	0	0.5	FD			AAA2680		<0.51	1.63	24.49	5.31	1.55	2.75	<0.55	2.84	2.06	0.13	2.53	0.1032
50-6524	0	0.5		486820.6	1768836	AAA2639		<0.45	<0.51	34.97	0.66	0.17	<1.53	<0.52	<2.57	0.6	0.06	0.7	0.0207
50-6525	0	0.5		486827.1	1768814	AAA2640		<0.26	1.22	21.84	0.03	0.96	<1.71	<0.06	<3.04	2.47	0.26	3.01	0.0853
50-6526	0	0.5		486915.4	1768807	AAA2641		<0.28	0.77	35.25	0.03	0.43	1.1	0.44	<2.21	2.3	0.15	2.53	0.0397
						AAA2641R		<0.56	<0.64	31.3	0.04	0.72	<1.72		2.71				
50-6527	0	0.5		486915.7	1768785	AAA2642		<0.4	<0.51	19.21	0.32	0.08	<1.52	0.38	<2.59	0.92	0.07	0.94	0.0082
50-6528	0	0.5		486914.1	1768771	AAA2643		<0.65	<0.62	25.61	1.82	0.77	<1.83	<0.57	<3.83	1.53	0.07	1.68	0.0494
	1.5	2.5				AAA2682		<0.32	1.23	22.4	7.05	1.91	2.8	<0.69	2.77	1.88	0.08	2.21	0.1012
	3	4				AAA2685		<0.25	<0.67	32.72	0.48	0.12	3.27	<0.26	2.07	1.38	0.07	1.39	0.0385
50-6529	0	0.5		487012.2	1768800	AAA2644		<0.24	0.65	34.47	0.05	9.26	2.29	<0.43	<2.81	2.47	0.18	2.75	0.0617
	1.5	2.5				AAA2683		<0.29	<0.44	33.44	0.05	0.04	2.42	<0.2	2.74	1.72	0.15	1.65	0.0325
	3	4				AAA2684		<0.33	<0.26	28.71	0.06	0.02	<1.54	<0.44	2.32	1.55	0.04	1.61	0.0445
50-6530	0	0.5		487017.9	1768789	AAA2645		<0.43	0.77	22.93	4.75	0.75	<1.75	<0.39	2.05	0.81	0.08	0.93	0.0332
50-6531	0	0.5		487024.3	1768770	AAA2646		<0.34	<0.63	24.53	2.75	0.88	<1.6	<0.56	2.4	1.4	0.07	1.33	0.0579
	1.5	2.5				AAA2705		<0.6	<0.6	31.18	0.32	0.2	<1.89	<0.22	3.35	1.58	0.1	1.66	0.0414
	3	4				AAA2706		<0.27	<0.32	26.91	0.07	0.05	2.45	<0.38	<3.27	1.3	0.15	1.37	0.0660

TABLE C-6 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6532	0	0.5		487112.5	1768774	AAA2647		<0.3	1.08	27.29	16.81	2.18	<1.62	<0.4	2.35	1.73	0.07	1.74	0.1385
50-6533	0	0.5		487117.4	1768762	AAA2648		<0.23	<0.27	21.05	0.3	0.23	<1.71	<0.41	<2.34	0.94	0.07	0.99	0.0144
	1.5	2.5				AAA2681		<0.4	<0.58	32.69	0.27	2.26	2.89	<0.26	<3.45	1.23	0.04	1.68	0.0501
	3	4				AAA2686		<0.35	<0.25	22.61	0.31	0.23	<1.61	<0.62	<2.31	0.65	0.02	0.72	0.0198
						AAA2686R		<0.1	<0.52	30.9			<1.53	<0.47	2.54				
50-6534	0	0.5		487121.6	1768751	AAA2649		<0.6	1.1	22.25	1.5	0.73	<1.75	<0.45	2.86	1.69	0.07	2.02	0.0650
50-6535	0	0.5		487201.9	1768800	AAA2650		<0.58	0.9	17.75	5.44	1.33	<1.83	0.06	3.33	1.61	0.06	1.65	0.1979
						AAA2650R		<0.42	<0.7	30.55			3.01		2.27				
	1.5	2.5				AAA2659		<0.56	1.56	40.68	8.22	2.29	<2.38	0.36	<3.37	1.98	0.16	2.21	0.0794
	3	4				AAA2660		<0.19	<0.66	45.31	0.99	0.31	2.23	0.09	3.86	1.58	0.1	1.61	0.0972
						AAA2660R													0.1361
50-6536	0	0.5		487207.8	1768791	AAA2651		<0.31	1.15	31.78	0.49	0.21	1.5	0.19	3.72	0.84	0.05	0.92	0.0280
	1.5	2.5				AAA2661		<0.41	1.66	45.04	10.74	3.29	<1.9	0	2.87	1.59	0.1	1.62	0.1103
	3	4				AAA2662		<0.32	3.19	36.84	12.03	8.86	1.72	0.47	<3.11	1.39	0.1	1.73	0.3034
50-6537	0	0.5		487219.8	1768782	AAA2652		<0.62	1.31	46.87	0.27	6.95	<1.69	0.09	<2.52	2.43	0.11	2.51	0.1058
						AAA2652R					0.33	0.6							
	1.5	2.5				AAA2663		<0.25	<0.58	30.71	0.02	0.02	1.89	<0.17	<2.71	1.56	0.08	1.38	0.0700
	3	4				AAA2664		<0.51	<0.3	35.41	0.02	0.02	1.33	0.24	2.18	1.59	0.08	1.55	0.0936

TABLE C-6 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6538	0	0.5		487306.8	1768799	AAA2653		<0.48	0.91	37.64	2.11	0.64	2.86	<0.14	<2.96	1.91	0.07	2.19	0.1130
	1.5	2.5				AAA2665		<0.3	<0.56	39.98	0.01	0.01	3.32	0.12	**5.25**	1.82	0.11	1.83	0.0492
	3	4				AAA2666		<0.34	<0.64	26.21	0.01	0	2.03	0.12	3.13	1.44	0.04	1.47	0.0442
50-6539	0	0.5		487306.2	1768785	AAA2654		<0.37	<0.44	35.25	0.62	0.17	<1.49	<0.17	<2.38	0.59	0.06	0.54	0.0278
	1.5	2.5				AAA2667		<0.45	<0.42	36.7	0.77	0.32	2.4	<0.07	3.48	0.94	0.06	1.05	0.0342
	3	4				AAA2668		<0.28	<0.55	38.53	0.49	0.27	1.54	0.05	<2.5	1.07	0.07	0.97	0.0384
50-6540	0	0.5		487305	1768772	AAA2655		<0.45	<0.74	35.29	4.07	1.13	<1.71	<0.02	**5.26**	1.77	0.08	1.71	0.1088
						AAA2655R													0.1390
50-6540	0	0.5	FD	487305	1768772	AAA2677		<0.56	<0.73	27.67	4.08	1.11	2.86	<0.1	3	1.49	0.05	1.61	0.0945
						AAA2677R										1.55	0.08	1.56	
	1.5	2.5				AAA2669		<0.22	<0.53	37.97	1.24	0.37	1.33	<0.18	2.35	1.63	0.12	1.6	0.1112
	1.5	2.5	FD			AAA2678		0.53	<0.45	41.48	1.19	0.37	<2	<0.57	2.82	1.53	0.06	1.5	0.0890
						AAA2678R					1.18	0.37							
	3	4				AAA2670		<0.42	<0.52	52.51	0.09	0.03	2.15	<0.19	<3.41	1.7	0.08	1.48	0.0430
						AAA2670R		<0.51	<0.3	29.43			2.97		2.53				
	3	4	FD			AAA2679		<0.6	<0.61	36.99	0.11	0.06	3.22	<0.16	3.88	1.63	0.06	1.39	0.0587
						AAA2679R								0.08					

TABLE C-6 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6541	0	0.5		487416.5	1768794	AAA2656		<0.43	<0.57	38.74	0.31	0.1	1.67	<0.19	2.96	1.14	0.05	1.16	0.0378
	1.5	2.5				AAA2671		<0.35	<0.52	40.92	0.04	0.03	<1.43	<0.09	2.84	1.3	0.04	1.18	0.0041
	3	4				AAA2672		<0.49	0.61	32.24	0.07	0.07	3.24	<0.12	2.81	1.65	0.08	1.47	<0.00581
50-6542	0	0.5		487419.4	1768781	AAA2657		<0.27	<0.39	26.97	0.47	0.22	1.33	<0.44	<2.14	0.8	0.03	0.71	0.0110
	1.5	2.5				AAA2673		<0.57	<0.6	34.09	1.07	0.31	<1.86	0.04	<2.49	1.54	0.07	1.51	0.0572
	3	4				AAA2674		<0.46	<0.51	24.24	0.26	0.12	2.67	<0.58	<2.2	1.18	0.02	1.17	0.0916
50-6543	0	0.5		487422.3	1768769	AAA2658		<0.67	0.86	32.78	0.02	0.44	2.07	0.41	2.41	2.43	0.09	2.69	0.0762
	1.5	2.5				AAA2675		<0.222	<0.482	43.866	0.006	0.04	1.9471	0.02	3.2795	1.364	0.069	1.566	0.0629
						AAA2675R					0.005	0.025							0.0522
	3	4				AAA2676		<0.166	<0.49	40.74	0.003	0.009	2.1258	<0.38	<2.98	1.283	0.033	1.175	0.1021
						AAA2676R								<0.12					
50-6550	0	0.5		486386.6	1768845	AAA3229	0.11	<0.34	<0.55	29.7	1.13	0.38	1.61	0.19	2.59	1.22	0.06	1.15	0.0440
50-6551	0	0.5		486392.3	1768836	AAA3228	0.1	<0.62	<0.72	25.89	1.09	0.46	4.09	0.02	2.39	1.48	0.1	1.55	0.0956
	1.5	2.5				AAA3218	0.12	<0.45	<0.32	37.57	0.23	0.24	<1.69	<0.2	<2.39	0.99	0.09	0.92	0.0483
	3	4				AAA3212	0.03	<0.21	<0.34	23.57	0.19	0.06	2.43	0.41	<2.17	1.01	0.07	0.87	0.0423
50-6552	0	0.5		486415.8	1768846	AAA3219	2.53	**0.9**	2.84	27.22	**25.99**	8.41	2.95	0.6	<2.53	1.37	0.1	1.27	0.0642
	3	4				AAA3216	0.68	<0.39	0.66	30.87	7.2	1.58	1.54	0.98	**5.07**	1.46	0.1	1.34	0.1246
50-6553	0	0.5		486415.7	1768839	AAA3215	0.36	<0.46	0.79	29.54	5.07	1.15	3.2	<0.05	<2.41	1.06	0.06	1.02	0.0291
						AAA3215R										1.04	0.07	1.14	

TABLE C-6 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6554	0	0.5		486457.2	1768848	AAA3205	0.26	<0.49	1.82	<26.6	1.07	2.65	<2.17	0.27	<2.69	2.59	0.14	3.05	0.1835
						AAA3205R		<0.35	1.63	<21.1			2.43		3.7				
	1.5	2.5				AAA3210	0.01	<0.57	<0.5	32.92	0.05	0.08	2.89	<0.2	2.7	0.98	0.09	1.18	0.0571
	3	4				AAA3209	0.01	<0.49	<0.49	39.41	0.04	0.03	2.81	<0.6	2.43	1.11	0.06	1.31	0.0514
						AAA3209R	0.01				0.03	0.04		<0.59					
50-6555	0	0.5		486456.4	1768840	AAA3203	1.36	<0.52	<0.62	32.61	4.07	5.14	<1.61	0.2	<2.62	2.74	0.12	3.03	0.1604
						AAA3203R													0.1516
50-6556	0	0.5		486457.6	1768835	AAA3213	2.84	1.3	3.59	29.71	2.56	6.91	3.79	<0.17	<2.6	1.91	0.15	2.13	0.4359
	1.5	2.5				AAA3217	0.86	<0.25	1.58	<21.1	6.46	2.69	1.94	0.3	2.95	1.55	0.05	1.32	0.0966
50-6557	0	0.5		486477.5	1768853	AAA3223	0.35	<0.57	1.42	39.19	4.76	1.42	2.82	0.04	<2.31	1.48	0.09	1.96	0.2015
	1.5	2.5				AAA3224	0.06	<0.22	<0.5	34.31	0.8	0.27	2.45	<0.6	<2.27	1.4	0.08	1.25	0.0836
	3	4				AAA3208	0.07	<0.52	<0.3	39.89	1.74	0.23	<1.51	0.32	2.14	1.31	0.09	1.23	0.0516
50-6558	0	0.5		486484.2	1768850	AAA3225	0.17	<0.53	<0.34	29.14	2.45	0.39	<1.55	0.04	<2.01	0.93	0.07	0.9	0.0404
	1.5	2.5				AAA3201	0.08	<0.43	<0.38	<21.7	0.73	0.24	<1.25	<0.06	<2.15	1.03	0.04	1.11	0.0256
	3	4				AAA3202	0.3	<0.24	<0.66	<25.4	4.46	1.37	<1.84	0.55	<2.67	1.57	0.08	1.42	0.1284
						AAA3202R													0.1136
50-6559	0	0.5		486486.6	1768847	AAA3211	0.26	<0.32	0.82	<23.3	2.5	1.2	2.03	<0.43	<2.88	1.6	0.11	1.88	0.2118
50-6560	0	0.5		486512.2	1768853	AAA3206	1.09	<0.4	<0.7	<26	16.94	4.51	1.53	0	<3.05	2.34	0.15	2.96	1.2229
						AAA3206R	1.06				16.77	4.24							

TABLE C-6 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6561	0	0.5		486511.3	1768846	AAA3207	4.17	<0.32	<0.69	<26.2	**67.82**	12.82	1.4	3.11	3.46	1.97	0.07	2.14	1.2640
50-6562	0	0.5		486460.1	1768830	AAA3214	0.05	**0.9**	<0.5	<23.3	0.13	0.49	<1.51	<0.42	<2.39	1.84	0.13	1.86	0.0234
50-6563	0	0.5		486620.5	1768823	AAA3200	3.22	<0.28	<0.6	<24.1	**31.71**	**19.51**	1.83	<0.02	<2.28	1.35	0.08	1.39	0.0587
50-6564	0	0.5		486736.3	1768800	AAA3204	0.05	<0.39	0.26	<20.4	0.53	0.15	2.05	<0.72	<2.59	0.72	0.07	0.72	0.0047
						AAA3204R										3.54	0.21	1.83	
50-6565	0	0.5		486445	1768839	AAA3221	0.69	<0.36	<0.58	28.61	1.67	2.19	3.24	<0.48	<2.43	0.89	0.07	0.84	0.0806
	1.5	2.5				AAA3220	1.83	<0.65	2.07	32.05	16.45	6.8	<1.98	0.41	<2.92	1.87	0.06	2.11	0.3232
						AAA3220R	1.82				15.71	6.9							0.3030
	3	4				AAA3226	1.13	<0.34	2.24	<23.2	13.64	3.53	<1.62	0.63	2.73	1.75	0.06	1.6	0.3742
						AAA3227R													0.0839
50-6566	0	0.5		486447.7	1768840	AAA3230	1.64	<0.56	0.91	<23.3	**37.38**	4.18	1.83	0.22	<2.81	1.48	0.04	1.46	0.0594
	1.5	2.5				AAA3231	1.61	<0.19	<0.69	<25.8	**23.31**	5.65	<1.95	0.85	<3.01	1.53	0.04	1.48	0.0650
	3	4				AAA3232	0.79	<0.58	<0.63	39.95	12.89	2.99	1.74	0.32	4.11	1.56	0.05	1.4	0.0514
50-6567	0	0.5		486448	1768843	AAA3233	0.14	<0.45	<0.66	<21.5	1.82	0.51	1.36	<0.05	<2.47	1.16	0.08	1.08	0.0052
	1.5	2.5				AAA3234	0.64	0.43	<0.8	<23	11.6	2.55	1.78	0.95	<2.71	1.47	0.07	1.36	0.1369
						AAA3234R	0.67				11.91	2.71							
50-6567	3	4				AAA3235	0.31	0.26	<0.7	<20.7	4.87	1.43	2.15	0.07	<2.45	1.58	0.12	1.68	0.0896

TABLE C-6 (continued)

Location ID	Begin Depth (feet)	End Depth (feet)	Field Sample Type Code	X-Coordinate	Y-Coordinate	Sample ID	Am-241	Co-60	Cs-137	K-40	Pu-238	Pu-239	Ra-226	Sr-90	Th-232	U-234	U-235	U-238	Tritium
50-6568	0	0.5		486442.2	1768842	AAA3236	1.43	<0.41	<0.7	<22.2	17.71	5.2	1.71	1.24	<2.69	1.58	0.11	1.33	0.0993
	1.5	2.5				AAA3237	1.04	<0.65	1.76	<24.2	33.87	3.58	3.66	0.62	<3.42	1.44	0.12	1.39	0.4682
						AAA3237R								0.37					
	3	4				AAA3238	0.43	<0.52	1.25	<28	4.62	2.24	1.89	1.33	2.97	1.58	0.06	1.63	0.1431
						AAA3241R		<0.27	<0.56	<26.1			<2.17	0.14	<2.85				
						SOIL SAL	**17**	**0.9**	**4**		**20**	**18**	**5**	**5.9**	**5**	**86**	**18**	**59**	**820**
						BACKGROUND UTL FOR SOIL			1.4		0.014	0.052		1	2.68	2.03	0.088	1.9	

APPENDIX D

PARAMETERS USED IN THE RESRAD PROGRAM

Version 5.6 of the RESRAD program was used to calculate industrial preliminary remediation goals for cobalt 60 and radium 226. Default values were used for all parameters except those listed in Table D-1.

TABLE D-1

USER-SELECTED VALUES FOR PARAMETERS WHERE DEFAULT VALUES WERE NOT USED

Parameter Name	User Input	Parameter Name	User Input
AREA	1.200e+03	THICKO	1.000e+00
LCZPAQ	2.000e+01	BRDL	1.500e+01
T(3)	5.000e-01	T (5)	5.000e+00
T (9)	1.000e+03	T(10)	5.000e+03
S1(1)	1.000e+00	S1(3)	1.000e+00
W1(1)	Not used	W1(3)	Not used
DENSCV	Not used	VCV	Not used
DENSCZ	1.600e+00	HCCZ	4.400e+02
BCZ	4.050e+00	HUMID	Not used
EVAPTR	9.990e-01	PRECIP	4.800e-01
RI	0.000e+00	RUNOFF	5.000e-01
DENSAQ	1.600e+00	TPSZ	3.000e-01
EPSZ	3.000e-01	BSZ	4.050e+00
VWT	3.000e-01	NS	Not used
H(1)	Not used	DENSUZ(1)	Not used
TPUZ(1)	Not used	EPUZ(1)	Not used
BUZ(1)	Not used	HCUZ(1)	Not used
H(2)	Not used	DENSUZ(2)	Not used
TPUZ(2)	Not used	EPUZ(2)	Not used
BUZ(2)	Not used	HCUZ(2)	Not used
INHALR	5.000e+03	LM	2.000e+00
ED	2.500e+01	FIND	0.000e+00

TABLE D-1 (continued)

Parameter Name	User Input	Parameter Name	User Input
FOTD	2.300e-01	RAD_SHAPE (1)	Not used
RAD_SHAPE (2)	Not used	RAD_SHAPE (3)	Not used
RAD_SHAPE (4)	Not used	RAD_SHAPE (5)	Not used
RAD_SHAPE (6)	Not used	RAD_SHAPE (7)	Not used
RAD_SHAPE (8)	Not used	RAD_SHAPE (9)	Not used
RAD_SHAPE (10)	Not used	RAD_SHAPE (11)	Not used
RAD_SHAPE (12)	Not used	FRACA(1)	Not used
FRACA(2)	Not used	FRACA(3)	Not used
FRACA(4)	Not used	FRACA(5)	Not used
FRACA(6)	Not used	FRACA(7)	Not used
FRACA(8)	Not used	FRACA(9)	Not used
FRACA(10)	Not used	FRACA(11)	Not used
FRACA(12)	Not used	DIET(1)	Not used
DIET(2)	Not used	DIET(3)	Not used
DIET(4)	Not used	DIET(5)	Not used
DIET(6)	Not used	SOIL	1.250e+01
DWI	Not used	FDW	Not used
FHHW	0.000e+00	FLW	Not used
FIRW	Not used	FR9	Not used
FPLANT	Not used	FMEAT	Not used
FMILK	Not used	LFI5	Not used
LFI6	Not used	LWI5	Not used
LWI6	Not used	LSI	Not used
MLFD	Not used	DROOT	Not used
FGWHH	Not used	FGWIR	Not used
C12WTR	Not used	C12CZ	Not used
CSOIL	Not used	CAIR	Not used
DMC	Not used	EVSN	Not used
REVSN	Not used	AVFG4	Not used
AVFG5	Not used	STOR_T(1)	Not used

TABLE D-1 (concluded)

Parameter Name	User Input	Parameter Name	User Input
STOR_T(2)	Not used	STOR_T(3)	Not used
STOR_T(5)	Not used	STOR_T(6)	Not used
STOR_T(7)	Not used	STOR_T(8)	Not used
STOR_T(9)	Not used	FLOOR	Not used
DENSFL	Not used	TPCV	Not used
TPFL	Not used	PH2OCV	Not used
PH2OFL	Not used	DIFCV	Not used
DIFFL	Not used	WIND	3.000e+00
REXG	Not used	HRM	Not used
FAI	Not used	DMFL	Not used
EMANA (2)	Not used	STOR_T(4)	Not used

All pathways were inactive, except for the following:

- external gamma,
- inhalation (without radon),
- soil ingestion, and
- radon.